

A MEMORY MODEL OF PRESYMBOLIC UNCONSCIOUS MENTATION

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ABSTRACT

The biological energy concepts used by Freud to account for unconscious mental processes in psychoanalysis are discredited by modern biological findings. As a result, different psychoanalytic schools developed new foundational theories in order to verify unconscious mentation. The present study argues that these theories are unsuccessful for two main reasons. Firstly, replacing Freud's drive energy theory with other equally hypothetical foundational constructs does not solve the problem of finding proof for the existence of unconscious mentation. Secondly, the clinical psychoanalytic definition of unconscious mentation as imaginary, internally generated processes, autonomous from the external world is misguided. External sensory data may play a formative role in producing unconscious mentation. In particular, neurobiological findings on sensory data encoding and storage in human infants may throw light on the nature of unconscious processes. The present study therefore compares ideas derived from Lacanian psychoanalysis with neuropsychological memory and infant research findings to ascertain whether unconscious mentation is linked to the memory encoding of sensory data in infants. This analysis is in turn contrasted with a more contemporary psychoanalytic synthesis of findings on infant memory and unconscious mentation (Lichtenberg, 1989, Lichtenberg, Lachmann, and Fosshage, 1992). The latter theory identifies connections between unconscious mentation and the encoding of sensory memories in infancy, but does not connect the episodic and procedural memory constructs used in this account to specific neurological mechanisms in the brain. The present study's original contributions therefore involve firstly connecting the development of aversive episodic and procedural memories to neurological mechanisms in the brain during the period between birth and 28 months of age. Secondly, this memory model suggests that the storage of aversive memories in infancy has lasting unconscious motivational significance for subjects. Presymbolic memories may unconsciously manipulate conscious attention and memory retrieval in verbal subjects, inviting comparison with the psychoanalytic concept of dynamic unconscious mentation.

Thirdly, the presymbolic memory model contributes towards a novel understanding of false memories of childhood sex abuse, and the dissociation of real traumatic memories that occur in many cases of Post Traumatic Stress Disorder.

Keywords: Psychoanalysis; Unconscious mentation; Episodic memory; Procedural memory; Infant Research; Neuropsychology; Lacan; Lichtenberg; Dissociation; Post Traumatic Stress Disorder; Freud.

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A MEMORY MODEL OF PRESYMBOLIC UNCONSCIOUS MENTATION

Empirically verifying unconscious mental processes has been an ongoing concern for psychoanalytic researchers ever since Freud's original problematic formulation of unconscious mentation and its underlying foundations. The present study firstly attempts to trace this problematic history and the consequent attempts to reconfigure unconscious mentation from within a variety of different conceptual frameworks. Secondly, in light of the limitations of these earlier attempts, the present study proposes a new model of unconscious mentation using neuropsychological conceptions of how brain systems, perceptual-motor functions and cognitive processes are integral to the formation and storage of episodic and procedural memories. The study adopts a developmental perspective in order to describe how from infancy aversive experiences are encoded and stored in episodic and procedural memory formats. This in turn has important implications for the development of different kinds of unconscious mentation.

The purpose of the first chapter is to present a historical overview of the problems inherent in the Freudian formulation of unconscious thought. Freud (1905/1991b, 1915/1957) proposed two innate conflicting drives that accounted for the production of unconscious, irrational fantasy-based wishes. These in turn influenced conscious language-framed thought and logic. This drive model of unconscious mentation was intrinsically connected to biological concepts in three different ways. First, the language of energetics and tension reduction pervading the drive model was inherited from earlier, unsound neurological formulations that Freud (1950/1966) set out in his *Project for a Scientific Psychology*. These scientifically incorrect concepts were redeployed in Freud's later psychoanalytic formulation of the psychosexual model of human development. Second, the psychosexual model conceptualises drives as manifesting in experiences occurring at specific anatomical locations, viz. the mouth, anus and genitals. Third, drives are conceptualised as evolutionary acquisitions, i.e. behavioural tendencies in unicellular organisms that were inherited by more complex multicellular organisms, and have evolved into mental attributes in human beings.

In chapter one the scientifically incorrect nature of points one and three is explored to illustrate how this mistaken conception of the origins of unconscious mentation presented a problem for future generations of psychoanalysts in search of a solid foundation for the theory of human psychosexual development and unconscious mentation encapsulated by point two. Given Freud's use of scientifically untenable biological concepts to build psychoanalytic theory, future generations of theorists were understandably wary of connecting unconscious infantile wishes initiated by body-based experiences of primary caregivers with the concept of biologically innate drives that supposedly enabled these wishes to coalesce in the infant-caregiver context. The Freudian connection of unconscious infantile wishes with drive terminology and evolutionary biology presented a complex problem for those theorists who were concerned with providing the psychosexual model of infant development with a scientifically credible foundation.

Historically there have been four broad categories of response to this problematic triad of conceptual connections that constitutes the legacy of classical psychoanalysis. These four categories of response are outlined in chapter two. The first category ostensibly preserves aspects of Freud's dual drive model, but proceeds to introduce additional motivational concepts that in effect supersede drive formulations as the foundational constructs of unconscious mentation. The second category explicitly abandons drive terminology in favour of other motivational constructs that appear to offer more plausible accounts of how unconscious mentation develops in human beings. These other constructs may include biologically innate properties, depending on the view held by the theorist in question regarding the scientific validity of making connections between biological and psychoanalytic constructs.

The third category, normally conceptualised as the hermeneutic-clinical model, criticises the search to validate drives or other motivational constructs as the way to establish a sound scientific foundation for psychoanalytic unconscious mentation. Drives, as foundational constructs are untenable because as innate biological entities they receive no empirical support from contemporary biological findings on motivation.

It is argued that drives have no intrinsic relation to Freud's clinical discoveries, and psychoanalysis cannot look to the discipline of biology for empirical support for its own constructs. Instead, category three prioritises the systematic categorisation of thematic connections between overt events occurring in the analytic therapy setting, and hypothetical covert events that occurred earlier in the patient's life. Psychoanalytic constructs that can supposedly be validated in this fashion include unconscious wishes, repression, the dream theory, primary process operations, and the existence of psychosexual stages of development in childhood. These constructs were previously reliant on drive formulations.

This category makes the valid point that simply replacing drive constructs with another theory of how unconscious mentation is constituted, e.g. object relations or interpersonal constructs, without any form of independent verification of the latter does not solve the problem concerning the scientific validity of psychoanalytic constructs like repression and primary process operations. However, the present study is critical of this third response because it mistakenly equates thematic affinities with causal connections between clinical phenomena and earlier hypothetical events. Secondly, it claims that the core foundational propositions of psychoanalysis can only be validated in terms of phenomena native to the domain of psychoanalysis itself. There can therefore be no mutually profitable relationship between psychoanalysis and the biological sciences. In particular, this category asserts that psychoanalysis is principally concerned with unconscious motives, and therefore with primary process operations. These operations are defined as internally generated modes of thought that condition the production of fantasy wishes. Primary process operations are imaginary functions autonomous from underlying neuropsychological events pertaining to brain, perception, and memory processes. As such, primary process operations can only be validated at a psychoanalytic level of enquiry and have no correlates in, for example, a neuropsychological discourse that describes nonconscious memory, perception, visuospatial processing and linguistic operations.

In light of the above assertions, the present study offers three critical proposals:

- i) It is unproven that unconscious mentation coincides principally with internally generated fantasy wishes.
- ii) External sensory data may play a formative function in relation to the genesis and operations of unconscious mentation.
- iii) It is unproven that knowledge derived from neuropsychological and recorded observations of infant behaviour is irrelevant to psychoanalytic models of unconscious mentation, and that such knowledge cannot provide independent verification of the existence of unconscious mentation relevant to psychoanalytic formulations of this phenomenon.

In the light of category three and the critical proposals raised by the present study, the fourth category of response provides a platform from within psychoanalysis for re-opening the debate concerning: i) The nature of the relationship between biological/neuropsychological processes and unconscious mental operations. ii) The nature of the relationship between external sensory material and the development of unconscious operations.

This fourth category, viz. Lacanian psychoanalysis, retains some of the drive terminology of classical psychoanalysis, but alters the definition and foundational status of these entities to such an extent that they bear little resemblance to Freud's original constructs. Drives are no longer biologically innate motivational forces, but are secondary products, the outcome of the infant's biologically immature perceptual processing of environmental material. Drives consist of primitive linguistic, visual, and tactile data that are processed inefficiently by the infant, who is primordially attuned to external stimuli. What is of central motivational importance for this fourth category is not drives, but the biological immaturity of the infant, and its initial primitive attempts to process environmental data.

The resulting encoding of sensory data represents not only a distortion of real infant-caregiver interactions, but also the first instance of an unconscious mental operation.

The following theoretical proposals that emerge from category four have an important bearing on the three critical proposals already put forward by the present study in relation to category three.

- i) The concept of immature biological, viz. perceptual and motor, systems underlying the first instances of unconscious mentation in infants.
- ii) The concept of a primordial infant attunement to external sensory stimuli that ensures this information is encoded.
- iii) The concept of external sensory material being essential to the formation of unconscious mental processes in infants.

The above points serve as a launch pad for chapter three's use of neuropsychological and infant research findings to investigate the validity of the concepts of biological immaturity and primordial environmental attunement in infants. Furthermore, chapter three explores neonatal and early infant information processing in order to establish whether unconscious mentation may be connected to immature biological constraints in sensory data processing in the manner suggested by points one and three of category four above. In particular, attention will be paid to the role that memory encoding and storage functions play in regard to the constitution of unconscious mental operations in infants. The present study intends to show that the biological sciences play a decisive role in the reformulation of psychoanalytic constructs pertaining to unconscious mentation.

The second part of chapter three outlines Lichtenberg's (1989, 1992) psychoanalytic model of presymbolic unconscious mentation that draws explicitly on infant research and neuropsychological memory constructs.

While this model accords with category four in stressing the importance of early perceptual and mnemonic processing of external information in the production of unconscious mentation, it represents a more explicit integration of psychoanalytic constructs with infant research and neuropsychological memory findings.

In particular, this model explicitly connects the neuropsychological concepts of episodic and procedural memory with the development of presymbolic unconscious operations in infants. As such it represents a more contemporary integration of many of the insights initially generated by category four. The episodic and procedural memory constructs imported from the neuropsychological literature are not explicitly connected to specific anatomical brain locations by Lichtenberg (1989), so there are no explicit links made between unconscious mental operations, memory constructs, and anatomical systems in the brain. Instead these links are indirectly inferred in Lichtenberg's (1989) model. Chapter three concludes with an outline of the present study's original contribution, viz. the construction of a model of presymbolic unconscious mentation that explicitly links episodic and procedural memory constructs to anatomical sites in the brain. This model is described in chapter four.

Chapter four uses the Lichtenberg model as a starting point for the empirical grounding of presymbolic aversive unconscious mentation via reference to neuropsychological research on memory. The present study will show that prior to 28 months of age, aversive episodic and procedural memories are encoded and stored by an array of anatomically distinct brain regions representing diverse components and processing aspects of these two different memory formats. The aim is to demonstrate how cortical and sub-cortical brain regions responsible for encoding and storing externally mediated aversive information in infants engenders a primordial level of presymbolic unconscious operations. The grounding of a presymbolic aversive memory system in diverse brain regions suggests that aversive events and their procedural responses stored in infancy have long-term unconscious motivational significance for the subject.

In this vein the present study argues that the unconscious presymbolic memory system persists into adulthood, in that it continues to interact with and influence later symbolically mediated experiences in verbally competent subjects. Chapter five explores how the presymbolic memory model enables a new view to emerge of how unconscious mentation can condition and interact with later events experienced by verbally competent subjects. It is argued that presymbolic procedural memories triggered by aversive cues in verbal subjects are able to dynamically influence conscious attention to and voluntary retrieval of currently experienced events. This ability of presymbolic memory to unconsciously manipulate conscious experience and voluntary memory retrieval in verbal subjects is in turn compared with the psychoanalytic conception of dynamic unconscious mentation. The memory model developed in the present study aims to provide a more empirically viable reformulation of psychoanalytic unconscious mentation than has been available up to now in the various psychoanalytic paradigms.

In conclusion, chapter six demonstrates how the model of pre-symbolic memory contributes towards an understanding of false memories of childhood sex abuse and the dissociation of real traumatic memories in verbally competent subjects, the latter phenomenon being central to the symptomatology structure of Post Traumatic Stress Disorder (PTSD). It will be explored how the present model of presymbolic memory contributes towards a more complete neuropsychological understanding of the memory dissociation and involuntary recall phases characteristic of PTSD. By offering new insights into these areas of memory manipulation, the present study hopes to demonstrate the explanatory efficacy of the memory model beyond the theoretical parameters within which it was originally developed.

CHAPTER ONE: THE BIOLOGICAL LEGACY OF THE FREUDIAN MODEL

1.1 Connecting Freud's Neurological Model of Mental Processes with the Psychoanalytic Formulation of Drives

Freud's psychoanalytic theory of drives attempted to explain how forces having their origin in the biological body were able to influence psychological functioning in the form of unconscious mental representations (1905/1991b, p.83). The present study will show that the conceptual origins of drives can be found in Freud's (1950/1966) pre-psychoanalytic *Project for a Scientific Psychology*, wherein a neurological conception of mental processes is outlined. It will become apparent that later psychoanalytic drive formulations are founded on scientifically discredited neurological concepts dating from this earlier publication, reformulated into psychological language. The dual drive theory of unconscious thought processes therefore rests on the back of discredited neurological concepts.

1.2 A Brief Description of Freud's Neurological Energy Model

The concept of drives as quanta of mental energy has its origin in the *Project for a Scientific Psychology* (Freud, 1950/1966). This work proposes that quantities of mental energy accumulate in neuronal systems and must be discharged to avoid the unbearable overloading of these systems. Stimuli arising from the external world and within the cells of the body are registered by the neuronal systems as smaller or greater quantities of energy (Freud, 1950/1966, p.304). Three distinct yet interconnected neuronal systems progressively modify these energy quanta in their journey from the sense organs or the internal nerve-endings of the body to the brain. The first two neuronal systems absorb the quantitative impact of the energy, somehow recognising the specific amount of energy involved. This energy is then siphoned off, so allowing the third system to process the qualitative dimension of the stimulus devoid of its energetic force (Freud, 1950/1966, p.310). The quality of the stimulus is experienced as a conscious sensation leading to reactive activity on the part of the organism (Freud, 1950/1966, p.311).

This activity enables the energy accumulated in the first two neuronal systems to be discharged, so allowing the organism to return to its original level of functioning.

1.3 A Contemporary Critique of Freud's Neurological Energy Model

Freud's model of three separate but interconnected neuronal systems is refuted by contemporary neurochemical findings.

i) Neurochemical studies show that there are many different types of sensory neurons respond to a specific incoming stimulus, or to a class of related stimuli (Kalat, 1984, p.32). So from the outset, neurons are responsive to specific qualities of energy as opposed to the quantitative impacts of incoming stimuli. Therefore Freud's (1950/1966) conception of the sense organs being linked to neuronal systems dealing exclusively with the reception and storage of energy quantities is incorrect.

ii) Individual neurons respond to a specific class of stimuli, but the quantitative intensity of the stimulus does not affect the electrical and chemical changes that take place within the neuron concerned (Kalat, 1984, p.41). The action potential of a particular neuron is fixed, reaching the same intensity every time it is activated regardless of the intensity of the incoming stimulus. At the peak of the action potential, the chemical properties of the stimulation change, so that the neuron returns to a resting level regardless of ongoing external stimulation (Kalat, 1984, p.42). The relative quantity of the stimulus is irrelevant to the neuronal conveyance of qualitative data in the form of a chemical code. Therefore separate neuronal systems that encode the quantitative aspect of sensory data in isolation from its qualitative nature are unnecessary. Freud's (1950/1966) neuronal classification system is therefore both redundant and incorrect.

iii) Freud's three neuronal systems were developed in response to the idea that the organism needs to discharge energy in order to return to a state of relative quiescence (Freud, 1950/1966, p.318). This discharge is accomplished in the form of motor activity.

However, an external discharge is unnecessary because the nervous system is able to internally self-regulate all available energy (Hobson, 1988, p.285). Chemical receptor sites in neuronal cell membranes react to incoming stimuli by activating the action potential of each cell, and subsequently become inactive when the action potential itself temporarily shuts down all receptors (Kalat, 1984, p.42). Because the chemical feedback mechanisms of individual neurons allow for an intermittent nonreceptivity to incoming stimuli (Hofer, 1981, pp.36-37), the organism does not suffer from stimulus overload. Furthermore, competing chemical messages from neighbouring neurons may either facilitate an action potential or inhibit it at a particular neuron, so that an energy stimulus may either be conveyed through that point in a neural network or be cancelled (Kalat, 1984, p.59). The nervous system is therefore able to receive, direct, or cancel energy without any recourse to a mechanism of discharge that involves energy release into the environment. Freud's (1950/1966) concept of neuronal energy being principally organised and regulated by a mechanism of external discharge is therefore mistaken.

1.4 From Neurological Energy to Psychoanalytic Drives: Freud's Model of Psychosexual Development

While it is relatively easy to refute Freud's neurological model of quantitative energy build-up and discharge from the perspective of modern neuroscience, it is also necessary to trace how these early concepts were integrated into Freud's psychoanalytic psychology. By the time *The Interpretation of Dreams* was published, Freud (1900/1991a) had already distanced himself from his earlier attempt to directly link psychological motives to neurological concepts. Although Freud (1905/1991b, 1915/1957) never abandoned the idea that drives have their sources in the biological body, psychoanalysis shifted the focus away from neurological systems and events, and instead concentrated on the way in which energy occurring in specific body areas becomes transformed into unconscious mental wishes (Freud, 1915/1957, p.123). In the psychosexual model the exact biological nature of drives remains unknown, although it is probably chemically constituted (Freud, 1905/1991b, p.83).

Freud therefore left the door open for the establishment of a link between the nervous system and this 'chemical origin' of drives. Freud (1905/1991b, p.169) concludes the outline of the psychosexual model by stating that far too little is known about the biological processes underlying sexuality, and by implication the constitution of the sexual drive itself. However, while the biological origin of the sexual drive is unknown, its somatic manifestation is self-evident in the various erotogenic zones, i.e. the sensitive areas of the mouth, anus and genitals of the infant, by means of which the survival needs of hunger, thirst, and waste elimination are transacted (Freud, 1905/1991b, p.83; 1940/1964b, p.151).

Freud (1915/1957) theorised that in early infant development the sexual drive is attached to the survival needs of the infant, and the initial manifestations of a separate sexual drive only gradually become visible (p.126). The focus of psychoanalytic formulations therefore shifted away from the preoccupation with neurological energy, and onto the energy forms drives assume in infant development. The different components of the sex drive share the same somatic locations as survival needs, but Freud (1912/1991c) claimed that their aims are different (p.249). The sensual satisfaction occurring during the fulfilment of a survival need is the first instance of the sexual drive. The sensual contact of the infant's mouth with the caregiver's breast during feeding, for example, represents the first instance of the oral component of the sexual drive. This sensual satisfaction becomes detached from the need for nourishment, as the infant wishes to recreate this sensation of pleasure for itself (Freud, 1905/1991b, p.98). Likewise it is the sensual pleasure felt during anal and genital transactions, e.g. waste elimination and cleaning, that constitutes the anal and genital components of the sexual drive (Freud, 1905/1991b, pp.102-105).

In situations where the primary caregiver is absent, the infant may attempt to recreate earlier drive satisfactions via self-stimulation, e.g. by sucking its thumb or rubbing its genitals (Freud, 1905/1991b, p.99). Accompanying the experience of satisfaction are perceptual and motor sensations that together constitute the infant's first unconscious mental content (Fenichel, 1946/1971, p.37).

This content is fantasmatic in the sense that the perceptual and motor sensations are linked to the sensation of pleasure and not to the nature of the objects (infant and caregiver) involved in creating this pleasure. The association between the pleasure experienced and the accompanying perceptual and motor sensations forms the content of the wish to repeat this experience. In summary, an endogenous unconscious drive impulse actualised in the pleasurable somatic sensations elicited in interactions with the caregiver gives rise to an unconscious wish, i.e. a fantasy thought-process that is framed by the primitive sensory and motor sensations accompanying the sensual pleasure.

It soon becomes apparent to the infant that pleasurable wish-fulfilment cannot be autogenerated for very long without the intervention of a caregiver, for the latter facilitates or frustrates pleasurable discharge (Freud, 1915/1957, p.137). It is in the latter instances of need frustration that the infant learns about the importance of the caregiver as a separate person. The infant learns to separate itself from the other, and in the process the primordial unconscious drive wishes are subjected to a secondary repression in the light of reality-based considerations, viz. retaining the love and positive attentions of the primary caregiver. The infant's developing sense of a conscious self, i.e. the ego, becomes actively involved in keeping oral, anal and genital impulses from becoming conscious, as these wishes could include thoughts harmful to the harmonious relationship with the now separately perceived primary caregiver on whom the infant depends for continued well-being.

1.5 The Psychosexual Model is founded on Discredited Neurological Energy

Constructs

In this model of infant psychosexual development, Freud (1905/1991b) produced his most compelling argument for the way in which innate drives and external environmental conditions shape unconscious mentation.

By connecting the self-preservative (survival needs) and the sexual drives to regions of the body, Freud (1905/1991b) attempted to show how these biological forces become manifest in localised bodily sensations experienced by the infant. Pleasurable relief from tension in oral, anal and genital regions produces unconscious fantasy wishes for the repetition of this pleasure.

The quantitative aspect of the older neurological energy model is retained, but redeployed in a different context, viz. the tension build-up and discharge properties of the mouth, anus and genitals. In particular, the concept of unconscious erotic tensions that cannot be cancelled, but must either be discharged directly in sexualised activity, diverted into non-sexual activity, or manifest as neurotic symptoms, represents the cornerstone of psychoanalytic drive theory (Freud, 1905/1991b, p.163). If either discharge or diversion of the original drive wish into an alternative activity is prevented from occurring, the subject will develop neurotic symptoms. In conclusion, the entire theoretical foundation of the psychosexual model rests on the energy discharge mechanism model originally described in the neurological language of the *Project for a Scientific Psychology*. However, as Sulloway (1979) observes, this debt owed by the psychosexual model to earlier neurological energy constructs remained unacknowledged by Freud precisely because of the dubious scientific status of many of these constructs, even in Freud's own era (pp.120-121).

In Freud's time the psychosexual model became subject to a different kind of controversy. It was not long before Adler (1923/1971) and Jung's (1960/1969) theoretical critiques of its premises forced Freud to respond with some quite fundamental revisions in regard to the nature of drives. It was in order to ground these revisions in a plausible foundation that Freud turned to a Lamarckian evolutionary approach, and so initiated his most controversial conceptual linkage between biology and psychoanalytic theory. In order to see why Freud was driven to make such a speculative and ultimately misguided connection, it is first necessary to outline Adler and Jung's criticisms of his psychosexual theory, and secondly to describe Freud's subsequent revisions of this model in the light of these criticisms.

1.6 Adler and Jung's Critique of the Psychosexual Drive Model

The early disagreements of Jung and Adler with Freud concerned the priority the latter gave to sexual drive motivations. Adler (1923/1971) critiqued Freud's concept of a sexual drive being the primary form of human motivation. According to Adler (1923/1971) what characterises infant development is a sense of primordial inferiority (p.13). Adler (1923/1971) traced this inferiority back to biology, specifically the child's possession of "inherited inferior organs, organic systems and glands" (p.18), which greatly intensifies the child's natural organ immaturity, feelings of helplessness, and dependency in relation to the caregivers. Out of this pervasive and fundamental sense of unconscious inferiority a covert desire for mastery takes root, and usually shows itself in the form of aggression. Aggression is therefore a secondary characteristic that emerges out of a sense of a fundamental unconscious inferiority. Adler (1923/1971) perceived Freud's sexual drive in the same light as aggression, i.e. as a secondary manifestation of unconscious inferiority.

Jung (1960/1969) on the other hand proposed that mental energy is fundamentally of a neutral composition, but that it manifests in specific mental forms, e.g. as sexual, aggressive or spiritual, depending on the context and type of emotional complex possessed by the person. Therefore sexual impulses and symptoms are only one manifestation amongst a multitude of unconscious and conscious forms that energy can assume. Energy can undergo an unlimited number of unconscious moderations in expression as long as the intensity, i.e. the quantity of the force, remains constant. No one expression, be it sexual, aggressive, or spiritual, has foundational priority over the others (Jung, 1960/1969, p.22). In other words, the oral, anal and genital stages of infant development are not manifestations of a primordial sexual drive, but specific sexual expressions of general life energy.

1.7 Freud's Revision of the Psychosexual Drive Model

Freud's (1922, 1923/1961) revision of the drive model was in part a response to these two sets of criticisms. The death drive was developed at a psychological level in order to accommodate Adler's descriptions of the role that aggressiveness and mastery play in the life of neurotic individuals. Adler's (1923/1971) concept of inferiority became reconceptualised as a primordial unconscious drive towards masochism and self-destruction, i.e. death, that co-exists with the survival and sexual drives of human beings (Freud, 1933/1964a, p.105). Freud (1923/1955a) had previously introduced the concept of narcissism, i.e. the idea that the ego serves as a reservoir of mental energy that can be directed towards external objects or redirected back into itself (p.249). The energy directed towards objects represents the sexual drive, whereas the energy stored or retracted into the ego is regarded as desexualised, i.e. forming part of the self-preservative drives (Freud, 1923/1955b, p.257). The two drives therefore share the same energy and are reclassified as a single life drive known as Eros (Freud, 1923/1955b, p.257).

Freud recognised that it was difficult to explain how the death drive, a tendency in organisms to aim for a non-energy state, could nevertheless manifest in the form of external aggression, a state demanding energy discharge. Freud (1923/1961) reasoned that the narcissistic withdrawal of energy back into the ego allows this energy to become desexualised because it is temporarily not being used for sexual aims, and so is at the disposal of other drives, including destructive tendencies (p.46). Freud (1933/1964a) proposed that this desexualised energy is used by the death drive, examples being masochism and aggression (p.105). Furthermore, desexualised energy is a secondary product of the sexual drive, not a fundamental quality of mental energy as Jung proposed (Freud, 1923/1961, p.46). Desexualised energy accounts for the active expression of the death drive as well as explaining other kinds of non-sexual drive aims that Jung (1960/1969) had originally highlighted.

On first appearances these theoretical revisions counteract Jung and Adler's criticisms, but while the concept of sexual and self-preservative drives had some evidential support from the psychosexual model and the clinical findings of work with adult neurotics, there was little discernible evidence for the fundamental nature of the death drive, viz. a primordial internal unconscious tendency towards self-destruction. It therefore became important to legitimise the primordial nature of the death drive so that it would not be relegated to a characteristic of desexualised energy as in the Jungian perspective. It was in order to substantiate the death drive as the co-foundation underlying unconscious thought, as opposed to a secondary feature of a unitary unconscious energy, that Freud (1922) turned to evolutionary biology in search of the means of verification (p.52).

1.8 Psychoanalytic Drives and Evolutionary Biology

Although Freud left the door open, he did not explicitly connect the drive energy formulations of the psychosexual model to a neurochemical foundation, because he had recognised during the writing of the *Project* that the available neurological paradigm was unable to validate his mentalist constructs (Sulloway, 1979, p.131). However, the biological model that Freud (1922) used to explain the origins of the death drive was concerned neither with human neurology nor neurochemistry, but involved an evolutionary-historical paradigm that located the origins of the drives in the primordial behaviour of unicellular and multicellular organisms (pp.47-50).

The evolutionary perspective that Freud adopted was not only Darwinian, but also greatly influenced by the theories of Lamarck (Sulloway, 1979; Badcock, 1994), particularly the latter's theory of the inheritance of acquired characteristics. This theory proposed that learned behavioural adaptations to internal biological needs are the major sources of evolutionary change, not Darwinian natural selection (Sulloway, 1979, p.274). These adaptations are inherited in the sense that they become part of the genetic constitution of the organism (Sulloway, 1979, p.408). From a Freudian perspective, this implied that drive motivations originated as adaptations to internal physiological needs in the first primitive organisms.

According to Sulloway (1979), Freud used this Lamarckian theory to justify the existence of a primal phylogenetic principle, viz. a tendency for all organisms to respond to their primordial internal biological needs, these responses becoming incorporated as genetic material that is henceforth inherited (p.408). Freud (1922), with reference to the work of several contemporary biologists, proceeded to locate the primordial origins of the drives in the behaviour of unicellular and multicellular organisms (pp.45-50). The tendency for energy processes to break down to simpler levels is exhibited in the case of unicellular organisms, where cell death occurs as a result of exposure to endogenous toxic metabolic waste products (Freud, 1922, p.48). However, when there is a union between two cells and an exchange of cellular material, both upon separation become rejuvenated, i.e. the infusion of new material into each cell offsets the toxic qualities of their own metabolic products (p.48).

Based on these findings, Freud (1922) proposed that the internal metabolic processes of early unicellular organisms represented the evolutionary origin or prototype of the death drive (p.49), whereas the union of alien material with internal cell processes that occurs in primitive unicellular conjugation represents the evolutionary prototype of the life drive (p.55). According to Freud (1922) the earliest form of reproduction is life-preserving because unicellular organisms takes other cells as their objects, and introduce new material, i.e. tensions or energy processes, into each other that inadvertently prolongs life (p.55). Freud (1922) reasoned that the adaptive reproductive behaviour exhibited by the first unicellular organisms became internalised as an inherited predisposition, because it was a response to the primordial tendency for living matter to bind together, i.e. a primordial chemical affinity evidenced by unicellular organisms (p.58). This connecting disposition of organic matter therefore exists alongside the death drive prototype of internal metabolic destruction. Freud (1922) argued that the connecting predisposition of organic matter was repeated and elaborated through all life forms until it became part of the genetic material of humans, where it takes the form of the sexual and self-preservative drives as outlined in the psychosexual model.

This evolutionary account of unconscious dispositions embodied Freud's Lamarckian conviction that human development involved a recapitulation of all earlier organic life forms (Sulloway, 1979, p.408). In conclusion, Freud suggested that individual cellular behavioural tendencies towards internal metabolic destruction and mutual reproduction evolved, via multiple elaborations in the genetic material of successive species, into macro life and death drives. These drives express contrasting unconscious mental dispositions of the entire human organism rather than simple cellular behaviours *per se*.

The fundamental problems with Freud's evolutionary biological assumptions are:

- i) That the Lamarckian concept of inherited behavioural responses, which are repeated and elaborated through all unicellular and multicellular organisms, is incorrect.
- ii) That the fundamental biological behaviour of cells, i.e. cellular connectivity and metabolic self-destruction, are unsupported by contemporary findings in cell biology. There are therefore no biological, cellular precursors that can be used to justify the validity of the dual drive model. The nature of these errors will be outlined in section 1.9 below.

1.9 The Errors in Freud's Biological Formulation of the Life and Death Drives

- i) Modern Mendelian and molecular genetics refutes Freud's Lamarckian assumption that behavioural adjustments to endogenous stimuli (the properties of organic matter) can become part of an organism's genetic endowment (Badcock, 1994, p.13). Research on the human genome in the light of Darwin's theory of natural selection indicates that, in response to the co-ordinates of specific environmental stimuli, specific genes are selected and expressed while others remain dormant (Steen, 1996, p.18). Behavioural adaptations in response to environmental or internal stimuli are not heritable in themselves (although the pre-existing specific set of genes enabling the adaptation may be more likely to be selected in the next generation if similar stimuli are present).

A behavioural adaptation therefore cannot be recapitulated without fail by successive generations in different species in the Lamarckian manner suggested by Freud.

Secondly, the genome of a living organism, whether it is single-celled or multicellular, consists of a macromolecule called Deoxyribonucleic acid (DNA) that encodes all the information necessary for the initiation of life processes (Steen, 1996, p.5). This includes instructions for the construction and maintenance of the internal cell metabolism as well as for the type of reproduction relevant to the organism (Wills, 1992, p.41). The fundamental chemical properties of organic matter therefore include self-maintenance and self-generation in concert with environmental stimuli. This contradicts the Freud-Lamarck conception of a primordial internal metabolic breakdown predisposition in organic matter. At the level of molecular genetics the cell prototype of the death drive has no foundation.

ii) At the intercellular level in multicellular organisms, Freud's (1922, p.60, footnote 1) concept of a cellular life drive, i.e. a generalised predisposition of cells to engage in transactions and functional organisations with neighbouring cells, is simply incorrect in many cases. In some cases it is clear that cells react to one another in terms of avoidance, e.g. in the developing brain individual neurons make connections with some adjacent nerve cells but not with others, depending on the chemical nature of the membrane cues of each individual cell concerned (Hofer, 1981, p.149). This contradicts Freud's (1922) claim of a general connective cellular predisposition (p.60). Freud's (1922) basic concept of connectivity cannot begin to provide a complex account of the different categories of cellular interactions, let alone genetic processes in interaction with the environmental contingencies of social systems. Given the failure of the concept of organic connectivity to account for our contemporary complex understanding of energy and information exchange between cells, Freud's (1922) attempt to correlate this cellular prototype of the life drive with its mental-energetic counterpart is doomed to failure.

Therefore Freud's psychosexual theory of the life drive – as an unconscious mental disposition consisting of oral, anal, genital and desexualised components developing during infancy – becomes detached from its evolutionary origin in cell biology once his account of cell behaviour in unicellular and multicellular organisms is shown to be mistaken.

Finally, the organic prototype of the death drive, i.e. the alleged tendency for organic matter to decompose as evidenced in the regressive metabolic processes of isolated cells, appears to be contradicted by the behaviour of cellular DNA. DNA actively produces proteins that serve as building blocks in all further life-functions of unicellular, multicellular and human organisms (Wills, 1992, p.41). In the most fundamental sense, the genetic code of unicellular, multicellular, and human organisms actively initiates the metabolic processes necessary for the functioning of life, including the organism's ability to respond to environmental stimuli (Cosmides and Tooby, 1992, pp.38-39). There is no primal tendency at this molecular level towards lower energy levels or an inorganic state. In fact the reverse occurs, for DNA provides the codes for the manufacture of specific enzymes that ensure the replication of the individual cell as well as the entire organism (Wills, 1992, p.41; Steen, 1996, p.6). Therefore the organic prototype of the death drive is refuted by the evidence of how cellular DNA functions at the molecular level.

In conclusion, the death drive concept is cast adrift from any empirical scientific support, unlike the life drive that can still be explained in the infant development terms of the psychosexual model. The scientifically discredited nature of Freud's evolutionary biological assumptions pertaining to the death drive soon became apparent to many of his followers. This resulted in the death drive being reconceptualised as a reactive-aggressive, secondary characteristic of unconscious motivation by future generations of psychoanalytic theorists. However, while the biological-evolutionary foundation of the drive model was largely rejected or ignored by psychoanalysts, an attempt was made to preserve the psychosexual model of the life drive (sexual and self-preservative drives) and its unconscious thought derivatives.

1.10 Biology Becomes a Problem for Psychoanalysis

The problem of the detachment of the psychosexual drive model from its discredited biological foundations has itself been addressed from many different angles by subsequent psychoanalytic schools. It could be argued that one of the major motivations for the splintering of psychoanalysis into competing theoretical discourses was the problem of finding adequate scientific foundations for the psychosexual model, once it became clear that Freud's biological foundations for the dual drives and the origins of unconscious thought were empirically untenable. Simultaneously a need arose to define psychoanalysis as an autonomous body of knowledge and to delineate its independence from the biological sciences. This redefinition was attempted in different ways by successive generations of psychoanalytic theorists.

In the following chapter the history of the different responses to these issues will be outlined in order to ascertain:

- i) The implications that the search for alternative theoretical foundations had for the relationship between psychoanalysis and the biological sciences.
- ii) The implications of this search for conceptualising the origins and proof criteria pertaining to the existence of psychoanalytic unconscious mentation.

Both these issues are central to the concerns of the present study in its attempt to develop a model of unconscious mentation that avoids the limitations of these earlier reformulations.

CHAPTER TWO: NEW FOUNDATIONS FOR PSYCHOANALYTIC UNCONSCIOUS MENTATION

The discrediting of the evolutionary and neurobiological foundations of the Freudian drive model, as outlined in chapter one, prompted future generations of psychoanalysts to formulate different foundations for the development of unconscious mentation. These reformulations can be divided into four major response categories.

2.1 Four Different Theoretical Responses to the Question of New Foundations for Psychoanalysis

- i) The first response ostensibly preserves the original sexual and self-preservative drive aspects of the psychosexual model, but additional ego, interpersonal, or social relations concepts are introduced that end up subverting drives as foundational constructs. In the process the biological origin and constitution of unconscious mentation undergoes a transformation.

- ii) The second response includes theorists who have abandoned biological explanations of drive constructs altogether in favour of a relational/psychosocial approach. This approach appears to offer a more secure foundation for the origins and constitution of psychoanalytic unconscious mentation. Some of these theorists provide an exclusively psychosocial account of unconscious mentation and mental conflict. Others suggest that both biological needs, divorced from drive theory, and psychosocial factors interact to create unconscious mental processes.

- iii) The third response critiques these attempts to elaborate drive or other kinds of biological-psychosocial constructs in the quest for scientific foundations for psychoanalytic unconscious mentation. Instead, it prioritises the systematic elaboration of thematic connections between a patient's symbolic material arising in the clinical setting and the hypothesised existence of unconscious mentation.

These thematic connections, it is argued, represent causal relationships between the patient's experiential material and psychoanalytic constructs such as repression, dream formation, primary process operations and unconscious sexual wishes. Furthermore, this category claims that the latter are core foundational constructs that can only be validated in terms of phenomena native to the domain of psychoanalysis itself. There can therefore be no mutually profitable relationship between psychoanalytic conceptions of unconscious mentation and findings from the biological sciences.

iv) A fourth response proposes that life and death drives are not innate motivational forces, but are products of environmental material that the biologically immature neonate must somehow process. From this perspective, drives are environmental constructs consisting of primitive linguistic, visual, and tactile data that are inefficiently processed by the infant. What is of central foundational importance for this model is not drives, but the neonates' biological immaturity, which includes initial primitive attempts to process complex environmental stimuli. The resulting encoding of perceptual information involves an inevitable distortion of real events, and it is precisely on the basis of this distorted encoding that psychoanalytic unconscious mentation is first produced. Therefore, contrary to the third response, the fourth response implies that biological considerations, viz. the infant's immaturity, cannot be excluded from the conceptualisation of psychoanalytic unconscious mentation. Furthermore, pre-eminence is given to the role of environmental material in constructing internal unconscious mental processes.

The remaining sections of the chapter examine these four responses, attending particularly to how each view the relationship between unconscious mental processes and the biological sciences. The evolving relationship between unconscious mentation and the biological sciences evident in these responses has implications for the model of presymbolic unconscious mentation to be outlined by the present study.

2.2 Response One: Drives Co-Exist Uneasily with Other Biopsychosocial Factors

2.2.1 Drives are subordinated to Biological Adaptation

Hartmann's (1939/1958) psychoanalytic ego psychology stresses that biological and environmental processes are not mutually exclusive, but implicate one another in the process of adaptation. Hartmann (1939/1958) retains Freud's psychosexual drive model, agreeing that the biological substrate of drives visible in the oral, anal and genital changes in children are the necessary precursors for psychosexual development (p.44). However, he regards the evolutionary-biological foundations of the life and death drives as irrelevant to his central concern, viz. the adaptive role of various ego mechanisms (p.44).

While acknowledging the importance of drive impulses on ego functioning in the context of unconscious mental conflict, Hartmann (1939/1958) proposes that ego functioning concerned with the development of perception, intention, object comprehension, thought, language, memory and motor processes is free from unconscious drive conflicts (p.8). Adaptive ego functions share a common genetic, biological origin with psychosexual drive functions (p.102); adaptive ego mechanisms and unconscious psychosexual impulses have equal ontogenetic and motivational status.

Furthermore, the ego no longer defends against the drives, but rather actively inhibits drive demands via the mechanisms of defence. This is an adaptive procedure, for it enables the ego to concentrate on environmental specifications relatively unhindered by drive impulses (Hartmann, 1939/1958, p.106). Hartmann displaces the drive formulations of the psychosexual model with his increasing emphasis on the inhibitory and adaptive functions of the ego. Hartmann's (1939/1958) attempt to reconcile biology with psychoanalytic constructs via the concept of adaptation therefore paves the way for unconscious dispositions and mental conflict to become less important from a motivational perspective in comparison to conscious ego functions.

2.2.2 Fromm: Drives are moulded by Socio-Economic Conditions

Fromm (1970), like Hartmann, believes that evidence for the existence of sexual and self-preservative drives can be observed in infants, young children, and in clinical practise (p.151, footnote 2). Contrary to Freud, Fromm (1970) proposes that relations with other people are not simply a means of satisfying drive impulses, but that drives are energy forces striving to relate and unite with significant others (p.72). The physiological pleasure associated with tension reduction is a means of expressing a more fundamental psychological motivation, i.e. the need to relate and be related to by significant others (Fromm, 1970, p.74).

Using the theories of Marx, Fromm (1970, p.164) proposes that the family is the medium whereby economic conditions structure and systematise the survival and psychosexual needs of the infant, i.e. in terms of the material resources each family possesses. Drives are conditioned by and adapt to the emotional and pedagogical configurations of the family, whose structure is in turn determined by social class and economic infrastructure variables (Fromm, 1970, p.158). While drives actively and creatively respond to social conditions, Fromm (1970) maintains that ultimately “the role of primary formative factors goes to the economic conditions” (p.164).

Fromm (1970) rejects Freud’s death drive formulation because he views this construct as based on biological evidence that had little empirical foundation (Fromm, 1970, p.150, footnote 1). While acknowledging the role of aggressive and destructive motivations within human beings, he views these as reactions to imagined survival threats or as consequences of psychosexual frustrations in relationships (Fromm, 1970, p.213). In Fromm’s model, drive wishes are frustrated, satisfied or moulded by the economic conditions implicit in family structures. Unconscious mentation is a product of the moulding of biological drive demands by economic conditions, while the ego is a product of successful drive modifications mediated by psychosocial conditions, not an independent biological adaptation agency (Fromm, 1970, p.43).

Unconscious mentation occurs when socio-economic conditions impose limits and inhibitions on innate wishes for gratification, as well as unconsciously shaping these wishes and forms of gratification.

2.2.3 Melanie Klein: Drives are Object-Seeking Emotions

Klein (1975) focuses on neither ego adaptation nor socio-economic conditions at the expense of drive impulses. Instead, drive constructs remain central to her theory of object relations. However, implicit in Klein's definition of drives and unconscious thought is a completely different non-biological foundation from that proposed by Freud (Greenberg and Mitchell, 1983). In the Kleinian schema, drives no longer have a biological origin in the body, i.e. oral, anal and genital erogenous zones are not the primary manifestations of drive impulses. On the contrary, the primal expression of the life and death drives is manifest in the fundamental emotions of love and hate (Klein, 1975, p.306). These emotions occur when gratification or frustration of bodily needs produces the corresponding sensual stimulation at the oral, anal and genital zones (Klein, 1975, p.306).

Drives are intrinsically psychological fantasy elements (Klein, 1975, p.308). The oral, anal and genital zones are simply the initial physical contexts in which the drives express themselves as imaginatively constructed unconscious emotions ultimately aimed towards external objects, i.e. the caregivers (Klein, 1975, p.408). Pleasure and frustration experienced at these bodily zones are not ends in themselves; rather they point the way to emotional relationships with the internal representatives of the external caregivers (Klein, 1975, p.408). Klein severs the link between drives as energy quanta and their unconscious mental manifestation as wishful fantasies. Furthermore, Klein rehabilitates the death drive by linking it to the directed emotion of hate. The death drive is no longer dependent on an evolutionary-biological foundation, but is grounded in the infant's earliest negative experiences of the primary caregiver. The life and death drives in the form of love and hate are unconscious experiential phenomena that in clinical settings speak for themselves, i.e. via the client's symptoms and emotional communication.

For Klein, drives are innate mental properties that emerge in meaningful ways at the level of psychological functioning, and within the context of the infant's experience. Their possible physico-chemical constitution is regarded as irrelevant to the task of deciphering the dynamics of unconscious thought processes.

2.2.4 Winnicott: Drives are subordinated to the Infant-Mother Relationship

Winnicott (1986) echoes Klein in stressing the importance of relational patterns with caregivers, but relegates dual drive wishes and the emergence of love and hate to a status secondary to that of ego development in the mother-infant context. The mother initially provides a holding function (Winnicott, 1986, p.240), which is the foundation for the care of the infant's physiological needs and the management of its ongoing experience. From the infant's perspective this holding relationship also has a psychological dimension, i.e. it facilitates the development of the ego as an integrated structure which eventually allows the infant to experience itself as a unified being (Winnicott, 1986, p.241). The holding function of the mother-infant relationship is the fundamental motivational principle in Winnicott's theory, for it "overlaps with, but is initiated prior to, instinctual experiences that in time would determine object relationships" (1986, p.240).

The Kleinian view of drives as experiences of love and hate only becomes realisable once the concept of the whole person is an integral part of ego experience. According to Winnicott (1986), before the infant is able to experience him/herself as a whole person, drive impulses are experienced as intrusive seductions or attacks on the developing conscious ego. The development of both normal and pathological mental structure therefore has a common foundation in the maternal holding function of the mother-infant relationship. In Winnicott's model, the holding dimension of the mother-infant relationship is the foundation for all subsequent psychoanalytic drive-object interactions involved in the production of unconscious mentation.

2.2.5 Kohut: Drives are subordinated to the Self-Object Relationship

Kohut (1996) reiterates Winnicott's emphasis on the foundational importance of the infant-mother relationship. Kohut (1996, p.352) coins the term "self-object" to describe the infant's initial experience of non-differentiation from the caregiver. The infant's self begins to differentiate from the caregiver when minor, adaptive delays in gratification lead to an increase in the intensity of needs. The infant begins to perceive a distinction between certain needs belonging to him/her, and processes whereby these demands are met or frustrated (Kohut, 1996, p.200). Kohut (1996) views drives as existing in larger compound relationships with the transactions of the primary caregiver. From birth, drives are fully integrated into the self-object unit (Kohut, 1996, p.199). They do not exist as primordial entities, but only as fragmentation products of the earlier self-object relationship if the primary caregiver empathically fails the infant (Kohut, 1996 p.199). This empathy failure is traumatic, and is followed by the break-up of the self-object experience. The components of the sexual drive then become visible as pathological bodily interactions, i.e. orally, anally and genitally fixated activity (p.188).

In response, a reactive aggressive drive resembling Freud's psychological version of the death drive emerges. This comes to dominate the infant's functioning in the form of rage or the wish to destroy itself or others (Kohut, 1996, p.200). In normal development, both the sexual and aggressive drive components would have no impact as unconscious thought and behavioural predispositions, because they are seamlessly integrated into the experiential unit of the self-object relationship that functions according to optimal frustration (Kohut, 1996, p.187). The infant-mother relationship is the foundational matrix for the later emergence of a cohesive self-identity, while drives have a secondary role in forming unconscious pathological experiences if serious failures in caregiver empathic responsiveness occur.

2.2.6 Critical Comment

i) These five theories typify the modifications made to classical drive theory once Freud had departed from the scene.

In each case the influence of unconscious drive wishes are subordinated to some other central consideration, i.e. ego adaptation, socio-economic conditions, object relations, infant-mother relations or self-object relations. However, no effort is made in any of these theories to provide empirical proof, apart from clinical material, that their constructs are any more valid than the admittedly speculative foundations of Freud's psychosexual model (Edelson, 1988).

ii) In the review of the third psychoanalytic response category presented in section 2.4 below, it will be demonstrated that clinical case material is inadequate proof of the empirical existence of a psychoanalytic construct, e.g. unconscious infantile sexual wishes, or empathic failures in infant self-object relations. Therefore the above five approaches, while providing alternative conceptions of unconscious mentation, conflict and motivation, do not provide a foundation for these concepts that is any more valid than that which exists in Freud's psychosexual model.

iii) Specific biological mechanisms involved in psychological development, whether relating to drive, ego, or object relations formulations, are never explicitly addressed by any of the theorists outlined above. The role of biology and innate factors in underpinning psychoanalytic views of human development is acknowledged, only to be largely ignored in favour of studying unconscious mentation in infant and child development exclusively from a psychosocial perspective.

2.3 Response Two: Abandoning the Drive Model in the Search for New Foundations

2.3.1 Fairbairn: Object Relations Explicitly Replaces Drives as the Foundation for Unconscious Mentation

Fairbairn (1986a, 1986b) reformulates the concept of a life drive in his model of object-seeking behaviour. Psychosexual energy is formulated as the motivation to obtain a satisfying experience from an external object, i.e. a real person, rather than a discrete quantity separable from this activity (Fairbairn, 1986a, p.74).

Energy and mental intention are therefore fused in Fairbairn's model. The oral, anal and genital zones are simply convenient somatic locations that the object-seeking life drive uses in order to secure satisfying experiences from the primary caregiver (Fairbairn, 1986a, p.74). According to Fairbairn (1986a), the importance of these zones in early caregiving procedures makes them especially suitable for the expression of object-seeking aims (p.75). For Fairbairn (1986a), the life drive simply uses the body as a means to make gratifying connections with the primary caregiver. The life drive therefore has no chemical origin in the tissues of the body.

Fairbairn (1986b) explicitly abandons Freud's dual drive model and reformulates the life and death drives into a single object-seeking drive. Life and death dynamics are respectively explained in terms of satisfying connections to external objects and destructive connections to internal objects. When early interactions with the primary caregivers are generally satisfying, the infant perceives the caregivers as whole people. When relations with the primary caregivers are frustrating, neglectful or abusive, the infant incorporates these failures as part of him/herself. The images of the caregivers connected to the bad experiences are repressed and become unconscious, while the negative qualities associated with these experiences become consciously recognised self-attributes for the infant (Fairbairn, 1986b, p.116).

An urge towards self-destruction is therefore not a primary motivation of human beings, but a secondary product of the infant's relationship with unconscious internalised bad object representations (Fairbairn, 1986b, p.123). Emphasising object seeking as the primary drive in human beings allows Fairbairn to avoid the biological aspects of the classical drive model, as well as the innate adaptive capabilities of the ego, in order to focus on the infant's experience of interpersonal relations in the social world. It is adverse psychosocial relationships that produce unconscious mentation, rather than innate biological forces conflicting with the social adaptive functions of the ego.

2.3.2 Sullivan: Interpersonal Anxiety Impacts Negatively on Biological Needs and Relational Patterns to Create Unconscious Mentation

For Sullivan (1953), biological needs produce prototypical emotions structured by the activity that the infant associates with the relief experience. The initial building block of emotional structure is an interpersonal relationship, consisting of the infant's expression of a biological need and its fulfilment mediated by the primary caregiver. The erotogenic zones of the classical psychosexual model are reconceptualised by Sullivan (1953) as the initial areas of interaction between the infant and the primary caregiver. Both biological and psychological existences are from the very beginning interpersonal in nature (Sullivan, 1953, p.41).

When the primary caregiver is attentive to the expression of needs, biological and psychological development proceeds along healthy lines. However, this development is disturbed when anxiety states in the primary caregiver are empathically induced in the infant (Sullivan, 1953, p.41). Anxiety has neither a biological substrate nor a biological process of alleviation, the latter only being achieved through a mental experience of interpersonal security (Sullivan, 1953, p.42). Unlike biological needs, the anxious infant's distress does not lead to a reassuring response from the caregiver, because the source of the anxiety comes from the latter. Anxiety is the experience of interpersonal insecurity with the primary caregiver (Sullivan, 1953, p.43).

Anxiety impacts negatively on biological need fulfilment and the emotional configurations developing around these satisfactions, because the caregiver's anxiety interferes with her co-operation with the infant (Sullivan, 1953, p.59). Biological need interactions at the infant's mouth, anus and genitals become differentiated into pleasurable and anxious dimensions. Similarly the caregiver is divided into good and bad aspects associated with pleasurable and anxious interactions (Sullivan, 1953, p.75).

Sullivan's complex model of psychological development rejects the classical emphasis on drives, but retains the erogenous zones as sites where biological needs call forth interventions from the primary caregiver. Zonal interactions and sensory information associated with extreme anxiety lead to the formation of unconscious not-me experiential dimensions, i.e. experience is truncated and distorted by intense emotions of awe, horror, loathing or dread, and is unavailable to conscious awareness (Sullivan, 1953, p.163). In Sullivan's model, interpersonally mediated anxiety produces unconscious thought dimensions of the self-system and unconscious mental conflicts.

2.3.3 Horney: Pathological Disturbances in Interpersonal Relations Produce Drive-Like Neurotic Trends

Horney (1945) focuses specifically on the structure of neurotic conflicts, the latter being viewed as largely a consequence of disturbances in human relationships (p.12). The dual drive model misunderstood the origin of the compulsive, urge-like forces that provoke inner conflict in humans. Horney argues that the life and death drives should be understood as neurotic cravings for affection and power that are the consequence of disturbed human relationships (Horney, 1945, p.13). These experiences are not motivational forces underpinning all human behaviour, but are signs of neurotic conflict having roots in earlier disturbances (Horney, 1945, p.12). Neurotic conflicts are not caused by repressing agencies and repressed drive forces, but by contradictory sets of trends that were initially attitudes towards others, but that have become internalised self-attributions (Horney, 1945, p.15).

Contradictory sets of self-attributes constitute the self as a fundamentally neurotic, conflictual structure. Horney (1945) traces the origins of inner conflict to the experience of basic anxiety in the child (p.41). Anxiety is characterised by a sense of helplessness and isolation accompanying the child's perception of the contradictory nature of parental attitudes and responses towards him/her. Some of these adverse relations are consciously perceived, while others shape the child's perceptions in unconscious ways.

The child unconsciously develops strategies to cope with the specific constellation of relations constituting the family milieu (Horney, 1945, p.42). These strategies become lasting coping mechanisms, i.e. neurotic trends (Horney, 1945, p.42). Biological processes play no role in dynamic conflicts or unconscious thought processes; instead the relational strivings for affection from and power over others are contained within the basic neurotic trends.

2.3.4 Critical Comment

The three theoretical approaches outlined above demonstrate the different emphases on the role of biological factors in shaping the psychosocial development of the child once classical drive theory is explicitly abandoned. For Fairbairn and Sullivan, the body is still an important site for the development of psychological structure, but these authors take opposite views in terms of how relations with others impact on the body. Fairbairn proposes an innate object-seeking drive that predisposes infants to seek out relations with others. Sullivan on the other hand proposes no such drive, but instead attempts to show how general physical needs allow for caregiver interactions that shape infant experience, and in particular how caregiver-mediated anxiety shapes unconscious mental structure in infants. While both theorists outline intriguing theoretical possibilities as regards how unconscious mentation is structured, neither provides any convincing empirical proof of the relationships they propose between biology and the development of mental structure.

Horney rejects any biological or body-based component to the structure of unconscious mentation and mental conflict, instead outlining an exclusively psychosocial model. While this model provides an interesting angle on the social and familial dimensions that help constitute unconscious conflict, the author provides no empirical proof to give her model any more credibility than those proposed by Fairbairn, Sullivan, and countless other psychoanalytic authors. The exclusive reliance of these authors on clinical data to substantiate their theoretical claims simply illuminates the inability of this data to provide convincing evidence that one model is correct and another false (Grunbaum, 1993).

This lack of falsifiability means that, while many of these models of unconscious mentation may appear to be more convincing than the discredited biological speculations of the classical drive model, they offer no definitive empirical answers to the question of whether unconscious mentation actually exists, or how it is formed. What is lacking in these neo-Freudian and object relations approaches is an openness to developments in the biological sciences that might throw new light on the empirical status of key psychoanalytic concepts pertaining to unconscious thought. Examples of such biological findings include those relevant to the existence of repressed mental contents, unconscious wishes, primary process operations, the role of interpersonal interactions, and the role of the body. Bowlby (1986) does not directly address this issue of empirical proof criteria for unconscious mentation. He does nevertheless provide a precedent for psychoanalysts to engage in a dialogue with contemporary biological findings in the quest to empirically verify psychoanalytic concepts.

2.3.5 Bowlby: Attachment Needs Shape the Development of Psychological Structure in the Context of the Infant-Caregiver Relationship

Bowlby (1986) critiques the classical drive model, the object relations school and Sullivan's (1953) interpersonal model. He concedes that biologically derived survival needs concerned with food intake and waste elimination are important. The relevance of the oral, anal and genital zones is also acknowledged, but they are not understood in terms of:

- i) The classical model's assumption that they are bodily localisations of generalised sexual drive energy.
- ii) The pure object relations approach of Fairbairn, which assumes that these zones are the main conduits whereby an innate object-related drive initially finds expression and connects with the primary caregiver.

Bowlby (1986) notes that contemporary biology has categorised species-specific patterns of behaviour. These instinctual behavioural sequences represent evolutionary adaptations to environmental conditions (Bowlby, 1986, p.178). In humans, observable patterns of behaviour – e.g. crying when hungry, sucking, manipulating the genitals and exploring the anus – are activated by specific conditions (Bowlby, 1986, p.179). Bowlby (1986) argues that it is not endogenous drives that produce these different responses (p.181), but specific systems that are evoked by environmental cues (p.183). Bowlby (1986) cites findings, based on direct observations of infant behaviour, which suggest a predisposition to respond to caregivers' facial and vocal schemas (p.171). These schemas are the stimuli necessary for activating several primary responses in infants. When the specific environmental conditions evoking the infant behaviour are alleviated, the behavioural sequence is terminated – either by a different set of environmental stimuli (e.g. changes in the caregiver's behaviour) or by stimuli mediated by an endogenous regulatory system (e.g. a physiological feedback system that gauges satiation in relation to eating and drinking).

As the primary caregiver initiates specific behavioural patterns, these are also regulated by her interventions. Bowlby (1986) proposes it is when primary behavioural patterns are impeded from reaching termination, e.g. by inappropriate caregiving, that the infant experiences anxiety, which may result in psychopathology. Such anxiety states would be the conditions necessary for the development of unconscious mentation and conflict. Bowlby (1986) critiqued the emphasis many object relations theorists placed on orality as the central determinant in early infant-caregiver interactions. Bowlby (1986) proposes that sucking, clinging, following, crying and smiling are equi-primordial instinctual responses that became integrated into attachment behaviour during the first year of life (p.186). In particular, crying and smiling elicit caregiving responses, indicating that emotional interactions with the caregiver can be ends in themselves, without a survival need being part of the agenda (Bowlby, 1986 p.186). All five behavioural sequences are components of a larger organisational and adaptive response to the primary caregiver, i.e. the attachment relationship.

Like Sullivan, Bowlby (1986) argues that biological needs and interpersonal interactions mutually interpenetrate one another to build complex mental processes in humans. But unlike Sullivan, Bowlby argues that biological needs do not initiate interpersonal transactions between infant and primary caregiver. Bowlby (1986) asserts that biological needs are only activated into expressive forms by cues originating with the caregiver's presence. In his theoretical revisions, Bowlby (1986) stresses the importance of direct observation of human and primate infants, as opposed to the psychoanalytic tradition of exclusive reliance on child and adult clinical material. In doing so, he introduces new possibilities of verification for psychodynamic constructs. He shows how non-zonal biological predispositions and behavioural sequences are activated by caregiver cues, and suggests how these may contribute to the development of unconscious mentation.

However, Bowlby's use of contemporary biological and infant research findings to verify psychoanalytic constructs has been criticised by another school of psychoanalytic thought. This school argues that psychoanalytic constructs cannot be validated by any non-psychoanalytic discipline, and that the mental operations corresponding to psychoanalytic unconscious mentation can only be explicated and verified by proof criteria internal to the discipline of psychoanalysis itself. This third response to the problem of verifying the existence of unconscious mentation is critically appraised in section 2.4 below.

2.4 Category Three: The Clinical Psychosexual Model and the Hermeneutic Emphasis on Meaning Affinities as Proof Criteria

2.4.1 Grounds for the Separation of the Psychosexual Model from the Underlying Dual-Drive Terminology

A number of authors, including Habermas (1968/1972), G. Klein (1976), Gill (1976), Ricoeur (1981), Edelson (1988) and Grunbaum (1993) distinguish between Freud's dual-drive model of energy discharge, and his theories of repression, dream formation, slips, and sexuality derived from observations made in the clinical setting.

It is argued that the latter theories stem from clinical observations and inferences that have been integrated into the drive-discharge model, but that there is no inherent relation between these clinically derived findings and the drive-discharge concept (G. Klein, 1976, p.67; Gill, 1976, p.103). As outlined in sections 1.2 and 1.3 of chapter one, the drive model's origins are neurological, a contention supported by Gill (1976) and Grunbaum (1993). In the context of Freud's psychosexual model, the earlier neuropsychological energy concept was reformulated as a mental wish having specific energy intensity. It is argued that this energy model of drives was then used to explain the clinical findings of sexuality, dream formation and so forth on a more abstract level (Ricoeur, 1981, p.259). Furthermore, clinical observations were thereafter reconstructed and explained in terms of the drive-discharge model (Habermas, 1968/1972, pp.244-245; Ricoeur, 1981, p.259).

As outlined in chapter one, Freud's neurologically inspired energy model and the later Lamarckian cell biology speculations that underpin his theory of life and death drives are discredited by contemporary scientific findings. The present group of authors concur with this view, but argue that the drive-discharge model is therefore not a more abstract version of the clinical findings, but is derived from neuropsychological and evolutionary biological contexts that are intrinsically unrelated to the phenomenology of the clinical findings (G. Klein, 1976, pp.67-68; Ricoeur, 1981, p.259). The clinical findings are therefore intrinsically unrelated to the theoretical properties and origins of the drives.

The drive aspect of the psychosexual model, together with the evolutionary drive formulations, have misrepresented and distorted Freud's clinical findings (G. Klein, 1976; Gill, 1976). While Freud's dual drive formulations are incorrect, these authors argue that this is insufficient reason to discard Freud's clinical propositions. It is unjustifiable to replace Freud's theory of psychosexual development, primary process operations and repression, with relational, ego-adaptation, or attachment accounts of unconscious mentation (Edelson, 1988, p.161).

Once Freud's clinically derived theoretical propositions are separated from their drive theory reformulations, the former can be used to found a psychoanalytic theory purified of drive speculations (G. Klein, 1976, p.68). In this regard, a number of core propositions have been identified as the basis of a drive-free clinical theory of psychoanalysis (Edelson, 1988; Grunbaum, 1993; G.Klein, 1976). These propositions are listed in the following section.

2.4.2 The Core Propositions of the Clinical Psychosexual Model

In identifying the crucial tenets of a clinical psychoanalytic model, some debate is inevitable, but the following propositions, derived from G. Klein (1976), Edelson (1988), and Grunbaum (1993), illustrate the essential components of the clinical theory.

i) According to Grunbaum (1993), the central pillar of clinical psychoanalysis is the theory of repression, devoid of its dual-drive terminology. Grunbaum refers to a model in which neurotic symptoms, dream contents, and parapraxes are all explained in terms of the concept of repression, but devoid of the language of energy and discharge (1993, p.7). The reformulation of these three repression-related phenomena is exemplified in the propositions put forward by Edelson (1988) and G.Klein (1976) below.

ii) Edelson (1988) proposes that where there are gaps or discontinuities in a patient's memory, experience or understanding, and/or overt symptoms that impinge on a patient's memory, experience or understanding, these are indicative of other phenomena that cause, i.e. produce, these gaps or symptoms (p.159). These causal phenomena are wishes and beliefs that in terms of their content, relations and significance may be partly or wholly unconscious.

iii) These wishes and beliefs, which may or may not be primarily sexual in nature, are constituents of conflicts or dilemmas originating in the mental life of children (G. Klein, 1976, p.36).

iv) The wishes that become components of conflicts are fulfilled in imagination rather than carried over into reality-accommodated thought or instrumental action. These fantasy solutions to wishes may, over time, shape and produce internal and external responses to objects and events (Edelson, 1988, p.160).

v) The mind has two fundamentally different modes of operation: the primary and secondary process modes.

a) The primary process mode involves the construction of mental representations of wishes and their fulfilment by means of the imaginative operations of condensation, displacement, secondary revision and iconic symbolisation (Edelson, 1988, p.182). Wishes and beliefs produced by these unconscious imaginative operations are intrinsically orientated towards an imaginative resolution in which considerations of reality and truth are irrelevant. When action becomes a manifestation of this thought mode, this is an enactment of an imaginative drama, not an act resulting from the conjunction of imaginative wish and reality-orientated instrumental belief (Edelson, 1988, p.182). The operations of the primary process are intrinsically imaginative and symbolic, and are not based on the functioning of a primordial psychosomatic energy as proposed by Freud (Edelson, 1988, p.182).

Imaginative operations may be connected to neuropsychological brain regions that function in terms of neurochemical events and chemico-energetic reactions, but the nature of these connections is at present unknown. Furthermore, such neurochemical events are irrelevant to the level of analysis that attempts to map the gross functional characteristics of primary process operations, i.e. the psychoanalytic level of investigation (Edelson, 1988, p.142). The unconscious wishes and their fantasy fulfilments produced by primary process operations are intrinsically the work and product of the imagination, not of neurological events (Edelson, 1988, p.160). An unconscious wish does not receive its intensity from an energy charge, but from the sum of the kinds of imaginative operations that construct it and its fantasy fulfilment, together with the nature of the affective conflict that it becomes a component of (Edelson, 1988, p.160).

In the clinical model, imaginative operations replace drive energy as the means for understanding how the primary process produces unconscious mental conflict and repression. Repression is reformulated as a fantasy, i.e. an imaginative operation of incorporating certain events, wishes or beliefs, rather than a content-free energy mechanism, operating outside of imagination, that manipulates mental contents (Edelson, 1988, p.176). In this sense, repression is just another primary process operation among a number of others.

b) In the secondary process mode of operation, wishes are fulfilled through instrumental action, achieved by a process of cognitive inferences exchanged between a wish and a reality-accommodated perception or belief (Edelson, 1988, p. 160). Traumatic events and the internalised vicissitudes of object relations form part of secondary process operations, because although they may be partly determined by or in turn influence primary process wishes and beliefs, they are intrinsically structured by reality-accommodated perceptions, beliefs and instrumental activity (Edelson, 1988, p.164).

vi) G. Klein (1976) provides a detailed account of a clinical psychoanalytic theory of sexuality stripped of energy drive formulations. Sexuality is not a drive that can be measured in terms of energy quantities, but is a physiologically based appetite for sensual pleasures of variable quality, subject to qualitative changes in different psychosocial contexts (G. Klein, 1976, pp.40-42). The erotogenic zones of the mouth, anus and genitals, as well as other areas of the skin, are physiologically sensitive to arousing stimuli that activate appetitive experiences (p.22). Through repetition, memories of these experiences are organised into increasingly sophisticated cognitive schemas (G. Klein, 1976, p.62), including a network of associated meanings that are reactivated in other sexual and non-sexual contexts (pp.24-25). While the drive model reduces all wishes to a sexual origin, the clinical theory proposes reciprocity between sexual and nonsexual motives and information systems (G. Klein, 1976, p. 25). Sexual motives may shape nonsexual behaviours, but nonsexual motives may also shape sexual behaviours.

2.4.3 Hermeneutics Misconstrues the Scientific Status of the Clinical Psychosexual Model

There has been considerable confusion concerning what kind of proofs are applicable to the core propositions of the clinical model. This has been the case particularly since Habermas (1968/1972) and Ricoeur (1981) argued that the clinical propositions should not be tested according to the conditions set for natural science hypotheses, because they do not embody the same kind of universal causal laws and relationships that pertain to the 'hard' sciences such as biology, chemistry and physics (Habermas, 1968/1972, pp.271-273; Ricoeur, 1981, p.255). Habermas (1968/1972) proposes that no invariant causal law links a neurotic symptom in the adult via the mechanism of repression back to a childhood wish-fulfilment. The causal connection that pertains to clinical psychoanalysis is not a natural law, but a symbolic creation of the patient in the context of reconstructing a life narrative (p.271). The connections between a symptom in the present and a remembered childhood wish are causal only in a symbolic sense, i.e. in the meaning connections that the patient makes between the symptom, recovering the memory of a conflict-inducing wish, and the primal origin of that wish (p.271). Habermas (1968/1972) reduces all unconscious imaginative activity to linguistic symbols that have become disconnected from consciously accessible linguistic and grammatical operations (p.257).

Repression is the process whereby symbolically encoded information previously available to consciousness has, due to conflicting need interpretations (i.e. wishes), become split off into an isolated idiosyncratic semantic format (Habermas, 1968/1972, p.241). This isolated format disrupts or creates gaps in conscious communication and activities, i.e. manifest dream contents, the content of slips, and neurotic symptoms. The split-off format can only be recovered through the patient's self-reflection in the analytic context (Habermas, 1968/1972, p.257), i.e. isolated symbolic contents are reconnected to consciously accessible linguistic systems via self-reflection. What is recovered in this process is not a causal chain of factual events occurring outside of the symbolic processes of the patient, but connections between linguistically encoded imaginative phenomena that are reintegrated into the patient's self-experience (Habermas, 1968/1972, p.271).

It follows from the above argument that the proofs for clinical propositions are to be found in the analytic situation, i.e. by examining the meaning connections that the patient and analyst agree have restructured the former's distorted self-narrative. The agreed-upon observations can be compared with other cases and, on the basis of multiple comparisons, general explanatory laws concerning self-formative processes and recurring mental configurations may be formulated (Habermas, 1968/1972, p.264). However, these general interpretations are not invariant causal laws, but more abstract descriptions of thematic interpretive connections made by individual patients and analysts.

Ricoeur (1981) endorses the above position, but proposes that non-narrative connections apart from the patient's self-reflection can be systematically applied to individual cases (p.269). While general hypotheses concerning the drive model are not validated by clinical observations, it is still possible to construct law-like propositions applicable to typical categories of observed behaviour. This categorisation involves making inferences concerning how clinical events are either related to or actually embody unconscious motives and mechanisms of distortion (Ricoeur, 1981, p.269). For Ricoeur (1981), the traditional drive model does not offer a valid causal account of the thematic connections agreed upon by analyst and analysand.

Instead he suggests that the application of a drive-free dream interpretation and symptom formation theory, i.e. primary process operations, may establish law-like psychoanalytic propositions in relation to clinically derived meanings (Ricoeur, 1981, p.272). However there is a central problem with this kind of proof procedure. The core clinical propositions outlined in section 2.4.2 above may provide a plausible causal account of the meaning affinities of an individual case, and so generate law-like propositions that make reference to unconscious motives. However, this does not prove that the core inferences made in relation to clinical observations are empirically correct, and therefore the resulting theory of causation remains a hypothetical model, not a framework of factual laws.

The meaning connections made in the analytic setting cannot validate the existence of the core propositions, for the latter are causal hypotheses generated to explain observed clinical phenomena in terms of other processes that remain hidden and hence unaccounted for. Furthermore, with reference to the narrative-hermeneutic and clinical case study methods, Grunbaum (1993) argues that a proximity in time between two events, or the fact that one event can explain a number of co-occurring events, is not evidence of a proven causal link between such events. Grunbaum (1993) maintains that inferences derived from thematic kinships between events, no matter how strong, do not suffice as proof of a causal link between such events (p.138). In the clinical setting, there is no way of proving that a certain remembered or re-enacted event is definitively related to an unconscious conflict which has in turn produced certain characteristic observable symptoms (Grunbaum, 1993, p.155).

In regard to time-distant events, the understanding of the patient's resistance of his/her transference to the analyst as a re-enactment of earlier unconscious conflict is a misguided causal inference made on the basis of thematic affinities existing between the present analytic activity and certain earlier events (Grunbaum, 1993, p.152). Grunbaum (1993) argues that the re-enactment of these themes in the transference does not necessarily mean that the earlier events caused the characteristics presently observed (p.155). Thematic relations do not automatically imply a causal relationship. Grunbaum (1993) concludes that scientific proofs for the clinical causal propositions are unlikely to be found using the clinical setting alone, because the latter can only generate thematic affinities. Grunbaum (1993) suggests that epidemiological and experimental studies are more likely to furnish proofs of core clinical propositions than observations and inferences derived from clinical case studies (p.162). Core psychoanalytic explanatory propositions cannot be validated by means of narrative-hermeneutic or case study accounts of clinical phenomena, but must be observed under certain clearly specifiable conditions in non-clinical contexts.

The following section provides a critical evaluation of both the theoretical assumptions underlying the core propositions and the methods proposed for their validation. In the light of this critique, the present study proposes a different set of criteria, potentially useful in proving or falsifying core psychoanalytic propositions.

2.4.4 Evaluating the Assumptions Underlying the Core Propositions of Clinical Psychoanalysis

Certain core propositions of the clinical theory, particularly some of those proposed by Edelson (1988), contain controversial assumptions about what concepts are relevant to psychoanalytic theory and research. In particular, the core concept of psychoanalysis as a science of the imagination founded on the operations of the primary process (Edelson, 1988, p.190) includes assumptions in need of critical examination. Edelson (1988) assumes that psychoanalysis is intrinsically more concerned with the relation of wishes to imaginative operations, than with the relation of wishes to reality-accommodated beliefs and instrumental action (p.161). This assumption is controversial because it downplays Freud's (1900/1991a) focus on how unconscious operations are initiated, viz. that reality-based thoughts from everyday life provide the necessary material for primary process operations to begin to represent an unconscious wish (pp.750-753).

2.4.4.1 A Critique of Edelson's Assumptions

i) In the classical model, the raw material for dreams consists of secondary process contents such as thoughts, ruminations, and interactions with other people that were insufficiently attended to during the day. These thoughts are potentially accessible to but presently below the threshold of consciousness (Freud, 1900/1991a, pp.751-752). This preconscious neutral material can be appropriated by an unconscious wish, the primary process operations then using this material to express a fantasy fulfilment of this wish (Freud, 1900/1991a, pp.753-756). Unconscious wishes and primary process operations appropriate reality-based material for their own purpose of fantasy production.

Edelson (1988) assumes that childhood traumas and disturbed object relations experiences are not primary causes of unconscious mentation in psychoanalysis, because the relationship of fantasy wishes to imaginative operations has first priority (p.161). But the present study argues that it is unproven that disturbed object relations and childhood traumas do not play a primary role in creating unconscious fantasy-based mental processes. Edelson (1988) assumes that primary fantasy material is autonomous in relation to object-relational and traumatic material, but this assumption is not based on any empirical data. To make this assumption is a fundamental error, because reality-based material may play a central role in producing unconscious mentation.

ii) Edelson (1988) addresses the issue of central importance to the present study, viz. whether proofs for the core propositions of clinical psychoanalysis can be sought from the biological sciences. Edelson (1988) attempts to show that no basis for a dialogue exists between neuropsychology and psychoanalysis. He argues that for a causal connection to exist between a set of neurological correlates and a set of mental operations, each mental operation must be explainable in terms of an invariable set of neurological correlates. These correlates must in themselves conform to a significant structure or function at the neuropsychological level of explanation (Edelson, 1988, p.137).

Furthermore, Edelson (1988) proposes that two separate neurological functions are needed to explain two different but conceptually related mental operations at the psychoanalytic level (p.142). If this can be achieved, then psychoanalysis will eventually be reduced to neuropsychology. Edelson (1988) argues that such a direct relationship between neurological and psychoanalytic concepts is extremely unlikely, because the kinds of regularities and patterns each discipline is looking for are qualitatively different, i.e. the two disciplines ask fundamentally different questions (p.139). For example, in studying memory the neuropsychologist focuses on the functions and processes constituting memory encoding, storage and retrieval, whereas the psychoanalyst is interested in why a certain event is consciously recalled at a certain time, and how this memory is causally connected to other unconscious mental states such as wishes.

Therefore psychoanalytic operations do not conform to a set of neurological functions that have conceptual and functional significance at the level of neuropsychology (Edelson, 1988, pp.141-142).

The present study concurs with Edelson (1988) that psychoanalysis cannot be reduced to neuropsychology (p.142), but argues that causal connections between a neuropsychological function and certain unconscious dynamic operations may exist. A specific function or group of functions at a neurological level may be the necessary condition for the existence of psychoanalytic unconscious mental operations, despite no one-to-one correspondence between discrete functions existing across levels of analysis. For instance, the location of procedural and episodic memory systems in various limbic and cortical brain regions may lead to an understanding of how different encoding, storage and retrieval operations within these systems account for unconscious manipulation of encoded material. This manipulation of encoded material by memory processes may correspond to psychoanalytic unconscious mental processes.

2.4.4.2 The Counter-Proposals of the Present Study

Counter-proposal one.

Contrary to Edelson (1988), the present study proposes that psychoanalysis needs to empirically verify whether primordial unconscious operations are endogenously created fantasy-based processes, or involve internalised encoding of real object-relational and traumatic experiential material. Reality-based material could be a necessary condition for the initiation of unconscious operations and the construction of fantasy wishes.

Counter-proposal two.

While Edelson (1988) would concede that interpersonal relations material sometimes plays a constitutive role in generating unconscious conflict, he would argue that this material is always appropriated by the imaginative operations of the primary process and reworked according to the rules of psychic reality (p.161). In anticipating ideas put forward by the fourth psychoanalytic response category, the present study proposes that interpersonal relations material encoded by infants may play a central role in the production of unconscious mentation. Secondly, the present study disputes Edelson's (1988) claim that endogenous primary process operations appropriate interpersonal material. The present study proposes a different view of the origins of unconscious mentation based on empirical evidence from fields outside psychoanalysis. By demonstrating that interpersonal relations material contributes to the formation and functioning of unconscious mental operations, it cannot be regarded as having only a secondary role in the constitution of this mental category.

Counter-proposal three.

It is premature for Edelson (1988) to dismiss the idea that no causal connections exist between neuropsychological findings on memory encoding, storage and retrieval on the one hand, and the role of memory in producing unconscious events, beliefs and wishes on the other (p.156). Dismissing the idea that psychoanalytic unconscious mental operations may be causally connected to significant neuropsychological processes appears to be denying a potentially fruitful grounding for these operations before any real inquiry has even begun.

2.4.5 Formulating a New Approach

The critical appraisal of the hermeneutic proof criteria for the clinical model of psychoanalysis reveals that data from the analytic situation cannot validate the causal laws encapsulated by the clinical model's propositions. It emerges that extra-clinical methods and sources of information are needed to substantiate or refute the empirical existence of these propositions. The present study's critical examination of the clinical model highlights the shortcomings of approaches to unconscious mental functions that remain isolated from other contemporary disciplines dealing with mental functions in humans, e.g. neuropsychology and infant research. The definition of psychoanalytic unconscious operations as a category of mental processes apart from neuropsychological constructs, together with the exclusive reliance on clinical data for conceptual verification, has ultimately led to a crisis concerning how the core clinical propositions may be validated (Grunbaum, 1993, p.162).

Contrary to the clinical model, the present study proposes that it is methodologically necessary for psychoanalytic psychology to engage in a dialogue with biological fields such as neuropsychology and infant development, insofar as these areas contain new information relevant to the nature of unconscious mental processes. These non-psychoanalytic domains may thus act as external, independent forms of verification for the formulation of a more accurate psychoanalytic model of unconscious mentation. The counter-proposals set out in section 2.4.4.2 suggest alternative ways of conceptualising the nature of unconscious operations and relevant proof procedures to those traditionally advocated by the clinical model. In the discussion of the fourth psychoanalytic response to Freud's work outlined in section 2.5 below and in chapter three, it will become apparent that some of the conjectures contained in the counter-proposals have already been pursued by psychoanalytic theorists (Lacan, 1966/1992, 1973/1977, 1993; Ragland-Sullivan, 1986; Lichtenberg, 1983; Lichtenberg, 1989; Lichtenberg, Lachmann and Fossage, 1992).

In particular the clinical model proposition, which views primary process operations as the *ultimate causes* of unconscious mentation, is shown to be highly questionable. In the final section of the present chapter, the fourth psychoanalytic response to the problem of unconscious mentation posed by Freud's drive terminology will be outlined. This response proposes that psychoanalytic unconscious operations are discontinuous from underlying biological processes. However, unlike the clinical model, this does not imply that there is no relationship between these operations and biological processes. Indeed, the relationship between unconscious mental operations and biological-perceptual processes articulated in this fourth response has important implications for the present study's contention that external reality-based material is crucial to the formation of unconscious mentation. This fourth response is an essential psychoanalytic precursor to the infant behaviour and neuropsychological memory research findings to be outlined in chapter three – findings that will ultimately contribute to the construction of a new model of unconscious mentation.

2.5 Category Four: Lacan's Reformulation of the Freudian Field

The work of Jacques Lacan (1966/1992, 1973/1977, 1993) constitutes a detailed alternative to the three previous psychoanalytic attempts, outlined above, to circumvent Freud's drive terminology when accounting for unconscious mentation. According to the Lacanian School, these attempts represent misunderstandings of Freud's original texts (Ragland-Sullivan, 1986, pp.5-6), and Lacan re-reads Freud in order to correct these misunderstandings (Ragland-Sullivan, 1986, p.ix). This reinterpretation proceeds in the light of early research on animal imprinting and infant behaviour (Ragland-Sullivan, 1986, p.17-18), structural linguistics and the mathematisation of space (Leupin, 1991, p.2) that was being done when Lacan was writing and presenting seminars. For the purposes of the present study, an account of Lacan's work is restricted to the role that drives, biological processes and perceptual identification play in regard to the origins of unconscious mentation in young infants. In the Lacanian theory of infant development up to 18 months of age, it becomes apparent that these three issues enable Lacanian psychoanalysis to:

i) Incorporate new findings in biology and infant research that were unavailable to Freud, in order to show that, paradoxically, there is a disparity between the development of neurobiological systems and psychoanalytic unconscious operations. The key Lacanian assumption is that biological immaturity with regard to motor skills during the first 18 months of life forces the infant to encode perceptual information that cannot be fully processed or understood at the time (Ragland-Sullivan, 1986, p.13). This initial biological immaturity so constrains information processing that the first mental operations are unconscious misrecognitions of events that take place between infant and primary caregiver (Ragland-Sullivan, 1986, p.19).

ii) Establish the importance of primitive perceptual identificatory processes initiated in response to external visual and auditory/verbal material impacting on the neonate prior to the maturation of the relevant sensory receptor systems (Ragland-Sullivan, 1986, p.19). Contrary to both Freud and the proponents of the clinical theory – Edelson (1988) in particular – Lacanians propose that unconscious operations are not innate properties of human beings, but are initiated as inadequate neonatal and infantile responses to the complex visual and linguistic material mediated by the social world, i.e. initially the primary caregiver (Ragland-Sullivan, 1986, p.13).

It is precisely these concerns, i.e. the nature of the relationship between psychoanalytic constructs and neurobiological processes, and the empirical constitution and status of the first unconscious mental operations, that have been identified as key areas in need of investigation by the present study. It is therefore imperative to investigate the way in which Lacanians configure these issues. This can best be achieved via an outline of the Lacanian account of how infants acquire successive dimensions of mental structure as they develop between birth and 18 months of age.

2.5.1 The Relationship between Biological Processes and Unconscious Mentation

2.5.1.1 Biological Immaturity Facilitates the Emergence of Unconscious Operations

According to Lacan (1966/1992), during the first six months of life the infant is physically helpless and has immature sensory-motor capacities (p.4). This physiological prematuration constrains the infant, who is embedded in the social world, from efficiently processing incoming visual and auditory/linguistic material (Lacan, 1966/1992, p.18, p.68). Given the inescapable presence of these stimuli, and this biological immaturity, the infant registers sensory information with immature perceptual systems (Lacan, 1966/1992, p.18). Perceptual abilities are present from birth, but the infant is unable to distinguish the perceiving activity from the properties of the external data perceived (Ragland-Sullivan, 1986, p.18). There is also a lack of bodily motor co-ordination with respect to the infant's dealings with the external world (Lacan, 1966/1992, p.18).

The assimilation of external material (Ragland-Sullivan, 1986, p.19) takes the form of sensory identification (Lacan, 1966/1992, p.18). The infant merges with, i.e. literally becomes, the material that it experiences (Ragland-Sullivan, 1986, p.18). This form of perceptual processing exists before there is any cognitive capacity to represent visual and auditory material as discrete properties separate from the infant's activity (Lacan, 1993, p.148, p.165). In other words, identification is a presymbolic unconscious mental operation. During the first six months it is the maternal primary caregiver who mediates most of the visual and auditory material used in the identification process (Ragland-Sullivan, 1986, p.25). The identificatory process has a bodily component, i.e. tactile, visual and auditory (linguistic) material mediated by the caregiver impacts on the perceptual surfaces of the body via the skin, ears and eyes (Ragland-Sullivan, 1986, p.20).

Identification is a result of the infant's non-distinction between bodily responses to the stimuli and the information itself (Lacan, 1966/1992, p.18).

Touching, seeing and hearing don't discriminate between internal and external stimuli from the infant's perspective. The sensations *are* the infant (Ragland-Sullivan, 1986, p.18). Areas of particular sensitivity and significance include the mouth, anus, genitals, ears and eyes (Lacan, 1973/1977, p.200). These areas are differentiated from adjoining bodily regions because of their specific sensitivity due to the functions they perform, and the greater extent to which they have contact with externally mediated stimuli (Ragland-Sullivan, 1986, p.20). The stimuli leave physical traces on these body surfaces, traces that are perceptually encoded in a non-representable presymbolic form of memory (Ragland-Sullivan, 1986, p.22, p.177).

2.5.1.2 Environmental Stimuli Condition Unconscious Operations Occurring in the Light of Neurobiological Immaturity

Neonates perceptually encode external stimuli in association with specific body surfaces rich in perceptual sensitivity (Ragland-Sullivan, 1986, p.177). This fusion of endogenous sensitivity with external sensory stimuli occurs because of a lack of co-ordination between sensory and motor systems in the first six months of life. This non-co-ordination is facilitated by neurological immaturities affecting the symbolic encoding of visual and auditory/ linguistic material (Lacan, 1966/1992, p.19). The first unconscious operations involving visual imagery and linguistic sounds emerge due to the relative failure of the neonate's neurobiological perceptual capacities to adequately distinguish the discrete properties belonging to environmentally mediated material (Ragland-Sullivan, 1986, p.18).

2.5.1.3 The Mirror Stage: maturing Motor Co-ordination Increases the Efficiency of Perceptual Processing, Engendering a Transformation in Unconscious Mental Operations

At six months the infant passes from relative helplessness and biological immaturity to a state where it can alter its own spatial relationship to its environment. This is due to the development of sensory-motor co-ordination skills that enable control over some movements (Ragland-Sullivan, 1986, p.21).

This initiates major changes in the infant's bodily perception. From perceiving different body surfaces in a disjointed fashion, the different perceptual aspects of the body are experienced as a single, interconnected whole (Lacan, 1966/1992, pp.2-3). There is a "species-specific active identification with body form" (Ragland-Sullivan, 1986, p.21). The infant is able to co-ordinate the disjointed perceptual identification of different sensory stimuli with different sensory modalities into a unified framework of senses and motor responses. This enables the body to be perceived as a single, unified entity (Lacan, 1966/1992, p.21; Ragland-Sullivan, 1986, p.22, 80).

2.5.2 The First Unconscious Mental Operations: Primary and Secondary Identification

2.5.2.1 The Constitution of Primary Identificatory Memories

Ragland-Sullivan (1986) writes that identification involves a fantasy component (p.24). The indistinguishable intermixing of external sensory stimuli with the body's perceptual activity is encoded and stored without the infant being consciously aware of the resulting associational memory network (Ragland-Sullivan, 1986, p.44, 72). In this connection, Ragland-Sullivan (1986) writes, "the first act of cognition, then, is a perceptual merger with image and sound. The mergers leave behind representational traces forming the foundation of a memory bank (p.177)." Visual and auditory/linguistic elements are initially encoded as environmental-perceptual fusions lacking the property of conscious recognition. This encoding is fantasmatic, i.e. not real, because there is no differentiation for the infant between external stimuli and internally generated activity. The encoding and storage of this perceptual fusion is the first unconscious presymbolic operation performed by the infant.

2.5.2.2 The Constitution of Secondary Identificatory Memories

By six months, primary identifications are overlaid by the perception of a cohesive body that is nevertheless still undifferentiated from the tactile, acoustic and visual elements of the caregiver (Ragland-Sullivan, 1986, p.26).

This process of perceptual-motor co-ordination is called secondary identification (p.35). Secondary identifications occur due to the formation of connections between previously isolated primary identificatory memory networks during their co-ordinated use in the performance of new motor skills (Ragland-Sullivan, 1986, p.141). Both forms of perceptual identification result in different levels of memory encoding and storage that persist in unconsciously conditioning adult perception (Ragland-Sullivan, 1986, p.141). These two knowledge systems together constitute what Lacan (1966/1992) refers to as the imaginary order (p.35). After six months of age the infant's transactions with the primary caregiver are characterised by both forms of perception-based memory encoding and storage (Ragland-Sullivan, 1986, p.146).

2.5.3 The Lacanian Theory of Drives

2.5.3.1 Drives are not Innate Biological Constructs, but Products of Environmental Information

Lacan (1966/1992) locates the origin of drives in primary identificatory experiences (pp.16-19). In the context of infant need fulfilment the auditory, visual and tactile interventions mediated by the primary caregiver give rise to identificatory experiences. According to Ragland-Sullivan (1986), it is the satisfactory or frustrating nature of these perceptual experiences that engenders drive demands, not underlying biological needs (p.72). Lacan (1966/1992) distinguishes between a biological need and the mental drive demand engendered by infant identificatory experiences when the caregiver satisfies or frustrates this need (p.311). Drives are therefore the products of physical needs and caregiver-related affective information processed by infants in the context of their sensory-motor immaturity (Ragland-Sullivan, 1986, pp.73-74).

Unlike Freud's drive formulations, the essential component for Lacanians is not a somatic or chemical source, but environmental cues emanating from the primary caregiver that the infant inefficiently encodes into visual-tactile-acoustic memory traces (Ragland-Sullivan, 1986, p.20).

Drives are not innate mechanisms as Freud and the object relations theorists maintain, but perceptually encoded aspects of interaction information that unconsciously condition later responsiveness and behaviour in subjects (Ragland, 1995, pp.42-43).

2.5.3.2 The Central Importance of the Primary Caregiver in Lacan's Drive Theory

Lacan fundamentally reformulates drives so they are no longer innate entities having neurophysiological origins. Drives do not exist from birth in the neonate, but are built up from sounds, smells, images, and objects that are woven into associational memory networks through primary identification (Ragland, 1995, p.95). The complex interaction between the real responses of the primary caregiver and the real biological needs of the infant results in an imaginative, fantasmatic encoding of this experience on the part of the infant (Ragland, 1995, p.35). The difference between what really occurs on the level of biological need and what the infant imaginatively experiences as satisfaction or frustration constitutes the trajectory of a drive. Drives therefore only come into existence as a consequence of the infant's immature perceptual encoding of real characteristics of the primary caregiver (Ragland-Sullivan, 1986, pp.73-74).

2.5.3.3 Lacan's Drives do not resemble the Endogenous Entities Described by Freud.

Lacan's reformulation of drives bears no resemblance to the innate forces defined by Freud. Much of Lacan's work presents complex innovations in the guise of Freudian concepts with the claim that the meaning of the innovation is really contained in Freud's original formulation. However, by understanding drives as encoded sensory-affective material derived from the infant's interactions with the primary caregiver, Lacan subverts the idea that drives have innate origins. In conclusion, Lacan's drives do not involve innate biological forces as they did for Freud, but rather the infantile perception of external relational cues.

2.5.5.4 Conclusion: Drive Theory is Peripheral to the Core Propositions Contained in the Lacanian Account of Early Infant Development

The core propositions of Lacan's theory of infant development include the following:

- i) Sensory-motor immaturity coupled with perceptual sensitivity to incoming data engenders the first unconscious mental operations.
- ii) These operations include presymbolic primary and secondary perceptual identifications.
- iii) Both identificatory operations include the encoding and storage of unconscious perceptual information into memory networks.

These propositions can be adequately explained and their validity investigated without any reference to drive terminology. In fact, the Lacanian conception of partial and unified drives can be entirely formulated in terms of biological needs, interpersonal relations data, affects and perceptual memory encoding, without any direct use of or reference to drive terminology. Drive terminology is therefore peripheral to the core concerns of Lacan's theory of early infant development.

2.6 The Relevance of Lacan's Model of Early Infant Development for the Present Study

In section 2.4.4 it was concluded that the proponents of the clinical model of psychoanalysis were unable to find adequate proof criteria for their core propositions, for the following reasons. Firstly, the establishment of causal relationships is not identical to the establishment of thematic affinities between events occurring within the clinical context. Secondly, the assumptions underlying some of the core clinical propositions are problematic. The present study therefore engages in a critique of the assumptions underlying these core propositions, and emerges with counter-proposals. These include:

- i) That reality-based material may be a necessary condition for the initiation of unconscious mental operations.
- ii) That interpersonal relations material encoded in early infant life could initiate the earliest unconscious operations, and shape later-maturing symbolic unconscious operations. Inasmuch as this early material has a bearing on unconscious mental operations, it cannot be regarded as irrelevant or peripheral to the core causal psychoanalytic propositions concerning the existence of unconscious operations.
- iii) That it is premature to dismiss the possibility that no causal connections exist between neuropsychological findings on memory and linguistic/visual neurocognitive functions on the one hand, and psychoanalytic unconscious mental operations involving the manipulation of mnemonic material (i.e. wishes, events) on the other.

It is clear that Lacan makes important and controversial claims relevant to the abovementioned three proposals. These claims concern:

- i) The relationship between biological development and unconscious mental operations.
- ii) The early structure of unconscious operations, viz. primary and secondary identificatory memory encoding and storage of perceptual data in infants.

The Lacanian positions related to these two key areas are outlined below in order to illuminate the resulting lines of investigation pursued by the present study.

2.6.1 The Relationship between Biological Development and the Earliest Unconscious Mental Operations

2.6.1.1 Lacanians Propose that Neuropsychological Sensory-Motor Immaturities at Birth Shape the Mechanism of Primary Identification

Lacan, like Edelson (1988), argues that psychoanalytic operations cannot be reduced to biological processes, but unlike the latter author he maintains that the two levels are related to one another. Biological functions, viz. sensory and motor skills, are crucial to the development of unconscious operations from the Lacanian perspective. In chapter three the present study investigates the relationship between neuropsychological sensory-motor functions and unconscious mental operations in neonates, as outlined in the infant research literature (Bremner, 1995; Lichtenberg, 1983, 1989; Lichtenberg et al., 1992). The aim is to discover if infant research findings can verify the relationship between biology and the earliest unconscious mental operations proposed by Lacan – in particular, whether immature sensory-motor processes, in response to environmental cues, indirectly produce unconscious mental operations in infants (Ragland-Sullivan, 1986, p.19). Lacanian psychoanalysis re-opens the debate concerning the relationship between unconscious mental operations and underlying neuropsychological constructs prematurely foreclosed by the proponents of the clinical model.

2.6.1.2 Lacanians propose that despite Sensory-Motor Immaturity, Infants are attuned to Actively Perceive Environmental Stimuli

Environmental material processed by immature neuropsychological sensory-motor receptors accounts for the initiation of imaginary operations (Lacan, 1966/1992, p.4, pp.18-19). Lacan argues that the infant is attuned to the environment from birth, and therefore to reality-based material. This material forms the basis of primary identifications – the first kind of unconscious mental operation (Ragland-Sullivan, 1986, p.13).

In chapter three, the validity of the concept of a primordial neonatal attunement to environmental stimuli will be assessed with reference to infant research findings (Bremner, 1995; Fernald, 1992; Lichtenberg, 1983, 1989; Lichtenberg et al., 1992), given that this concept is central to Lacan's account of the formation of unconscious identificatory operations.

2.6.2 The Structure of the Earliest Unconscious Mental Operations

2.6.2.2 Lacanians propose that the Neonate's Initial Perceptual Encoding of Sensory Information Involves an Identificatory Merger

In the context of survival needs the neonate is forced to assimilate external data, thus initiating the first instance of an unconscious mental operation, viz. an identificatory merger (Ragland-Sullivan, 1986, p.19). With reference to the infant research literature (Bremner, 1995; Fernald, 1992; Lichtenberg, 1983, 1989; Lichtenberg et al., 1992), chapter three will attempt to ascertain whether the infant's initial encoding of external sensory material embodies an identificatory merger, or another kind of memory encoding and storage process.

2.6.2.3 Lacanians propose that the Primitive Perceptual Encoding of Real Information Initiates Primary Identification in Neonates

From the Lacanian perspective, external material forms the content of the newborn's unconscious mental operations. Lacanians claim that primary identification is an immature attempt to accommodate sensory material (Ragland-Sullivan, 1986, p.19). In chapter three, the present study will attempt to verify the existence of primary identificatory encoding, thus substantiating the claims made in counter-proposals i and ii concerning the central role that reality-based material may play in the formation of unconscious mental operations.

2.6.2.4 Lacanians propose that Primary Identification Involves a Presymbolic Memory Encoding and Storage Format that is Fundamentally Unconscious

Lacanians connect primary identification to the evolution of discrete memory networks, and in this sense unconscious mental operations and memory traces imply a mutual co-existence from the time of the infant's initial perceptual mergers with external data (Ragland, 1995, p.108). In chapter three the present study will investigate whether memory encoding and storage systems in infants persist as unconscious mental processes, as the proponents of primary identification claim. Memory is a major neuropsychological construct, and neuropsychological studies of memory in developing infants may clarify whether structures exist that enable neonates to encode experience in formats akin to the perceptual formats of primary and secondary identification (Johnson & Morton, 1991; Butters and Squire, 1992; Lichtenberg, 1983, 1989; Lichtenberg et al., 1992).

2.6.2.5 Lacanians propose that Immaturities in Memory Contribute to the Inaccessible Nature of Information Encoded During Primary Identification

If it can be verified that immature neuropsychological memory processes in neonates contribute to a distorted encoding and storage process, this finding would support Lacan's view that immature biological functions account for the fantasmatic nature of the first mental operations and memories. With reference to the literature on neuropsychological studies of memory and memory distortions (Ceci, 1995; Squire, 1995), chapter three will investigate the evidence for memory encoding and storage distortions in young infants.

2.6.2.6 Lacanians propose that Sensory-Motor Skill Co-ordination, Perceptual Processing Efficiency and Memory Processing Efficiency Co-evolve to Produce Secondary Identification

Memory traces derived from primary identifications are gradually co-ordinated into an associational memory network by developments in motor co-ordination. This enables the perceptual-motor encoding of the body as a cohesive form, and this encoding operation constitutes secondary identification (Ragland-Sullivan, 1986, p.21). Emerging sensory-motor co-ordinations enable corresponding changes in processing efficiency and mutual linking of discrete traces to occur in perceptual and memory systems, resulting in secondary identificatory encoding and storage (Ragland-Sullivan, 1986, pp.21-22). Sensory and motor memory traces that formerly would have received isolated storage are, after six months of age, linked into more complex sensory-motor trace networks. In chapter three references are made to the infant research and neuropsychological memory literature in order to examine the evolving relationship between sensory-motor skills, perceptual processing, and memory systems from birth to 18 months of age (Bremner, 1995; Ceci, 1995; Lichtenberg, 1983, 1989; Lichtenberg et al., 1992; Squire, 1995). The nature of the links between these three aspects of the developing infant will be assessed in order to ascertain whether they contribute towards a mental operation akin to secondary identification.

2.7 Conclusion

This chapter has outlined how the problematic relationship within psychoanalysis between unconscious mental processes and biological processes, initiated by Freud, has generated:

- i) A multitude of different post-Freudian discourses on appropriate ways of formulating unconscious constructs.

ii) A number of debates over the role biology may play in relation to both conceptualising and validating unconscious mental processes in psychoanalysis.

Despite the inevitable conceptual and epistemological modifications that have occurred within the psychoanalytic field concerning adequate proof criteria, these have not ruled out the possibility that the biological sciences may yet contribute towards the validation, refutation or modification of psychoanalytic unconscious mental constructs. In this regard, the proposals contained in the Lacanian perspective on early infant development have clearly demonstrated that there is little consensus within psychoanalysis in general concerning how biological functions and reality-based material enter into the formation of unconscious mental operations. Lacanian psychoanalysis re-opens the debate concerning:

i) The relationship that exists between biological development and reality-based material.

ii) The relationship that exists between biological functions, unconscious mental operations and reality-based material.

In relation to these two concerns, seven core proposals have been extracted from the Lacanian infant development theory. That a combination of biological functions and reality-based material may engender the formation of unconscious mental operations necessitates an investigative dialogue between the relevant Lacanian proposals and findings in the biological sciences that may validate, refute or modify these assumptions. This position of dialogue in order to validate or modify current psychoanalytic knowledge and debate is adopted by the present study. Chapter three begins by investigating whether the seven proposals on unconscious operations outlined in section 2.6 above can be validated or modified by comparing these concepts to relevant infant observation and neuropsychological research findings.

This investigative dialogue addresses the issue of biological development in relation to brain functions and perceptual-motor activity, how the developing human infant encodes external perceptual material into memory, and whether these memories are related to the development of unconscious mental processes.

CHAPTER THREE: LACAN, INFANT RESEARCH, NEUROPSYCHOLOGY AND THE IMPORTANCE OF MEMORY FOR A NEW MODEL OF UNCONSCIOUS MENTATION

Chapter two concluded that the Lacanian theory of early infant development contained a number of controversial proposals concerning:

- i) The relationship between biological development and reality-based material.
- ii) The relationship between biological functions, unconscious mental operations (primary and secondary identifications), and reality-based material.

In sections 3.1, 3.2, and 3.3 below, the seven Lacanian proposals covering these two issues will be critically examined in relation to findings in the fields of infant research and neuropsychological memory studies (Bremner, 1995; Ceci, 1995; Fernald, 1992; Janowsky, 1993; Lichtenberg, 1983, 1989; Lichtenberg et al., 1992; Nelson, 1993; Parkin, 1993; Squire, 1995). In particular, attention will be paid to the roles that memory encoding and storage functions play in regard to the constitution of unconscious mental processes. Infant research and neuropsychological memory constructs are used in order to evaluate, and where applicable modify, the ideas contained in the Lacanian proposals.

The second part of chapter three outlines Lichtenberg's (1989, 1992) model of presymbolic unconscious mentation, which draws explicitly on infant research and neuropsychological memory constructs. While this model accords with the Lacanian proposals in stressing the importance of infant perceptual and mnemonic processes for the constitution of unconscious mentation, it represents a more explicit integration of psychoanalytic constructs with infant research and neuropsychological memory findings. In particular, this theory explicitly connects the neuropsychological concepts of episodic and procedural memory with the development of presymbolic unconscious operations. As such, it represents a more contemporary integration of many of the ideas contained in the Lacanian proposals.

An outline of Lichtenberg et al's (1992) theory will illustrate the use made of episodic and procedural memory constructs in accounting for unconscious mentation. These constructs are imported from neuropsychology, but are not explicitly connected to specific anatomical brain locations by Lichtenberg (1989). There are no explicit links made between unconscious mental operations, memory constructs, and anatomical systems in the brain, although these links are indirectly inferred in Lichtenberg's model (1989, Lichtenberg et al., 1992). The section concludes with an outline of the present study's original contributions to be presented in chapters four, five and six.

3.1 The Relationship between Biological Development and Reality-Based Material

3.1.1 Lacanians propose that Neuropsychological Sensory-Motor Immaturities at Birth Shape the Mechanism of Primary Identification

The infant research findings appear to focus more on the sensory-motor abilities of neonates than on their immaturities. However, researchers acknowledge that the neonate is characterised by sensory-motor immaturity and lack of co-ordination in relation to external stimuli. Gaining motor control and co-ordination is a gradual process, and locomotion is an important step in the infant's development of spatial perception (Bremner, 1995, p.34). According to Lichtenberg (1989), sensory-motor co-ordination begins to occur when the infant is able to track both the internal information arising from its own actions, and the sensory feedback of the object world acted upon (p.24).

Bremner (1995) states that motor development and spatial orientation gradually improve between six and 18 months (p.163). Motor control over bodily rotation precedes bodily displacement, the latter kind of motor control only being mastered in the act of crawling (p.163). The two types of motor co-ordination are only co-present at approximately 18 months of age.

Bremner (1995) argues that the spatial transformations that occur once infants can crawl and sit up by themselves mean that they process more sensory information about the world in different ways, and that their spatial orientation abilities mature once underlying motor co-ordination has been achieved (p.162). It is therefore accurate to describe the infant between birth and at least six months as lacking sensory-motor co-ordination. Motor events leading to locomotion facilitate the infant's perceptual abilities by matching proprioceptive and visual information (Bremner, 1995, p.175). This implies that the lack of motor co-ordination at birth contributes to the limitations in the infant's perception of sensory stimuli. The sensory-motor immaturity of the infant up to at least six months, noted in observations of infant development, provides initial support for the above Lacanian proposal. However, it still needs to be verified whether neonatal environmental information extraction (perception) and encoding (memory) processes function according to the concept of primary identification proposed by Lacanians.

3.1.2 Lacanians propose that Despite Sensory-Motor Immaturity, Infants are attuned to Actively Perceive Environmental Stimuli

The existence of a primordial attunement to various forms of sensory data, particularly visual and acoustic data, is unambiguously supported by the infant research literature. In regard to visual attunement, neonates have poor visual acuity (Bremner, 1995, p.102; Mehler and Dupoux, 1990, p.49), but they are able to discern the true shapes of objects (Bremner, 1995, p.102), classify colours (Mehler and Dupoux, 1990, p.59), and use dynamic depth cues to spatially situate the objects perceived (Bremner, 1995, p.99). Research shows that neonates can hear better than they can see (Mehler and Dupoux, 1990, p.51). Auditory skills include attending to certain prosodic cues in speech, orientating towards and recognising the primary caregiver's voice and preferring it to a stranger's, and being affected by the alterations in intonation in the primary caregiver's vocalisations (Fernald, 1992, pp.402-404). Mehler and Dupoux (1990) state that neonates organise acoustic material into rhythmic groupings, i.e. distinct "sound streams", as opposed to discerning an unstructured cacophony (pp.68-69).

Furthermore, Bremner (1995) cites evidence that neonates are able to make audiovisual matches, i.e. intersensory links, in relation to specific speech sounds and facial imagery (p.113). There is also evidence that tactile sensations may be matched with visual cues from as early as the first month of infancy (Bremner, 1995, p.116). The above findings support the Lacanian proposal of a primordial neonatal attunement to environmental stimuli. However, they do not necessarily validate Lacan's concept of primary identification with regard to the perceptual processing and encoding of auditory, visual, and tactile information prior to six months of age.

3.2 The Relationship between Biological Functions, Unconscious Mental Operations and Reality-Based Material

3.2.1 Lacanians propose that the Neonate's Initial Perceptual Encoding of Sensory Information Involves an Identificatory Merger

3.2.1.1 Perception

The evidence concerning how infants initially perceive external stimuli is incomplete. Research indicates that infants younger than six months perceive objects as permanent entities, understand that objects can move relative to each other, and that objects can obstruct one another (Bremner, 1995, p.142). However, there are limitations to the young infant's perceptual abilities. For example, infants under four months do not understand the laws of gravity in relation to objects, and tend to treat two objects in proximity as if they were a single unit (Bremner, 1995, p.144). Nevertheless, neonates' perceptual systems are more sophisticated than originally thought, for they are able to extract three-dimensional visual cues inherent in environmental information (Bremner, 1995, p.175; Mehler and Dupoux, 1990, pp.95-96).

There is now evidence that visual three-dimensionality is constructed by the initial perceptual analysis of the retinal image, rather than by a higher cognitive interpretation of a two-dimensional retinal image (Bremner, 1995, p.118).

According to Bremner (1995), infants have to learn to construct the social meanings and functions of objects, not their three-dimensional realities (p.176). Young infants also appear to have cross-modal perceptual abilities. Chugani, Phelps and Mazziotta (1993) used positron emission tomography measures of local cerebral metabolic rates for glucose (LCMRG) to show that, between two and three months of age, there are increases in LCMRG in brain structures connected to visuospatial and visuo-sensorimotor integration (p.138). These brain structures include the parietal cortex, primary visual cortex, and the cerebellar hemispheres (p.138). The evidence indicates that infants under six months have considerably developed connections between visual and other sensorimotor modalities.

The Lacanian proposal of primary identificatory fusions with discrete audio, visual, and tactile sensory details may underestimate the young infant's ability to combine audio, visual and tactile data when perceiving three-dimensional objects. However, the concept of primary identification needs to be re-evaluated from the perspective of the new evidence, rather than summarily dismissed. Young infants still have to learn the social meaning of what they perceive, and these meanings change continuously in line with evolving perceptual abilities such as visual acuity, visual contrast sensitivity, and auditory localisation during the first six months of life (Bremner, 1995, p.60, p.108). While perception of three-dimensional objects may exist from birth in rudimentary form, the physical, perceptual and social properties of objects evolve as new adjustments in visual, spatial and auditory orientation become possible.

Bremner (1995) argues that the spatial transformations that occur once infants can crawl and sit up by themselves means that they process more information about the world from different perspectives, and that spatial orientation abilities depend upon underlying motor co-ordination (p.162). The ability to sit up (six months) and to begin crawling (10 months) facilitates change in perceptual abilities because the infant is able to match new proprioceptive and visual information. Changes in postural and locomotive abilities therefore mediate changes in the quality and meaning of perceptual input.

Up to six months of age, infants have blurred vision and their other perceptual abilities are limited by their locomotive, visual and postural inadequacies. Infants can focus on and co-ordinate the audio, visual, and tactile aspects of three-dimensional objects within their limited visual field (Bremner, 1995, p.58). However, once these objects are removed from their field of vision this co-ordination falls away. As the primary caregiver enters and leaves the visual field of the neonate, moments of audio-visual-tactile co-ordination in relation to the sensory aspects of the caregiver are followed by complete sensory absences, or by absences in one or more sensory modality, e.g. vision, that result in the disruption of the earlier experience. Temporary identificatory mergers with the three main sensory inputs from the primary caregiver are followed by moments where different sensory mergers occur, viz. where one or more sensory modality is temporarily withdrawn. For example, the primary caregiver can be heard but not seen or felt. A sensory merger can also be replaced by a moment of sensory absence in relation to the specific object being focused upon, e.g. when the primary caregiver leaves the room. Infant research findings therefore suggest that primary identificatory mergers may include co-ordinations of all three sensory modalities, or inputs from only one or two modalities.

Lichtenberg (1989) notes that young infants not only possess an inter-modal perceptual capability, but that perception occurs in concert with motor activities and emotional reactions (p.26). Perceptual experience is always integrated into an activity and an affect context, so that in infant experience there is no clear distinction between perceiving an object and the actions performed in relation to the object (Lichtenberg, 1983, p.100). Lichtenberg maintains that young infants respond to external stimuli in terms of integrated perceptual-affective-action patterns (1989, p.26). This lack of differentiation between affect, motor reactivity, and perceptual co-ordination of sensory stimuli suggests that these different types of data are merged in infant experiences of moments of interaction with the primary caregiver. Primary identifications therefore need to be reformulated as perceptual-affective-action sequences that are encoded by infants during their ongoing encounters with the primary caregiver and other objects.

This type of perceptual processing dominates experience prior to six months of age, after which motor developments mediate changes in the quality and efficiency of perceptual data processing. The encoding of experience in terms of fused perceptual-affective-motor action sequences represents a more detailed description of the infant perceptual encoding process than that originally described by the Lacanian concept of primary identification.

3.2.1.2 Memory

Bremner (1995) reports that by three months infants encode the properties of various stimuli (p.67), and that evidence exists that newborns encode auditory information for a few hours, or possibly even days (p.68). Parkin (1993) notes that neonates can recognise and learn a particular stimulus, but recall is something that only emerges in late infancy (p.150). Furthermore, early memory is highly context-dependent, for a similar activity in a different context will not be recognised in relation to the previous learning situation (p.150). Memories cannot be recalled unless adequately encoded and stored, and initial encoding depends on the state of the cognitive neuro-architecture functioning at any given age (Ceci, 1995, p.95). In neonates and young infants, this neuro-architecture is apparently immature. Infant development studies have found evidence from habituation that young infants encode perceptual stimuli, but it appears this occurs without any reflective or recollective capacity in relation to the perceptual contents (Janowsky, 1993, p.669). This ties in with the Lacanian perspective on primary identification, where perceptual mergers resulting in memory traces cannot be recognised or reflected upon by the young infant.

It has been suggested that early perceptual encoding in neonates and young infants involves a single generic memory system that initially records all perceptual stimuli, and then proceeds to retain those that recur while discarding those that do not (Nelson, 1993, p.363). Experiential events in young infants are only stored temporarily because the long term storage for this type of memory depends on areas of the neocortex (Squire, 1995, p.214) which only function efficiently after myelination of this region occurs at 18 months of age (Lichtenberg et al., 1992, p.47).

Infant memory stores therefore consist of generic schemas extracted from many individual perceptual experiences. Discrete perceptual-motor-affect mergers with the primary caregiver and the surrounding world are initially encoded as separate episodes. These episodes are transformed into common schemas, i.e. nonconscious generic knowledge, if similar experiential sequences recur (Nelson, 1993, p.379). This concept of infant memory encoding appears to coincide with the Lacanian position on primary identification, viz. that the infant cannot differentiate itself from the information it encodes and stores as memory. In terms of the infant research memory model, this lack of differentiation occurs because perceptual stimuli are encoded as nonconscious sensory-motor skills, habits (Squire, 1995, p.207) or generic schemas (Nelson, 1993, p.379), rather than discrete perceptual episodes which the infant can consciously recognise. From this perspective, individual perceptual-action-affect sequences either decay or are reorganised into a nonconscious, impersonal memory system.

3.2.1.3 Fantasy

Memory encoding is an outcome of perceptual analysis (Squire, 1995, p.199), and therefore the infant's perceptual-motor immaturities will contribute to distortions in memory encoding. For example, encoding will reflect the neonate's poor visual acuity and lack of sensory-motor co-ordination. These perceptual distortions will in turn become part of the infant's initial generic knowledge schemas. Inasmuch as generic memories contain limitations in perceptual processing, they represent distorted fantasy reproductions of external perceptual cues. Therefore Lacanians are correct in proposing that perceptual processing limitations, amounting to fantasmatic distortions, permeate the infant's initial memory schemas.

3.2.2 Lacanians propose that the Primitive Perceptual Encoding of Real Information Initiates Primary Identification in Neonates

The outline of infant perceptual and memory processes in section 3.2.1 above appears to support the Lacanian concept of identificatory mergers, although infant research findings enable a more precise reformulation of this concept in terms of perceptual-activity-affect sequences. It is found that early infant constraints in perceptual, motor, and memory processing account for distortions in the encoding of environmental material consistent with the Lacanian concept of primary identificatory mergers. Furthermore, it is clear from the infant research findings that environmental cues form the basis of memory content and initiate the memory encoding process in young infants. This view accords with the Lacanian contention that real external information acts as the catalyst that initiates the primary identification process. Finally, the nonconscious, generic perceptual memory networks that receive permanent storage in young infants are compatible with the Lacanian concept of presymbolic unconscious memory networks encoded as a result of primary identifications.

3.2.3 Lacanians propose that Primary Identification Involves a Presymbolic Memory Encoding and Storage Format that is Fundamentally Unconscious

Generic knowledge schemas correspond to data abstracted from discrete perceptual and motor responses and are completely nonconscious (Squire, 1995, p.207), i.e. they are unavailable at the time or later as discrete events or facts (p.218). Generic schemas are expressed as nonconscious behaviour without any conscious sense of memory being involved (Squire, 1995, p.207). Storage of individual events cannot occur given the immaturity of the relevant neocortical structures (Squire, 1995, p.214), and there is no representation of self or sense of autobiographical continuity inherent in the infant's generic knowledge schemas (Squire, 1995, p.219). Therefore this presymbolic infant memory system accords with the Lacanian concept of primary identifications that are inaccessible to the conscious autobiographical memory system operative in older children and adults.

3.2.4 Lacanians propose that Immaturities in Memory Contribute to the Inaccessible Nature of Information Encoded During Primary Identification

The immaturities in perceptual processes, coupled with the abstract nature of generic memory encoding in young infants, are responsible for the inaccessible nature of early infant experiences. Memory encoding occurs on the basis of perceptual analysis (Squire, 1995, p.199), and generic memory schemas will to some degree preserve the early distortions in perceptual abilities, e.g. poor visual acuity and lack of stereoscopic vision (Bremner, 1995, p.102), because memory can only encode what perceptual analysis provides. Therefore the Lacanian contention that immaturities in infant memory processes contribute to the inaccessibility of information encoded during primary identificatory mergers is supported by current findings on generic memory in infants.

3.2.5 Lacanians propose that Sensory-Motor Skill Co-ordination, Perceptual Processing Efficiency and Memory Processing Efficiency Co-evolve to Produce Secondary Identification

According to Bremner (1995), motor development and the spatial orientation dimension of perception both gradually improve between six and 18 months of age (p.163). Bremner (1995) argues that once infants begin to crawl and sit up by themselves, they are able to process more visuospatial information about the world in different ways, i.e. their spatial orientation abilities mature once underlying motor co-ordination occurs (p.162). Bremner (1995) concludes that motor events leading to locomotion facilitate the infant's perceptual abilities by prompting co-ordination between proprioceptive and visual information (p.175). By six months, infants sit up using their arms as supports, enabling a major change in spatial orientation to surrounding stimuli to occur (Bremner, 1995, p.33). New proprioceptive and visual matches become possible based on this innovation in the infant's posture.

Given that memory encoding depends on the underlying complexity of perceptual analysis, new matches of proprioceptive with visual data enabled by sitting up will not only facilitate changes in visuospatial processing, but also in memory encoding (Squire, 1995, p.199). According to Squire (1995), procedural memory consists of patterns of similarity and change registered by perceptual systems, these patterns being encoded as new skills or habits (p.207).

Changes in motor and perceptual abilities will be initially encoded as novel episodes before being re-organised into generic memory schemas, providing they are repeated. New generic memories reflect new information regularities encapsulated by developing motor and perceptual co-ordination skills. New generic memories in turn facilitate further co-ordination of sensory and motor data processing. The changes in postural and perceptual abilities at six months means that the infant experiences a shift in relating to his/her body and the primary caregiver. Changes in perception and locomotion will be reflected in the infant's ongoing emotional encounters with the primary caregiver. The generic memory knowledge system enables the infant to automatically compare current perceptual-affective-action sequences to existing schemas, and to construct new associations and co-ordinations within and between different schemas (Nelson, 1993, pp.372-373).

For instance, infants at five months are able to detect mismatches between proprioceptive and visual stimuli in relation to limb movement, indicating that they have begun to discriminate between and co-ordinate different modes of sensory data in relation to bodily movement (Bremner, 1995, p.206). These new perceptual and motor data co-ordinations condition the encoding of new generic memory schemas. In turn, these new generic schemas, once stored, will enable improved co-ordination between visual, proprioceptive and motor data. Current generic memory schemas will reflect innovations in sensory and motor processing, and enable these co-ordinations and comparisons to be consolidated in long-term storage.

The co-ordinations enabled by the earliest generic memory schemas allow the infant at five months to match limb movement patterns with the visual experience of their own limbs in action, and this eventually facilitates visual self-recognition (Bremner, 1995, p.206). Furthermore, at six months infants are able to take account of bodily rotation due to their improving spatial orientation with regard to perceptual stimuli (Bremner, 1995, p.163). These new perceptual-motor co-ordinations achieved at six months suggest that memory – as an outcome of perceptual analysis (Squire, 1995, p.199) – will reflect these changes in its encoding and storage operations.

Based on these findings, the present study contends that, between five and six months, disparate body parts are integrated into a whole body schema, as visual information pertaining to body movement is connected to proprioceptive sensations stemming from whole body rotation and limb movements. In turn, these co-ordinations are encoded and stored as a generic memory schema representing a map of the infant's body as a whole. There is therefore a co-ordination between maturing perceptual, motor, and memory processes that accounts for an emergent body-based self-concept by six months of age. This accords well with the Lacanian concept of the six-month-old infant shifting from a fragmented body-experience to a cohesive experience of having a whole body, and hence being a unified, cohesive person (Ragland-Sullivan, 1986, p.21, p.25). Infant research findings indicate that infant self-perception also develops in relation to the behaviour of others, specifically the primary caregiver. The infant begins to perceive the behaviour of others as being directed towards his/her body-self (Bremner, 1995, p.206).

This appears to contradict the Lacanian assumption that secondary identification with a whole body-self does not involve any differentiation between the infant and the primary caregiver as separate people (Ragland-Sullivan, 1986, p.24). Research shows that young infants readily perceive people, differentiate objects from people, and are capable of detecting the emotions of others, but these abilities do not necessarily depend on any reflective awareness of the difference between self and others (Bremner, 1995, p.207).

There is a need to distinguish between infants' social interactive abilities, whereby they give the appearance of treating the caregiver as a separate person, and a later knowledge of self and other within the context of social relationships. The latter knowledge is made possible only by symbolic representation (Bremner, 1995, p.207). Between 18 and 21 months of age infants perceive their mirror image as an indicator of cohesive selfhood, for they connect the activity in the mirror image to their own actions (Lichtenberg, 1983, p.105; Howe and Courage, 1997, p.506). This mirror test corresponds to the development of a representational self-concept that supersedes the earlier perceptually orientated body-self image (Bremner, 1995, p.256).

Prior to 18 months infants may engage in purposeful interactions with the primary caregiver, but there is no representational or self-reflective ability on their part (Howe and Courage, 1997, p.507). The infant's body-based self at six months includes neither a symbolic referent, nor a sharp differentiation between the infant's activity and the caregiver's interventions. The infant's initial responsiveness to others is framed in terms of imitating and mirroring others' activities, without yet making a conceptual distinction between itself and others as separate entities (Howe and Courage, 1997, p.507). In this sense, the development of a bodily self-concept at six months initially exists without any sharp conceptual differentiation between self and other in relation to the infant's ongoing interactions with the caregiver. This infant research finding accords with the Lacanian idea that secondary identification involves a lack of a formal differentiation between the infant's experience of itself and of the caregiver.

3.3 Summary: The Central Importance of Memory Constructs in Constituting Unconscious Mental Operations

The present study uses neuropsychological research on memory in concert with infant research findings to throw light on the veracity of the seven proposals put forward in the Lacanian account of the development of the first unconscious mental operations. The main findings of this comparative analysis are presented below.

i) Firstly, the Lacanian account of the relationship between biologically immature sensory-motor functions and the development of the first unconscious mental operations coincides with infant research accounts of immaturities in early sensory-motor data processing systems. These sensory-motor limitations are carried over into the subsequent memory encoding and storage of external information.

ii) Secondly, the Lacanian concepts of primary and secondary identification coincide with infant research and neuropsychological memory accounts of infant perceptual-action-affect sequences that undergo significant perceptual-motor and memory reorganisation at six months of age.

iii) Thirdly, and most importantly for the present study, the connection between perceptual response systems and the development of unconscious memory implicit in the Lacanian approach to unconscious mental operations is reiterated by the infant and neuropsychological memory research conception of a nonconscious generic memory system in infants.

Lichtenberg (1989) and Lichtenberg et al. (1992) have used infant research and neuropsychological memory findings to develop a memory model of unconscious mentation that supersedes all previous drive, object relations, and hermeneutic/clinical psychoanalytic models of unconscious mentation. In the following section this memory model is described, with particular attention given to how it fits with the perception-memory model of unconscious mentation that has taken shape in relation to the seven Lacanian proposals outlined above. The Lichtenberg model accords with the Lacanian proposals in stressing the importance of early perceptual and mnemonic processes in generating unconscious mentation. However, it represents a more explicit integration of psychoanalytic constructs with infant research and neuropsychological memory findings. In particular, this model connects the neuropsychological concepts of episodic and procedural memory systems with the development of presymbolic unconscious operations. As such it represents a more contemporary formulation of many of the ideas contained in the Lacanian proposals.

3.4 Lichtenberg: Unconscious Processes and Memory Encoding

Lichtenberg (1989) uses infant research findings to identify five classes of basic activity into which neonates' pre-adaptive behaviours can be divided (p.1). These categories are: the psychic regulation of physiological requirements such as sleeping, eating and waste elimination; attachment-affiliative activities, including clinging, crying, and following; exploratory and assertive activities; aversive activities of antagonism and withdrawal; and activities bound up with sensual enjoyment and sexual excitement (Lichtenberg, 1989, p.1). In line with contemporary neuropsychological memory studies, Lichtenberg concludes that these five basic classes of activity facilitate sets of stereotypical experiences that are encoded from birth as unconscious procedural memories (Lichtenberg, 1989, p.276). Procedural knowledge is not directly accessible to consciousness because it consists of skills abstracted from the residues of common schematic activities rather than individual autobiographical events (Baddeley, 1992, p.311). This concept is similar to Nelson's (1993) model of generic schemas (p.363).

Simultaneously, singular events, i.e. schematic activity sequences occurring on possibly only a single occasion, are coherently structured by episodic memory (Baddeley, 1992, p.311). Infantile schematic activities in combination with caregiver responses form perceptual-affective-action sequences, and these constitute the earliest discrete affective events (Lichtenberg et al, 1992, p.67). Episodic encoding occurs when a single sequence is characterised by intense affects (Lichtenberg et al., 1992, p.70). When similar events are repeated, they form a generalised schema from which all idiosyncratic event features are discarded (Nelson, 1993, p.363). According to Lichtenberg, isolated traumatic events are special situations that despite only occurring once or twice in infancy may receive long-term encoding in procedural and/or episodic memory because of their affective intensity (1989, p.281).

3.4.1 The Presymbolic Dimension of Unconscious Mentation

Infant research findings prompted Lichtenberg et al. (1992) to define a realm of unconscious thought that in some ways parallels, but also differs from the Lacanian concept of primary and secondary identification (p.67). The five-system model identifies a number of different dimensions of presymbolic unconscious mentation.

3.4.1.1 Unconscious Information Processing Rules

Lichtenberg et al. (1992) propose that there is a level of fundamental unconscious mentation (p.67). This consists of innate rules or pattern regulators that structure the way in which raw sensory-experiential data is selected, organised and encoded as procedural and episodic memory (Lichtenberg et al., 1992, p.67). These rules of organisation actively structure the environmental information that infant's process in terms of the five schematic activity classes (p.67). According to Lichtenberg et al. (1992), as action sequences for each class of activity unfold, so positive or aversive affects are triggered (p.69). Innate rules govern the infant's re-creation of familiar affect states, whether these are positive or aversive (p.69). Other rules include information-processing principles that govern maintenance of interest in the light of the novelty or familiarity of external stimuli (Lichtenberg, 1989, p.276). Lichtenberg et al (1992) conclude that uncoded rules determine which action sequences will be encoded as procedural memory and which as episodic memory, while another rule codes for different motivational choices, e.g. prioritising the repetition of familiar affect states (p.70). In turn the outcomes of the motivational selection process are encoded as either procedural, episodic knowledge, or both.

This system of innate information processing rules appears to conflict with the Lacanian-infant research view of unconscious mentation outlined above. Lacanians would deny that primordial unconscious mental operations are innate.

They would argue that it is precisely because the innate biological perceptual processing capacities of the infant are immature that the distorted perceptual processing and encoding of sensory experience typical of unconscious primary and secondary identifications occur at all. It could be argued that Lichtenberg et al (1992) gloss over the fact that i) the innate processing rules are initially very primitive, ii) they are prone to distorting incoming data, and iii) incoming data actively organises these rules in turn. On the other hand, because Lacanians stress that innate processes are immature, they tend to undervalue the degree to which these processes do contribute to the distorted encoding of external data associated with primary and secondary identifications. While environmental information constitutes the vital raw material of the first unconscious operations, innate information processes – the sensory and motor attunement characteristics of neonates – encode this raw material. In turn this encoded raw material proceeds to organise and shape the encoding rules in the perceptual and motor areas of the brain, something that Lichtenberg et al. (1992) concede (p.70).

It is important to stress that these pattern regulators are not stored unconscious memory contents, but conform to episodic and procedural information processing principles – empty in themselves – that are instrumental in the perceptual and memory analysis of environmental inputs. These pattern regulators coincide to some degree with the primary and secondary identificatory mechanisms of the Lacanian School. Both schools agree, unlike other psychoanalytic models, that presymbolic perceptual-mnemonic encoding and storage mechanisms are central to an understanding of unconscious mental operations. These nonconscious information processes are permanently unavailable to symbolic representation and consciousness (Lichtenberg et al., 1992, p.91).

3.4.1.2 Presymbolic Procedural Memories

Lichtenberg et al. (1992) state that procedural memory contents encoded and stored prior to the linguistic and imagistic modes of symbolic representation are remote from awareness, but as nonconscious habits and emotional dispositions they can influence symbolic behaviour and emotional expressiveness (p.91).

Lichtenberg et al. (1992) neglect to add that procedural memories, whether developing prior to or after symbolic representation, are inaccessible to conscious recall, because they are nonconscious skills, habits and dispositions that manifest behaviourally rather than as representable knowledge systems (Squire, 1995, p.207). This is true even for procedural memories that are only encoded once symbolic representation is operating. For instance, the rules governing the correct use of language are procedural in the sense that the user is completely unconscious of their existence but nevertheless embodies their use in spoken discourse. Procedural schemas develop in relation to activities regulating physiological requirements, attachment/affiliation needs, exploration/assertion needs, sensual/sexual sensations and aversive responses.

3.4.1.3 Presymbolic Episodic Memories.

Perceptual-activity-affect sequences in infants, encoded as episodic memories, often find expression as bodily or sensory experience if they are not re-coded into symbolically organised memories (Lichtenberg et al., 1992, p.91). Episodic memories refer to the encoding of perceptual, motor, and affect information into a coherent event structure. Positively toned episodic memories encoded prior to symbolic representation will be actively sought and repeated by infants, leading to their reorganisation into abstract generic memory schemas. Generally speaking, positive events encoded prior to 18 months of age will not be individually stored on a long-term basis, but will be amalgamated into nonconscious generic schemas once similar instances recur.

According to Lichtenberg et al. (1992), the myelination of the cerebral hemispheres, beginning at 18 months, is a necessary condition for linguistic and visuospatial processing in cortical association areas to begin (Lichtenberg et al., 1992, p.67). These formats reorganise current procedural and episodic memories into new representational forms. However, the transformation to efficient symbolic functioning is a gradual process, and as a result both positive and aversive episodic memories occurring prior to and during this reorganisation period are very inefficiently encoded and stored in terms of the new formats.

In effect, most pre-existing presymbolic episodic memories are not successfully reformatted, and remain unavailable to linguistic and complex visuospatial symbol systems.

Apart from positive presymbolic episodic memories, which are generally reorganised into generic schemas, presymbolic aversive events may occur that have a high affective impact (Lichtenberg, 1989, p.281). Lichtenberg (1989) suggests that prior to symbolisation these events may be stored in two different ways. Either the event is particularised, in the sense that it precipitates a narrow response such as aversive withdrawal from the stimulus, or it is generalised into a global behavioural procedural schema that shapes infant responses to a wide variety of experiential stimuli apart from similar aversive events (Lichtenberg, 1989, pp.281-282). The concept of particularisation implies that isolated aversive episodes may in some cases receive long-term storage outside of the infant's generic memory network. Lichtenberg et al (1992) affirm this implication when they state that fundamental unconscious mentation consists of both episodic and procedurally encoded presymbolic material (p.74).

3.5 Developing a Memory Model of Presymbolic Aversive Unconscious Mentation

The outline of presymbolic unconscious mentation presented above has many features in common with the perspective outlined in relation to the Lacanian proposals. Firstly, while Lichtenberg et al's (1992) model does not emphasise the initial limitations of unconscious information processing rules, these limitations are implicit in their distinction between presymbolic perceptual-affective-activity sequences and the symbolic reorganisation of experience in children and adults. Secondly, understanding the perceptual and affective dimensions of infant activity sequences in terms of raw material for presymbolic memory encoding operations accords with the Lacanian view on sensory information and perceptual processing being integral to primary and secondary identifications.

Thirdly, in accordance with the Lacanian School, Lichtenberg explicitly acknowledges the importance of memory systems in structuring presymbolic unconscious operations and information systems. Unconscious mental operations are inseparable from perceptual processing, memory encoding, and long-term storage functions. However, the use of the procedural and episodic memory constructs enables the emergence of a more detailed understanding of presymbolic unconscious mentation than that contained in the critical appraisal of the seven Lacanian proposals. In particular, the proposed presence of presymbolic aversive episodic memories in addition to a generic memory system in infants suggests a new specificity in demarcating different categories of unconscious mental process having significance for human motivation. In this context, Lichtenberg et al. (1992) identify an aversive knowledge system integral to the structure of human subjectivity (p.153).

It follows that presymbolic aversive memories form a component of this system. Both acute and chronic aversive episodic material has an important role to play in structuring memory systems in young infants. However, Lichtenberg et al's (1992) theory of unconscious aversive presymbolic memories exists only in a provisional, speculative form. The theory is supported in a general way by the myelination of the cerebral cortex after 18 months, and neuropsychological theories of episodic/generic and procedural knowledge encoding in young infants and toddlers (Lichtenberg et al., 1992; Nelson, 1993; Squire, 1995). In the context of this ongoing attempt to integrate a psychoanalytic view of unconscious mentation with relevant knowledge from the biological sciences, the present study attempts three original contributions.

i) The Lichtenberg model will be used as a starting point for the empirical grounding of presymbolic aversive unconscious mentation via reference to neuropsychological studies of memory. In chapter four the present study will demonstrate how aversive episodic and procedural memories are encoded and stored by an array of anatomically distinct brain functions embodying the diverse components and processes making up these memory formats.

The brain regions responsible for regulating presymbolic procedural and episodic encoding and storage of aversive knowledge will be described via reference to neuropsychological studies of memory. The present study intends to show how cortical and sub-cortical brain regions responsible for encoding and storing externally mediated aversive information in infants engender a fundamental level of presymbolic unconscious processes in human subjects.

ii) The grounding of a presymbolic aversive memory system in diverse brain regions may establish how aversive events and their procedural responses are stored in different brain regions so that they come to have long-term motivational significance for the subject. Chapter five demonstrates that the presymbolic memory model enables a new understanding of how presymbolic, and later symbolic, aversive events interact to create dynamic unconscious operations that accord with the psychoanalytic conception of unconscious mental dynamics. The memory model developed in the present study therefore aims to provide a reconceptualisation of psychoanalytic unconscious mentation that is more empirically viable than those offered by the other psychoanalytic paradigms discussed.

iii) The study concludes in chapter six with an exploration of how the presymbolic memory model may contribute towards an understanding of different types of memory distortion. This exploration includes a) applying the presymbolic memory model to understand how false memories of infant trauma may arise, and b) applying the model to more adequately explain the dissociation of true memories of abuse and their later involuntary recall within the context of Post Traumatic Stress Disorder (PTSD). By offering new insights into these memory distortions, the present study attempts to demonstrate the explanatory efficacy of the presymbolic memory model beyond the theoretical parameters within which it was originally developed.

CHAPTER FOUR: THE NEUROLOGICAL MECHANISMS OF PRESYMBOLIC MEMORY

In chapter three the memory research literature was cited in order to show that memory encoding and storage in infants under 18 months of age conforms to a nonconscious system of generic schemas that cannot be consciously recalled (Nelson, 1993, p.363). However, later in the same chapter it was stated that in addition to this form of unconscious memory, isolated aversive events with a high affective valence might be encoded into a particularised trace containing information about the context (the episode) and the associated fright response (procedure) in presymbolic infants (Lichtenberg, 1989, p.281). In fact a major debate exists within the neuropsychological memory research literature concerning whether infants under 18 months actually encode anything that corresponds to a discrete episode or event structure, and whether such episodes are maintained in long-term storage as discrete entities.

In the present chapter it is argued that infants do encode information into event episodes, and that this is particularly likely to happen when unusual, aversive incidents occur. Furthermore, the aversive quality of the stimulus ensures that such events receive long-term storage. The present study considers aversive affect to be a key encoding and storage property of events in infancy and it is therefore integral to the establishment of a presymbolic unconscious memory system. The debate concerning encoding and storage of events in infancy, and the role of aversive affect in this process is outlined in section 4.1 below. This section is an essential precursor to section 4.2 in which the present study's main task of constructing a developmental model of presymbolic memory is presented. Presymbolic memory is defined as an unconscious, non-linguistic event and corresponding procedural response memory system that develops in infants between birth and 28 months of age. The present study contends that this event and procedural response system in turn influences later symbolic functioning in a number of different ways. These are described in the following two chapters.

4.1 The Debate Concerning Infant Memory

4.1.1 Early Infant Memory Episodes Are Not Stored

Lichtenberg maintains that infants encode and store experiential sequences as event-episodes due to their highly aversive content that does not fit into any pre-existing positive memory schema (1989, pp.45-47). Furthermore, the aversive affect may ensure encoding of traces representing individual episodes rather than generic schemas even if similar events reoccur during the presymbolic stage of development (Lichtenberg, 1989, p.283). Therefore, a class of early episodic memories and corresponding procedural responses are created because of the aversive affects integral to the original infant experiences (Lichtenberg, 1989, p.283). Stein (1996) argues in support of this view that children younger than 24 months encode emotional nonverbal event memories (p.173). When an event is unusual or violates prior knowledge schemas as occurs with preverbal aversive affects, the event structure is tagged as differing from other generic schemas, and so is stored in discrete episodic form (p.184).

However, the idea of aversive episodes receiving long-term memory storage in infancy has until recently been rejected by most neuropsychological memory researchers. The prevailing view proposes two distinct memory encoding and storage systems in the brain that correspond to declarative (explicit, episodic, event-centred) and nondeclarative (implicit, procedural, habit-based) memories (Squire, 1995, p.207). Episodic/event encoding depends on the activation of the Medial Temporal Lobe (MTL), viz. the hippocampus and adjacent cortical areas. These traces are in turn relayed to multiple regions of the neocortex where long term storage occurs (Squire and Zola, 1996a, p.186). The dual systems model argues that while MTL episodic encoding occurs in infants, the neocortical storage regions are comparatively slow to mature and so encoded episodes cannot be placed into long-term storage in these regions (Squire, 1995, p.214). Therefore infantile episodic traces decay and this explains the absence of permanent autobiographical event memories prior to two years of age.

This model argues that nondeclarative-procedural memory encoding does not involve the MTL system, but includes a number of different brain regions that encode and store motor conditioning rules, emotional response conditioning rules, habit schemas, perceptual schemas, and cognitive skills outside the neocortex (Poldrack and Gabrieli, 1997, p.304, p.306; Squire, 1995, p.192; Squire & Zola, 1996a, p.192). Squire (1995) maintains that no direct interaction or information exchange occurs between event and procedural memory systems, and that only non-declarative/procedural memories receive long-term storage in neonates and young infants (p.209).

4.1.2 Early Infant Memory Episodes are Stored but cannot be Retrieved

The argument opposing infant memory episodes focuses on infantile amnesia. This concept describes the absence of consciously recalled events for the period between birth and 36 months of age, and is cited as proof that pre-verbal infants lack the capacity for long-term episodic storage. However, a careful analysis of the properties of infantile amnesia reveals that immature linguistic, visuospatial, and strategic memory retrieval functions account for the lack of consciously recalled autobiographical memories from the infancy period, not the absence of stored pre-verbal memory episodes *per se*. In section 4.1.2.3 below the main properties of infantile amnesia are briefly outlined in order to distinguish between verbal event memories that can be consciously retrieved, and the potential existence of preverbal event memories that may persist in long-term storage despite lacking the information parameters required for conscious retrieval.

4.1.2.3 The Case for the Retrieval Failure of Early Infant Memories

Tessler and Nelson (1996) argue that the advent of verbal discourse abilities enables a spatio-temporal narrative construction of events to be encoded after 36 months of age (p.102). The authors concede that infants encode preverbal episodic memories but these are unavailable to the later developing autobiographical storage system (p.113).

Non-aversive episodes are generalized into generic schemas, while isolated aversive episodes decay, as they cannot be integrated within the later developing parameters of verbal discourse (p.116). Events encoded prior to three years lack the verbal narrative structure necessary for their rehearsal and subsequent integration into long-term autobiographical memory storage.

The present study argues contrary to this view that verbal autobiographical memory co-evolves with efficient memory retrieval functions, and has no relationship to long-term storage capacity. Autobiographical events are not stored differently from preverbal episodes; rather the former possess retrieval codes that the latter do not have. Therefore amnesia for events occurring prior to 36 months of age is caused by the absence of viable retrieval codes for episodic traces stored up to this age, not an absence of stored episodes *per se*. The present study contends that the emergence of verbal skills in toddlers is a product of prefrontal cortex maturation. These verbal skills in turn facilitate the prefrontal cortical ability to develop retrieval strategies for episodes in cortical storage. The temporal and spatial markers contained in verbally formatted memory episodes serve as retrieval parameters for the prefrontal cortex.

Many linguistic information processes occur in the prefrontal cortex (Buckner, 1996, p.156; Nyberg, Cabeza, and Tulving, 1996, p.145; Passingham, 1993, pp.260-261), in areas identical or adjacent to those responsible for strategic memory retrieval (Poldrack and Gabrieli, 1997, pp. 300-301; Fletcher, Frith, and Rugg, 1997, p.217; Tulving and Markowitsch, 1997, p.212). This indicates that verbal discourse and memory retrieval abilities mutually implicate one another, and are located in adjacent or overlapping prefrontal regions that mature at roughly the same age (Fuster, 1997, pp.453-455). The ability of toddlers aged 36 months to verbally recall events in contrast to younger infants who lack verbal recall (Tessler and Nelson, 1996) suggests that competent language use coincides with the prefrontal strategic memory ability to use temporal and spatial cues as retrieval markers for memory episodes at the time of their storage.

While the prefrontal cortex is crucial for the development of verbal skills and memory retrieval, it does not play a significant role in the storage of many memories. The present study accepts that prefrontal-mediated verbal skills and memory retrieval abilities are collectively involved in the conscious recall of autobiographical episodes after 3 years of age. This does not preclude the possibility that prior to the evolution of prefrontal verbal retrieval strategies, non-verbal memory episodes receive long-term storage. Such episodes would merely lack the information parameters necessary for concurrent or future retrieval into a conscious verbal format. The following section explores problems pertaining to the storage of pre-verbal episodes during the infancy period.

4.1.2.4 Problems with Long-term Episodic Storage in Infants

Episodes encoded in infancy are reorganised into generic memories.

The late onset of episodic memory in comparison to procedural memory proposed by the dual systems infantile amnesia model has recently been challenged by a number of researchers (Nelson, 1993; Howe and Courage, 1997; Rovee-Collier, 1997). Research conducted by Rovee-Collier (1997) refutes the assumption that episodic memories develop later than implicit-procedural memories. At three and six months specific details concerning the context of a learning situation are retained by infants, implying that specific episodes are encoded from at least three months of age (p.486). By six months of age infants form associations between independent episodic memories on the basis of a common or similar context (Rovee-Collier, 1997, pp.489-490). The linked memories are thereafter integrated into a common generic memory network (Rovee-Collier, 1997, p.490).

Nelson (1993) similarly proposes that infants encode activity-affect sequences into episodes, but once these re-occur, common features are abstracted and re-organised into script-like schemas corresponding to a generic memory system (p.373).

According to Nelson (1993) non-recurring events are maintained in a separate, temporary episodic format before decaying due to their lack of common features and adaptive significance (p.373). Therefore episodic memories in infants are temporary holding patterns, rather than long-term memory traces (p.373). While some researchers no longer dispute the encoding of event episodes during infancy, the above authors do not endorse the long-term storage of such representations.

The "where" of long-term aversive episode storage

According to Howe and Courage (1997) traumatic pre-verbal episodes persist as separate traces because their uniqueness enhances encoding and storage, while non-aversive pre-verbal episode traces decay because they have less emotive impact as individual occurrences (p.514). The latter are integrated into generic schemas that are stored long-term. It is only with the development of gestural, visual, and linguistic processes that non-aversive events are more easily encoded, stored and retrieved as discrete episodes (Howe and Courage, 1997, pp.513-516). In preverbal children aversive episodes are encoded but are inaccessible to conscious recall because they lack the necessary visuospatial and linguistic information parameters (Howe, Courage, and Peterson, 1996, p.140). In these cases the central details of aversive episodes are nonconscious but remain in storage, as evidenced by their long-term expression as nonconscious behaviours (p.140).

The present study maintains that isolated aversive events receive long-term episodic storage because their emotional consequences have greater adaptive significance for the subject than non-aversive events. The role of aversive affect in the long-term storage of preverbal infant memories is corroborated by findings that independently verified infant traumas occurring prior to 28 months cannot be recalled as explicit events (Goodman, Quas, Batterman-Faunce, Riddlesberger, and Kuhn, 1996, p.4), but remain available as nonconscious behavioural memories (p.7).

Despite aversive affect enhancing the encoding and storage of pre-verbal episodes, the question must still be asked where and how such information can be stored, given that neocortical association and prefrontal areas involved in linguistic episode storage are not sufficiently operational prior to 28 months of age.

4.2 Expanding the Theory: How Infant Memories are Stored

4.2.1 Overview

4.2.1.1 Neocortical Primary Sensory and Motor Networks Store Memories from Birth

The answer to the question of where presymbolic aversive event traces are stored lies in identifying anatomically differentiated processing hierarchies in the brain for both procedural and episodic memory systems (Fuster, 1997, p.452). The onset of efficient function in different anatomical layers at different developmental ages is influenced by maturational factors in the brain. Developmentally and anatomically speaking the first memories are encoded and stored in simple neural networks in the respective sensory and motor areas of the cortex (Fuster, 1997, p.452). It is feasible that preverbal aversive episodes could receive long-term storage in these primary sensory and motor neocortical receptor areas. Cortical functions in the first month of life are limited to the primary sensory (auditory, visual and tactile) and motor areas (Chugani et al., 1993, p.137). There are anatomically separate sensory areas for processing auditory, visual, and tactile data in the deeper cell layers of the posterior cortex, and these same areas are responsible for storing single sense component memory traces (Fuster, 1997, p.454). Similarly, the simplest and developmentally the earliest motor responses are initiated and stored in the brainstem, cerebellum, and primary motor area of the frontal lobe cortex (Fuster, 1997, p.455).

4.2.1.2 The Role of the Medial Temporal Lobe (MTL) in Presymbolic Episode Storage

The MTL serves as an intermediary between the unimodal sensory memory traces of the sensory cortical areas and the multi-sensory trace networks of the association cortical areas (Fuster, 1997, p.452). Fuster (1997) stresses that the MTL is pivotal in integrating unimodal sensory information into an episodic trace prior to transmitting this information to the neocortical association areas (p.452). It is the contention of the present study that prior to the maturation of the multi-sensory association cortical areas in pre-verbal infants, the MTL encodes unimodal sensory and motor information into an event episode and then relays this representation back to the primary sensory-motor cortex. The individual data components constituting the trace receive long-term storage in the relevant sensory and motor networks of the primary layer of the cortex.

4.2.1.3 The Limbic System Co-ordinates Episodic and Procedural Memory Organization in Infants

There are reciprocal connections between the lower areas of the motor cortex and the sensory areas of the posterior cortex, indicating that there is ready communication between sensory and motor functions (Fuster, 1997, p.455). A vital link between the primary sensory input and motor output areas of the brain is the limbic system, including MTL structures, the amygdala, and parts of the basal ganglia, thalamic nuclei, and cerebellum (Braak, Braak, Yilmazer, and Bohl, 1996, pp.266-267). The present study maintains that from shortly after birth the limbic region integrates disparate sensory-motor information components and encodes these into episodic and procedural memory representations. Furthermore, this region is instrumental in facilitating the long-term storage of both types of memory.

4.2.1.4 Objectives of the Presymbolic Memory Model

In the light of the above three points, the present study firstly intends to provide a detailed description of the neurological mechanisms that are operative during the encoding and long-term storage of episodes in infants up to 28 months of age. This will enable the present study to offer a detailed solution to the problem of where pre-verbal episodes are stored and why verbally competent subjects cannot consciously retrieve them after the fact. Secondly, in the course of the above description certain connections are outlined between episodic and procedural memories. In terms of the model described episodic and procedural memory traces are viewed as different processing records of the same external stimulus. Episodic event encoding constitutes a record of an aversive stimulus experience, whereas the procedural skill sequence constitutes the record of the adaptive or maladaptive response to this experience. Therefore the model critiques the idea of dual memory systems operating separately from one another. Instead it proposes a single interactive cortical memory storage system consisting of episodic and procedural information components that are encoded and reactivated by different processing modules in the limbic system.

Thirdly, the present study describes how presymbolic memory traces stored in the primary sensory-motor cortex unconsciously shape the storage, retrieval, and behavioural responses to later-occurring stressors in verbally competent subjects. It will be demonstrated in chapter five that this function of the presymbolic memory system has important implications for reconceptualising unconscious dynamic processes in the discipline of psychoanalysis. Section 4.2.2 below describes the neurological mechanisms involved in the encoding and storage of presymbolic episodic memory, while section 4.2.3 outlines the mechanisms involved in the organization of presymbolic procedural memory.

4.2.2 Presymbolic Episodic Memory

From evidence outlined in section 4.1 it appears that aversive affect possesses properties that facilitate encoding and long-term storage of events in young infants (Howe and Courage, 1997; Goodman et al., 1996; Stein, 1996). Re-occurring non-aversive presymbolic events are generally transformed into generic schemas and thereafter decay in their episodic forms prior to the advent of linguistic and visuospatial encoding parameters. The present study therefore argues that i) aversive affect is the most important cue for maintaining preverbal episodic traces in individualized storage, and ii) individual presymbolic episodes in long-term storage represent aversive events.

4.2.2.1 The Amygdala and Presymbolic Aversive Episodes

The amygdala activates hormones that enhance the encoding and storage of aversive information.

The amygdala is a limbic system processing region involved in the modulation of all emotionally charged stimuli (McGaugh, 1995, p.259). The amygdala modulates the encoding of aversive environmental cues (Ledoux and Muller, 1997, p.1724), including fear and anxiety based information (Davis, Walker, and Lee, 1997, p.1675; Ledoux and Muller, 1997, p.1719). Despite distinguishing between these different kinds of aversive information, it is not the long-term storage site for aversive episodes (Davis et al., 1997, p.1685). The amygdala responds to aversive information by activating noradrenergic systems, which in turn enhance long-term storage of aversive events in other brain regions (McGaugh, 1995, p.265). This hormonal evidence supports the present study's contention that aversive affect enhances encoding and storage of information, thereby acting as an important presymbolic memory cue.

The amygdala is connected to the MTL region responsible for episodic encoding.

The amygdala is connected to both the hippocampus and the entorhinal cortex (Braak et al., 1996, p.272), both of which form part of the MTL system. McGaugh, Cahill, and Roozendaal (1996, p.13512) maintain that the amygdala influences the encoding and temporary storage of aversive information in the hippocampus via mediating changes in the plasticity of neuronal connections in the latter region. This strongly suggests that the amygdala enhances the hippocampal encoding of aversive episodic memories. The release of noradrenergic hormone cascades by the amygdala in response to an aversive stimulus may contribute to the robust encoding of the stimulus into an event by the MTL system. In order to explore how aversive presymbolic episode encoding and long-term storage occur in the aftermath of amygdala modulation, it is necessary to outline the role of i) the hippocampus, ii) the adjacent MTL regions, and iii) their transactions with the primary sensory and motor cortical receptor networks.

4.2.2.2 The Medial Temporal Lobe (MTL) Circuit

The MTL is divided into a number of substructures, including the hippocampus, entorhinal cortex, perirhinal cortex, and parahippocampal cortex (Eichenbaum, Schoenbaum, Young, and Bunsey, 1996, p.13500). The last three cortical regions mature prior to neocortical association layers, and provide the main connecting pathways between the hippocampus and the different areas of the cortex, including the primary sensory and motor regions. Recent findings show that separate regions of the MTL process different aspects of memory, so in the present outline the functions pertaining to each substructure and their connections with other substructures will be presented in subsections for the sake of clarity.

The hippocampus.

As noted in section 4.2.2.1 above the amygdala modulates hippocampal encoding and neuroplasticity (McGaugh et al, 1996, p.13512).

Amygdalar neuromodulatory responses to affective stimuli facilitate the release of plasticity-related proteins in the hippocampus that stabilize memory and result in prolonged temporary storage for emotional events in the hippocampal template (Morris and Frey, 1997, p.1489). Discrete event episodes are encoded and temporarily stored as changes in synaptic weights (Morris and Frey, 1997, p.1489). The modulatory role of the amygdala suggests that aversive episodes are retained for longer periods in the hippocampal template than emotionally neutral events because they trigger greater changes in synaptic plasticity. While positive events initially receive equally robust encoding, the greater likelihood of their routine re-occurrence means they are not retained in the event template for very long. The fate of positive presymbolic events is outlined in the description of the functions of the parahippocampal and perirhinal cortices below.

The hippocampus has three main functions pertaining to the general encoding and organisation of episode traces. Firstly it detects novel stimuli (Morris and Frey, 1997; Knight, 1996), in other words it distinguishes which incoming stimuli are unfamiliar in amongst those that match with previously encoded episodes. Secondly, the hippocampus automatically encodes simplified, compressed representations of events in specific contexts (Morris and Frey, 1997, p.1489), i.e. it integrates disparate sensory and motor data components into a unified episode trace. Separate cortical sensory inputs including visual-spatial, auditory, and tactile information components are combined with body-rotation and movement information from the frontal and parietal motor cortices to form episodes (Eichenbaum et al., 1996, p.13500; Berthoz, 1997, pp.1443-1446).

Thirdly, the hippocampus reactivates presymbolic episode traces and transfers them to the neocortex for long-term storage. Hippocampal traces degrade because new traces disrupt the synaptic weights constituting an earlier episode (McClelland, McNaughton, and O'Reilly, 1995, p.441). The hippocampal storage system has a limited capacity that cannot maintain a record of all the information it continuously encodes, so traces are re-directed for long-term storage elsewhere as soon as possible. According to Murre (1996) the hippocampus initiates and directs the long-term storage of episodes in the neocortex via spontaneous reactivation (pp.676-677).

During reactivation a trace is transferred from the hippocampal template and decompressed into its sensory and motor components in the entorhinal cortex (McClelland et al., 1995, p.452). These components are thereafter relayed to anatomically distinct areas of the cortex for long-term storage (Murre, 1996, p.677). Once relocated in the cortex, the discrete sensory, motor, and affect components of an episode are initially linked via a few weak connections spanning great distances between different cortical areas (Murre, 1996, p.677). Further spontaneous hippocampal reactivations consolidate these cortical associations between the different trace components until the trace network is sufficiently robust that continued hippocampal storage of the episode is unnecessary (Murre, 1996, p.677). In pre-verbal infants, only primary sensory and motor areas of the cortex would be involved in storing the reactivated components of presymbolic episodes.

The entorhinal cortex.

The entorhinal cortex lies between the parahippocampal and perirhinal cortices, and receives most of its sensory-motor inputs via these regions, which it in turn passes on to the hippocampus (Squire and Zola, 1996b, p.13518). When a hippocampal trace is reactivated for neocortical storage, the entorhinal cortex is involved in re-inscribing the trace back into its sensory-motor components (McClelland et al., 1995, p.452).

The perirhinal and parahippocampal cortices: Presymbolic generic memory schemas.

Mishkin, Suzuki, Gadian, and Vargha-Khadem (1996) maintain that the perirhinal and parahippocampal cortices are responsible for primitive semantic memory encoding, i.e. factual data schemas are derived from generalisations of individual episodes encoded by the hippocampus (p.1465). The parahippocampus encodes schemas representing general spatial properties (Eichenbaum et al., 1996, p.13505), while the perirhinal cortex integrates visual, auditory, and tactile information to encode object schemas (Gaffan and Hornak, 1996, p.1484).

The parahippocampal and perirhinal cortices analyse new sensory features in order to differentiate between familiar and novel spatial properties and object schemas. Non-matching information is relayed to the hippocampus, which encodes data into novel episodes. Matching features are integrated into pre-existing schemas in the parahippocampal and perirhinal cortices. Parahippocampal-perirhinal encoding supports the concept of generic memory schemas for re-occurring events in preverbal infants as outlined in chapter three (Nelson, 1993). Due to the greater likelihood of non-aversive presymbolic events being sought after and purposely repeated by infants in comparison to aversive events (Lichtenberg, 1989, p.280), the present study maintains that non-aversive episode traces are shunted out of hippocampal novelty storage and into the parahippocampal-perirhinal generic system once they re-occur.

Aversive presymbolic episodes, because of their unusual affective valence, generally unwelcome presence, and intrinsic adaptive significance, are more resistant to generic reorganisation even once they re-occur. Aversive traces are therefore likely to remain in hippocampal storage long enough for repeated reactivations to ensure their transferral and storage in multiple cortical regions. The participation of the perirhinal and parahippocampal cortices in the re-distribution of episodic memory components to neocortical sensory-motor areas during hippocampal reactivation (McClelland, et al., 1995, p.452) suggests that generic schemas are reactivated and re-distributed to neocortical sensory-motor areas in the same way. In young infants the long-term storage of generic memories will be confined to networks spanning the functional sensory and motor areas of the neocortex. Presymbolic aversive episodic and non-aversive generic memories therefore receive long-term cortical storage via the mediation of the hippocampal and parahippocampal-perirhinal regions.

4.2.2.3 The Role of Cortical Regions in Presymbolic Episodic Memory

The role of the primary sensory and motor cortex in presymbolic aversive episodic storage.

Research reveals that the cortical areas involved in perceptual analysis also function as memory storage facilities (Gaffan and Hornak, 1997, p.1484). Modality-specific auditory and tactile sensory cortical networks involved in analysing incoming information store memories of elementary sensations (Fuster, 1997, p.454), while polymodal sensory areas analyse, encode, and store co-ordinations of all three sensory modalities (Fuster, 1997, p.454; Zola, 1997, p.452). That unimodal cortical sensory cell layers are fully functional from birth (Chugani et al., 1993), suggests that these areas together with later maturing polymodal layers respectively store discrete sensory components and more complex sensory co-ordinations of pre-verbal episodes during infancy.

The MTL system acts as the control centre for episodic encoding and long-term storage (Murre, 1996, p.676). During encoding the MTL integrates disparate information components from the sensory cortex with an affective analysis of the same information from the amygdala. The MTL initiates and directs the long-term storage of episodic and generic memories in the neocortex via the reactivation process (Murre, 1996, p.677). The present study contends that when presymbolic aversive episodes are spontaneously reactivated, their individual components are redistributed to the primary sensory and motor cortical areas. Repeated MTL reactivations ensure that many robust point-to-point associative connections are established between isolated sensory components in order to consolidate an episodic trace network in long-term cortical storage (Murre, 1996, p.677).

Presymbolic episodic memories are unavailable to prefrontal cortical retrieval strategies.

In adults and older children the prefrontal cortex performs a variety of executive functions in relation to episodic memory organisation including the voluntary conscious retrieval of stored events. It is important to ascertain when this retrieval function occurs in order to understand the implications it has for the conscious accessibility of previously stored presymbolic aversive episodes. The mature prefrontal cortex is responsible for the temporal ordering and retrieval of autobiographical episodes (Badderly, 1992, p.26; Moscovitch, 1992, p.9; Poldrack and Gabrieli, 1997, p.301).

Research on verified instances of traumatic events that occurred before 28 months of age indicates that the resulting episodic memories remain unavailable to conscious voluntary retrieval once the infants involved became competent verbal discourse users after this age (Howe, Courage, and Peterson, 1996, pp.140-141; Terr, 1996, p.74). Prefrontal retrieval functions only reach a degree of observable efficiency in toddlers between 28 and 36 months of age, for episodes encoded during this later period were verbally recalled in a proficient and routine manner (Terr, 1996, p.74; Tessler and Nelson, 1996, p.103). Therefore the prefrontal cortex is only mature enough to ensure consistent conscious verbal retrieval of events after 28 months of age (Terr, 1996, p.74; Tessler and Nelson, 1996, p.103; Zola, 1997, p.453).

In the light of these findings, it appears that Lichtenberg's assumption that presymbolic memories begin to be reformatted into linguistic and sophisticated visuospatial parameters from around 18 months of age (1983, 1989, Lichtenberg et al., 1992), may be retained as long as it is recognised that this process is more gradual than anticipated. By 18 months visuospatial processing has progressed to the point where infants have developed a visual sense of self illustrated by the mirror-rouge test (Bremner, 1995; Howe and Courage, 1997; Lichtenberg, 1983). Howe and Courage (1997) argue that visual self-recognition at 18 months is a necessary prerequisite before episodes can be organised into an autobiographical memory system (p.506).

The present study accepts this observation, and contends that in the 18 to 36 month period infants normally undergo a gradual re-organisation from presymbolic (i.e. preverbal) to symbolic (i.e. verbal discourse) processing of memory episodes. At 28 months verbal reorganization is normally still so incomplete that episodic memories encoded and stored up to this age are essentially presymbolic, for they are unavailable to later voluntary prefrontal retrieval as verbally formatted autobiographical memory episodes (Terr, 1996, p.74).

4.2.2.4 Summary: Presymbolic Episodic Memory

In light of the above findings, the present study argues that the prefrontal memory retrieval system appears to operate primarily in terms of linguistic processes that underlie both its own functioning and that of verbal discourse. The above findings on absence of recall for traumatic incidents occurring prior to 28 months of age illustrate that prefrontal retrieval is essentially a verbal memory recall system. In contrast, presymbolic episodes consist mainly of raw sensory data, and therefore the prefrontal system cannot access these memories stored in this pre-linguistic format. Episodes encoded after 18 months of age rapidly accumulate linguistic data components, but up until 28 months there are usually still too few components in individual trace networks to enable the prefrontal cortex to re-organize episodes into a linguistic-verbal format. The present study contends that it is only when the number of linguistic data components in an episodic trace network reach a certain critical number that the prefrontal retrieval system is able to reformat the memory. This critical number of operative linguistic information components usually occurs in the period between 28 and 36 months of age. Prior to this critical accumulation of linguistic information components, episodic memories are essentially presymbolic and unavailable to conscious verbal recall.

4.2.3 Presymbolic Procedural Memory

Procedural memory systems include the generation of habits, dispositions, skills, and behavioural responses, which are nonconsciously expressed in presymbolic infants, verbal toddlers and adults alike. A number of distinct neocortical and limbic brain regions are involved in the encoding and storage of these fundamentally unconscious memories. The present study maintains that a procedural memory system consisting of complementary responses to aversive episodes develops between birth and 28 months of age. The origins and development of this system will be outlined in the following sections. To begin with, the present study describes the roles of the amygdala and basal ganglia structures in encoding and storing procedural stimulus context traces during the presymbolic period.

4.2.3.1 The Amygdala Modulates Basal Ganglia Encoding of Aversive Procedural Memory Sequences

As noted in section 4.2.2 on presymbolic episodic memory, the amygdala modulates the encoding of aversive environmental cues (Ledoux and Muller, 1997, p.1724). This modulation includes the conditioning of fear responses, a form of procedural memory (Poldrack and Gabrieli, 1997, p.305). However, the amygdala does not itself encode these aversive responses, but instead regulates the basal ganglia encoding of the context and rule components of aversive procedural memories. Projections from the amygdala enable aversive information to be simultaneously relayed to the caudate nucleus and the ventral striatum regions of the basal ganglia for procedural memory encoding (Davis, 1997, pp.385-386; Evered and O'Connor, 1984, p.109).

4.2.3.2 The Basal Ganglia Encode Procedural Responses to Aversive Events

The basal ganglia are involved in generating responses to motor, perceptual, and cognitive stimuli (Poldrack and Gabrieli, 1997, pp. 303-304; White, 1997, pp.165).

They process new associations embodying consistent relationships between incoming motor, perceptual, and cognitive stimuli and thereafter generate appropriate responses to these (White, 1997, p.165). In adults and children over three years of age the basal ganglia form an information processing circuit with the prefrontal cortex that includes connections between frontal cortices, caudate nucleus, globus pallidus, and thalamus, the latter having return connections to the frontal areas (Heilman, 1997, p.445).

Basal ganglia automatically encode procedural memory traces prior to their goal-directed use by the frontal lobes.

When an aversive stimulus occurs, the caudate region integrates the relevant sensory and motor information received from the cortex with affective information from the amygdala in order to encode a map depicting the associations between the different kinds of data. Sensory and motor stimuli are transferred from the primary cortical receptor layers to specific sites in the ventral and medial regions of the caudate nucleus (White, 1997, p.164; Passingham, 1993, p.214). Specific sensory and motor cortical inputs are connected to multiple segments of the caudate, each segment containing a different combination of cortical inputs (White, 1997, p.166). The complex mapping of these inputs with aversive data from the amygdala results in a representation of the aversive context. This context trace is then compared with previous context traces stored in the striatum.

Once the current context trace is encoded by the caudate and fails to be matched with previous context traces in the striatum, the caudate generates a singular response to the novel context trace (White, 1997, p.166). In turn the striatum formalizes the association linking the response to the specific context and ensures that appropriate motor behaviour guided by this response occurs (White, 1997, p.166). When a new aversive stimulus occurs in children three years of age and over the basal ganglia effectively trains the prefrontal cortex to recognise the associative relationship between context and response, and to carry out the latter when the context initially reoccurs (White, 1997, p.167).

In contrast, a familiar aversive stimulus activates the relevant matching context trace stored in the striatum. In response to the recurring stressor, the striatum re-activates the context-response association, which results in a familiar motor behaviour output sequence, e.g. avoidance or withdrawal.

4.2.3.3 Presymbolic Procedural Memories are Encoded and Stored in the Absence of Prefrontal Cortical Functions

According to Passingham (1993) the prefrontal cortex-basal ganglia system encodes and executes new procedural context-response skills prior to these becoming automatically triggered when the stimulus re-occurs (p.198). The prefrontal cortex is activated only when new response decisions need to be made (p.212). Therefore in verbally competent subjects there is a stage where a new behaviour response to a stimulus is under voluntary control. The subject is aware of learning a new skill and enacting a cognitive-behavioural schema. Once the sequence becomes automatic, the prefrontal cortex is no longer involved, and the response, if triggered, is performed without conscious awareness or volition.

The present study contends that in presymbolic infants procedural responses are encoded by the basal ganglia in parallel with MTL episodic encoding. The basal ganglia are functional from early after birth (Howe and Courage, 1997, p.504), while the cerebellum is involved in the automation of procedural memories once the initial response selection process has occurred (Passingham, 1993, p.198). The immaturity of the prefrontal cortex prior to 28 months of age with regard to the conscious retrieval of episodic memories noted in section 4.2.2 above suggests that volition and awareness will not be components of learning a new goal-directed procedural response until after this age. This implies that prior to 28 months of age the basal ganglia encoding of procedural memories must somehow be relayed to the cerebellum for storage and future automated activation without the involvement of the prefrontal cortex.

The basal ganglia and cerebellum are indirectly connected via the premotor area of the frontal cortex (Passingham, 1993, p.220). The premotor cortex is functional before the prefrontal cortex (Fuster, 1997, p.455) and interacts with the basal ganglia during the encoding of behavioural response traces and thereafter with the cerebellum in the automatic performance of movement-related skills (Passingham, 1993, p.220). This suggests that the premotor region connects the basal ganglia with the cerebellum in terms of relaying behavioural information. The present study proposes that in infants under 28 months of age, procedural response traces encoded by the basal ganglia are automatically relayed to the premotor cortical area where they are transformed into a motor output sequence. Thereafter the procedural response memory trace is relayed from the premotor cortex to the cerebellum. In the following section the cerebellum is identified as the long-term storage site for the behavioural response component of procedural memory. However, the basal ganglia store the context aspect of procedural memories on a permanent basis in the GABA containing neurons of the striatum (White, 1997, p.166).

4.2.3.4 Presymbolic Procedural Response Traces are Stored in the Cerebellum

In the presymbolic period premotor cell networks respond to a procedural response encoding relayed from the basal ganglia by producing motor output resulting in behavioural change, e.g. an eye blink in response to an external stimulus. The present study maintains that the association created between the stimulus context and the response in the process of the premotor cell activation is relayed to the cerebellum where it is stored as a procedural response memory trace. The cerebellum automatically activates a stored response memory script when a similar aversive stimulus reoccurs, but it does not generate new responses (Passingham, 1993: p.198).

Thompson and Kim (1996), in accordance with the present study, propose that the cerebellum is the long-term storage site for procedural memory sequences. Specific neural networks in the cerebellum encode information related to aversive stimulus contexts (Thompson and Kim, 1996, p.13441).

There is evidence that the long-term storage of aversive procedural skills, habits, and cognitive dispositions occurs in a localized region of the cerebellum, viz. the anterior interpositus and overlying cortex (Thompson and Kim, 1996, p.13442). Long term depression (LTD), a memory storage mechanism, has been identified in the cerebellar cortex, indicating that this region is crucially involved in the long-term storage of skill response memories (Thompson and Kim, 1997, p.13442). Therefore, it is plausible that aversive procedural response information transferred from the basal ganglia and premotor cortex receives long-term storage in the anterior interpositus and adjacent cortex regions of the cerebellum.

4.2.3.5 Summary: Presymbolic Aversive Procedural Memory

The present study proposes that from at least shortly after birth the infant encodes aversive procedural memory traces, because the impact of aversive stimuli demands a response that will facilitate coping with both the present context and future stressors. The infant by 28 months of age possesses a complex procedural memory system consisting of response scripts containing sensory, motor, and cognitive information components stored in the cerebellum. Specifically matching environmental cues can automatically activate these scripts. However, evidence from priming studies in verbally competent subjects indicates that procedural responses to environmental cues do not only include complex, multi-sensory behavioural scripts stored in the cerebellum. Procedural responses also include isolated aversive reactivity to individual sensory and motor stimulus features present in otherwise non-aversive contexts. Section 4.2.3.6 below presents an outline of the cortical encoding and storage of these reaction components and examines the implications for the presymbolic infant memory model.

4.2.3.6 Cortical Encoding and Storage of Procedural Response Components

Priming studies suggest that in addition to procedural response scripts stored in the cerebellum, the discrete perceptual and motor information components co-activated during the behaviour output stage of a procedural response are stored in the sensory and motor cortices. Sensory cortical layers activated in perceptual priming tasks indicate that discrete sensory response data is stored in these regions (Verfaellie and Keane, 1997, p.157). Similarly, frontal, temporal, and parietal association cortices activated during conceptual priming tasks indicate that cognitive, meaning-based response components are stored in these areas (p.157). These cortical areas are respectively involved in the initial perceptual and cognitive analysis of incoming data, and thereafter store the outcomes in the same neural networks responsible for these analyses (Verfaellie and Keane, 1997, p.157). For example, incoming visual, auditory, and tactile features of a stimulus analysed in the corresponding sensory areas, are encoded and stored in the same localised neural networks (Squire and Zola, 1996a, p.192; Ungerleider, 1995, p.771).

Cortical priming of a single component response versus procedural memory mediated cortical co-activation.

The present study contends that in both presymbolic infants and verbally competent subjects individual cortical response outputs activated by discrete aversive cues on their own can on other occasions form part of larger co-ordinated cortical outputs activated by procedural memory scripts. Procedural memory scripts stored in the cerebellum are triggered by familiar aversive stimulus contexts. A single stimulus feature will only activate the corresponding cortical storage node during perceptual analysis. However, the reoccurrence of an entire stimulus context co-activates many data storage nodes that together succeed in activating the basal ganglia complex. The caudate integration of these sensory and motor inputs is relayed to the striatum for comparison with previously stored stimulus context traces. When a context match is found, the striatum reactivates the relevant procedural response information and relays this via the premotor cortex to the cerebellum where the behaviour sequence script is stored.

In turn this procedural memory script co-activates the many cortical sensory and premotor nodes that together constitute the complex behavioural output of the procedural response. The present study therefore maintains that individual sensory and cognitive features in cortical storage can be co-activated by a complex aversive procedural memory, or individually primed by a matching aversive feature present in an otherwise non-aversive stimulus.

4.2.4 Conclusion: Presymbolic Episodic and Procedural Memory

The model of presymbolic episodic and procedural memory outlined above demonstrates that unconscious mentation in human beings is a product of developing memory systems. Individual cortical networks store information units that embody both stimulus presentation (episodic component) and appropriate response output (procedural component) representations. The hippocampus is responsible for binding together the diverse data components of a stimulus into a cohesive presymbolic episode, and for co-ordinating its cortical storage in component form. Similarly the cerebellum binds response output information received from the basal ganglia and premotor cortex into a memory trace, and co-ordinates the cortical activation of sensory-motor behavioural output when the procedural memory is activated in future.

The present study contends that when a procedural memory script is activated, the sequence template is relayed from the cerebellum back to the basal ganglia and the diverse cortical networks responsible for the storage of the original sensory, motor, and cognitive response output information. The template activates the appropriate basal ganglia context trace, which in turn co-activates the premotor and sensory cortical networks representing the behavioural output sequence. The present study proposes that in the presymbolic context the cerebellar template reactivates basal ganglia and cortical information components into a complete behaviour output sequence.

This role is similar to the one the hippocampus is thought to play in reintegrating information stored in discrete cortical networks into a coherent episode, prior to relaying this to the prefrontal cortex for episodic retrieval in subjects over three years of age (Fletcher et al., 1997, p.215).

Furthermore, discrete sensory and cognitive feature traces stored in cortical networks can be unconsciously activated in isolation if the associated aversive cues reoccur in otherwise unfamiliar environmental contexts. In contrast, when a multi-sensory aversive stimulus occurs, anatomically distinct brain regions (the MTL, basal ganglia, and cerebellum) combine the many simultaneously activated cortical information components in order to co-ordinate different categories of presymbolic knowledge. These include aversive episodes, aversive stimulus contexts, and behavioural response scripts.

The current model therefore proposes that a common cortical information input and storage system is used to encode and reactivate presymbolic episodic and procedural memories. This model differs from earlier approaches that viewed episodic and procedural memory systems as completely separate from one another (Squire, 1995). In the following chapter it is explored how the different kinds of presymbolic aversive memory outlined in the present model serve as the basis for rethinking psychoanalytic unconscious mentation. The present model will attempt to reconceptualise psychoanalytic unconscious mentation in terms of stored presymbolic memories that react to the episodic encoding and storage of aversive events in verbally competent subjects.

CHAPTER FIVE: PRESYMBOLIC MEMORY AND PSYCHOANALYTIC UNCONSCIOUS MENTATION

5.1 Introduction: Summary of Argument

In chapter four it was argued that aversive stimuli have features that make them highly amenable to robust event encoding and long-term storage in preverbal infants. Presymbolic episodes in long-term storage are generally the outcome of aversive stimulus contexts, whereas non-aversive events are transformed into generic schemas prior to their incorporation of sufficient linguistic data components at around 28 months of age. Linguistic cues are necessary for non-aversive stimuli to receive long-term storage as singular episodes, because they enable the identification of novel features during encoding that are missed by a presymbolic perceptual-affect analysis of the same stimuli.

The present study argues that despite the increasing functionality of the prefrontal cortex between 18 and 28 months of age, aversive episodes encoded by the hippocampus and stored in sensory-motor cortical areas during this period lack the linguistic data components required for their retrieval as verbally formatted autobiographical memories. Verbally competent subjects cannot consciously retrieve aversive episodes stored during the preverbal period of infancy (Howe and Courage, 1997, p.511). Aversive episodes stored prior to 28 months therefore constitute a presymbolic layer of unconscious content intrinsically unavailable to the verbal recall strategies of the prefrontal cortex. In addition, chapter four argued that aversive presymbolic stimuli are not only encoded as event episodes, but elicit matching procedural responses that receive long-term storage as memory traces. By definition procedural memories refer to behavioural activity responses as opposed to experiential contents. They are therefore intrinsically unavailable to consciousness whether they occur in infants or verbally competent subjects. Despite being intrinsically unconscious, the present study contends that presymbolic episodes and their associated procedural responses indirectly influence memory processes and behaviour in verbally competent subjects.

In the present chapter the influence of presymbolic memory on the behaviour of verbally competent subjects is explored in terms of the implications it has for a psychodynamic view of unconscious mentation.

5.2 Implications for a Psychodynamic Model of Unconscious Mentation

The model of presymbolic memory has a number of implications for a psychoanalytic conception of unconscious mentation. Freud (1915/1957) describes dynamic unconscious processes as drive related experiences, ideas, wishes, and emotions that are prevented from becoming conscious due to the mechanism of repression (p.152). These unconscious contents are actively prevented from entering consciousness by a censoring agency, viz. the repressive mechanism (Freud, 1915/1957, p.173). However, these repressed unconscious memories persist, and can enter consciousness provided similar cues are presented to the subject's conscious awareness. For example, if the analyst makes an interpretation in some way reminiscent of a repressed memory trace in a patient, this interpretive cue may form a connection to the unconscious memory trace, enabling it to become conscious and thereby lifting the repression (Freud, 1915/1957, pp.175-176).

Apart from dynamic unconscious contents, Freud (1915/1957) also describes a second kind of unconscious content, the nucleus or core of the unconscious system that cannot become conscious under any conditions. The primary process consists of drive impulses existing side by side in isolation from one another prior to the operation of the repressive censorship (Freud, 1915/1957, p.186). This primordial unconscious content exists from birth. Freud (1923/1961) describes the id as including both dynamically repressed unconscious contents and the unrestricted operation of drive impulses that are fundamentally unconscious and not subject to repressive forces (pp.24-25). Freud therefore makes a distinction between fundamental or primordial unconscious content that cannot be brought to consciousness under any conditions, and a repressed dynamic unconscious content that can potentially become conscious under the appropriate conditions.

Despite having critiqued Freud's drive terminology in chapters one and two, his distinction between a fundamental level of unconscious mentation and dynamically repressed unconscious mentation still has relevance for the presymbolic memory model. The present model reformulates this distinction in terms of its own concepts by proposing that:

- i) Presymbolic aversive episodic and procedural memory traces are fundamentally unconscious as they cannot be consciously retrieved or experienced under any conditions.
- ii) Aversive presymbolic memories unconsciously influence the conscious experience and recall of aversive episodes in verbally competent subjects. Specifically, presymbolic memories can dynamically prevent aversive episodes encoded in verbally competent subjects from being available to conscious retrieval.

These two points are a more specific reformulation of Lichtenberg's concept of a fundamental level of unconscious mentation consisting of presymbolic memories that shape later symbolic representation by contributing their own processing rules (Lichtenberg et al., 1992, pp.67-69). Chapter four has already demonstrated that presymbolic memories coincide with a level of unconscious mentation fundamentally unavailable to conscious experience and verbal retrieval. The present chapter outlines how presymbolic memories may nevertheless be able to dynamically influence the experience and recall of later occurring aversive events in verbally competent subjects.

5.2.1 The Psychoanalytic Concept of Empathic Failure and its Relation to the Presymbolic Aversive Memory Model

According to Lichtenberg et al. (1992) fundamental unconscious mentation consists of episodic and procedural memories of positive and negative infant experiences (p.69). The present study has linked presymbolic episodic memories exclusively with aversive infant experiences, and has therefore focused on building a model of aversive presymbolic episodes and their related procedural responses.

According to Lichtenberg et al. (1992) every infant inevitably experiences heightened aversive moments involving physical distress, minor injury, interactive anger and fear, task frustration and excessive stimulation (p.140). These stressors will only be encoded as aversive episodes if caregivers fail to affirm the infant's search for cohesion and vitality in the context of these distressing moments (pp.140-141). The caregiver's lack of affirmation of the infant in distress constitutes an empathic failure. The present study contends that empathic failures as defined above are the basic criteria for the encoding and storage of aversive episodes in presymbolic infants. Empathic failures do not include instances of caregiver-initiated physical or sexual abuse, or prolonged neglect. Empathic failures refer to acute experiences of the caregiver being absent, or the caregiver substituting an inappropriate physical stimulus such as food or a finger to suck on, in place of the emotional response required to alleviate the infant's distress (Lichtenberg et al., 1992, pp.141-142).

Furthermore, the present study maintains that presymbolic empathic failures also occur when caregivers display aversive affect dispositions during routine infant-caregiver interactions. For example, a depressed or angry caregiver may communicate aversive affect in his/her unusually tense handling and strained vocal intonations accompanying a feed. This affect conflicts with the infant's current non-aversive generic memory schema derived from earlier instances of unambiguously pleasurable feeds. The dissonance between the memory schema and the caregiver's current behaviour creates a complex, ambivalent situation that the infant cannot adequately understand due to immaturities in sensory-motor and emotional processing. Therefore the situation is encoded as an aversive episode that in turn triggers either a fear-related response of behavioural withdrawal, or a breakdown in approach-avoidance behaviour in the infant (Main and Morgan, 1996, pp.112-115).

In general, a mismatch between the infant's current distress experience and the caregiver's response results in heightened aversive arousal which enhances episodic encoding and triggers a procedural response which effectively embodies avoidant behaviour or behavioural disorganisation.

Presymbolic cortical memory traces containing empathic failure data influence the organisation of episodic memories, procedural reactions, and mood dispositions in verbally competent subjects (Lichtenberg et al., 1992, pp.164-165). The present study argues that while traumatic abuse and neglect episodes are encoded and stored as presymbolic episodes in infants before 28 months of age, these events are relatively uncommon. Less severe empathic caregiver failures are more commonly the building blocks of aversive presymbolic memories.

5.2.2 Presymbolic Procedural Memories Dynamically Influence Behaviour and Experience in Verbal Subjects

Studies with children where there was independent verification for traumatic incidents occurring prior to 28 months of age, demonstrate that although no conscious verbal recall of the events occurred once subjects became verbally competent, almost all of them displayed indications of nonconscious behavioural memory storage, including personality changes, trauma-related fears, and post-traumatic play (Goodman et al., 1996, p.7; Terr, 1996, p.75). The present study argues that post-traumatic behavioural changes in verbally competent children illustrate how previously stored presymbolic procedural memories (the responses to traumatic events) can be elicited by aversive cues in the present. The result is a dynamic unconscious response where the child's verbally processed conscious thoughts, emotions, and behaviour are unconsciously shaped by a preverbal procedural memory. In summary, presymbolic episodes are unavailable as consciously retrievable memories, but their associated, equally unconscious procedural memories trigger involuntary behaviour in verbally competent subjects faced with a current stressor. In this sense presymbolic procedural memory acts psychodynamically on conscious symbolic experience.

5.2.2.1 Between Eight and Twenty-Eight Months of Age Procedural Memory Encodes Visuospatial and Linguistic Material into Aversive Response Scripts

When the prefrontal cortex begins to function after eight months of age (Chugani et al., 1993, p.138), motor output sequences gradually become integrated with linguistic and coordinated visuospatial processing of sensory material to form complex goal-directed behaviour scripts (Fuster, 1997, p.455). These procedural reaction scripts no longer only consist of simple motor, somatic, and sensory changes in arousal. The onset of a visuospatial imaging capacity at nine months of age enables infants to incorporate visual imaging methods including imagined withdrawal from a visual stimulus, as integral components of an avoidant procedural memory script (Lichtenberg et al., 1992, pp.44-46). A new ability to visually scan and evaluate the affect states of others by attending to their facial expressions enables infants to imaginarily visualize positive or neutral expressions in place of actual aversive encounters (Lichtenberg et al., 1992, p.46). This may be used in conjunction with physically averting the gaze or switching visual focus to a neutral stimulus.

After eight months of age, procedural responses triggered by aversive cues gradually begin to combine word recognition with visuospatial skills and motor gestures during the enactment of avoidant behaviour (Chugani et al., 1993, p.138; Fuster, 1997, p.455; Howe and Courage, 1997, p.509). For example, attending to or vocalising specific word sounds may be used in conjunction with avoidant motor gestures and non-aversive visual imagery to distance the infant from the immediate experience of a painful stressor. Infants between 18 and 28 months of age, who are capable of more sophisticated linguistic skills may vocalise whole words and phrases together with the use of non-aversive visual imagery to comfort and/or distract themselves from an aversive stimulus. The use of verbal and imaging distraction techniques is integrated with motor and sensory cues to form a complex procedural response memory. A stressor possessing verbal, visuospatial, and sensory-motor features similar to the original presymbolic stimulus could automatically trigger the associated procedural memory in verbally competent subjects.

In summary, the present study maintains that between eight and 28 months of age infants encode increasingly complex cognitive processing components in order to achieve aversive procedural response goals.

5.2.2.2 Presymbolic Procedural Memories Function as Unconscious Defence Mechanisms in Verbally Competent Subjects

Referring to symbolic unconscious mentation in verbally competent subjects, Lichtenberg et al. (1992) describe the concept of unconscious model scenes that develop in response to events containing conflict related, aversive elements (p.77). The aversive information results in some or all of the contents being "encoded as symbolic representations of affect-laden memories, fantasies, and beliefs " (Lichtenberg et al., 1992, p.77), that are sequestered in an unconscious altered state, i.e. a model scene. The present study argues that symbolic model scene representations are unconscious because they include stored episodic memories that are prevented by presymbolic procedural memories from having access to prefrontal retrieval strategies in verbally competent subjects.

In the preceding section it was argued that presymbolic procedural memory scripts consolidated between eight and 28 months of age include co-ordinated visuospatial and verbal behaviour components. These memory scripts are re-triggered if stressors occur that possesses sensory, imagistic, and verbal features reminiscent of the original aversive stimulus. Once the original presymbolic data features stored in cortical networks are co-activated by the perceptual analysis of a current stressor, the corresponding stimulus context trace and procedural memory script are reactivated by the basal ganglia and cerebellum respectively. The resulting procedural output may include unconscious involuntary use of sensory-motor data, visual imagery, and verbal skills that distract the verbally competent subject from consciously attending to the current stressor. The subject with fully developed verbal skills remains unaware that concentrating on specific non-aversive stimulus features, or imagining and saying certain things, are in fact behavioural techniques used to manage an unconsciously recognized aversive stimulus.

The present study contends that presymbolic procedural memories consolidated between eight and 28 months of age include verbal expressive and visual imaging skills that are unconsciously used by verbally competent subjects to effectively divert their conscious attention away from aversive stimuli.

If a presymbolic procedural memory is triggered in a verbally competent subject by a current stressor, the script may use a combination of sensory, verbal, and co-ordinated visuospatial focusing strategies to divert conscious attention away from the unfolding event during its automatic encoding by the hippocampus. The resulting memory episode does not receive a prefrontal retrieval code while being transferred into cortical storage by the hippocampus, because the prefrontal memory system is diverted towards non-aversive cues by the operation of the procedural script during the storage period. The episode therefore cannot be voluntarily retrieved as an autobiographical memory at a later stage. In effect, the episode is stored in an "altered state" inaccessible to conscious prefrontal retrieval. The episode is blocked from consciousness because its aversive valence conflicts with the subject's presymbolic memory objective, viz. to avoid or withdraw from aversive situations where possible.

In summary, presymbolic procedural memory scripts function as psychodynamic defence mechanisms that are automatically and unconsciously triggered by symbolic stressors. Symbolic stressors become temporarily inaccessible to voluntary retrieval, because recall depends on the prefrontal working memory system focusing on them as they are encoded by the hippocampus. When prefrontal attention is diverted from events, cortical storage of the memory episodes proceeds under the sole mediation of the hippocampus, with no prefrontal working memory organization of the episodes occurring. The stressful episodes are dynamically unconscious, because they may still be involuntarily recalled to consciousness via cue-mediated hippocampal reactivation if subjects experience similar stressors in the future (Krystal, Bennett, Bremner, Southwick, and Charney, 1996, p.172). These aversive episodes can therefore become available to consciousness under the right conditions. This concept is similar to Freud's description of the recovery of dynamically repressed memories.

However, presymbolic procedural memory activation and cue-dependant hippocampal involuntary recall represent a better explanation of how previously unconscious memories are recovered in verbal subjects, in comparison to Freud's hypothetical concept of repression.

In summary, the attention refocusing activities performed by presymbolic procedural memory scripts in response to stressors are unconscious in relation to the subject's conscious intentions. In this sense, presymbolic procedural memories can function as defence mechanisms. The present study argues that this unconscious manipulation of aversive symbolic episodic memories by presymbolic procedural memories in verbally competent subjects enables the psychoanalytic concept of dynamic unconscious mentation to be reformulated. The levels of unconscious mentation encompassed by the presymbolic memory model are outlined in section 5.3 below.

5.3 Two Unconscious Memory Systems

5.3.1 Fundamental Unconscious Mentation

The presymbolic aversive episodic and procedural memories stored in neural connections across diverse neocortical, basal ganglia, and cerebellar regions embody a fundamental unconscious memory system. Fundamental unconscious mentation can be defined as the layer of stored memory traces that are permanently inaccessible to voluntary prefrontal retrieval and conscious verbal organisation, due to the inherent absence of certain information parameters. Presymbolic episode traces are not blocked or prevented from entering conscious awareness by other cognitive processes, but inherently lack sufficient linguistic information attributes necessary for prefrontal retrieval to access and re-format these networks. Although presymbolic episode traces cannot be directly integrated into the later developing autobiographical memory system, their sensory networks can be unconsciously activated by later symbolic stressors possessing sensory features reminiscent of presymbolic contexts.

In turn, this presymbolic episodic network activation automatically triggers the associated presymbolic procedural memories, including somatic sensations, vocal tones, facial expressions, gestures, and symptomatic acts (Lichtenberg et al., 1992, p.26).

Presymbolic procedural memories are unconscious whether activated in presymbolic or verbal subjects, because they encapsulate learned behaviour sequences, not records of experience. The automatic changes in visual, verbal, somatic, and motor functioning noted by Lichtenberg (1989) in therapeutic settings, indicate that verbal subjects often unconsciously respond to stressors instead of consciously attending to and acknowledging their presence (pp.285-287). The present study has argued that presymbolic procedural memory scripts produce nonconscious changes in sensory, verbal, and visuospatial reactivity that can effectively prevent conscious attention and strategic memory retrieval from focusing on and integrating current stressors into the subject's ongoing autobiographical narrative. Presymbolic procedural memories function as defence mechanisms that effectively prevent verbally competent subjects from consciously attending to and verbally recalling specific symbolic episodes. In these cases, presymbolic procedural memories dynamically divert conscious attention and block verbal recall of symbolic aversive episodes, so giving rise to symbolic unconscious mentation.

In summary, stored presymbolic aversive episodic and procedural memory traces conform to a fundamental level of unconscious mentation, because this information cannot be consciously retrieved in either an involuntary or voluntary sense, even if the relevant memory traces are activated. Presymbolic episodic and procedural memories correspond to information contents stored in and across synaptic connections, but the present study does not claim that this content "hard-wires" the internal architecture of synapses and their connections. In fact, multiple memory traces are stored in the same synaptic connections, while individual neurons form part of many different memory trace networks. The same neuronal networks are therefore used repeatedly to store new memories. Individual memories do not fix synaptic architecture or neuron networks.

5.3.2 Dynamic Unconscious Processes

The unconscious activation of presymbolic episode traces triggers their associated procedural memory responses, and can result in the dynamic suppression of conscious attention to and voluntary recall of the activating stressor. Presymbolic procedural memories are fundamentally unconscious, but when operationalised they can dynamically influence other memories so that the latter are temporarily unavailable to conscious retrieval. Therefore the distinction made by Freud (1915/1957) between a fundamental unconscious system and dynamic unconscious processes governed by defence mechanisms (pp.180-181), appears to be valid, despite the evidence and conceptual framework used by the present model differing from the biological paradigm subscribed to by classical psychoanalysis.

The present developmental model of presymbolic episodic and procedural memory rooted in neuropsychological and infant research provides for a more circumscribed reformulation of fundamental and dynamic unconscious mentation in comparison to earlier psychoanalytic models that employed intrapsychic, interpersonal, or attachment relational concepts to understand unconscious mental processes. Unlike the present model, these earlier attempts failed to align their concepts in relation to i) specific maturation rates in different brain areas, ii) the onset and maturation of sensory-motor functions, and iii) how these co-evolve with memory processes in the developing human being.

5.4 Implications for Psychotherapy

The present model of presymbolic unconscious memory has implications for the practise of psychodynamic psychotherapy. In a psychotherapeutic context, the client cannot ameliorate his/her symptoms by recalling the corresponding aversive event if the latter is of presymbolic origin. In verbally proficient toddlers where external verification of a presymbolic trauma exists, there is no subsequent verbal recall of the gist of the trauma (Terr, 1996, p.74).

Therefore the therapeutic goal of psychodynamic psychotherapy needs to shift away from attempting to uncover or re-create early infantile memories that encapsulate aversive Oedipal or pre-oedipal experiences. Up until now this has been the *modus operandi* adopted by the classical and object relations psychoanalytic models.

Therapy should also not be solely concerned with the task of forging a positive attachment relationship between client and therapist to replace the hypothetical poor attachment scenarios, early deficits, or bad internal object relationships that may have characterised the client's developmental history. The present study proposes that therapist and client need to discover what kind of procedural memory scripts are being unconsciously used by the latter when dealing with current and past aversive contexts. In other words, from the perspective of the presymbolic memory model, the goal of dynamic psychotherapy centres on the client piecing together the cognitive and behavioural rules that he/she habitually uses in an unconscious fashion in order to cope with aversive life events and relationships in the present. On the basis of these rules, therapist and client may jointly reconstruct aversive presymbolic model scenes depicting how procedural scripts may have arisen in response to infantile stressors and thereafter evolved into the unconscious routines presently used by the client.

On the one hand there is an empirical element to such a therapeutic approach, viz. identifying and describing the aversive procedural scripts routinely used by clients in their present-day contexts. On the other hand this therapy also involves a hermeneutic-interpretive approach, viz. a reconstruction of how such scripts may have arisen in the course of the client's life, which is always a speculative endeavour. The third and final phase of therapy involves the therapist and client engaging together in the systematic disruption of aversive, maladaptive behaviour scripts, and the systematic experimentation with non-aversive behaviour sets in place of the aversive procedural scripts. The behaviour experimentation process unfolds in the context of the evolving interactions characterising the relationship between therapist and client.

In the concluding chapter of this study, the presymbolic memory model will be deployed in order to provide an original contribution to the theoretical understanding of two specific areas of clinical psychology and psychotherapeutic practise:

- i) The false recollection by adults and children of traumatic sexual abuse memories allegedly occurring in pre-verbal infancy.
- ii) The dissociation and involuntary recall of real traumatic memories as found in Post Traumatic Stress Disorder (PTSD).

The explanatory utility of the presymbolic memory model in relation to these memory phenomena will add to its robustness as a conceptual tool useful to psychologists working in both clinical and forensic contexts.

CHAPTER SIX: THE PRESYMBOLIC MEMORY MODEL IN EXPLAINING FALSE TRAUMATIC MEMORIES AND THE DISSOCIATION OF TRUE MEMORIES

6.1 Introduction

Chapter five concluded with a description of fundamental and dynamic unconscious mentation from the perspective of the presymbolic memory model. In the present chapter these two types of unconscious mentation will be shown to be integral to the theoretical understanding of false traumatic childhood memories, dissociation of true memories, and Posttraumatic Stress Disorder (PTSD). The present study contends that the presymbolic memory model can provide a unified theoretical understanding of these phenomena, currently characterised by an assortment of apparently contradictory and piecemeal findings. In the course of the present chapter it will become apparent that a model of presymbolic aversive memory is a necessary conceptual tool for understanding how these memory phenomena are constituted.

6.2 The Influence of Presymbolic Aversive Memory

6.2.1 Presymbolic Aversive Events are Inevitably Distorted Due to Processing Constraints

Stein (1996) argues that children younger than 24 months encode pre-verbal emotional events, and that the appraisal of an event as emotional leads to its encoding as a causally coherent memory episode (pp.173-174). When an event is unusual or violates prior knowledge schemas, for instance by containing aversive elements, the encoded trace is tagged as differing from other generic schemas and is stored as a discrete episode (Stein, 1996, p.184). This coincides with the present study's emphasis on the importance of aversive stimuli for the encoding and storage of presymbolic episodes. While aversive affect ensures that presymbolic events are encoded and stored, this in no way implies that the resulting episodic traces are accurate records of what actually occurred.

According to Stein (1996) encoding accuracy depends on the structure of the input registered, the subject's initial level of knowledge, and the ability to organise incoming information into a causally coherent episode (p.176). The logical implication for infants younger than 28 months, who lack mature prefrontal strategic retrieval and verbal competence skills, is that encoding of incoming information is compromised by these constraints, while prior stored knowledge is often lacking. Hence presymbolic episodic memories are encoded and stored in terms of these limitations.

6.2.2 Presymbolic Aversive Memories Dynamically Influence the Encoding and Storage of Stressors in Verbally Competent Subjects

In chapter five it was argued that presymbolic aversive memory episodes are inherently unconscious due to the absence of certain information parameters that facilitate the operation of prefrontal retrieval strategies in older subjects. Furthermore, it was contended that presymbolic procedural memories dynamically manipulate the encoding, storage, and recall of stressors in verbally competent subjects. Evidence of presymbolic manipulation of later memories was observed in subjects who experienced pre-verbal traumas prior to 28 months of age, but who could not later recall the episodes in the form of verbally coherent narratives (Goodman et al., 1996, p.7; Cameron, 1996, p.59; Terr, 1996, p.74). Despite the lack of conscious recall, these verbal children displayed persistent procedural memory responses relating to the trauma. These responses included posttraumatic play activities, personality changes, and trauma related fears (Cameron, 1996, p.59; Terr, 1996, p.75). Therefore, presymbolic trauma memories can indirectly continue to influence verbally mediated experience, including the encoding of verbal memory episodes and associated emotional reactions.

In addition, the dynamic influence of aversive presymbolic memories on verbally mediated experience is supported by research on disorganised infant attachment states.

When a caregiver displays alarm or is directly frightening, the infant's ability to shift attention away from this aversive stimulus breaks down because this coincides with the infant's normal source of stress alleviation, i.e. the attachment to the caregiver (Main and Morgan, 1996, p.120). As a result, the infant's regulation of attention is derailed by the ambiguous, aversive caregiver behaviour, and there is a lapse into a temporary disorganised state characterised by a breakdown in ongoing attention and self-monitoring (Main and Morgan, 1996, p.122). The authors suggest that such temporary collapses of attention and approach-avoidance behaviour in the pre-verbal period of infancy have long-term consequences for the subsequent symbolic organisation of memory, attention, and behaviour in the individual concerned (pp.129-131).

The findings on disorganised infant responses coincide with the view advanced by the present study, viz. that not only presymbolic physical or sexual traumas, but also more modest aversive caregiver responses can exert dynamic unconscious influences on later conscious self-monitoring, attention, and memory recall processes in verbally competent subjects. The present chapter focuses on how presymbolic aversive episodic and procedural memories actively influence some verbal subjects to create false memories of infant abuse, while predisposing others to dissociate in response to traumatic events.

6.3 Presymbolic Memory and False Memories of Abuse

6.3.1 Defining False Memories of Sexual Abuse

The alleged recovery of childhood sexual abuse memories in adults who previously had no knowledge of such memories has led to an intense debate concerning their accuracy. Researchers argue that many of these memories are false, and are fabricated in response to suggestive questioning techniques employed by irresponsible psychotherapists or criminal investigators (Ceci, Huffman, Smith, and Loftus, 1996, pp.227-228; Toglia, 1996, p.317).

Others argue that the conditions giving rise to false memories need to be enumerated, and that this will facilitate discrimination between verified abuse memories and those that are mostly false (Fivush, 1996, p.165; Stein, 1996, p.189; Ornstein and Myers, 1996, p.219; Saywitz and Moan-Hardie, 1996, p.259; Schooler, 1996, pp.292-293). Saywitz and Moan-Hardie (1996, p.245) note that the research and clinical findings reveal three basic patterns of early traumatic memories:

i) Continuous memory of the trauma.

ii) Memory loss for some but not all aspects of the trauma with later recovery and corroboration of all aspects.

iii) Temporary memory loss for the entire event.

It is the recovery of the third category of memory that is debated, primarily when there is no independent source of verification for the trauma outside of the subject's recovered memories themselves.

6.3.2 The Roles of Suggestion and the Prefrontal Cortex in the Creation of False Aversive Memories

Research on false recollections of sexual trauma has focused on the role of suggestion (Saywitz and Moan-Hardie, 1996, p.246). It is alleged that suggestions lead to the creation of experientially plausible false episodic memories because they prime fragments of real, albeit less aversive episodic memories stemming from childhood that are thereafter placed within a fabricated abuse context (Schacter, 1995, pp.22-23; Toglia, 1996, p.318). It is argued that these childhood memories have decayed to the extent that they cannot be retrieved in the form of intact episodes, so suggestions succeed only in priming the discrete visual, tactile, auditory, or olfactory components of these traces. Subjects may experience these sensory reactions as inexplicable, because they contain no conscious memory of the original childhood event.

In response to these retrieval restrictions, the prefrontal cortical strategic memory system creates a false episode that accounts for subjects' involuntary aversive reactions to interviewer suggestions (Squire, 1995, p.219). The prefrontal strategic memory system responds to the subject's need to organize an autobiographical memory that will meaningfully contextualise these inexplicable behavioural responses to the suggestion (Ceci, 1995, p.118). Prefrontal strategic memory is therefore thought to be instrumental in creating false episodic memories of childhood sexual abuse.

6.3.3 The Presymbolic Memory Contribution to the Suggestion Model of False Memories

The present study contends that suggestions about early abusive events can facilitate the creation of a false memory of abuse in two ways. Firstly, an aspect of the suggestion may nonconsciously prime a discrete feature of a presymbolic aversive episode in cortical storage (Ungerlieder, 1995, pp.771-772; Verfaellie and Keane, 1997, p.157). This results in a modality-specific behavioural response, e.g. a visual, auditory, tactile or olfactory startle, without conscious recall of any specific event. Secondly, suggestions may include a number of sensory and cognitive features reminiscent of stored presymbolic information. These features of the suggestion may activate an entire presymbolic episode network and trigger the associated procedural memory response script. The activation of the script would in turn produce an involuntary behaviour sequence without the subject consciously recognising a specific memory episode.

In both cases the presymbolic feature(s) primed or co-activated by the suggestion may prompt the prefrontal cortex to create a false aversive episodic memory. Suggestions of abuse can be explicit or implicit depending on the nature of the subject's personal material in relation to which the suggestion is made. In either case the content of the suggestion may succeed in priming or co-activating presymbolic memory components. The present study contends that interviewer suggestions of abuse could activate nontraumatic but nevertheless aversive presymbolic memory components stored in the cortex. The activation results in the involuntary behaviour responses that subjects find inexplicable.

The suggestions in turn provide subjects with a context within which to consciously evaluate their involuntary behaviour. This goal-directed evaluation activates a prefrontal strategic memory search for an appropriate autobiographical context. However, because there are no prefrontal retrieval co-ordinates for presymbolic memory episodes, the prefrontal cortex responds to the search goal by “retrieving” a fictional spatiotemporal episode. This episode is created from a combination of data derived from the subject's involuntary response and the therapist/ interviewer's suggestion. The prefrontal cortex cannot detect its own retrieval error, because the real presymbolic episode that is associatively linked to the subject's response bias is irretrievable to consciousness.

The prefrontal working memory system responds to subjects' need to understand their involuntary behaviour in an autobiographical context (Ceci, 1995, p.118). The structure of the false episode encoded by the prefrontal cortex is derived from the specificity of the suggestion in combination with the sensory and affective characteristics of the individual response bias. The present study argues that suggestions can plausibly account for the creation of false memories of abuse in some cases, because they inadvertently activate presymbolic procedural responses to empathic failure episodes in verbally competent subjects. False memories of abuse are created when subjects mistakenly attribute an autobiographical memory to a presymbolic procedural response bias elicited by a suggestion of abuse. The dynamic influence of aversive presymbolic memories can therefore lead to the creation of false verbal memories of sexual trauma in the presence of suggestions.

6.3.4. The Presymbolic Memory Contribution to the Creation of False Abuse Memories in the Absence of Suggestion

The presymbolic model argues that false memories of childhood abuse may also arise outside of suggestive therapeutic or forensic interview contexts. Aversive presymbolic episodic memories are stored in sensory-motor cortical receptor networks that double as memory storage facilities (Fuster, 1997, p.454).

Therefore, moderate life stressors with sensory features similar to those contained in a presymbolic episode will activate the receptor network combinations involved in the storage of the earlier event during the initial perception process. The inadvertent perceptual activation of a nontraumatic aversive presymbolic episode results in the triggering of the associated procedural memory script. The activation of the script produces an involuntary emotional response that verbally competent subjects may experience as inexplicable in their current life contexts.

The present life stressor is felt by subjects to be an inadequate explanation for their involuntary behaviour. The prefrontal working memory system as part of its executive function, organizes a search for an autobiographical context that would account for the involuntary behaviour. The lack of prefrontal retrieval parameters for the activated presymbolic episode constrains the prefrontal system to fabricate a plausible context for the involuntary behaviour. Given the current high profile of sex abuse in the mass media, this phenomenon may provide a plausible context into which verbally competent subjects can meaningfully organise involuntary, highly distressing behaviour typical of responses to preverbal empathic failures. The resulting false trauma memory provides an unambiguous autobiographical explanation for subjects' behavioural responses to current life stressors.

6.4 Recovered Memories of True Abuse and the Phenomenon of Temporary Memory Loss

The contribution of presymbolic procedural memory reactions to the formation of false memories of child abuse should not obscure the fact that some recovered memories of childhood abuse may be true. In some cases, recovered memories of child abuse have been verified by independent sources of information (Harvey and Herman, 1996, p.30). Interest has accordingly shifted to an examination of the conditions necessary for child abuse to be forgotten in cases where verbally competent children experienced the abuse.

The literature suggests that true trauma memories can be distorted by a lack of support or manipulative suggestions from caregivers and perpetrators (Tessler and Nelson, 1996, p.116). Schooler (1996) suggests that lack of discussion, shame, and embarrassment may lead individuals to actively avoid thinking about traumatic memories, and so results in the temporary inaccessibility of the memory to conscious recall (p.288). However, some verbally competent victims of childhood abuse remember part or all of the abuse episodes throughout their lives without any social acknowledgement from primary caregivers, family, and friends (Cameron, 1996, p.60). Therefore, lack of social acknowledgement cannot be the main reason why symbolic abuse episodes are sometimes temporarily unavailable to conscious recall.

Subjects with continuous memories of childhood abuse tend to have a) been abused by individuals other than family members who were easier to avoid if the subject was attentive and vigilant, b) been abused in a relatively undisguised, less intrusive manner by family members, and c) deliberately remembered their abuse in order to be unlike their abuser (Cameron, 1996, p.60). These criteria indicate that trauma memories are accessible not because they are positively reinforced, but for two other reasons. Firstly, the absence of certain types of negative reinforcement, e.g. coercive suggestions that the abuse never occurred, enables the memory to be recalled. Second, deliberate attention to the abuse when it occurs enables uninterrupted retrieval of the memory.

Severe abuse, perpetrated covertly by family members on an ongoing basis, and involving attempts to deceive the victim about the nature of the acts is more likely to result in dissociative amnesia for the abuse episodes (Cameron, 1996, pp.59-60). In contrast, the ability of the person to consciously attend to the abuse despite a lack of social acknowledgement facilitates its immediate and long-term recall. The conscious availability and voluntary recall of a trauma memory appears not to be solely dependent on its original social contextualisation and affective attributes, but also on the integrity of the subject's conscious attention system during the abuse episode.

In addition to attentional focus, the accessibility of abuse/trauma memory episodes in verbally competent subjects may depend on how these interact with earlier knowledge and emotional disposition (Stein, 1996, p.185). The present study argues that verbally skilled subjects' prior knowledge includes aversive presymbolic episodic and procedural memories. In chapter five it was argued that presymbolic aversive procedural memories may dynamically react to stressors encoded in verbally competent subjects by diverting conscious attention away from current aversive stimuli. As a result the current stressor is not encoded by the prefrontal working memory system, and so cannot be voluntarily retrieved into consciousness. In the case of childhood trauma/abuse where the victim is verbally competent, the trauma episode encoded by the hippocampus receives cortical storage, and yet remains unavailable to prefrontal memory retrieval due to this presymbolic memory intervention. Therefore, verbal-symbolic trauma memories may be effectively excluded from the subject's autobiographical memory system. This presymbolic memory theory of traumatic event dissociation will be systematically developed in later sections of the chapter once an initial investigation of the properties of dissociation as it occurs in the context of Post Traumatic Stress Disorder (PTSD) is completed below.

6.5 PTSD and the Dissociation-Involuntary Recall of Traumatic Memories

Posttraumatic Stress Disorder (PTSD) consists of two alternating phases. In the initial phase a subject responds to a trauma by becoming emotionally numbed and avoiding trauma-related cues, while in the second phase he/she displays high emotional arousal, florid symptoms, and involuntarily recalls traumatic material (Cameron, 1996, p.43; Courtois, 1996, p.359; Foa and Hearst-Ikeda, 1996, pp.207-209). Initially, subjects avoid remembering or recognizing traumatic episodes and related stimuli; while in the second phase they involuntarily orientate towards and recall trauma-related cues and episodes (Cameron, 1996, p.44; Courtois, 1996, p.359). When the onset of the second PTSD phase occurs in verbally competent subjects, memories recovered include fragmented images, smells, emotions, and visceral pains instead of a coherent event (Cameron, 1996, p.59). In other words, discrete sensory components of the trauma memory episode are recalled.

Dissociated memories are a core phenomenon in PTSD, and may be defined as a) the initial loss of certain events to consciousness, and b) the related behavioural avoidance of ongoing stressors. The recovery of dissociated memories involves two components. Firstly an orientation towards cues possessing some features structurally similar to the original trauma(s), and secondly, the consequent involuntary recall of components belonging to the trauma episode(s). Cameron (1996) notes that dissociative amnesia in PTSD victims affects the explicit recall of trauma episodes, but not the implicit procedural memory responses to traumas. These responses continue to manifest as involuntary behavioural and emotional reactions to ongoing stressors in the victims' environments (Cameron, 1996, p.60).

6.6 Properties of PTSD-Related Dissociation

6.6.1 Dissociation Involves a Lack of Co-ordination Between Sensory, Affective, Attentional and Self-Monitoring Systems During the Trauma Experience

Spiegel (1995) speculates that the narrowing of attention during a traumatic experience results in fewer associations within the stored memory network (p.137). For example, somatic, olfactory, visual, and auditory information components may be automatically encoded and stored during an incident of intrusive sexual abuse, while higher order cognitive processes, including conscious attention to the event, are lacking. Alternatively, the subject may recall a sanitized verbal account of the event devoid of emotionally disturbing sensory, motor, and somatic details. Spiegel (1995) proposes that in both cases the trauma memory trace possesses few neural connections to other memories, and few associative links connecting cognitive self-monitoring and strategic memory retrieval processes with the sensory and affective trauma components (p.137). Trauma episodes can be wholly or partly unconscious, suggesting that the unavailable components are not processed by the self-monitoring and memory integration/retrieval functions of the prefrontal cortex at the time of their encoding (Moscovitch, 1995, p.242).

6.6.2 Involuntary Recall indicates that the Prefrontal Cortex is Not Involved in the Encoding and Storage of Dissociated Trauma Episodes

There is evidence that the involuntary recall of previously unavailable trauma memories in PTSD patients occurs due to cue-dependent hippocampal reactivation, and does not initially involve prefrontal strategic retrieval (Krystal et al., 1996, p.172). In PTSD, the involuntary re-experiencing of isolated sensory and motor memory components, including images, smells, or sensations related to the trauma, indicates that they are unconsciously activated by the presence of trauma-associated cues (Krystal, Southwick, and Charney, 1995, p.160). Similarly, the involuntary re-experiencing of a visual-audio-tactile flashback sequence may be due to the inadvertent co-ordinated activation of these sensory memories by a current stressor that resembles these features. According to Krystal et al. (1996) the hippocampus is involved in the involuntary recall of trauma memories (p.172). The activation of the trauma's sensory features by a current stimulus is automatically communicated to the hippocampus, which reactivates these specific features of the episode without the involvement of the prefrontal strategic retrieval system (Krystal et al., 1996, p.172). This accounts for the partial, fragmented recovery of sensory components characteristic of involuntary recall.

Krystal et al. (1995) note that the spatial and temporal co-ordinates of a trauma memory may be disturbed or absent during involuntary retrieval (p.158). This indicates that the episode was not originally integrated by prefrontal working memory into a spatial-temporally organised autobiographical context. Prior to involuntary recall, the episode cannot be retrieved into consciousness as a coherent event by the prefrontal system (Moscovitch, 1995, p.234). The relative absence of spatial-temporal co-ordinates during involuntary recall suggests that the prefrontal strategic memory monitoring and retrieval functions responsible for mediating these information parameters may somehow be temporarily diverted during the encoding and storage of trauma memories (Moscovitch, 1995, p.245).

6.6.3 The Neuropsychology of Dissociation Involves a Decrease in Sensory Arousal and Conscious Attention to Trauma-Related Cues

Involuntary recall of traumatic memories and flashbacks involve an increase in autonomic arousal to sensory stimuli (Krystal et al., 1996, p.167; O'Brien, 1998, p.183). It is therefore logical to assume that emotional numbing, avoidance of trauma-related cues, and memory dissociation in response to a trauma involves a corresponding decrease in sensory arousal (Krystal et al., 1996, p.172). According to Krystal et al. (1996), extreme stressors initially result in very high levels of sensory arousal (p.175). Research shows that stressors activate noradrenergic (NE) neurotransmitters in the limbic system, and that this increase in NE production stimulates thalamic receptors (p.175).

The thalamus is a limbic system structure responsible for the modulation of sensory arousal. By acting as a sensory gate, the thalamus modulates heightened or lowered arousal to sensory information, and in turn controls the degree to which the cortex and hippocampus have access to incoming sensory information (Krystal et al., 1996, p.173). The initial response to a trauma therefore involves increased activation of thalamic receptors via NE modulation, which in turn increases sensory arousal and alertness to aversive cues (Krystal et al., 1996, p.175). However, the onset of emotional numbing and the generalized avoidance of aversive environmental stimuli accompanying memory dissociation in PTSD patients, indicate that some form of sensory gating must occur in the wake of this heightened thalamic arousal (Krystal et al., 1996, pp.173-176). These authors suggest that glutamate production increases in cases of extremely high aversive arousal and serves to subsequently redirect sensory alertness by changing the receptivity of the thalamus to incoming stimuli (Krystal et al., 1996, p.175).

Furthermore, the direct links between the thalamus and the prefrontal cortex indicate that sensory gating due to glutamate modulation of thalamic receptivity can lead to changes in conscious attention and self-monitoring systems (Krystal et al., 1996, p.176).

Changes in thalamic receptivity therefore account for conscious attention being redirected during trauma experiences towards less aversive peripheral sensory detail, or non-aversive internal sensory processes (p.176). Despite the sensory gating and subsequent diversion of conscious attention, the traumatic episode is encoded and stored, but without the involvement of the prefrontal working memory system which is diverted towards non-aversive stimuli (Krystal et al., 1996, p.174). Krystal et al. (1996) suggest that the hippocampus, which is involved in the involuntary cue-dependent recall of traumatic memories, automatically encodes the trauma into an event episode. Thereafter the hippocampus, via unconscious reactivation, ensures that the episode receives cortical storage despite not being tagged by prefrontal working memory for later voluntary retrieval (Krystal et al., 1996, pp.171-172).

6.7 The Role of Presymbolic Memory in the Dissociation and Involuntary Recall of Symbolic Traumas

The neuropsychological theory of dissociation proposed by Krystal et al. (1996) is the starting point for the contribution of the presymbolic memory model to understanding the phenomenon of traumatic memory dissociation. The sections below describe the presymbolic memory regulation of prefrontal processes during the encoding and storage of trauma episodes in verbally competent subjects. It is argued that presymbolic memory contributes to the dissociation of traumatic memory episodes during the initial phase of PTSD. Secondly, involuntary recall of abuse-related memories in verbally competent subjects is viewed as an outcome of continuous interplay between underlying presymbolic memories and external trauma-related cues. Demonstrating that the presymbolic memory model can provide a more comprehensive neuropsychological understanding of memory dissociation in PTSD patients constitutes the second original contribution to knowledge made by the present study.

6.7.1 The Presymbolic Memory Contribution to the Neuropsychology of Dissociation

6.7.1.1 Presymbolic Memories can be activated by Traumas in Verbally Competent Subjects

In chapter five, previous research on verified instances of presymbolic infant traumas noted the presence of associated procedural memory responses and personality changes in later verbal contexts (Terr, 1996, p.75). In addition, Main and Morgan (1996) observe that disorganized infant responses in the wake of ambiguous (frightening or frightened) caregiver behaviour include trancelike behavioural stilling and freezing, dissociated actions and body movements, and the alternating expression of avoidant and resistant behaviour (p.131). These authors suggest that presymbolic disorganized responses to caregiver mediated empathic failures predict later dissociative behaviour and memory manipulation observed in older children and adults (p.131).

In the light of these findings, the present study contends that trauma cues undergoing perceptual analysis in verbally competent subjects may inadvertently activate pre-existing presymbolic aversive trauma or empathic failure memories stored in the same cortical regions. This occurs if the current trauma contains perceptual features reminiscent of material contained in the presymbolic memory trace. The present study argues that the activated presymbolic trace network sets in motion a sequence of brain processes resulting in the current trauma becoming dissociated relative to the subject's autobiographical memory system. This sequence of events will be outlined in the following sections below.

6.7.1.2 During Infancy the Amygdala Responds to Aversive Stimuli by Regulating the Thalamic and Basal Ganglia Encoding of Procedural Memories

The present study contends that during infancy the amygdala regulates thalamic arousal and basal ganglia functions, so enabling the latter regions to encode procedural memory responses to aversive stimuli.

The amygdala is directly connected to the thalamus (Davis, 1997, p.385), and produces an increase in NE and cholinergic hormone activity in response to aversive stimuli (McGaugh et al., 1996, p.13510). The release of cholinergic hormones by the amygdala in turn enhances thalamic sensitivity to aversive sensory stimuli (Davis, 1997, p.386). The amygdala is therefore responsible for the thalamus acting as an early response system to aversive sensory stimuli, a role that Krystal et al. (1996) previously identified in relation to the thalamus.

In verbally competent subjects, the amygdala indirectly regulates prefrontal attention and self-monitoring in relation to aversive stimuli, because the prefrontal cortex relies on the thalamus for access to sensory information. However, chapter four established that prefrontal cortical working memory and retrieval functions are immature prior to 28 months of age. Therefore the amygdala regulation of thalamic arousal during presymbolic infancy has little effect on the immature prefrontal system. Despite this, the heightened thalamic arousal to aversive stimuli will prompt the infant to react behaviourally by encoding an appropriate procedural memory response.

In presymbolic infants the sequence from initial perceptual analysis of aversive cues to the behavioural enactment of an appropriate procedural response can be divided into three stages outlined below.

- i) In response to aversive cues relayed by cortical perceptual receptors, the amygdala increases NE and cholinergic hormone release to the thalamus. This leads to heightened thalamic arousal and preferential processing of ongoing aversive sensory cues, concurring with the initial thalamic response role in relation to traumatic stressors noted by Krystal et al. (1996) above.
- ii) The increased thalamic arousal facilitates the hippocampal encoding of an aversive episodic trace.

The present study argues that on analysing the episode trace, the amygdala releases opiate receptor agonists that suppress NE production (McGaugh et al., 1996, p.13510), resulting in increased glutamate release in the thalamus and decreased arousal to ongoing aversive cues (Krystal et al., 1996, p.177). The amygdala therefore contributes to the sensory dimension of the procedural memory response by ensuring that presymbolic infants nonconsciously “avoid” further aversive sensory cues. This is achieved via an amygdala-mediated switch in thalamic receptivity to aversive stimuli, based on its analysis of the aversive episode.

iii) Simultaneous with the reduction in sensory arousal to aversive cues, the amygdala regulates a basal ganglia response which in turn generates avoidant motor activity in the premotor cortex. The basal ganglia encode and relay a startle response to the premotor cortex. This area translates and co-ordinates the response trace into motor output activity geared towards avoiding the ongoing aversive context (Fuster, 1997, p.455; White, 1997, pp.166-167). The amygdala therefore indirectly regulates the motor dimension of the procedural memory response as well.

The present study argues that once the presymbolic procedure is embodied in sensory-motor reactive activity, the sensory withdrawal and motor response components are combined into a procedural memory trace in the cerebellum for storage and automatic activation, should similar stressors arise in future. In addition to the cerebellar script, the sensory and motor behaviour output patterns of the procedural memory are stored in the relevant primary sensory and premotor cortical networks in presymbolic infants.

6.7.1.3 Presymbolic Memories Account for Dissociative Responses to Traumas in Verbally Competent Subjects

Perceptual analysis of trauma stimuli can trigger presymbolic procedural memories.

The present study argues that the perceptual analysis of a trauma can trigger an underlying presymbolic memory, so initiating the dissociation process in verbally competent subjects. Trauma cues analysed by cortical sensory networks will activate presymbolic episodes stored in these regions, provided the two sets of sensory data resemble one another. If enough sensory features of a presymbolic episode are co-activated by current trauma cues, the data match is automatically relayed to the basal ganglia. The basal ganglia integrate the common features into a network resembling the earlier presymbolic stimulus context. The amygdala simultaneously analyses the affect component of the trauma stimulus and relays the outcome to the basal ganglia where it is integrated into the current context trace.

The current trauma-presymbolic context resemblance is relayed from the basal ganglia via the premotor cortex to the cerebellum, so enabling the corresponding procedural memory script to be triggered. The procedural script is activated in response to the presymbolic context resemblance processed by the amygdala and basal ganglia on the basis of the initial perceptual analysis of the trauma. These limbic system sub-regions respond to this shallow perceptual analysis before the relevant prefrontal cortical areas can carry out a more in-depth visuospatial and linguistic analysis of the same stimuli. The present study argues that because of this initial limbic system response, the presymbolic procedural memory associated with the presymbolic-current trauma resemblance is triggered in cerebellar storage.

The procedural memory, comprising both sensory and motor response components, is presented to the amygdala-basal ganglia-thalamus complex for processing into behavioural output sequences in the sensory and premotor cortices.

The entire procedural response activation process is completed before a prefrontal linguistic analysis of the trauma information can occur. Thompson and Kim (1996) note the reciprocal links between cerebellar, amygdalar, and hippocampal systems, and highlight the role of the cerebellum in generating specific behavioural responses designed to deal adaptively with aversive events (p.13438). The present study suggests that once activated, presymbolic procedural memory scripts stored in the cerebellum are transferred via reciprocal connections to the amygdala for operationalisation by the limbic system.

Presymbolic procedural memories condition the limbic system response to the current trauma.

Once the procedural memory is relayed to the amygdala, the aversive presymbolic information this script contains triggers an affective analysis. The amygdala bases its own subsequent regulatory activities on the analysis of this presymbolic information, and in this sense does not recognize the unique features of the current trauma context. The amygdala in response to the script relays the original presymbolic aversive affect data to the basal ganglia for motor response output encoding. Simultaneously, in line with the goal of the script, the amygdala releases opiate agonists to reduce levels of NE and increase glutamate production to the arousal centre in the thalamus (Krystal et al., 1996, p.175). As a result, sensory receptiveness to ongoing aversive cues decreases, and information pertaining to the trauma is thereby prevented from reaching prefrontal cortical attention centres via the thalamic pathways in verbally competent subjects (Krystal et al., 1996, p.176).

Prior to the activation of the presymbolic procedural script, the hippocampus receives the results of the initial perceptual analysis of the trauma and encodes the data into a sensory-motor episode. Once the procedural script is activated and prefrontal attention is diverted from aversive cues, the trauma episode cannot be integrated into the prefrontal working memory system responsible for organising episodic memory retrieval. The episode is therefore reactivated by the hippocampus and stored in the sensory and motor areas of the cortex without any modification by the prefrontal retrieval system.

Conclusion: Presymbolic procedural memory diverts prefrontal attention and strategic retrieval during the storage of the trauma episode.

The decrease in sensory arousal to the trauma data results in the subject redirecting conscious attention towards non-aversive cues before any strategic working memory encoding of the trauma features can occur. Conscious prefrontal attention processes reliant on thalamic data are prevented from focusing either on external trauma-related cues or the hippocampal encoding of the trauma. Despite being stored in the various sensory areas of the cortex, the trauma episode cannot be consciously organised into current self-experience while the prefrontal attention system focuses on non-aversive data. The diversion of attention from trauma-related cues means that prefrontal voluntary retrieval strategies for the trauma episode are not encoded, since the general prefrontal system does not incorporate the trauma context within its own working memory parameters at the time it occurs.

Therefore the current trauma memory is stored in widely separated sensory and motor cortex regions without individual components having the capacity to be connected by a retrieval strategy into a verbally coherent memory episode. The trauma memory is effectively dissociated from the subject's autobiographical memory due to the lack of prefrontal retrieval codes that normally enable the separate components of trace networks to be re-connected in terms of a common set of spatiotemporal co-ordinates. The lack of autobiographical co-ordinates is evident in cases of involuntary recall when previously dissociated trauma memories are vividly re-experienced in their immediate sensory and affective details, instead of being recalled as a coherent spatial-temporal event (Krystal et al., 1996, pp.171-172).

In summary, the present study argues that pre-existing presymbolic trauma or empathic failure memories predispose verbally competent individuals to dissociate in response to symbolic trauma stimuli.

In cases where memories of traumatic abuse are always remembered, subjects may not dissociate at the time the abuse occurs because they lack relevant presymbolic aversive memory traces that set up this defence mechanism. Previous research suggests that susceptibility to dissociation is due to early pre-verbal traumatic or disorganised infant state memories (Chu, 1996, p.385; Main and Morgan, 1996, p.109). The presymbolic memory contribution outlined above attempts to explain how this susceptibility may work in practise.

6.7.1.4 Trauma-Avoidant Behaviour Occurs in PTSD Patients due to the Re-Triggering of Presymbolic Procedural Memories

In the first phase of PTSD with dissociation, subjects attempt to avoid situations and stimuli reminiscent of the trauma (Cameron, 1996, p.44; O'Brien, 1998, p.183). One of the most effective means of accomplishing this may be by focusing on non-aversive cues. The present study argues that in this phase moderately aversive environmental cues resembling one or more features of the trauma succeed in activating the cortically stored trauma episode. The perceptual analysis of the current cue inadvertently activates the matching features of the trauma network. If sufficient trauma features are co-activated, these inputs are automatically relayed to the basal ganglia, which integrate the features into a network resembling the trauma context. This pre-verbal sensory context in turn also resembles the presymbolic context originally activated when the trauma first occurred. The basal ganglia therefore match the current sensory stimulus with the original trauma-presymbolic context association.

The chain of activation, from current perceptual input, to pre-verbal sensory trauma network, to presymbolic context network, results in the basal ganglia relaying the latter trace via the premotor cortex to the cerebellum in order to activate the appropriate procedural memory script. The whole process occurs before the linguistic and visuospatial processing regions of the prefrontal cortex can analyze the current cue.

As a result, the limbic system "interprets" the current cue as a re-occurrence of an aversive presymbolic episode. This episodic memory context in turn demands the appropriate procedural response. The activated presymbolic procedural memory script re-initiates the limbic system sequence that previously resulted in the subject's dissociative response to the trauma. Once again thalamic arousal to ongoing aversive sensory cues is modulated, resulting in a re-orientation towards non-aversive stimuli. Simultaneously, a basal ganglia fear response is relayed to the premotor networks. The outcome includes the behavioural avoidance of current aversive stimuli and the re-orientation of prefrontal conscious attention towards non-aversive cues. This re-orientation of behaviour and attention towards non-aversive cues is typical of the trauma-avoidant stage exhibited in PTSD patients.

6.7.1.5 Involuntary Recall and Presymbolic Memory

Involuntary recall depends on the degree of fit between the trauma memory and a current stressor.

In the second stage of PTSD, subjects are overwhelmed by the involuntary recall of image, affect, sensation, and verbal memory components relating to the traumatic event (O'Brien, 1998, p.183). Studies of amnesiac survivors of traumatic sexual abuse who subsequently recall their abuse report specific cues that initiate the process of involuntary recall (Cameron, 1996, p.62). Cues generally take the form of a scenario or aspect of a scenario highly similar to the original abuse context. For example, similar abuse episodes are experienced by subjects, or happen to someone known to the subjects (Cameron, 1996, p.62). Alternatively, subjects re-experience a sensory component of the abuse experience. For example, a visual, tactile, or somatic feature of a current experience replicates a component of the original trauma memory (Cameron, 1996, p.62). It appears that the more exact the fit between a current aversive stimulus and the original trauma memory, the greater the probability that involuntary recall of the latter will be triggered.

The hippocampus matches the current stressor with the trauma memory.

The present study maintains that prior to involuntary recall, a new stimulus reminiscent of the original trauma co-activates the sensory features of the trauma episode while undergoing perceptual analysis. The activated trauma features are, along with the current stimulus, integrated into a stimulus context by the basal ganglia. Once again, this pre-verbal sensory context essentially resembles the presymbolic context activated when the trauma originally occurred. As in the case of trauma-avoidant behaviour described above, the basal ganglia analysis of the current perceptual input results in the triggering of the presymbolic procedural memory script in the cerebellum. This occurs before a prefrontal verbal analysis of the current stimulus can occur.

Concurrent with the activation of the procedural memory script, the hippocampus in its capacity as a novelty detection device automatically compares the current perceptual analysis of the stressor with previous aversive episodic memories (Tulving and Markowitsch, 1997, p.211). The present study concurs with Krystal et al. (1996) that the hippocampus plays a pivotal role in the involuntary recall of previously inaccessible trauma material. At the level of shallow perceptual analysis, the trauma episode can be nonconsciously activated by aversive cues that either partially resemble or closely match the stored trauma features. In the first case, a more complex hippocampal novelty analysis of the same information fails to find enough common features to warrant a match with the trauma memory. The current cue is encoded into an unrelated aversive episode trace despite other parts of the limbic system (the amygdala, thalamus, and basal ganglia) activating the presymbolic procedural script in response to the cue. As a result, aversive cues that partially resemble the trauma result in trauma-avoidant behaviour and the continued dissociation of the trauma memory.

However, in the second case the resemblance between the current cue and the trauma initially registered at the level of perceptual analysis is verified by the hippocampal novelty detection analysis. There are enough common features in the current aversive event to warrant a match with the trauma memory. In the process of this match the hippocampus reactivates the trauma memory from cortical storage. Instead of simply encoding a new aversive episode, the two sets of aversive event data are first relayed to the amygdala for further affective analysis. The amygdala receives both the current stressor and trauma data, and analyses both data sets in relation to the simultaneous operationalisation of the presymbolic procedural memory script.

The present study contends that the relaying of episodic data to the amygdala represents the first time that the latter region is able to process the trauma data from the perspective of the more complex hippocampal analysis. On the occasion that the trauma was initially experienced by the subject, the amygdala processed the trauma firstly in terms of the outcome of the perceptual analysis, and secondly from within the instruction parameters of the presymbolic procedural script. This occurs without hippocampal intervention, because no comparative event data match pertaining to the trauma is previously recorded by the hippocampus. In the present context, the amygdala finally has access to two complex sets of event data. These data sets enable the amygdala to process a new current stimulus-trauma association, and hence to recognize the presymbolic procedural script as inapplicable to the new stimulus context.

Contrary to the data parameters of the presymbolic procedural memory script, the new association prompts the amygdala's central nucleus, responsible for regulating sensory arousal during associative learning (Davis, 1997, p.389), to modulate a further increase in thalamic sensitivity to current aversive cues. This enables the amygdala to monitor the ongoing aversive situation in order to formulate a behavioural response appropriate to the new contingency. The increased thalamic arousal in turn enables the prefrontal conscious attention system to become increasingly attuned towards ongoing external and internal aversive cues (Krystal et al., 1996, p.176).

The current stressor-trauma association results in increased prefrontal attention to aversive cues.

The prefrontal attunement to aversive cues enables the subject to consciously organise the current aversive episode into ongoing self-experience. The hippocampal encoding of the current episode is accompanied by the co-activation of the prefrontal cortical working memory system, which locks onto the trace network and codes it with a spatial-temporal tag that facilitates later retrieval. Despite the subject's conscious focus on the current stressor, the original trauma episode with which it shares sensory features is still unconscious, because the latter lacks its own spatial-temporal retrieval co-ordinates. In contrast to Krystal et al. (1996), the present study suggests that cue-dependant hippocampal reactivation of trauma memories cannot by itself enable their involuntary recall. The present study proposes that the information features common to both the current stressor and trauma networks are co-activated when conscious attention is focused on the current event. The features common to both networks will therefore be the first components of the dissociated trauma to enter consciousness in association with the currently experienced event. In turn, the neural pathways linking the unique features of the trauma to the shared features when the latter become conscious activate the former.

Involuntary recall involves co-operation between prefrontal retrieval and hippocampal reactivation processes.

The present study argues that the trauma episode components are involuntarily retrieved according to two different information processes. Firstly, the features common to both the current stressor and the trauma episode are retrieved during the subject's conscious focus on the former event. Secondly, the features unique to the trauma episode are involuntarily retrieved once the subject recognises that the common features belong to two distinct events. Experientially, the common features in the present event remind the subject of the previous trauma.

This strategic recognition enables the common data features to function as cues conditioning the hippocampal reactivation of the unique features of the trauma episode. Cue-dependant hippocampal reactivation is therefore a secondary response to trauma memory components inadvertently retrieved by the prefrontal cortex. This process should not be confused with the automatic nonconscious reactivation of the trauma episode when the hippocampus is engaged in novelty analysis. At this earlier stage in memory processing, the prefrontal retrieval system has no access to the current stressor or trauma episode components. It is only once the prefrontal cortex has partial access to trauma memory components that hippocampal reactivation results in the associated unique memory components being integrated into the prefrontal working memory system, so enabling their conscious retrieval.

Once the prefrontal retrieval system has access to the current event, involuntary recall of the trauma does not occur all at once. Distinct trauma components are recalled on different occasions, depending on the specific cues involved in each recall attempt. Features unique to the trauma episode may only be recalled some time after the shared features, and not necessarily all on one recall occasion. Dissociated episodic memories are often recalled as fragmented images, sensations, smells, or sounds that are only gradually pieced together and organised into an integrated episode. This view of gradual memory integration coincides with Cameron's (1996) description of involuntary recall where separate components of the original trauma are recalled at different times, often over a period of weeks or months (p.63).

Presymbolic memory and individual differences in dissociation.

In some cases of involuntary recall, verbal discourse fails to accurately convey the aversive impact of a trauma (Krystal et al., 1995, p.158). This suggests that the verbal formatting of trauma material does not occur or is segregated from sensory and affective data components during the original encoding and storage of the memory.

This characteristic appears to be due to sensory and motor components of the trauma being stored in isolation from the higher order linguistic and visuospatial features of the episode. The prefrontal cortex normally encodes the latter features (Buckner, 1996, p.156). From the present study's perspective, the initial activation of the presymbolic procedural memory script in response to a trauma produces a shift in prefrontal cortical attention away from aversive cues. This may render the prefrontal linguistic and visuospatial encoding areas unable to encode the relevant features of the trauma episode. Therefore, in some cases of dissociation, the verbal discourse component of the trauma is not encoded. In these cases fragmented sights, sounds, sensations, and emotions without any accompanying verbal narrative characterise involuntary recall.

In other cases of dissociation a verbal description of the event is available to consciousness from the time of the trauma's occurrence, but sensory and affective components of the experience remain unconscious. The present study suggests that the left prefrontal cortical linguistic area (Nyberg et al., 1996, p.145) may sometimes encode an affect-free verbal account of a trauma, despite adjacent left prefrontal areas mediating conscious attention to sensory-affective cues being diverted towards non-aversive stimuli by the switch in thalamic arousal. In other words, the decrease in thalamic sensitivity to aversive sensory cues may not affect all prefrontal processing regions in the same way in different subjects. This variation may be due to the degree to which thalamic arousal is affected by individual presymbolic scripts. In some cases, procedural memory scripts may produce a total blanket reorientation of sensory arousal towards non-aversive cues. In other less extreme cases, peripheral trauma cues, including relatively affect-free linguistic data may be encoded. The degree to which the thalamus switches sensory arousal focus may be regulated by the affective intensity of the specific presymbolic procedural memory underlying the change in thalamic functioning.

Another possible explanation for this variation in dissociative response may be due to differences in the data configurations of individual procedural memory scripts.

Chapter five suggests that procedural scripts encoded after eight months of age include increasingly complex visuospatial imaging and verbal avoidance components in their configurations. These more complex scripts may account for individual differences in selective conscious attention towards the verbal aspects of traumatic stimuli. For example, a verbal avoidance strategy that is part of a procedural script may allow conscious focusing onto linguistic details of the trauma scenario so long as these are devoid of affective valence.

The common factor in these partial forms of dissociation is the absence of rich sensory and affective data from the initially conscious memories. This is due to the subject's fundamental attentional avoidance of these cues occasioned by the switch in thalamic regulation of sensory arousal. The present study contends that it is only once the prefrontal working memory system gains access to the stored sensory and affective components of the trauma episode during involuntary recall that the dissociation is lifted. Involuntary recall enables sensory and verbal components to be integrated into a complete episode. In summary, the different kinds of memory compartmentalisation typical of dissociation suggest that presymbolic procedural memory scripts dynamically manipulate the sensory-affective, verbal, and visuospatial organisation functions of the prefrontal working memory system during the experience of traumatic events.

6.8 The Presymbolic Memory Contribution to Dissociation: Implications for Therapy

The present study proposes that dissociation is caused by the triggering of a presymbolic procedural memory in response to the initial perception of a trauma in verbally competent subjects. The presymbolic memory produces a decrease in sensory arousal and prefrontal conscious attention to some or all of the trauma-related cues. The diversion of conscious attention towards non-aversive cues in turn prevents the prefrontal system from encoding an appropriate autobiographical retrieval strategy for the cortically stored trauma episode. Therefore dissociation in verbally competent subjects is an avoidant, defensive response to a trauma, mediated by the inadvertent activation of the presymbolic memory system.

Psychotherapists working with child and adult PTSD victims experiencing dissociation followed by involuntary recall of trauma memories need to acknowledge the role of presymbolic memory. Clients need to understand that their dissociative reactions to a trauma are at least partially conditioned by presymbolic memory scripts encoded prior to the traumatic event(s) in question. The presymbolic memory model explains why some verbally competent people dissociate in response to traumatic events, viz. due to the activation of underlying presymbolic episode and related procedural response memory networks. Subjects who consciously experience and recall a trauma from the time it occurs may do so because they lack presymbolic memories comparable to the sensory and affective features of the trauma. Clients' dissociative reactions need to be contextualised in relation to earlier presymbolic memories. Therapists should communicate to clients that the content of aversive presymbolic memories is intrinsically unrecoverable to conscious recall. Therefore, therapy should focus on identifying and understanding the defensive functions of presymbolic procedural scripts, and establish how these are triggered by later stressful client experiences. Clients need to understand their dissociative responses not only with regard to the trauma experience itself, but also in relation to their pre-verbal developmental history.

At all times in therapy a clear distinction must be maintained between the hypothetical nature of aversive episodes occurring during the presymbolic infancy period, and the recall of symbolic trauma material. The therapy process may require a fictional reconstruction of a presymbolic episode in order to contextualise the specific behavioural characteristics of the associated presymbolic procedural script evident in a verbally competent client's dissociative response to a trauma. The therapist needs to emphasize that this reconstruction does not involve conscious recovery of presymbolic memories. Once the existence of a specific procedural script operative in dissociation is clearly identified, therapist and client can work together to reconstruct a likely presymbolic event scenario. This may be accomplished by:

- i) Examining how current trauma material is organised as it emerges during involuntary recall. This may reveal how sensory aspects of the trauma are segregated from one another by the original dissociative response (the presymbolic procedural script).
- ii) A joint analysis of the client's behavioural responses to aversive cues before, during, and after the involuntary recall of trauma memories. This may enable a cohesive procedural response pattern to emerge in the course of the therapeutic dialogue.

The organisation of the recovered trauma material together with the client's behavioural response repertoire could thereafter be used along with other personal history data to reconstruct a likely presymbolic model scene (Lichtenberg et al., 1992, p.26). This narrative describes the type of presymbolic episode and procedural response scenario that probably occurred during the client's infancy. It should be emphasized to clients that model scenes are useful tools for understanding how the procedural memory response responsible for the later dissociation may have originated, but do not represent verifiable memories of actual events. The model scene has value as a tool for contextualising dissociation in terms of a personal, albeit presymbolic developmental history. In this sense, it facilitates a more complete understanding of the client's dissociative behaviour pattern.

The therapeutic approach to dissociation should therefore involve an interpretive reconstruction of early presymbolic aversive scenarios in order to contextualize the client's subsequent dissociative response to a trauma. This hermeneutic component to working with dissociation should be made explicit to clients in order to avoid suggestive therapeutic techniques that can lead to the fabrication of false memories of presymbolic childhood traumas. For example, the recovery of memories of sex abuse allegedly occurring prior to 36 months of age. Therapists need to constantly emphasize the difference between potentially verifiable dissociated symbolic memories that are involuntarily recalled, and presymbolic model scenes that are plausible, but fictional reconstructions of pre-verbal, fundamentally unconscious aversive episodes.

6.9 Concluding Summary

This final chapter demonstrates that the presymbolic memory model is an important tool for understanding how false memories of sex abuse may develop, and how real traumatic events experienced by verbally competent subjects may be unconsciously manipulated by a presymbolic memory-response system. To recap, the present study formulated the presymbolic memory model in order to provide a contemporary scientific account detailing the pre-verbal, infantile origins of unconscious mentation. The presymbolic memory model has its roots in the Lacanian theory of presymbolic infant development (Lacan, 1966/1992, 1973/1977, 1993; Ragland-Sullivan, 1986, 1995), and in Lichtenberg's later synthesis of infant research, neuropsychological memory concepts, and psychoanalytic unconscious mentation (1983, 1989, Lichtenberg et al., 1992). The present study emphasizes how these earlier theories - the former implicitly, the latter explicitly - suggest that the origins of unconscious mentation can be found in pre-verbal memory processes in infants. Furthermore, the Lichtenberg model suggests that an aversive presymbolic memory system can be located within various reciprocally connected regions of the limbic system (Hadley, 1989, pp.361-363).

The central thesis of the present study is that memory systems and unconscious mentation co-evolve when environmental cues are processed by immature sensory receptors during infancy. The study attempts to demonstrate that unconscious mentation has an empirical foundation visible in the developmental relationship between environmental cues and their increasingly complex encoding by maturing sensory and memory processing modules in the brain. The present account therefore stands opposed to psychoanalytic theories that attempt to define the existence of unconscious mentation exclusively in terms of either an imaginary primary process model (Edelson, 1988) or a text-orientated model (Habermas, 1968/1971). Unlike the presymbolic memory model, neither of these models proposes any relationship between dynamic unconscious mentation and empirically verifiable constructs such as brain regions, perceptual receptor systems, and memory processes.

In addition, the presymbolic memory model suggests that brain regions and memory processes are implicated in structuring a sense of self and identity. This is particularly clear in the sections examining prefrontal cortical involvement in the organisation of conscious attention, self-monitoring, and autobiographical memory. Clearly, self-identity is inextricably linked to the evolution of an autobiographical memory system, i.e. a self-narrative consisting of a record of event episodes occurring at specific times and places (Tessler and Nelson, 1996, pp.114-115). However, the sections dealing with the creation of false memories, the influence of suggestion, and the dissociation of real trauma memories reveal that the autobiographical self does not correspond to a historically accurate memory bank.

Furthermore, presymbolic aversive episodic and procedural memories exercise an unconscious, pervasive influence on attention to, encoding, storage, and strategic retrieval of aversive episodes in verbally competent subjects. The conscious autobiographical self that develops as a result of prefrontal spatiotemporal organisation and strategic retrieval of episodic memories, is a metaphorical approximation of the history of actual life events experienced by subjects. This metaphorical structure is partly the result of presymbolic constraints on perceptual and memory systems that impact on episodic encoding, storage and retrieval. In turn, these early pre-verbal constraints on memory impact on the evolving prefrontal system responsible for organising autobiographical memories in verbally competent subjects.

The metaphorical nature of autobiographical memory is also an outcome of the dominance of verbal discourse in structuring consciously retrievable memory episodes. The prioritisation of verbal discourse in autobiographical recall enables information to be bound more efficiently into coherent narrative episodes (Tessler and Nelson, 1996, p.103). However, this encoding efficacy may lead to non-linguistic details being marginalized and discarded from episodic memory traces. For example, it is often the affective and sensory components of aversive experiences that cannot be voluntarily retrieved, while affectively neutral verbal accounts of traumas remain available to conscious recall.

The linguistic dominance that prevails in autobiographical self-narratives may distort or obscure important memory information registered in other modalities. The present study therefore arrives at a somewhat paradoxical conclusion given its search for an empirical foundation for unconscious mentation. The existence of a presymbolic memory system that exercises a dynamic unconscious influence on experience in verbally competent subjects ensures that the self-identity embodied by the autobiographical memory system is a distorted misrepresentation of the individual's developmental history. In short, verbal-symbolic memory episodes stored in distributed cortical networks give rise to an autobiographical self that is always an incomplete representation of the sum of presymbolic and symbolic experiences constituting the developmental history of every person. The present study concludes with the reflection that the presymbolic memory model of unconscious mentation appears to justify the psychoanalytic claim that conscious self-narratives are always partial (mis) representations of subjective experience. The present study rests with this discrepancy between cortically stored memory traces and the verbal autobiographical self-narrative selectively derived from these.

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