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Anticipation as Exercising (Language) Motor Programs During Dreams. A Neuropsychoanalytical Hypothesis

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Abstract. A neuropsychoanalytically framed hypothesis considering dreams as the 'motor exercising' of humans most typical behavior, namely language, is presented. In psychoanalysis dream bizarreness is often resolved by reading the dream content textually. It is defended that this literal interpretation comes down to analyzing language on its articulatory or phonemic structure. While in awake language, lexical (or ego) control is exercised in such a way that scansion of the phoneme structure is operated meaningfully in line with the context, this control is thought not to operate in dreams where it is the motor part (i.e. the articulation) which is thought to be important. The uncontrolled running of these articulatory programs could then result in phonemic ambiguities, thereby accounting for the bizarre elements of the dream.
Keywords: anticipation, dream, psychoanalysis, phoneme, lexicon.

1 Introduction

1.1 Clinical Fragments

The starting point of this paper is a clinical observation recurrent in dreams. This phenomenology is illustrated in three clinical fragments, gathered by analytical clinicians (personal communications, 1999-2001). Common to these dreams is the observation that an a priori not suspected and conceptually not related alternative interpretation of the dream is accessed upon a literal reading of the dream story as told by the dreamer himself. This is essentially similar to what Freud (1900/1975) repeatedly demonstrated in his 'Interpretation of Dreams'.

- An English-speaking woman dreams that she and her therapist are sitting in front of each other. They are sitting in such a way that the soles of their feet are touching. The woman says: "We were sitting sole to sole.". Upon saying this aloud, she suddenly hears the similarity of this sentence with its phonological analogue: 'soul to soul' and thereby gets access to another interpretation of her dream.

- A French-speaking pregnant woman dreams she is driving a big Mercedes down a spiral garage driveway. While she is driving the car, the driveway gets narrower and at one point her Mercedes gets stuck. The therapist asks her attention for 'la Mercedes': "Why a Mercedes?". When the woman gains access to an alternative reading of this element, namely: 'la mère cède' or 'the mother fails/gives up', a new signification of her concerns becomes clear. The woman was at that moment preparing for the presentation of her PhD thesis and therefore experiencing some conflict between this time- and energy consuming achievement and her imminent motherhood.
- A Dutch-speaking young man dreams he is flying with a rocket to the universe. The therapist avoids focussing primarily upon a possible 'phallic' interpretation and thereby avoids understanding the elements of this dream as symbols with a fixed meaning. Instead, she asks the man's attention for the Dutch word 'universum' ('universe'). The man indeed is himself somewhat astonished about his choice and mentions he normally would not use this word, but rather one of its more current Dutch synonyms (namely 'heelal' or 'ruimte'). He then freely associates upon this word 'universum' and immediately switches to the neighbouring word 'universiteit' ('university'). He thereby gets access to the frustration and shame he experiences not having finished his university studies.

1.2 Problem Statement

These three clinical fragments illustrate an underlying dream process suggesting dreams are driven by a literal language processing. The question therefore is: "What specific language dynamics are thought to be at the basis of these dream processes, how do they differ from awake conversational language and what sense does this make from a functional or evolutionary point of view?". Based upon both clinical and neurophysiological evidence, the idea of two different language dynamic systems is defended and, in conclusion, the idea that the literal structure of dream language reflects an evolutionary dream function, namely that of exercising and stabilising strategic motor patterns.

2 A Neuropsychoanalytical Language Model

2.1 The Signifier as the Phonological Form of the Language

2.1.1 Signifiers are Saussurian Phoneme Structures.

By adopting the Saussurian term of 'signifier' (1915/1967) for the phonological element of the language, Lacan (1957/1977) anchors his theory in the fundaments of structural linguistics. Essential there is the notion of 'phoneme'. De Saussure (1915/1967) defines phonemes as 'speech sounds distinguishing meaning'. In this definition the crucial point is the distinction between 'phones' or continuously varying speech sounds and 'phonemes' or more or less arbitrarily but categorically contrasting classes of speech sounds. In English e.g. the phoneme /p/ distinguishes *tap* from *tab, tag*

and *tan*, and distinguishes *pin* from *bin, din* and *kin*. But this phoneme nevertheless includes several neighbouring phones, e.g. the phoneme /p/ has slightly different phonetic characteristics in *pot, spot* or *top*. Nevertheless these different phones are all perceived as belonging to the same phoneme in English. This is somewhat arbitrary since in Korean e.g. a distinction between these phones would still be heard and they would accordingly be classified as belonging to different phonemes. It is clear that perceiving language elements as different is a necessary condition for the attribution of particular meanings to particular phoneme combinations. An Englishman would not attribute different meanings to *pot* if the starting phoneme /p/ would artificially be replaced by the phoneme /p/ from e.g. *top*; a Korean person, however, could perfectly do so, since he or she would be capable of clearly distinguishing these words.

2.1.2 Phonemes are Perceptual and Motor Categories.

In different domains - psychoanalysis, psycholinguistics and neurolinguistics - the idea is defended that phonemes should not solely be viewed as perceptual categories but also as *motor* categories, and even possibly as categories constrained by a certain level of resonance between simultaneous perceptual and motor determinants. In conceiving phonemes as motor categories, phonemes are not seen as classes of phones but as classes of articulatory movements or articulatory gestures. It is then the particular constellation of proprioceptive feedback information from articulatory muscles and joints when voicing out a phoneme that characterises that particular phoneme. Identification would be possible whenever enough proprioceptive information is accessed as to single out one phoneme.

A straightforward objection to this view is of course the observation that one effortlessly gets access to the phonemic structure of speech solely by listening and apparently without any motor contribution to this process. It is for the dismantling of this view that different arguments coming from several disciplines have been presented.

- In psycholinguistics, attempts to map the minimal spectrographic acoustic elements that would permit to classify phones unambiguously to particular classes of phonemes have been inconclusive (for review, see Cutler & Clifton, 1999). Adults show an impressive capacity to correctly classify broadly varying or highly impoverished acoustic information (e.g. coming from very different voice pitches and intonations) to the correct phonemes. Liberman, Cooper, Shankweiler & Studdert-Kennedy (1967) and Liberman & Mattingly (1985) have therefore proposed the 'Motor theory of speech perception', which supposes that it is not a minimum of information to recompose a complete acoustic record that is traced by the listener, but rather that amount of information that could permit the reconstruction of the articulatory motor intention of the speaker.
- In neurolinguistics, it is known since Ojemann's electric stimulation experiments (e.g. 1979, 1983, 1991) that stimulation of both perceptual *and* motor language areas (at either side of the Sylvian fissure) disturb the process of phoneme identification. More recently Price et al. (1996) have shown the implication of a particular part of the Broca area (the so-called 'motor speech centre') in *listening*. Moreover, this specific area seems to be functionally and anatomically different from the parts of this area implicated in active speech or short-term memory processes.

- Freud (1891/1978) himself had already defended the idea of an active motor participation in listening and understanding. Based on his study of the clinics of aphasia (and in particular of the phenomenon of 'echolalia'), Freud (1891/1978, pp. 91-92) defends the idea that "understanding of spoken words is probably not to be regarded as simple transmission from the acoustic elements to the object association; it rather seems that in listening to speech with understanding, the function of verbal association is stimulated from the acoustic elements at the same time, so that we more or less *repeat to ourselves the word heard, thus supporting our understanding with the help op kinaesthetic impressions.*". In an earlier passage of the same study (1891/1978, pp. 73-74) he had already proposed the hypothesis that "we learn to speak by association a 'word sound image' with an 'impression of word innervation' (...) " and "by endeavouring to equate the sound image produced by ourselves as much as possible to the one which had served as the stimulus for the act of innervation of our speech muscles". He in fact introduces an enigmatic new element in these views, namely that of 'the impression' or 'feeling' of 'the language innervation'. It is highly improbable that he uses this description to indicate the proprioceptive feedback information of the articulatory system, which he clearly refers to as the 'kinaesthetic word image' (p. 73). Alternatively, a sound interpretation for this description is that of the 'efferent copy' which feed backs to the neocortex whenever an efferent motor command is leaving the motor cortex. These efferent copies inform the neocortex that a motor command has effectively been sent out, while the proprioceptive feedback informs the neocortex that a motor command has effectively reached the target (and been carried out). According to Freud, phonemic access is therefore gained whenever this motor innervation impression reaches some level of identity with a perceptual acoustic image in line with what was laboriously learned through association during infancy. By implying the innervation impression or efferent copy as the relevant motor element in this identification process, Freud (1891/1978) offers a solution to the possible lack of real proprioceptive feedback whenever language is textually conceived without really having been spoken. Indeed, it is probably not necessary to suppose that an articulatory movement was effectively carried out for a pattern of efferent copies to be produced. Rather, a silent pattern of internal speech, possibly implying an impoverished or abstracted phonological level, might be sufficient for the generation of a motor image of efferent copy information.

2.1.3 Conclusion

In conclusion, the idea is proposed that the first event in gaining meaningful access to language is the active deduction of articulatory intentions from the gathered acoustic information. Both producing and active listening to language seem to imply the involvement of motor programs. We therefore at first experience language as ambiguous phonemes, not making any difference between e.g. 'sole' and 'soul', since both signifiers are determined by the same acoustic and articulatory feedback information. Disambiguation of this raw phonemic information necessarily involves further downstream processing.

2.2 The signifier as an Empty Position

2.2.1 Signifiers are Understood by Anticipation.

In introducing the 'signifier' as the basic linguistic element (in contrast to de Saussure's choice of the 'sign') Lacan (1957/1977, p. 153) also implies another dimension of the concept of the signifier, namely the signifier as 'an empty position'. He illustrates his approach by several examples. In conversation e.g., sentences like "I shall never...", "All the same it is..." or "And yet there may be..." are often understood *before* the real informative part is spoken out: the listener automatically anticipates the meaning to come. Whenever entering a train station in a new town, we readily interpret whatever is written upon a typical station sign as the name of that town, even if this name is commonly known to us in a different sense (e.g. Main). Actually, these examples illustrate the way pragmatical information given by a symbolic context (a conversation, a station sign) anticipates upon the meaning of signifiers not yet identified.

Other levels of information add to this anticipatory effect. It is clear e.g. that the syntax also commands the meaning of the particular signifiers. Lacan (1957/1977) illustrates this point with a verse of Victor Hugo's poem *Booz Endormi* ('La légende des siècles', 1859-1883) in which an object is used as a personification for the central character 'Booz'. Lacan (1957/1977) argues that it is the *positional* structure of the sentence, as prescribed by the knowledge of the syntax, which is crucial in understanding language. Indeed, this structure carries the information enabling a listener to understand that whatever word, appearing in the position of the *subject* of a particular action, should be interpreted as the actor of that action, even if the common meaning of that word would not suggest so. In the verse chosen by Lacan (1957/1977) a number of human properties are ascribed to a sheaf. By the position of the word 'sheaf' the listener knows that 'sheaf' is the subject of the sentence and therefore necessarily a person; the sheaf then is understood as a personification for Booz.

But the syntactical anticipation upon the meaning of a signifier is of course a far more general phenomenon. It is in the first place the syntactical position, and only in the second place the particular nature of a signifier, that produces the meaning of that signifier. In a sentence like e.g. "Are we going to...?", whatever word after 'to', will be understood as the name of a place, even if the signifier has another far more common meaning (e.g. 'Main'). This is what Lacan (1957/1977) indicates when referring to the signifier as an 'empty position'.

2.2.2. A Signifier Structured Language is Auto-Constructive in both an Anticipatory and Retroactive Way.

Actually, Lacan considers the process of signification as both anticipatory *and* retroactive: "…the sentence completes its signification only with its last term, each term being anticipated in the construction of the others, and, inversely, sealing their meaning by its retroactive effect." (Lacan, 1960/1977, p. 303). Therefore, he suggests that both a progressive and a regressive dynamic are at work in human speech. As indicated, the progressive dynamic is thought to work by anticipating the meaning based upon the specific place the phonemes are allocated to in relation to each other. It thereby

tentatively provides 'good guesses' for the scansion of the sentence and for the isolation of lexical units (words). At some point in this dynamic process there is also access to the meaning of these lexical propositions. Lacan's view can therefore be seen as the combined movement whereby the possible semantic alternatives provided enhance the information level of the system, thereby regressively reducing the degrees of freedom for the possible scansion propositions. These combined progressive and regressive movement then would come to stabilisation at the 'best guess', which phenomenologically corresponds with the meaningful understanding of the sentence given its context.

The definition of anticipation that is therefore dealt with in this paper is that of 'strong anticipation', which is not – unlike weak anticipation – predictable. It thereby differs from Rosen's definition: "An anticipatory system is a system containing a predictive model of itself and/or its environment, which allows it to change state at an instant in accord with the model's predictions pertaining to a later instant." but is best in line with the suggestions of Van de Vijver (1998), considering anticipation as 'a dynamic movement or behavior that takes place between systems and their environment and that opens the possibility for each of the participants to be changed by it'. The difference pertains to the externalist stance Rosen expresses: "Anticipatory systems are to him not instances of complex, self-organizational and autonomous systems that are *auto-constructive* while building models from the environment. System and environment are taken to be seperable here, and the problem of stabilization between these two separable poles is solved in quite classical Neo-Darwinian terms" (Van de Vijver, 1998). Language, in contrast, seems to contain an internal auto-organizational dynamic capacity that is able to organize itself at a different – higher – level of functioning by seeking for a stabilisation point at the meeting of two opposing movements, a progressive and a regressive one.

2.2.3 Lexical Labels

Next to the pragmatic and syntactic level, a third anticipatory information level for the meaning of signifiers to come is suggested, namely a 'lexical' level. Next to or apart from imagining some hard-wired syntactical and more or less abstract preconstruction in which received sentences are necessarily coded, conferring the status of 'subject' to one position and of 'verb' to another, it is suggested that constraining information of signifiers to come is coded at the level of preceding signifiers. The kind of information coded at this level could be typically syntactical, like 'this is a verb', or 'this verb is typically followed by an object (i.e. this is a transitive verb)' but it could also be far more specific for the particular signifier (e.g. this word - namely 'to pour' - necessarily has a liquid object), and therefore the level is conceived generally as 'lexical'.

An important ethological experiment illustrates this point. In an attempt to teach chimpanzees a human-like language, Savage-Rumbaugh (1986) used so-called 'lexigrams'. These pictures have an arbitrary relationship to the object or action they refer to. The chimpanzees were successfully taught to use the combination of the lexigrams for either 'give' and 'banana' or 'pour' and 'juice' in order to receive a banana or juice respectively. They were then given the four pictures simultaneously to

freely express their wishes. The chimps however could not make any sense of this vocabulary and randomly indicated the lexigrams (e.g. 'pour give banana pour') or persevered indicating only the most recent learned combination. It appeared that the trainers actively had to *unlearn* all impossible combinations (e.g. 'give give' or 'pour banana'). Only after this laborious unlearning period the chimps gained access to some simple rules, including the use of an object with a verb and including the fact that the verb 'to pour' necessarily implies the object to be liquid.

This experiment reveals a crucial characteristic of human language, animals - in contrast to children - do not have automatic access to. Deacon (1997, p. 85) formulates this as follows: "the relationship that a lexigram has to an object is a function of the relationship it has to other lexigrams, not just a function of the correlated appearance of both lexigram and object". In other words, lexigrams do not only bear information about the object they refer to, but also about the lexigrams to come and, inversely, the meaning of lexigrams is also conditioned by the preceding lexigrams. A lexigram here is to be viewed as a signifier since it incarnates the concrete form of the language. This view therefore implies that there is information, coded at the level of the signifier that commands the use or the comprehension of the signifiers to come. It is easy therefore to generalise all this information (syntactical, lexical) as 'lexical labels', thereby supposing that this information is directly connected or labelled to the lexical entity.

2.2.4 The Model of Damasio and Caramazza

This concept of a true *lexical* level, concerned with information that is specifically designed for the use of a (spoken, written) language system and therefore different from the primarily experiential encoding, has found important grounding in the neurolinguistic work of Damasio and co-workers (Damasio, Grabowski, Tranel, Hichwa & Damasio, 1996; Tranel, Damasio & Damasio, 1997) and of Caramazza and co-workers (Caramazza & Hillis, 1991; Hillis & Caramazza, 1995; Miozzo & Caramazza, 1997). Damasio et al. (1996) make an essential distinction between a semantic level and a lexical level. While the semantic level is concerned with all experiential characteristics of the object world, encoded on various occipito-temporoparietal areas of *both* hemispheres, there seems to be a clearly distinguished lexical level, concerned with naming and encoded exclusively on the left temporal lobe. The distinction becomes apparent in anomic aphasia, when the patient, while clearly indicating the characteristics and the use of a pictured object, is nevertheless incapable of naming it.

The one crucial observation in the work of Damasio et al. (1996) is that this lexical level has its own organization: lexical entities seem to be grouped by object category. Damasio et al. (1996) distinguish three classes: animals, tools and unique persons. The grouping of these lexical systems is confirmed by the observed correlation between the site of focal lesion in the aphasic patients and the site of PET-activation in healthy volunteers. Other authors found comparable grouping criteria like living things, plants and man-made artefacts (e.g. Gainotti, 2000).

In its introducing commentary upon Damasio et al.'s Nature-article (1996) Caramazza (1996) proposes a revised linguistic model in which an organised lexical level mediates between a phonological system at the one hand and a semantic system at the other. Work by his group (Caramazza & Hillis, 1991; Hillis & Caramazza, 1995;

Miozzo & Caramazza, 1997) and by others (De Renzi & di Pelligrino, 1995) has reported a similar observation in agrammatical patients: focal lesions correlate with selective deficits for particular grammatical classes (e.g. verbs, nouns, function words). He therefore suggests that a similar organization exists at the lexical level for syntax information next to Damasio's reported organization for object category information. In line with the preceding suggestion, the model of Damasio et al. (1996) and Caramazza (1996) therefore seems to confirm an organization with lexical labels indicating the object category and the grammatical class respectively.

2.2.5 Conclusion: a Lacanian Signifier as a Lexical Entity.

Several lines of evidence, both from clinical and experimental research, suggest the autonomous existence of a lexical level with an organised topography. This topography displays a grouped pattern from which the grouping criteria are seen as lexical labels. It is suggested that a 'signifier', as introduced by Lacan (1957/1977), can be seen in this model as essentially similar to a lexical entity. Such a lexical entity indeed is determined by its different lexical labels in much the same way a signifier is anticipated by diverse pragmatic, syntactic and lexical constraints from the symbolic context. Moreover, the lexical determinations of a lexical entity are to be seen apart from its semantic connections in much the same way the anticipation of the signification of a signifier functions with a not yet (phonologically) identified and therefore empty signifier.

2.3 The Signifier Between Phonology and Semantics

2.3.1 An Integrated Model

In the preceding paragraphs we have hitherto discussed two approaches to the Lacanian concept of the signifier: the signifier as articulated in phonemes and the signifier as a lexical entity anticipated by its lexical constraints. The questions now are: how do both approaches integrate and how does this model throw light on the introductory phenomenology?

In constructing a coherent linguistic model we bring together both preceding arguments[1]:

1. It is the signifier as phonemic structure that is connected with the widely distributed semantic domains but this phonology in itself cannot disambiguate between various possible but dramatically different semantic connective networks. With the exclusive information /sɒ tu: sɒ/ e.g. access is evenly gained to two different semantic networks.

[1] This view is in line with the status of the signifier as an anticipatory structure incarnating the relation between universal and particular as conceived in Greek philosophy and in particular by the Stoicians and Epicurians (for discussion, see Van de Vijver, 1998). Lexical labels indeed indicate word classes and therefore function as abstractions of the signifier to be identified. The universal can therefore be considered as the empty position with its lexical labels at the one hand and the particular as the phonemic structure of the identified signifier at the other.

2. The signifier as lexical entity gathers a bunch of categorical information permitting selection between competing alternatives as to its signification. This information, however, results from constraints given by the preceding signifiers. It is therefore anticipated and does not require the identity of the particular signifier to be known yet. In this view the lexical function of the signifier is not considered to be directly connected with semantic domains and is therefore said to be empty.

When phonemic and lexical information work in resonance lexical constraints can disambiguate between the phonologically activated semantic networks and the signifier is understood in line with its relevant context.

2.3.2 Disconnecting Phonology and Lexicality

It is essentially the possibility of disconnecting both functions - phonological and lexical - that is the crucial point of this discussion. In this disconnection two different kinds of language functioning are distinguished: one in which there is an associative access to semantics that is not directed by contextual constraints and one in which these constraints are taken into consideration in order to access an interpretation that has verified its pertinence in function of the given context. Some clinical situations (dreams, free association) give us a cue as to the possibility of a relatively separate functioning of these different language dynamics. In dreams indeed bizarreness often results from the incongruity of the dreamed situation given the settled context (e.g. why would one sit sole to sole with his therapist?). In free association also one is not bound to congruity, logic, coherence, verification with reality etc. but is encouraged to let its thoughts wander freely. It is then observed that the internal logic of both clinical situations is built at least partially upon phonemic regularities, something that is of course not intentionally aimed at in awake conversation language. This is, we are not planning to sit with soles joined whenever we want to be emotionally close to someone, or we do not intentionally talk about rackets to the universe whenever we want to express feelings about the university. But, amazingly, we sometimes do seem to follow this kind of logic, as becomes clear from dream narratives or by free association.

The question at this point could be formulated as: what is at a neurolinguistic level the crucial difference between both ways of language functioning? One good proposition comes from Deacon (1997), who in his book 'The symbolic species' builds his arguments upon a coherent overview of ethological, clinical, experimental, anatomical and neurophysiological results. The author defends the idea that it is essentially the *prefrontal cortical functioning* that enables humans to switch from an animal like indexical - exclusively associative - interpretation of tokens (words, signifiers) to a symbolic interpretation in which the understanding of a token is made a function of its relationship to the surrounding tokens. The prefrontal contribution is in this context an inhibition of the indexical or associative automaticity. Deacon (1997) formulates it as follows: "The prefrontal cortex helps us inhibit the tendency to act on simple correlative stimulus relationships and guides our sampling of alternative higher-order sequential or hierarchic associations." (p. 265).

Different observations are in line with this proposition (cf. Deacon, 1997). First, it is most probably because of the lack of a substantial prefrontal cortex that other primates never really get access to symbolic language. Moreover, prefrontally damaged

patients are characterised by a disturbed 'flow' of ideas and word choices, not to mention a sort of 'concreteness' in the interpretation of sentence meaning (p. 267). Finally, of all neocortical areas the prefrontal cortical area is the last one to become physiologically and functionally mature in children. This maturation delay is possibly in line with the language acquisition progresses seen in normal language development.

At a local neurolinguistic level too, prefrontal cortical functioning seems a good candidate. Indeed, it seems that the Broca area and the other prefrontal cortical linguistic areas are concerned with far more language functions than pure motor speech expression. For one thing, Broca's area also functions as the phonological loop of the short term verbal memory system in which speech portions are continuously repeated by subvocal rehearsal in order to stay in memory (Smith, Jonides, Marshetz and Koeppe, 1998). For another, adjacent prefrontal areas (in particular BA 45 and 47) are thought to have an executive role, associated with this verbal memory system: Poldrack, Wagner, Prull, Desmond, Glover and Gabrieli (1999) suggest these areas are concerned with the retrieval, the selection and the evaluation of semantic concepts, which are distributed and represented elsewhere in the neocortex. Thompson-Schill, D'Esposito, Aguirre and Farah (1997) state it is not the retrieval of semantic knowledge per se that is associated with activity of the left inferior frontal gyrus but rather the selection of information among competing alternatives from semantic memory. And this is precisely the function that would be needed in order to disconnect both ways of language functioning, as was described earlier.

2.3.3 The Freudian Ego as the Prefrontal Cortical Function

In summary, it is thought that the prefrontal cortex functions as that control system that permits one to switch from an associative, bizarre, incoherent use of language to a sound, communicative, verified and pertinent one. The one remarkable thing now is that this hypothesis is also quite clearly in line with Freud's suppositions as stated in the Project (1895/1995; see also Van de Vijver & Geerardyn, 1992). Indeed, one of the basic assumptions of this work is the difference between so-called primary and secondary processes. Primary processes take place associatively: quantities or excitations automatically follow the most facilitated pathways and are thereby driven by the wishful idea in order to obtain satisfaction. Secondary processes, at the contrary, take place under the inhibiting steering of a central instance, called the 'ego' by Freud (1895/1995). This inhibition is precisely needed to prevent excitations to follow these 'speedways' and to make exploration of other pathways possible. This exploration or 'thinking' is steered by the perceptual image and not by the wishful idea, so that, even if satisfaction might eventually be accessed, the followed pathway nevertheless is verified by the external reality and therefore pertinent given the actual context.

Psycholinguistically, it is in the given context tempting to suppose that whenever language is used associatively, with semantic domains accessed solely upon phonological cues independent of their pertinence in the actual context, and therefore without (or with modified) prefrontal control, primary language processes in the Freudian sense of the term are then taking place. Alternatively, whenever phonological cues only give access to pertinent and verified interpretations, i.e. under inhibitory prefrontal control, then secondary processes are taking place. Indeed, Freud

(1895/1995) himself considers that dreams and free associative talking are primary processes, which is of course in line with the here cited examples. Moreover, he considers the ego, which needs some time to get formed, as the instance permitting a switch from primary to secondary processes and claims it does so by exhibiting a restraining influence. As indicated higher, this again is in line with the supposition that the ego should be seen as the prefrontal cortical influence, with its relatively late maturation in development and its predominant inhibitory influence.

In conclusion, it is suggested that, whenever the signifier, as an empty position with its pertinent restriction labels, interferes in the free access from phonology to semantics, language functions as a predominant secondary process under the inhibitory control of the prefrontal cortex. Alternatively, it is suggested that whenever the signifier, as an articulated phoneme structure, has a free associative access to multiple semantic domains, language functions as a predominant primary process with a lowered level of inhibitory prefrontal control.

3 Signifiers as Anticipatory Programs in Dreams

We started this argument with some dream observations: dreams were therefore used as the paradigmatical examples of primarily phonetically driven language in this study. The question we now come to is: why do primary processes take place in dreaming? How is this to be situated at a functional level, or even at an evolutionary level?

A sound speculative answer to this question might be found in Winson's work (1990). Winson (1990) reports that a typical component of the electroencephalogram (EEG) - the theta rhythm - is observed both in awake animals when they are behaving in particular ways and in sleeping animals during Rapid Eye Movement (REM) sleep. The authors describes the particular behavior in which the theta rhythm is observed as "that behavior that is most crucial to the species survival but that is not genetically encoded since it requires a response to changing environmental information". Examples of this kind of behavior are predation in cats, apprehension in rabbits and exploration in rats. Moreover, it seems that this theta rhythm originates from the hippocampus and that it reflects the settling of long-term memory processes so as to consolidate strategically important acquired motor patterns (cf. Winson, 1990). Therefore it is speculated that dreams in these animals should represent "practice sessions" in which animals hone survival skills.

Winson 's results correlate with multiple other dream research results indicating a process of human memory consolidation to be strongly dependent on REM sleep (for a recent review, see Hobson, Pace-Schott and Stickgold, 2000). If language should be considered as human's most typical behavior, which is not genetically encoded since it requires a response to changing environmental information, then it is to be expected that speech motor patterns are reiterated during dreams so as to consolidate speech memory. The hypothesis therefore is that it is primarily *the phonemic structure* that is the material of brain processes during dreams, this is the motor articulatory program. It is thus speculated that it is this phonemic structure, which is neurophysiologically considered the strategic pathway to be consolidated, much apart from every possible semantic interpretation. Semantic interpretations with their impressive imaginary

elements as known from dreams, are then considered to be secondary to the central motor of the dream, namely the articulatory programs. Since dreams are not communicative events and therefore need not to be under lexical control, there is no need for prefrontal cortical steering. It is indeed seen that in dreams a relative prefrontal cortex deactivation is measured, which is much in line with the present hypothesis (Hobson et al., 2000). Semantic interpretation without any lexical or prefrontal steering is expected to result in phonological errors, e.g. mistakenly interpreting 'soul' as 'sole', and this now is exactly what is observed in dreams, as illustrated in the introduction. In conclusion, dream bizarreness is in this context explained as resulting from a primary process in which phonological fragments can gain access to multiple semantic domains with their associated imagery and are thereby not restricted by lexical inhibitory processes. As a consequence, in working with dream material in clinical contexts it is suggested that attention should be paid to the literal structure of the dream narrative as told by the dreamer.

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