UNIVERSITÀ DEGLI STUDI DI PADOVA

Department of Developmental Psychology and Socialisation

Department of General Psychology

Psychology of Community, Wellness Promotion, and Social Change

MASTER'S THESIS

Lost in Dream Report Translation

Supervisor: *Prof.* ***Nicola Cellini***

Co-supervisor: *Prof.* ***Daniel Erlacher***

Candidate: ***Stefano Maraschin***

Student number: 2054540

Academic Year 2023/2024

Index

I. Abstract

Dreams have always been a source of fascination and inspiration for mankind. Some dreams are remembered, while others fade away. They can be prophetic, life-changing, haunting or terrifying. In rare cases, we can even control them. Dreams are a rich but nebulous subject that has been intertwined with esotericism and religion for millennia. Even today, understanding and study of dreams remains an unprecedented challenge. This is not made any easier by the fact that we have no way of studying them directly, neither on a neuro-physiological nor psychological level. This is because, on one hand, dreams overlap with sleep, and on the other hand, they require the mediation of language to know their content. In this thesis we will consider both issues in order to have at least a satisfactory answer to the question 'what is a dream?'. But in particular we will explore the issue of language as a necessary tool, exploring the question of linguistic relativity. It proposes that cognition and language (as a product of culture) influence each other, leading to presumable differences in thinking, attention, and perception between people with different languages. If this is true, we can also expect a difference in the description and understanding of dreams. Therefore, translating them could be detrimental to their content and meaning.

This problem can be mitigated by content analysis, which unlike interpretation does not search for the underlying meaning, but objectively analyses (or at least tries to) the dream experience. To test this ability, the following research question arose: does the translation of dream reports significantly distort the analysis of their content? The dream reports from Peters et al.'s study (2023) were then translated and reanalysed, finding variable reliability of the analysis on the translations. Thus, underlining the need for more studies in this regard.

II. Introduction

«The interpretation of dreams is the royal road to a knowledge of the unconscious activities of the mind.»

(Freud, 1900)

Nowadays, we no longer view dreams as omens or premonitions in the same way that the oracles of Ancient Greece once did (Freud, 1900). Even compared to Freud's classical conception of dreams, our current perspective differs significantly (Roesler, 2023). However, one aspect of dreams has remained constant over time: they are complex phenomena filled with rich material that require interpretation to extract their true meaning. This is where the practical requirements of research and the theoretical conceptions of clinical practice intersect and collide. While the need for simplicity to facilitate measurement is pressing on one side, the other side seeks complexity that is worthy of the profound nature of human experience.

In the following chapters, we will delve into the dream, attempting to identify its neurophysiological and psychological characteristics. We will explore theories about its functions, components and sources. We will make a brief reference to lucid dreaming, discussing its peculiarities. Finally, we will draw a theoretical distinction between dream interpretation and content analysis.

We will then deal with language and communication, trying to understand how we understand each other. We will then discuss the theory of linguistic relativity, focusing on aspects of language's influence on cognition.

Finally, we will get to the essence of the thesis, talking about the content translation-analysis experiment. The method of research and data analysis will be described, not forgetting to highlight its limitations. We will then conclude with a discussion of the results, proposing future perspectives for research that links language and dreams.

III. The dream

What is a dream? It is not easy to answer this question. We all dream, and we also know that some animals do. We know that it is a phenomenon that occurs spontaneously when we sleep. It brings with it representations of more or less bizarre stories. It can affect us emotionally, it can frighten us, excite us, and even make us wake up in a good mood. We could list a multitude of clichés about dreams, which proliferate and are now part of mass culture. And this is only possible because not even scientific research, until now, has been able to clearly trace the characteristics of this phenomenon. The dream remains nowadays, although somewhat less than in the past, a fascinating and obscure event. It is difficult to understand and study, but precisely because of this it remains interesting to most. In the following paragraphs I will provide an overview (without the presumption of exhaustiveness) of what we know about dreams today.

Sleep phases: When we dream?

Sleep in humans is a cycle with two main stages: REM sleep (Rapid Eye Movement) and NREM sleep (Non-Rapid Eye Movement). The latter can be further divided into three stages: N1, N2 and N3. Each of which leads to deeper and deeper sleep. We spend about 75% of sleep in NREM, mainly in N2. Each stage of sleep is characterised by changes in muscle tone, brainwave patterns and eye movements. The body goes through all phases approximately 4 to 6 times each night, and each cycle lasts on average 90 to 110 minutes (Feinberg & Floyd, 1979; Malik et al., 2018; Memar & Faradji, 2018).

We dream principally but not exclusively during REM sleep. NREM dreams are mainly characterised by thoughts and emotions, whereas REM dreams can be characterised by visual imagery with motion in space, intense emotions (fear, anger, etc.), belief that what is being experienced is real, and inconsistencies and discontinuities in the plot (*'dream' in APA Dictionary of Psychology*, 2018). Furthermore, REM dream reports are on average more vivid and bizarre, and have more complex plots (Fosse et al., 2001; Strauch & Meier, 1996).

Neural activation during dreaming

What we know about the neural basis of dreaming comes mainly from studies of REM sleep. The distribution of neural activation during REM sleep is not homogeneous but varies between activation and deactivation patterns (Braun et al., 1997; Maquet et al., 1996; Nofzinger et al., 1997). Further studies have found that all sleep phases are characterised by transient changes in both brain activity and connectivity (Dang-Vu et al., 2008; Massimini et al., 2005, 2010).

The activation pattern of brain regions in REM sleep appears to be consistent with the main features of dreaming (Hobson et al., 1998; Schwartz, 2004; Schwartz & Maquet, 2002) (Fig. 1).

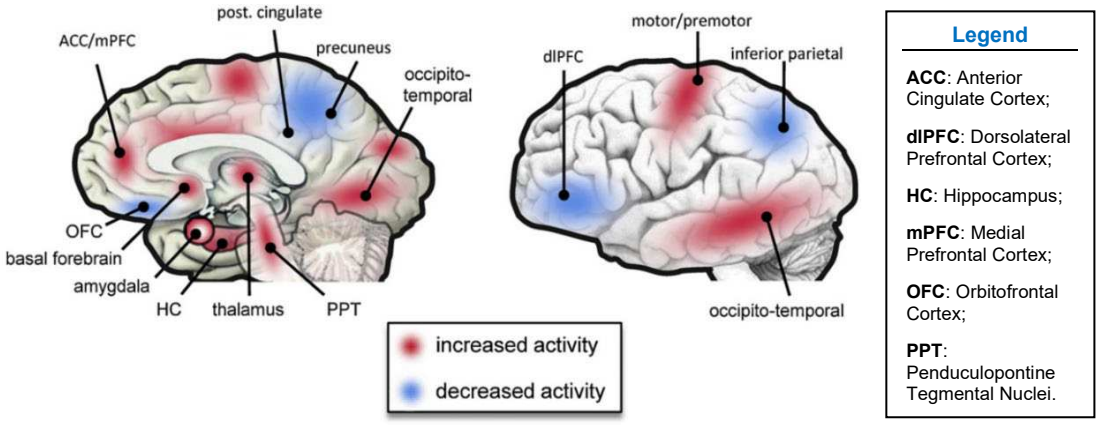

Fig. 1: Representation of the human brain during REM sleep: the more activated areas are highlighted in red, the less activated areas in blue. The reconstruction combines the results of several neuroimaging studies using PET (Positron Emission Tomography) (Braun et al., 1997, 1998; Maquet et al., 1996, 2000; Nofzinger et al., 1997; Perogamvros & Schwartz, 2012).

Activation of the amygdala is usually linked to feeling intense emotions such as anger or fear, which are sometimes experienced in dreams (M. R. Smith et al., 2004). Furthermore, activation of the amygdala, medial prefrontal cortex (mPFC) and anterior cingulate cortex (ACC) appear to be involved in emotion regulation processes (Fu et al., 2007; Pace-Schott et al., 2009). Activation of the limbic and paralimbic regions suggests that REM sleep may promote the recall and reprocessing of new or relevant memories that are particularly emotionally salient (Sterpenich et al., 2007, 2009; Wagner et al., 2001; Walker & van der Helm, 2009). These regions are also those that potentially allow the dream to tap into recent memories (Schredl & Hofmann, 2003; Schwartz, 2010). In contrast to wakefulness, in REM sleep the dorsolateral prefrontal cortex (dlPFC),

orbitofrontal cortex (OFC), posterior cingulate gyrus, precuneus and inferior parietal cortex are deactivated (Braun et al., 1997; Maquet et al., 1996, 2000, 2005; Nofzinger et al., 1997). This may explain some typical features of dreaming: disorientation, illogical thinking and impaired working memory (Hobson et al., 1998; Schwartz, 2004; Schwartz & Maquet, 2002). Finally, the activation of associative sensory regions and the parieto-temporo-occipital (PTO) junction could be involved in the generation of the sensory and spatial component of the dream (Perogamvros & Schwartz, 2012). Just as motor circuit activation (Braun et al., 1997; Maquet et al., 2000) is likely to be involved with the generation of movements and actions.

However, we must not lose sight of the fact that dreams, although with different characteristics, also occur during the NREM phase. Sinclair and colleagues found by means of high-density electroencephalography that, during both REM and NREM phases, a reduction in low-frequency activity (1-4 Hz) in the posterior cortex was associated with dreaming. Real-time monitoring of activity in this area made it possible to predict the dreaming experience. So, it appears that the posterior cortex is involved in dreaming regardless of sleep stage (Siclari et al., 2017).

Unfortunately, we still have no way of clearly defining the brain circuits involved in dreaming. This is due to the hardly manageable overlap between sleep phases and dreaming itself (Tsunematsu, 2023). Furthermore, we know that some specific features of dream seem to trigger different brain regions with different intensities in the same phase, such as the degree of lucidity and recall (Siclari et al., 2017). Nevertheless, over time various authors have attempted to identify theoretically and empirically the neural circuits involved in dreaming. Among them, two main theories have emerged (Tsunematsu, 2023). The first holds that dreams are generated by activation of neural activity in the brainstem and signal transmission to the cortex. The other that dreams are caused by dopamine activation of the forebrain (Tsunematsu, 2023).

Discussing the theory concerning neural signals from the brainstem, we cannot avoid mentioning the **activation-synthesis model**, which claimed that the dream process is twofold and consists of activation and synthesis (Hobson & McCarley, 1977) (Fig. 2A). During REM sleep, neural activity in the pons

(brainstem) triggers activation of the lateral geniculate nucleus (LGN) and visual cortex to generate information. In this way, without external stimuli, internally created inputs randomly activate sensorimotor information, and the passive synthesis of this information (perceptual, conceptual and emotional) gives shape to dreams (Hobson & McCarley, 1977). From this, the **AIM model** evolved, with the aim of assessing similarities and differences between states of consciousness (Hobson et al., 2000) (Fig. 2B). It represents the first three-dimensional space model and is based on the following variables (Tsunematsu, 2023):

1) **Activation**: the information processing capacity of the system (total and regional brain activity levels). This is relevant to us because the dream presents itself, regardless of the sleep phase, when the cortical excitation exceeds a certain threshold (Zimmerman, 1970);
2) **Input**: the degree of input of external stimuli and information, and their influence on behaviour (external vs. internal source);
3) **Modulation**: how information is processed by the system (cholinergic vs. aminergic path).

During wakefulness, activation is elevated, input is externally dependent, and modulation is dominated by monoaminergic systems. In NREM sleep, activation and modulation are lower and come from both inside and outside the body. During REM sleep, sensory thresholds increase to protect mental processes, shifting attention to internal inputs (Antrobus, 1991). While activation is high, and modulation comes mainly from the cholinergic system (Tsunematsu, 2023).

The second main theory of dream generation does not consider the brainstem as the point of origin but claims that dreaming and REM sleep are two dissociated states, and that the first originates from forebrain mechanisms (Tsunematsu, 2023) (Fig. 2C). Solms (2000) hypothesised that dreaming could only be mediated by cholinergic mechanisms, as dreaming appears to be manipulated through dopaminergic agonists and antagonists without affecting REM sleep frequency, duration or density. Furthermore, forebrain stimulation causes dream generation in both REM and NREM phases. However, the brainstem, which controls REM sleep, is only one of the possible factors responsible for activation

of the forebrain system. In particular, the mesocortical-mesolimbic dopamine system is also involved in dream generation (Tsunematsu, 2023).

From studies involving brain lesions, it was observed that patients with lesions to the parieto-temporo-occipital (PTO) junction reported a total cessation in the dreaming ability (Bischof & Bassetti, 2004; Cathala et al., 1983; Murri et al., 1984; Solms, 2014). In addition, the same condition has been reported by patients with lesions in the white matter surrounding the anterior part of the lateral ventricles (Bradley et al., 1958). Lesions in this region impair dreaming but not REM sleep itself (Solms, 2000). This is because they disrupt the mesolimbic circuitry of the Seeking system (Alcaro & Panksepp, 2011; Panksepp, 1982, 2004). Solms argued that REM sleep was not fundamental to dreaming, but the activation of this system was (Solms, 2000) and several other studies seem to bring data to support this hypothesis (Balon, 1996; Gaillard & Moneme, 1977; Nausieda et al., 1982; Pinter et al., 1999; Sharf et al., 1978; Thompson & Pierce, 1999, 1999).

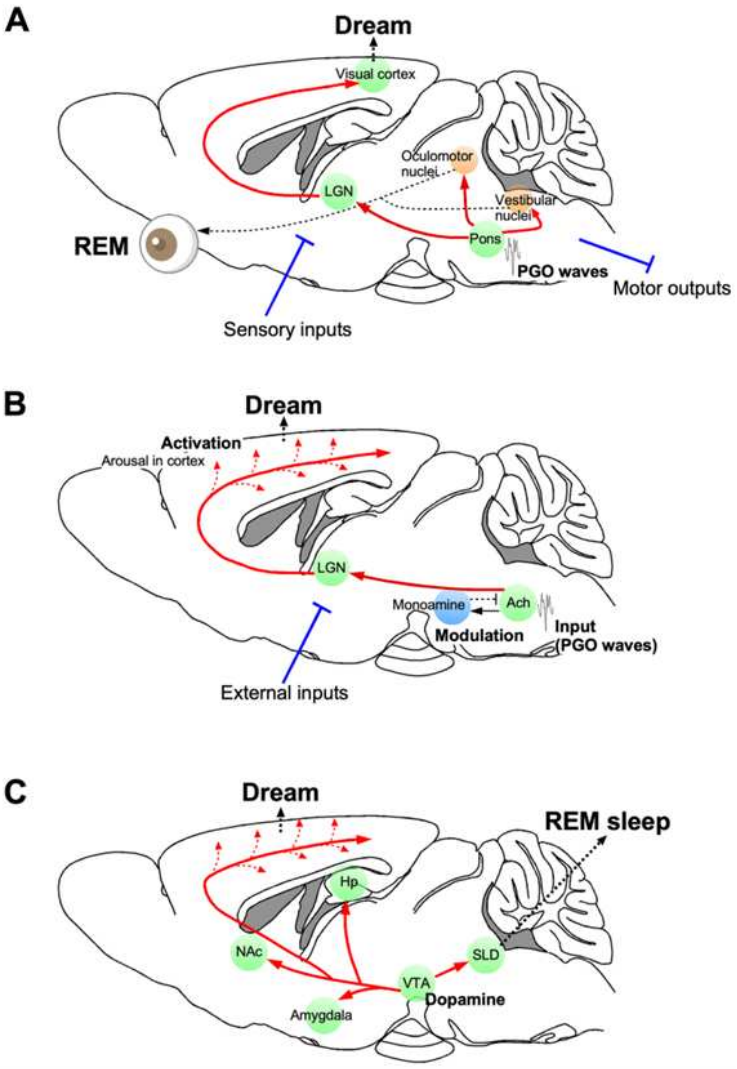

Fig. 2. Representation of the proposed models of neural mechanisms during REM sleep in the rat brain (Tsunematsu, 2023).

A. Activation-synthesis model: ponto-geniculo-occipital waves (PGO) activate the pons which in turn activates the lateral geniculate nucleus (LGN) and the visual cortex. The information that generates the dream is then passively synthesised in the cortex. The vestibular and oculomotor nuclei are also activated causing the typical rapid eye movements. Finally, sensory inputs and motor outputs are blocked.

B. AIM model: PGO waves in this case activate the cholinergic neurons that trigger the LNG and cortex. In the latter, dreams are generated, while monoaminergic neurons and external inputs are inhibited.

C. Dopaminergic mechanism in the forebrain: ventral tagmental area (VTA) is triggered by the activation of its cholinergic neurons, activating simultaneously amygdala, hippocampus, nucleus accumbens, and cortex. This process induces dreams with intense emotions. It also activates the sublaterodorsal nucleus (SLD), which initiates the REM phase.

What exactly is this Seeking system? The Seeking system operates as a 'curiosity-interest-expectancy' command mechanism, linked to instinctive appetitive desire states (Alcaro & Panksepp, 2011; Panksepp, 1982, 2004). Functioning as an emotional and motivational psychobehavioural system within the mammalian brain, it drives approach behaviours and the sense of anticipation

during the pursuit of a reward (whether an actual external stimulus or an internal representation of one) (Alcaro & Panksepp, 2011). Its essential circuits encompass dense Mesolimbic dopaminergic (ML-DA) pathways extending from the ventral tegmental area (VTA) to various brain regions including the lateral hypothalamus (LH), mediodorsal thalamus, medioventral pallidum, nucleus accumbens (NAcc) shell, olfactory tubercle, amygdala, anterior limbic cortex, and prefrontal cortex (Fig. 3).

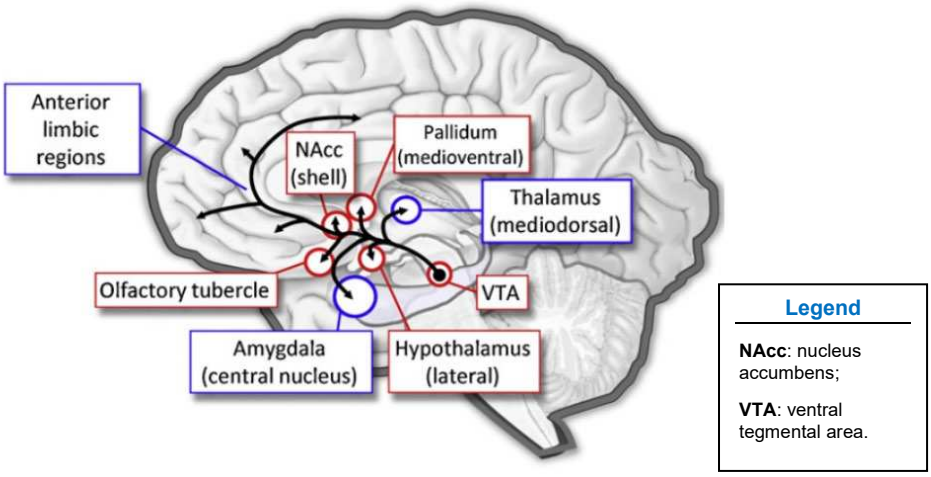

Fig. 3. The ML-DA component of the Seeking system. This representation shows the ML-DA projections of the Seeking system originating from the VTA in the midbrain. Stimulating the areas highlighted in red promotes exploration and approach behaviours, while the blue regions contribute to the broad-scale coordination and propagation of the Seeking signal (Alcaro & Panksepp, 2011). Included in the anterior limbic areas are the ventromedial prefrontal cortex, orbitofrontal cortex, anterior cingulate cortex, and the insula (Perogamvros & Schwartz, 2012).

The ML-DA system is one of the two main dopaminergic ascending pathways in the brain (the other is the nigrostriatal pathway). it is involved in learning (Adcock et al., 2006), motivated behaviour (Alcaro et al., 2007), reward processing (Ikemoto, 2007) and emotion processing (Alcaro et al., 2007).

Activation of the Seeking system not only encapsulates the internal perception of reward but also the emotional and anticipatory aspects of an appetitive search strategy (Panksepp, 2004). The feelings associated with activating this system are interest, curiosity, and anticipation, but notably not pleasure or consumption. This system can sometimes be triggered independently of voluntary goal-directed actions. For instance, addictive substances such as cocaine and nicotine directly exploit and 'hijack' this system, leading to the continuation of related behaviours, like the relentless search for the drug and the

chase of the subjective pleasure sensation it induces (Perogamvros & Schwartz, 2012).

Functions: Why do we dream?

As already seems clear, there is no single theory that can explain the dream phenomenon. Similarly, its functions are not clear, as we can come across a multitude of different hypotheses (both complementary and conflicting). Undoubtedly, the dream plays an important psychological and cognitive role. Therefore, let us try to identify the most accredited theories to explain its function.

The dream according to Freud (1900, 1916, 1933) fulfils two functions: firstly, it preserves sleep as its 'guardian'; secondly, it allows the satisfaction of the dreamer's repressed desires in hallucinatory form. The dream safeguards sleep from disturbing external stimuli or desires intolerable to the ego through incorporation and censorship (i.e. defence mechanisms such as condensation and displacement). The result of deformation and dreamwork is thus the manifest dream, which symbolically conceals latent desires while allowing them to be satisfied and resolving psychic tensions (Freud, 1900, 1916). In contrast, Jung (1954, 1969) argues that dreams directly reflect the unconscious without undergoing any form of censorship. According to Jung, the dream plays a compensatory role, showing previously unconscious aspects of reality provides insights and solutions to conflicts. In doing so, the dream promotes psychic growth, self-healing and personal development. In accordance with this, Bion (1962, 1967), framed the dream as fundamental to thinking, memorising, and remembering, and thus necessary for psychic growth. Indeed, it, like unconscious thought, draws from the alpha elements the material for symbolic thought. The latter are nothing more than the transformative outcome of the beta elements, i.e. the raw sensory data, due to the 'alpha function', and represent the constituent elements of the psyche. Through this process, raw primary experiences are transformed into something the mind can work with, and the dream draws from this by promoting creative conflict resolution and the generation of new ideas, and playing a fundamental role in psychic health and growth. What Bion claims contrasts with Freud's classical perspective. As already mentioned, Freud considers the dream as the guardian of sleep, while Bion considers sleep as the

safeguard of the dream, thus underlining the importance of dreaming for psychic well-being (Roesler, 2023).

Certainly, some psychoanalytic researchers claim, based on their empirical studies, that Freud's premise of the protective function of dreams for sleep is empirically demonstrable (Ermann, 1955; Solms, 1997). But a review of the results of dream research on this topic shows that this is actually an isolated position (Roesler, 2023). Most dream researchers and psychoanalytic authors (e.g. Werner & Langenmayr, 2005) interpret the empirical results as a refutation of Freud's view. Dreaming is not the guardian of sleep, if anything the opposite: REM sleep (dreaming) is essential, in fact if we are deprived of it the organism compensates for it in the following nights to a greater extent (Schredl, 2006).

Dreaming generally assumes a regulatory function for the organism (Berner, 2018). In the dream there is a reworking and alleviation of difficult affects. However, dreams contain a strong problem-solving activity that can effectively process the psychic tensions and conflicts of a person's waking life and thus not only perform psychic regulation work, but also advance personality development towards stronger integration (Roesler, 2023). Freud had underestimated this problem-solving capacity of the dream. The constructive contribution of the dream, however, also plays a role in Freud's theory, insofar as the dream accommodates unconscious conflicts, thematises them and thus creates a potential for making them conscious.

The role of dreaming in creativity is obvious, several artists (Salvador Dalí, Ingmar Bergmann, Carlos Saura, Federico Fellini, Paul McCartney, etc.) transposed their dreams or were inspired by them to create a work (Roesler, 2023). Even some great discoveries, such as the structure of the periodic table, the invention of the sewing-machine and the deciphering of Babylonian cuneiform script, have sprung from dreams (Schredl, 2006). Furthermore, various research supports the idea that dreams are able to provide creative impulses (Kuiken & Sikora, 1993; Schredl, 2000).

Dreams also appear to play an important emotional regulation and problem-solving function. The mastery hypothesis (Wright & Koulack, 1987) argues that dreams actively seek solutions to problems in the waking world. Furthermore, mood regulation theory (Kramer & Hoffmann, 1993) and trauma

processing theory (Hartmann, 1998) emphasise the important role of dreams in emotional equilibrium and self-therapy through the integration of repressed affects into a framework of safe experimentation. Indeed, it appears that REM dreams are involved in a dynamic reconfiguration of emotional experiences, moving from negative to more positive affects by the end of the night (Cartwright et al., 1998). Thus, dreams allow us to process and experience new affective patterns, enhancing coping strategies in the waking state and potentially providing a self-regulating function for the psyche (Cartwright, 1991, 2005; Picchioni & Hicks, 2009). Furthermore, dreams do not merely reproduce what has been experienced during waking, but perform a fundamental information-processing activity, representing it in a creative way to alleviate mental weight and promote problem-solving (C. Hall, 1966; Windt, 2015).

In summary, dreams are not only a window into our unconscious, but also appear to be a fundamental tool for emotional regulation, creativity, and psychological adaptation (and problem-solving).

From a neurological point of view, we have seen that during REM sleep the reward-related components of the Seeking system are activated (Perogamvros & Schwartz, 2012). But what do we mean by 'reward'? In this case, we can understand it as:

a) the spontaneous activation of internally generated rewards or punishments during sleep, as relevant (Montague et al., 2006) or novel (Wittmann et al., 2007) memory elements;
b) the cognitive, affective or physiological response to these internally generated reward or punishment signals while the organism sleeps (Perogamvros & Schwartz, 2012).

Reward processing is one of the main functions of the mesolimbic dopaminergic system (ML-DA). It influences behaviour consistently with external and internal rewards or punishments in order to learn adaptive and goal-oriented behavioural strategies (Haber & Knutson, 2010). It is a central component in the development and monitoring of behaviour in all mammals. Within this system, two main types of dopaminergic signals can be distinguished: phasic and tonic. On the one hand, phasic activity plays a role in reward processing (Heien & Wightman, 2006; Redgrave et al., 1999; Schultz, 2010). On the other hand, tonic

activity supports relatively stable affective states and motivations (Ikemoto, 2007).

Based on this evidence, the Reward Activation Model (RAM) proposes that ML-DA activation:

- contributes to memory consolidation mechanisms by prioritising the processing of information with high emotional and/or motivational relevance;
- contributes to the generation of REM sleep;
- contributes to the generation of dreams through the motivational and affective drives of the Seeking system.

These features suggest that dreams may potentially play a role in learning, memory, and emotion regulation. However, little empirical evidence exists to support the latter hypothesis (Perogamvros & Schwartz, 2012).

Thus, RAM argues that dreams may arise from the activation of the emotional and reward components of the Seeking system. This is in agreement with Wamsley & Stickgold (2010) who have recently proposed that dreaming may reflect sleep-dependent memory processing during sleep, as well as with models that claim that dreams are influenced by the sleeper's emotional concerns during wakefulness (Cartwright et al., 2006; Mancia, 2004; Nielsen & Levin, 2007; Schredl, 2010). Activation of the mesolimbic reward system during REM sleep would therefore explain why this phase can be considered a 'dream facilitator'. On the other hand, the activation of contextual and emotional memories by reward-related structures during NREM sleep (amygdala, ACC, hippocampus, ventral striatum) could also explain NREM dreaming (Perogamvros & Schwartz, 2012). We do not yet know what the conditions are for a memory trace to facilitate the production of a dream. It is hypothesised that memories with a high emotional and motivational value for the individual are favoured to be reactivated during sleep and can therefore amplify the activation of the ML-DA and Seeking system (Perogamvros & Schwartz, 2012).

Comparing this model with Freudian theory we can find interesting points of contact: the activation of the Seeking system, which can be interpreted as the Freudian 'drive', generates the dream and preserves its continuity. Thus,

unconscious desire is ascribable to the anticipation of a reward, just as a threat could be ascribable to the anticipation of a punishment that would trigger avoidance or safety-seeking behaviour (defence mechanisms) (Perogamvros & Schwartz, 2012). However, the Freudian notion of a censorship that would transform the latent content of a dream into manifest content lacks neurobiological support. Furthermore, unlike the Freudian dream model, RAM also implies that dreams can potentially be related to new events or a probable future, and not only to the past. Although there is evidence for the presence of past and present waking concerns in dream content (Cartwright et al., 2006; Schredl & Hofmann, 2003), dreams are usually novel constructions and rarely reproductions of past events (Meier, 1993). The forementioned anticipation mechanism is likely to contribute to adaptive behaviour by enhancing future performance and emotion regulation processes (Perogamvros & Schwartz, 2012).

Finally, according to Threat Simulation Theory (TST) (Revonsuo, 2000; Valli & Revonsuo, 2009), the function of dreaming is to enable an organised and selective 'offline' simulation of threatening events that would ultimately promote the development and maintenance of threat avoidance skills. Confirming the universality and prevalence of threat experiences in dreams, being chased or attacked is the most typical dream theme worldwide (Zadra, 1996). Such virtual rehearsal during dreaming would lead to improved performance in real situations and this training could be used as learning or maintenance of threat avoidance skills (Valli & Revonsuo, 2009). RAM seems to play in favour of TST, explaining why emotionally relevant experiences are more likely to be activated during dreaming (Perogamvros & Schwartz, 2012). Exposure to feared stimuli (e.g. characters, situations, thoughts, memories, physical sensations) in a totally safe context, such as a dream, may resemble exposure therapy for anxiety disorders (Pace-Schott et al., 2009). Nightmares would instead reflect the failure of an adaptive process of extinguishing fear memory in the presence of a temporary (e.g., daily worries) or more persistent (e.g., trauma) increase in affect load (Nielsen & Levin, 2007). RAM is thus in agreement with TST and extends it by proposing that one of the main functions of dreaming is to expose the dreamer to rewarding or aversive stimuli in order to maintain and enhance 'offline' memory consolidation processes and performance in real-life situations, while also

contributing to emotion regulation processes (Perogamvros & Schwartz, 2012). As it is responsible for appetitive motivational drives (such as sex) and exploratory behaviours (such as exposure to a potentially harmful/rewarding stimulus), the engagement of ML-DA circuits, as modelled in RAM, offers a plausible neurophysiological and neurocognitive model of dreaming that complements and supplements the fear-related amygdala mechanisms proposed by TST (Perogamvros & Schwartz, 2012).

To summarise, various authors have contributed over time trying to define what the functions of dreams are. Although there appear to be two parallel research currents in the literature that contrast empirical and analytical studies of dreams, we have seen how these can actually be integrated to a certain measure. Thus, functions appear to be common to different theoretical frameworks, i.e. that dreams seem to play a role: (1) in emotional regulation; (2) in problem solving and learning effective coping strategies; (3) in creativity. This is as far as we can tell so far.

Sources & Components: How does our mind build a dream?

Freud, as we have said, argues that all dreams are wish fulfilment. However, not all desires are tolerable by the ego. Therefore, as the dream is the 'guardian of sleep' (Freud, 1916), it uses defence mechanisms to censor its content and safeguard rest. Freud, therefore, distinguishes the manifest content (what we objectively experience in the dream) from the latent content; that is, the unacceptable unconscious desire (Freud, 1900).

According to Freud, the sources from which the mind draws to construct the dream are the following:

1) **Recent and indifferent material**: dreams invariably connect to the events of the day preceding the dream (diurnal residue). Although in reality they can draw on material from any time in life, as long as it possesses an associative link with the recent experience. Moreover, if during the day we have had two or more experiences potentially constitutive for the dream, it will tend to represent them in a unified way. Thus, we can say that the source of the dream in this case can be:

- a recent, psychically significant experience, directly represented in a manifest way;
- several recent, significant experiences, which the dream merges into unity;
- one or more recent, significant experiences which are represented, in the dream content, by the hint of an experience of the same period but indifferent;
- an intimate, significant experience (memory or succession of ideas) regularly represented in the dream by a recent but indifferent impression.

If the dream draws on the indifferent material, it is censoring the underlying desire by displacement (Freud, 1900).

2) **Infantile elements**: we can see the intervention of infantile events even in dreams whose content would not suggest such an assumption. The dream is nothing other than the representation of the fulfilment of a desire that originates in the infantile life. This is buried in the latent content by other more tolerable meanings (or wish fulfilments) (Freud, 1900).
3) **Somatic sources**:
    - objective sensory stimuli;
    - states of internal excitement of the sense organs (subjective experience);
    - somatic stimuli from within the body.

    When the internal nervous and external somatic stimuli are intense enough to force psychic attention towards them without waking the dreamer, they become a nucleus of dream material to which the mind tries to associate a corresponding wish fulfilment. If, on the other hand, the somatic stimuli are not intense enough, they will be incorporated and utilised in the dream as well as the recent indifferent material (Freud, 1900).

What Freud postulated seems to fit with what Seligman & Yellen postulated in 1987. They claim that there are three elements that constitute a dream: visual episodes, emotional episodes and the cognitive integration of the first two elements (Seligman & Yellen, 1987).

Visual episodes are passively observed by the dreamer. They are prolonged in time, so they are more like short and mute motion pictures than photographs. None of the three mentioned elements influences the content of the subsequent visual hallucination. So, according to the authors, the content is not constrained by what happens within the dream, but only by external factors (Seligman & Yellen, 1987). These episodes may represent, in Freudian terms, the daytime residues that constitute the manifest part of the dream. The mutual non-influentiality of the elements may also be consistent in this sense, as the authors consider only the objective content of the dream without the aim of grasping associative implicit links.

Emotional episodes are the second element that, together with the visual episodes, constitute the skeleton of the dream. And as we know, dreams are often highly emotionally charged (Seligman & Yellen, 1987). According to the classical analytical perspective, emotional episodes could represent censored infantile desires or recent psychically salient material.

The third element that constitutes the dream is none other than the attempt to **integrate**, to explain, to create meaning between the visual and emotional episodes. In other words, it is the mind's attempt to create a coherent plot (Seligman & Yellen, 1987). In Freudian terms this integration can be seen as a combination of condensation of content or deformation of the dream in the case of censorship and adoption of indifferent material. For example, suppose a dreamer produced the following elements:

Ronald Reagan's face, a grapefruit, a rowboat and a feeling of sadness.

The mind would likely produce something like this: ‘Ronald Reagan came to speak in Berlin and we were having breakfast together. He ordered grapefruit, the waiter brought it, and he put sugar on it. He talked about how badly the summit meeting had been going and how he thought that he might have to fire the Secretary of State. We were both overcome with sadness about this, and thought it would be a good idea to go out for a swim. When we went outside, we saw a rowboat on the Wahnsee’ (Seligman & Yellen, 1987).

If asked, the dreamer will be able to distinguish primary visual experiences from cognitive integration. Visual episodes are more vivid and are not bound in

their content by the plot. In contrast, the material produced by integration is less vivid, less bizarre, more continuous and constrained (Seligman & Yellen, 1987).

In general, depending on specific theories of dream functions, the content of dreams may vary or have different sources. Certainly, most dream elements come from recent memory (Schwartz, 2003), whereas the representation of life episodes is rarer: no more than 1-2% of dream reports (Fosse et al., 2003). RAM proposes that the dream exposes and trains the dreamer to motivationally or emotionally relevant stimuli, which may relate to behaviours or instinctual drives (such as feeding, mating, fighting, fleeing, etc.) or elements of memory (such as current preoccupations), as well as novel cues (e.g., novel combinations of memory elements) (Perogamvros & Schwartz, 2012).

Lucid dreaming

The original source the dream reports used in this thesis is a study by Peters and colleagues (2023), which aimed to assess the effectiveness of hypnosis as a method of inducing lucid dreaming. But what is a 'lucid dream'? There is still a lack of an unambiguous and agreed definition in the literature, but in general we can say that it is a state of consciousness that emerges during a dream and allows us to actively act by changing the scenario and the story we are experiencing. LaBerge defined this experience as 'dreaming while knowing you are dreaming' (Godwin, 1994). From a neurophysiological perspective, lucid dreaming is nothing more than "a hybrid state of consciousness with quantifiable and measurable differences from waking and REM sleep" (Voss et al., 2009). It represents a true bizarreness in a perspective in which NREM and REM sleep alternate for proper sleep hygiene.

Dream Interpretation & Content Analysis

The interpretation of dreams has been carried out since immemorial times with the perspective that they can predict the future. The **symbolic** interpretation of the dream considers it in its totality by trying to replace its content with a more comprehensible, and in some respects similar, one. An example of this is the

explanation of Pharaoh's dream provided by the biblical Josephus. Seven fat cows followed by seven lean cows that will devour the former: a prediction of seven years of famine in Egypt, which will devour the abundance accumulated in the seven fortunate years (Freud, 1900).

Another method that has historically been used for dream interpretation is **decipherment**. It treats the dream as a kind of cipher language. The dream is 'translated', through a predetermined key, into a message or experience with an overt meaning. For example, I dreamt a letter, but also a funeral. Through a given dream manual, for more or less reliable socio-psycho-cultural reasons, I discover that 'letter' is to be translated as 'sorrow', 'funeral' as 'engagement'. It is now up to me to make a logical connection between the terms, obviously always with the aim of predicting the future (Freud, 1900).

Freud criticises these ancient methods and is certain of their unreliability as well as their obvious unusability for a scientific treatment of the dream. However, he also maintains that the decipherment method is based on a correct technique: the fragmentation of the dream content. Indeed, he argues that through the fragmentation and presentation of partial and manifest contents to the dreamer, it is possible to get in touch with the deeper desires that resurface from the unconscious (i.e., latent contents). However, this is only possible through the techniques of free associations within the therapeutic relationship. Furthermore, he argues that the meaning of certain dream symbolism varies between patients and contexts and is not univocal (Freud, 1900).

Despite Freud's undeniable contribution, modern psychoanalytic theory has moved away from his assumptions (Bohleber, 2012). Today the focus of investigation is the actual content of the dream, what is manifest. Freudian theory underestimated this component and the fact that it had an integrative function of its own. The modern psychoanalytic interpretation of dreams focuses on the creation of meaning rather than the discovery of latent unconscious content. The dream narration, in therapy, performs a primarily communicative function (Thomä & Kächele, 1996). Indeed, in dreams one has access to unconscious elements that can be the subject of conversation, useful insights for reasoning. Moreover, every dream should also be considered as a commentary on the analytic relationship and analysed accordingly (Ermann, 2020). However, despite the

discrepancy between theories, it must be said that recent research has confirmed certain key elements proposed by Freud: firstly, primary-thinking processes operate in dreams; secondly, unconscious motivations, in particular desires, play an important role in dream generation (Bohleber, 2012).

Regardless of the reference theory, the goal of dream work during the analytic session must be 'the transfer of the dream into the interpretive micro-universe shared by analyst and analysand. The dream is the personal contribution of reflection on one's own situation in a pre-verbal language that is not easily accessible' (Moser, 2003). So, the (re)construction of the meaning of the dream is a hermeneutic process that takes place through the analyst-patient relationship. Therefore, it will always result in (inter)subjective meaning with the aim of promoting therapeutic change. Clinical dream research attempts to empirically trace these processes of intersubjective meaning production and their effects on therapy. However, by its own nature, dream interpretation does not easily fit the methodological assumptions of classical scientific research. Thus, empirical dream research has taken a different path: it objectively studies the recurring and normative characteristics of the dream, and its function for the organism. It is not specifically interested in the subjective meaning of the dream for the dreamer, it aims to be a nomothetic science (Roesler, 2023).

Dream **content analysis** is the most effective tool for empirical dream research. This method fulfils common assumptions of scientific research (unlike dream interpretation), such as the possibility of replication, assessment of reliability and validity and minimisation of experimenter bias (Domhoff, 1996; C. S. Hall & Van De Castle, 1966). The purpose of content analysis is to quantify particular characteristics of dream reports in order to perform statistical analyses (Schredl, 2010). And it does so by collecting and analysing dream reports through content-specific scales.

The basic steps to perform a dream content analysis are the following:

1) formulating a hypothesis;
2) selecting an existing scale or developing a new one;
3) soliciting dream reports;
4) preparation of dream reports;
5) blind evaluation by external judges;

6) calculation of interrater reliability;
7) statistics Interpretation of results.

Usually, in order to choose the scales used in the analysis, a dream manual is adopted. This is a collection of content analytic scales that aim to measure the main features of dreams (C. S. Hall & Van De Castle, 1966). The most common coding system is the scales of Hall and Van de Castle (Domhoff, 1996), which allows the coding of more than 300 different subscales. Here, however, the problem of multiple testing arises: if the significance level is $p < 0.05$ and 300 statistical tests are performed, an average of 15 significant differences are obtained, even in a completely random data set. One option to deal with this problem is to adjust the alpha level to the number of tests. For example, in the case above $p = \frac{0.05}{300} = 0.00017$; the researcher would need a very large sample ($n > 1000$) to obtain sufficient statistical power for his study (Schredl, 2018). Therefore, it is much simpler to select one to five hypotheses and add exploratory analyses that will be discussed with caution (if significant). This is useful because it can suggest to other researchers what would be interesting to investigate further, to confirm or refute with future studies what has been found (Schredl, 2018).

Dream reports can be collected in various ways: interviews, questionnaires, dream diaries and awakenings in the sleep laboratory (Schredl, 2008). However, the simplest method is to ask dreamers to write down as completely as possible the last dream they remember (Domhoff, 1996). The advantage of the retrospective collection of the report lies in the fact that the dream is not influenced in its content by the study itself, since at the time they had that dream they did not know they would take part in it. On the other hand, depending on how much time elapsed from the dream to its report, the participant may have difficulty remembering all the details of the dream (Schredl, 2018).

After collecting the dream reports, they are processed by removing all information that does not reflect the dream experience. For example, 'I dreamt about my uncle ~~whom I saw the day before~~': we must avoid distracting the judges with irrelevant information. Furthermore, depending on the research question, it may be necessary to edit the report more thoroughly (Schredl, 2018). Once this has been done, it is necessary to reorder the dreams randomly (while keeping

track of the original numbering for possible revisions), so that the external judge cannot associate several dreams with the same person or figure out which condition the dream belongs to ('blind judging') (Schredl, 2018).

In this thesis, the dreams that were subjected to content analysis came from the study by Peters et al. (2023). In the original experiment, dream reports were collected through audio-recording and subsequently typed up and processed by the experimenters following the instructions given in 'Researching Dreams: The Fundamentals' by Schredl (Peters et al., 2023; Schredl, 2018). For the content analysis, 'Dream manual' by Schredl (1998) was used, applying the following scales:

1) **Realism/bizarreness**: four-point scale indicating whether the dream events are common, uncommon, or impossible in the everyday life of a person of Western culture. [1] dream events are possible in real life and part of everyday experience; [2] many elements normally present in waking life, but the actions in the dream are uncommon and impossible for the dreamer in real life; [3] presence of one or two fantastic elements, bizarre connections, or impossible actions in the real world; [4] presence of many fantastic elements, bizarre connections, or impossible actions in the real world (Schredl, 1991).
2) **Emotions in the dream**: two subscales concerning positive-negative emotions (each is coded on four points: none, mild, moderate, strong). Both positive and negative feelings can be coded simultaneously. The dream is neutral if both subscales are coded with 0 (none). Focus on explicit expressions of feelings by the dreamer. If feelings are clearly manifested through actions or the situation, the corresponding feelings can be coded. If several feelings are manifested in the dream, the strongest feeling is used for encoding.
3) **Number of people** present in the dream: groups that are only perceived as a whole are counted as one person, even if the number is mentioned, e.g. 8 persons. If members appear as individuals in the continuation of the dream, they are counted again.

A subdivision into subgroups also leads to the counting of the newly emerged subgroup. Each person who appears is counted once. If a person transforms, i.e. changes identity, they are counted as one person. If only people, contact wishes or objects belonging to other people are mentioned (e.g. 'my uncle's car'), these mentions are not coded as one person. The dreamer is not counted (Schredl, 1998).

4) **Verbal interaction** (present or not present).
5) **Physical interaction** (present or not present).
6) **Aggressiveness**: four subscales: physical or verbal, directed at the dreamer or directed by the dreamer at others; present or not present. By 'aggression' we mean aggressive actions of the dreamer against persons, animals, or objects. Aggression of persons, animals or dream beings should be coded as voluntarily acted aggression, but not as accidents or the like.

This is only one of the possible examples of scales for content analysis. However, this method, like the others, suffers from certain limitations. As mentioned above, the uniqueness of the dream cannot be captured, since by applying specific scales it is possible to measure only certain aspects of the dream report, inevitably losing information (Schredl, 2018). Moreover, since we necessarily have to use dream reports to study their content, a big question remains: how close is the dream report to the original dream experience? For example, if a dreamer did not explicitly report the emotions or thoughts he or she had during the dream, the outcome of the content analysis would be biased (Schredl, 2018). Furthermore, dream reports appear to have a bias towards content with emotional and motivational value (such as socialising, fighting or sexual activity) and less towards common everyday life content, such as typing, washing dishes or buying food in the supermarket (which are not frequent in dream reports) (Schredl, 2010).

In conclusion, dream interpretation and dream content analysis are two quite different techniques. The former embraces the uniqueness of the dream and emphasises its (inter)subjective meaning within the therapeutic framework. While the second sacrifices the understanding of the content in order to wield effective statistical tools for nomothetic utility. Although it has to be said that

content analysis is not able to detach itself totally from the interpretation component since the very application of certain scales, even if following pre-established criteria, requires a bit of it (e.g., the bizarreness scale). I believe, however, that both research traditions can productively influence each other as complementary perspectives. In the future, dreams or dream series from clinical practice could be studied in their significance for psychotherapeutic processes with research methods that interpret meaning and do justice to scientific criteria such as objectivity in terms of replicability and intersubjective reliability. The challenge is difficult, but not impossible.

IV. Language, Cognition & Meaning

«When people talk, […] they expose themselves to all kinds of risks. It is a miracle that any 'meaning' can be transmitted, since each expression can communicate an almost unlimited number of meanings. Nevertheless, people almost always manage to understand each other well enough» (Wikan, 1992).

Language is one of the distinctive characteristics of human beings. It performs a social function of communication and is based on a complex and structured system of syntactic, grammatical, and semantic rules. It allows the expression of concepts, thoughts, emotions, and desires through verbal and non-verbal, written and spoken signals (Vygotsky, 2012). It can be defined as the specific product of a region's culture and plays an important role in human cognition (Wolff & Holmes, 2011).

Unfortunately, everything that has to be studied through language runs the risk of suffering its specificity. Not only because of misunderstandings, but also because of the effect it has on human cognition. In this chapter, we will explore this issue in more detail, delving into the theory of linguistic relativity.

Communication: Words & Meaning

A word without meaning is an empty sound. Meaning is the soul of the communication message; it is an indispensable component of the word. Moreover, language is mutable: the structure of meaning itself and its psychological nature vary according to place and time. However, it is not only the content of a word that changes, but the way reality is generalised and reflected in a word (Vygotsky, 2012).

Communication is inextricably linked to social interaction, which on one hand conveys meaning, but on the other hand involves an unspoken, something that is obvious to the speaker (Barth, 1993). Contextualisation is not sufficient to ensure a full rendering of what is said or understood. The only chance we have to grasp the unspoken is to immerse ourselves in the culture and routine of the

speaker (Wikan, 1992). Furthermore, attention must be paid to the effects people are trying to achieve and the relevance of their words in relation to their positioning in the social space, and what their goals are, rather than the message their words seem to encompass (Sperber & Wilson, 1986).

In many cases, when a human being wants to transmit a message, it is partly defined and partly vague. Communication is not successful when the listener recognises the linguistic meaning of the enunciation, but when he deduces the speaker's 'meaning' from it (Sperber & Wilson, 1986). To do this, we must abandon ‘our obsessive trust in words and exact enunciation' (Wikan, 1992), and get into 'resonance' with the interlocutor.

Resonance evokes shared human experience, something that people can have in common in any space and time. Where culture separates, resonance reunites. The latter does not deny differences, but makes them relatively insignificant in the face of the interpretation of the purposes of communication (Wikan, 1992). It is only through this process that people are able to interpret ambiguous linguistic expressions such as '*Kids make nutritious snacks*' (Pinker, 2003), to understand a conversation not in their mother language, or to successfully adapt the content of a translated text.

Linguistic relativity

Language not only represents an essential tool for communication, but also seems to play an important role in human cognition. This idea is embodied in the theory of linguistic relativity, also known as the Sapir-Whorf Hypothesis, that is based on three main assumptions (Gentner & Goldin-Meadow, 2003; Gumperz & Levinson, 1996; B. Malt & Wolff, 2010b):

1) languages can differ significantly in the meanings of words and syntactic constructions;
2) the semantics of a language influences how the speaker perceives and processes the world;
3) language influences thinking. So, speakers of another language think differently.

Linguistic relativity has often been defined as a weaker form of linguistic determinism (according to which thought is radically shaped by language), but this is oversimplifying. Actually, linguistic relativity includes a 'family' of more or less supportable theoretical propositions (they are all shown in Fig. 4) that we will now explore (Wolff & Holmes, 2011).

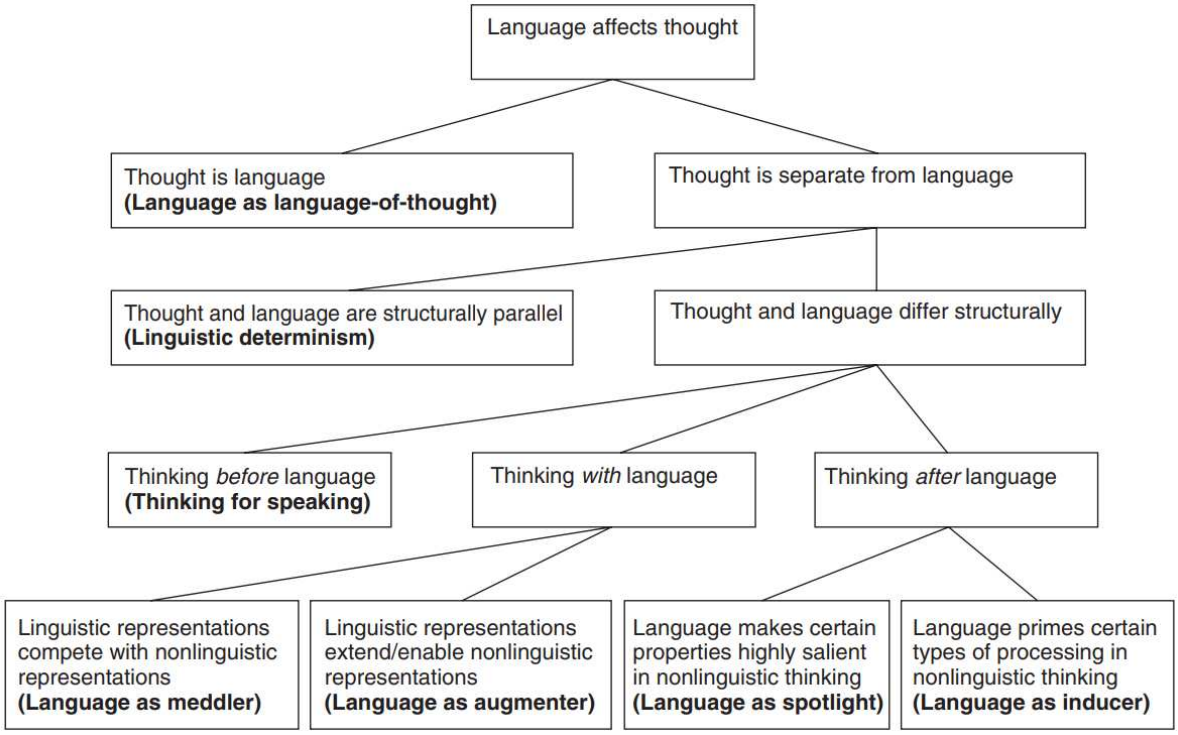

Fig. 4. Classes and subclasses of hypotheses on how language might affect thought (Wolff & Holmes, 2011)

Among these, the most contestable theories are two: 'language as language-of-thought' and 'linguistic determinism' (Wolff & Holmes, 2011).

According to the **Language as language-of-thought** theory, thought is equated with the production of subvocal speech (Watson, 1913). However, this does not make sense, as people can have thoughts that are difficult to express (verbalise). Moreover, as already mentioned, people can also understand ambiguous linguistic expressions. The very ability to recognise this ambiguity indicates a finer level of representation than that encoded in the meanings of words (Pinker, 2003). Finally, if people thought entirely in words, words expressing new concepts could never be coined, because there would be no way to imagine their meaning. And several studies indicate that both infants and primates have access to relatively sophisticated forms of thinking, even in the absence of language (Bloom & Keil, 2001; Cheney & Seyfarth, 1990; Hare et al.,

2001; Hespos & Spelke, 2004; Needham & Baillargeon, 1997; Penn et al., 2008; Phillips & Santos, 2007; Spelke, 2003).

The theory of **Linguistic determinism** assumes that language shapes thought so profoundly that it can even overwrite pre-existing perceptual and conceptual abilities (Gumperz & Levinson, 1996; B. Malt & Wolff, 2010b). Linguistic determinism, unlike the previous theory, considers language and conceptual system separately (Gordon, 2010; J. Lucy, 2010). It argues that differences in language lead to differences in thinking. This implies a perspective in which language and thought have a relatively tight connection, and thinking and the world a loose connection. This is because it assumes that thought is determined by language and not by the world (Wolff & Holmes, 2011).

However, studies on human cognition argue the opposite: the connection between thought and the world is closer than that between thought and language (Gleitman & Papafragou, 2005; Levinson, 1997; B. Malt & Wolff, 2010a; Papafragou et al., 2002; L. B. Smith et al., 2003). In support of this, cross-linguistic studies have shown that differences in word meanings between languages are greater than differences in underlying concepts (Ameel et al., 2005; Gennari et al., 2002; B. C. Malt et al., 1999; Munnich et al., 2001; Papafragou et al., 2006). The language-thought-world relations just described are represented in Fig. 5. The lack of alignment between language and thought confutes linguistic determinism, but this does not imply that language cannot have an effect on thought. Since semantic and conceptual systems differ, it is probable that a tension arises from them leading to mutual pressure and influencing each other (Wolff & Holmes, 2011).

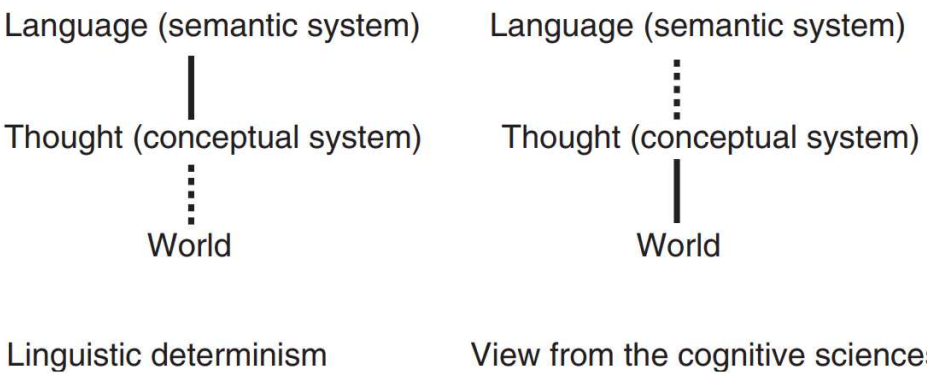

Fig. 5. Representation of the comparison of the language-thought-world relationship for linguistic determinism and cognitive science. Solid line: tight connection; dotted line: loose connection (Wolff & Holmes, 2011).

Thought *before* Language: Speech & Element Salience

Language may influence thinking in those tasks where the former precedes the latter, for instance in the production of a speech. It is likely that such influence, given that different languages vary in the salient aspects of experience to which the person must pay attention, produces inter-linguistic differences in thinking (Wolff & Holmes, 2011). For example, in English, as opposed to Indonesian or Mandarin, verbs must specify tense. Thus, English speakers presumably have to present attention to when an event occurred. Instead, in Turkish, descriptions of past events must also indicate whether or not the speaker witnessed the event (Slobin, 1996). This process of attention, which is intrinsic to language and leads one to orient oneself towards a specific mental activity in order to pay attention to certain aspects of the experience, has been termed 'thinking for speaking' (Slobin, 1996, 2003).

Language specificity also appears to influence attention and memory for motion events (Gennari et al., 2002; Regier et al., 2010). This is because some languages (e.g., English, German, Russian, Chinese) tend to encode manner in the main verb (e.g., jog, roll, march) and path in a variety of other language structures, whereas other languages (e.g., Greek, Spanish, French, Japanese) do exactly the opposite (see Tab. 1 for a comparison between English and Spanish in this regard). Thus, the second language group seems to focus much more on the path when they have to describe a scene; however, when they do not have to verbalise it and can observe it freely, their eye movement (i.e. their attention) does not change compared to the first language group (Gennari et al., 2002; Papafragou et al., 2008).

Tab. 1. English-Spanish comparison. Path priming on the left and manner priming on the right (Montero-Melis & Jaeger, 2020). Manner verbs refer to the way a figure performs a movement. 'Hop', 'skip' and 'jump' are examples of English manner verbs. Path verbs refer to the trajectory on which a figure moves, usually relative to another reference object. "Rise", "arrive" and "cross" are examples of English path verbs (Billman et al., 2000).

Path priming		Manner priming	
Path in the event	Verb	Manner in the event	Verb
up	subir 'ascend'	push + roll	rodar 'roll'
down	bajar 'descend'	push + slide	empujar 'push'
into	entrar (en) 'enter'	pull + roll	tirar (de) 'draw'
across	cruzar 'cross'	pull + slide	arrastrar 'drag'

Thought *with* Language: rules, incorporation and classification

Recent studies have shown that in some tasks, processes associated with language and non-linguistic processes are activated simultaneously, so in this case thinking occurs with language.

There are two general classifications for this type of language effect:

1. **Language as meddler**: the effect is determined by the spontaneous assumption of both linguistic and non-linguistic codes. The former meddle in the decision-making process. When the two codes are consistent with each other, speed and accuracy of choice are better, but when they conflict, performance may be compromised (Winawer et al., 2007).

   An example of this type of influence of language on thinking is colour cognition. Indeed, the Russian chromatic distinction between '*siniy*' (dark blue) and '*goluboy*' (light blue), leads to differences in colour discrimination. In fact, Russian speakers, unlike English speakers, show better matching performance when colours belong to different language categories than when they belong to the same category. Moreover, these differences disappear under conditions of verbal interference (Winawer et al., 2007).

   Similarly, in Gilbert et al.'s study (Gilbert et al., 2006), the same results were found in English speakers. Participants were faster in locating a target when

its linguistic category differed from that of surrounding distractors (e.g. a green among blue). In contrast, performance worsened when the target and distractors shared the same linguistic category (e.g., a green among other shades of green). However, this only occurred when the target was presented in the right visual field. This 'lateralisation' effect may be due to the fact that presentation in the right visual field implies that the stimulus will initially be processed in the left hemisphere, i.e. the side of the brain where language processing typically takes place (Wolff & Holmes, 2011).

In conclusion, therefore, language can interfere with cognition through spontaneous codes (Regier et al., 2010; Roberson & Hanley, 2010; Winawer et al., 2007). However, this does not imply a change in the underlying perceptual mechanism or memory representations (Wolff & Holmes, 2011).

2. **Language as an augmenter**: in some cases, linguistic and non-linguistic representations can combine to enable people to complete tasks that would otherwise not be possible using only one of the two channels. In other words, language can augment thinking by offering new conceptual tools (Christie & Gentner, 2012; Frank et al., 2008; Gentner, 2003).

   An example of this can be found in the domain of number. There are three main systems for representing numerical quantities. The first is 'subitizing', which enables even infants to automatically recognise small quantities of objects (≤4) without the aid of counting (Wynn, 1995). The second system allows not only infants but also animals to discriminate larger quantities in an approximate way (how much sand is in a bag, or how many fish in a net) (Dehaene, 1997; Gallistel, 1990). These two systems are innate, as opposed to the third system. The latter is the one that allows exact quantities to be specified, and must be defined and learned. Thus, it depends on language. This has been confirmed using fMRI, showing that this type of task involves neural networks typically associated with language processing, unlike the other two systems (Dehaene et al., 1999).

   However, to support the hypothesis of linguistic relativity per se, it is necessary to show that the effects differ between languages. Such evidence has been found through studies on so-called 'one-two-many' number systems. For example, in Piraha, a language spoken by a small tribe in the Brazilian Amazon, number words only roughly correspond to actual quantities.

The Piraha word for one, '*hoi*', can be used to describe up to 6 elements; the word for two, '*hoí*', up to 4-10 elements; the word for many, '*baagi*', between 7 and 10 elements. Thus, in Piraha there is a lack of words for exact quantities (Frank et al., 2008). Consequently, when a Piraha speaker is presented with tasks requiring exact quantities, he or she will attempt to complete the task using an approximate number system (Frank et al., 2008; Gordon, 2004, 2010). Thus, it is safe to say that the exact calculation of quantities necessarily requires language (Dehaene et al., 1999).

How exactly might language influence numerical cognition? Concepts such as 'five' and 'six', 'even' and 'odd', depend on a system of rules that give them meaning. The fact that specific numeration is learned much later than language, and that they are both a prerogative of human beings, supports the claim that language can be used to reason about numbers (Bloom, 1994; Pinker & Jackendoff, 2005; Wolff & Holmes, 2011). In particular, it is language that allows us to learn rules and, a component that should not be underestimated, to incorporate rules within other rules.

It appears that the latter competence also plays a role in the understanding of false beliefs, since it assumes an ability to represent incorporated propositional structures, such as 'I know she thinks X, but actually true is Y' (Pyers & Senghas, 2009). Anyway, if language aids the formation of incorporated knowledge structures, it is likely to play a significant role in many other cognitive activities.

Finally, thanks to language we can create categories and learn new ones (Gentner & Namy, 1999; Waxman & Markow, 1995). This type of influence on thinking has been demonstrated through a series of studies in which participants were asked to distinguish between approachable and non-approachable alien creatures. These categories could be learned on the basis of visual information alone; however, category learning was much faster if accompanied by auditory or written labels (Lupyan et al., 2007). Furthermore, categories learned with labels (through language then) are more resistant to the interference of novel stimuli and more flexible in their ability to incorporate new members (Lupyan, 2006).

Thought *after* language: the spotlight

As mentioned earlier, the long-term use of a language can direct attention to specific properties of the world. Furthermore, language can induce a certain processing mode, which can persist even when people engage in other non-linguistic tasks. The very exposure to words or constructions that emphasise specific properties, attention can dwell on them. Thus, it is fair to say that language can act as a spotlight, making some aspects of the world more salient than others (Wolff & Holmes, 2011).

For instance, such effects may occur as a result of the exposition of the typical grammatical gender in many languages (each noun is assigned a gender). Indeed, the ability to learn associations between proper and common nouns is disturbed when the grammatical gender of the common noun differs from the biological gender of the referent of the proper noun (Boroditsky et al., 2003).

Another way in which language can influence the way people observe the world is by promoting a particular frame of reference for the conceptualisation of space. Many studies confirmed that the used frame of reference can be (Gallistel, 2002; Haun et al., 2006; Levinson, 1996; Levinson et al., 2002; Li & Papafragou, 2005; Majid et al., 2004; Newcombe, 2005; Taylor & Tversky, 1996):

- absolute (or geocentric): it implies a coordinate system whose axes are applied to the environment (e.g. a house facing east);
- intrinsic (or object-centric): places the axes in objects (e.g. the front of a car);
- relative (or egocentric): defines axes with respect to the observer's body (e.g. comb on my left).

All three reference frames are present in all cultures and languages (Gallistel, 2002; Haun et al., 2006; Levinson et al., 2002; Newcombe, 2005). However, there are cross-cultural (and thus inter-linguistic) differences in people's preference and ability to use these reference schemata (Haun et al., 2006; Levinson, 1996; Levinson et al., 2002; Majid et al., 2004). Thus, languages

vary in the frequency with which they encode the three reference schemas (Majid et al., 2004).

In addition, the encoding of spatial relations also varies greatly by language (Bowerman, 1996). For example, placement verbs in Korean, unlike English, distinguish between adherence and looseness and ignore the distinction between containment (e.g., "to put in") and support (e.g., "to put on top") (Casasola, 2005; Choi, 2006; Choi & Bowerman, 1991; McDonough et al., 2003).

Finally, one last domain in which language might influence the salience of elements is the distinction between objects and substances. This is the language-specific way of dividing the world into discrete objects (books, flowers) and unbounded continuous masses (rice, sand). For example, in English, when referring to several chairs in a room, the plural marker ('-s') must be used. In contrast, in Japanese or Yucatec Maya, such markers are usually unnecessary, since it is as if the noun 'chair' means 'chair stuff' (Imai & Gentner, 1997; J. A. Lucy & Gaskins, 2001; L. B. Smith et al., 2003). Thus, when categorising objects, speakers in languages such as English are inclined to focus on form, since for them objects can be identified on the basis of this. In contrast, languages such as Japanese lead speakers to focus on the material, as their nouns do not explicitly identify objects (Imai & Gentner, 1997; Imai & Mazuka, 2003; J. A. Lucy & Gaskins, 2001). However, as in the case of spatial frames of reference, language can lead people to spontaneously focus on certain aspects of experience, but does not seem to rigidly prevent people from considering aspects of experience that are not encoded in their language. Thus, regardless of language, people are still able to think of fixed objects of regular form as individuated entities (Li et al., 2009).

V. Content Analysis of Translated Dream Reports

In the following chapter, we will discuss in detail the experiment performed on the dream reports obtained during my internship at the University of Berne (CH). We will then discuss the results and draw conclusions.

Method

The dream reports used in this thesis come from a study by Peters et al. (2023). They are in total 103, and they were collected from 10 female students with an average age of 21.6 years (standard deviation = 2.5). Inclusion criteria included good dream recall skills, no previous experience of lucid dreaming and a good attitude towards hypnosis. Each participant spent three consecutive nights in the laboratory, being subjected to three different conditions. On the first night, participants were subjected to acoustic suggestion. The sentence ‘You are dreaming’ was presented from the third REM phase through speakers. On the second night, acoustic suggestion was replaced by mere acoustic stimulation through the presentation of the subject's name. Finally, on the third night, the acoustic suggestion was again presented following hypnotic enhancement. More information about this can be found in the paper by (Peters et al., 2023).

Participants were informed about the study and its objectives. In addition, they were given instructions to train a specific eye movement at home (LRLR) to be able to report a lucid dream. Participants were provided with informed consent and were rewarded with €90 each.

The dream reports were processed and evaluated in their original language (German) by Melanie Schädlich. The content analysis was conducted with the criteria presented in "Researching Dreams: The Fundamentals" by Schredl (2018). They were assessed for:

1. closeness to reality/bizarreness: on a scale of 1 to 4;
2. emotions: positive (scale from 0 to 3) and negative (scale from 0 to 3);
3. number of people;

4. verbal interaction (0/1 = No/Yes) and physical contact (0/1 = No/Yes);
5. aggression: verbal aggression from the dreamer, verbal aggression on the dreamer, physical aggression from the dreamer and physical aggression on the dreamer (0/1 = No/Yes);

In addition, some special themes relating to the experiment were explored:

6. **Explicit Listening** (present or not present): the mere description of actions is not sufficient for an encoding, in the case of a conversation only the mention (quotation) of the words heard confirms explicit listening. In contrast, in the case of acoustic signals the signalling by the dreamer is sufficient.
7. **Direct incorporation of the acoustic stimulus** (present or not present): indicating whether the dreamer's name or the phrase 'You are dreaming' appears in the dream (the acoustic stimulation).
8. **References to the laboratory** (present or not present): indicating whether there are direct references to the sleep laboratory in the dream (e.g. electrodes or other instruments are mentioned) and indirect references (e.g. the study becomes the theme of the dream).

The dream reports were translated directly from German into Italian via ChatGPT 4.0. Through the input ‘Translate the following dream report into Italian:’, followed by the specific dream, the A.I. was prompted to translate the content. After translation, the reports were again evaluated in their content in Italian.

Data analysis was then conducted by comparing the inter-rater agreement using contingency tables for each specific scale and calculating the corresponding correlations and/or agreement indices. Clustered bar charts and cumulative bar charts were produced for each ordinal multi-categorical scale, i.e. those referring to 'bizarreness', 'positive emotions', 'negative emotions'. In addition, the following indices were calculated:

- **Percentage of agreement**: $\%A = \left(\frac{a+b+c+d}{N}\right) \times 100$

Where $a + b + c + d$ represent frequencies of the overlapping assessments and N is number of observations.

- **Correlation**: $Cor = \frac{\sum[(ITA_i - \overline{ITA})(GER_i - \overline{GER})]}{\sqrt{\sum(ITA_i - \overline{ITA})^2 \times \sum(GER_i - \overline{GER})^2}}$

  Where ITA_i are the specific observations of the Italian rater, and $\overline{ITA}$ their mean. GER_i are the specific observations of the German rater, and $\overline{GER}$ their mean.

- **Weighted Cohen's Kappa**: $K_W = 1 - \frac{\sum W_{ij} \times fo_{ij}}{\sum W_{ij} \times fe_{ij}}$

  Where W_{ij} are the weighting factors, fo_{ij} the observed frequencies, and fe_{ij} the expected frequencies.

The correlation can assume values between -1 and +1. When the index is positive, a direct linear correlation exists between the two observed variables. When the index is negative, an inverse linear correlation exists between the two observed variables. Instead, when the index is equal to 0, there is no correlation between the two observed variables.

Weighted Cohen's kappa is a measure of the agreement (coefficient of agreement) between two ordinally scaled samples. It is useful for assessing inter-observer variation, in two people evaluating the same objects. This index generally varies between 0 and 1, and should be interpreted as follows: ≤ 0 as no agreement; 0.01–0.20 as poor; 0.21–0.40 as modest, 0.41–0.60 as moderate; 0.61–0.80 as substantial; and 0.81–1.00 as almost perfect agreement (McHugh, 2012).

For the 'people number' scale, which is our only discrete variable, the inter-rater correlation was calculated. Then a scatter plot was produced to represent this and a line plot to show the overlap of ratings in individual cases.

Finally, contingency tables were produced for all dichotomous scales ('verbal interaction', 'physical contact', 'verbal aggression by dreamer', 'verbal aggression to dreamer', 'physical aggression by dreamer', 'physical aggression to dreamer'), through which reliability, specificity and sensitivity were calculated assuming assessments in German as true values.

Accuracy indicates the proportion of observations that have been correctly classified as true positives or true negatives. A high accuracy value

indicates a strong agreement between the two ratings and suggests that the index is reliable in distinguishing between the two dichotomous categories. On the other hand, a low accuracy value indicates a significant discrepancy between the ratings, suggesting that the index may not be reliable or that there are systematic differences in the way the ratings are evaluated. Accuracy is calculated using the following formula:

$$\frac{true\ positive + true\ negative}{number\ of\ observations}$$

In our case, **specificity** measures the effectiveness of the assessment in Italian (ITA) to correctly identify negative cases, when the assessment in German (GER) also identifies them in the same way. It is calculated using the following formula:

$$\frac{true\ negative}{true\ negative + false\ positive}$$

In contrast, **sensitivity** measures the ability of the Italian (ITA) assessment to correctly identify positive cases, when the German (GER) assessment also identifies them in the same way. It is calculated using the following formula:

$$\frac{true\ positive}{true\ positive + false\ negative}$$

Results

The first scale we are going to compare is the '**bizarreness**' scale. In the following table of observed frequencies (Tab. 2), we can read the correspondences in the rating on the descending diagonal. The inter-rater correlation is about **0.67**, which is quite good.

*Tab. 2. Contingency table of the observed frequencies of the variable '**bizarreness**'. In rows the evaluations in Italian (ITA), in columns those in German (GER). Next to the table the respective indices '% (percent) of agreement', 'correlation', 'weighted Cohen's Kappa'.*

1 BIZARRENESS

ITA \ GER	1	2	3	4	
1	18	6	1		**25**
2	9	13	8		**30**
3		19	18		**37**
4		2	7	2	**11**
	27	**40**	**34**	**2**	**103**

% of Agreement	49.51%
Correlation	0.666
Weighted Cohen's Kappa	0.460

If we look at the charts comparing the frequencies observed in the two evaluations (Fig. 6), we can also see that they do not particularly differ. Rather, they appear to be quite similar.

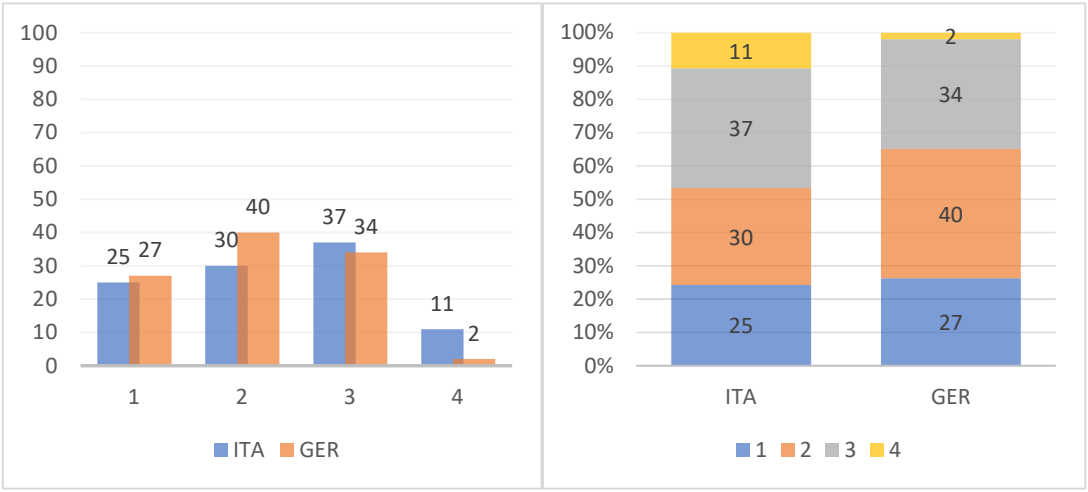

*Fig. 6. On the left, a clustered bar chart comparing Italian (ITA) and German (GER) ratings for each specific value in the range of the '**bizarreness**' variable (1-4). Above each bar there is the frequency of the observed value for the given evaluation. To the right, a cumulative bar chart representing the same data as the adjacent chart, but providing a better 'top-down view' of the two assessments.*

About the 'positive emotions' and 'negative emotions' scales, the results seem much less promising. In fact, from the respective observed frequency tables (Tab. 3), we can see less overlap in the ratings. Furthermore, the inter-rater correlations are approximately **0.44** for '**positive emotions**' and **0.53** for '**negative emotions**', respectively.

*Tab. 3. Contingency tables of the observed frequencies of the variables 'positive emotions' and 'negative emotions'. On the top the '**positive emotions**' table, and on the bottom the '**negative emotions**' table. In the rows the ratings in Italian (ITA), in the columns those in German (GER). Next to the tables the respective indices '% (percent) agreement', 'correlation', 'weighted Cohen's Kappa'.*

2.1 POSITIVE EMOTIONS

ITA \ GER	1	2	3	4	
1	22	28	24	8	**82**
2		1			**1**
3		2	4	1	**7**
4		1	4	8	**13**
	22	**32**	**32**	**17**	**103**

% of Agreement	33.98%
Correlation	0.444
Weighted Cohen's Kappa	0.246

2.2 NEGATIVE EMOTIONS

ITA \ GER	1	2	3	4	
1	50	22	2	2	**76**
2	1	4	3		**8**
3	1	1	2	3	**7**
4	3	2	4	3	**12**
	55	**29**	**11**	**8**	**103**

% of Agreement	57.28%
Correlation	0.526
Weighted Cohen's Kappa	0.404

Observing the charts for the two scales (Fig. 7; Fig. 8), we can see a significant inconsistency concerning the '0' ratings (emotionally neutral dream). On both the 'positive emotions' and 'negative emotions' scales, the rating given on the dream reports translated into Italian seems to be more neutral. Especially in the case of the former.

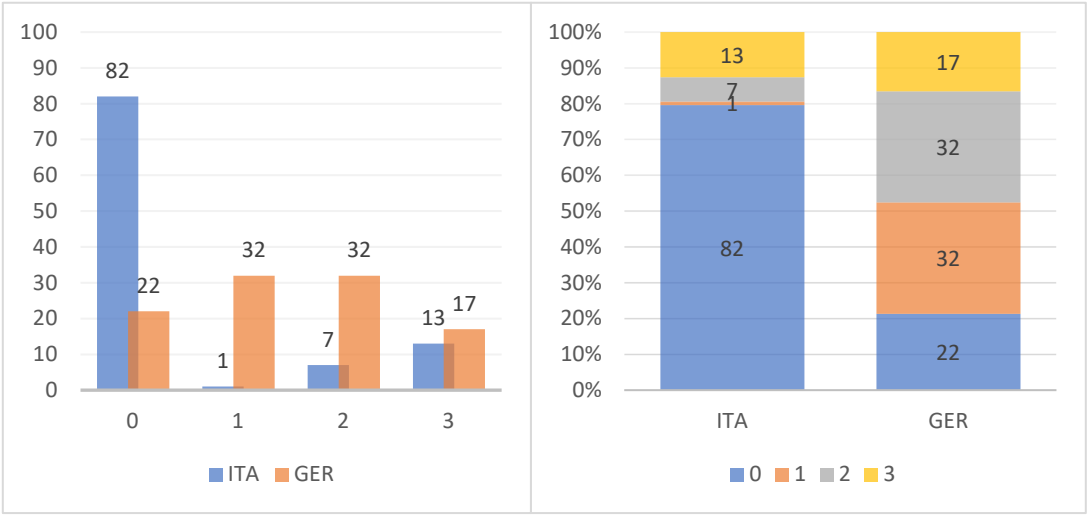

*Fig. 7. On the left, a clustered bar chart comparing the Italian (ITA) and German (GER) ratings for each specific value in the range of the variable '**positive emotions**' (0-3). Above each bar there is the frequency of the observed value for the given evaluation. To the right, a cumulative bar chart representing the same data as the adjacent chart, but providing a better 'top-down view' of the two assessments.*

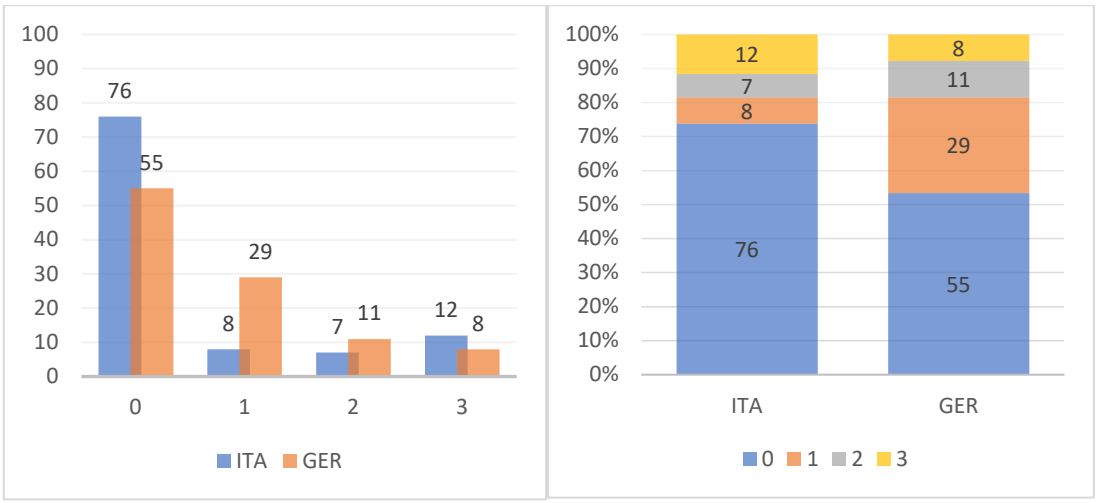

*Fig. 8. On the left, a clustered bar chart comparing the Italian (ITA) and German (GER) ratings for each specific value in the range of the variable '**negative emotions**' (0-3). Above each bar there is the frequency of the observed value for the given evaluation. To the right, a cumulative bar chart representing the same data as the adjacent chart, but providing a better 'top-down view' of the two assessments.*

In absolute terms, the scale where there is the highest inter-rater correlation is the '**people number**' one, with about **0.95**. In fact, looking at the comparison plot on the individual dream report ratings, we can see a good congruence (Fig. 9). And the scatter plot also confirms an almost perfect correlation (Fig. 10).

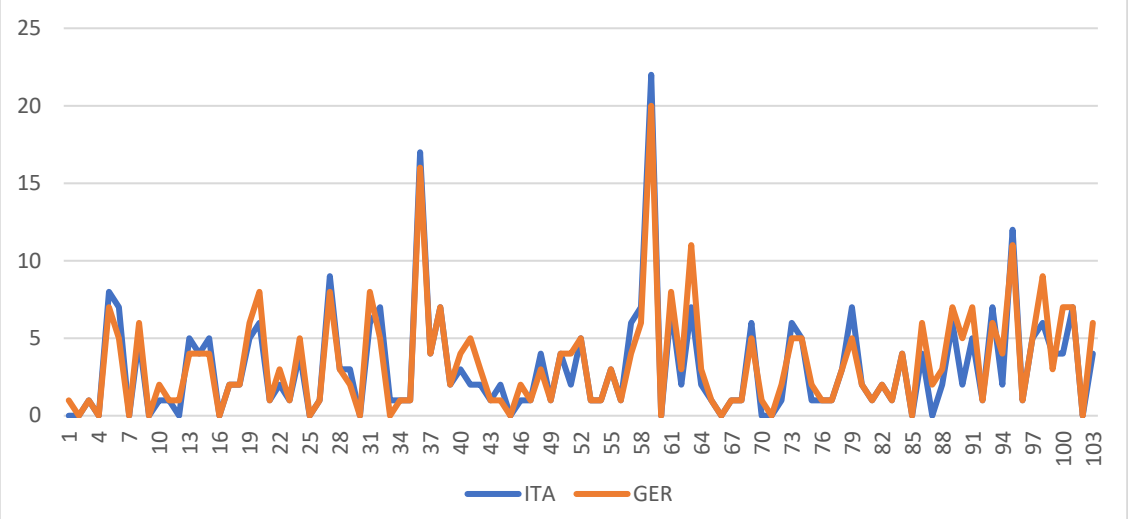

*Fig. 9. Comparison line diagram for the assessment of '**people number**' in the individual dream reports. The blue line refers to assessments made in Italian (ITA); the red line refers to assessments made in German (GER).*

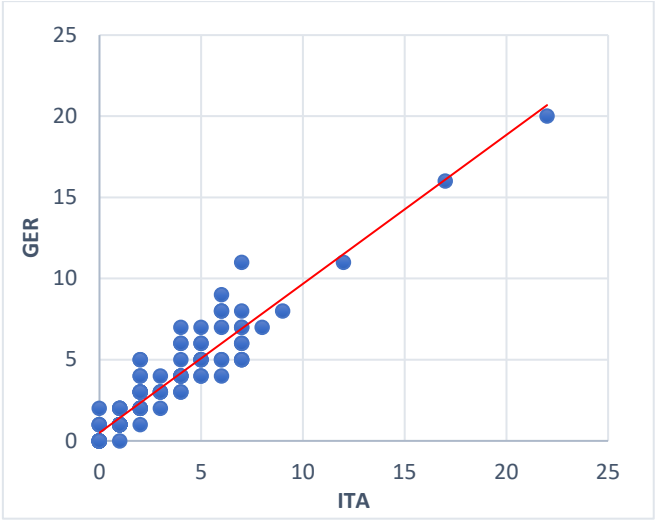

*Fig. 10. Scatter plot for the inter-rater correlation comparing the assessment of the '**people number**' in Italian (ITA) and German (GER). The co-ordinates of each point coincide with the assessment given in the two languages to the individual dream report. Many points are overlapping.*

All of the following scales are dichotomous (yes/no), which is why we will not use correlation, but accuracy, specificity and sensitivity, assuming the original language rating as true.

The first of these dichotomous scales we will discuss are the 'verbal interaction' and the 'physical contact' ones, which show very good inter-rater overlap. Indeed, as we can see in the respective tables (Tab. 4), there is an accuracy of **0.92** in '**verbal interaction**' and **0.96** in '**physical contact**'.

*Tab. 4. On the left, '**verbal interaction**' scale: contingency table of observed frequencies for comparison of assessment in Italian (ITA) and German (GER). Beside the respective accuracy, sensitivity, and specificity values. On the right, '**physical contact**' scale: contingency table of the frequencies observed for the comparison between the assessment in Italian (ITA) and in German (GER). Beside the respective accuracy, sensitivity, and specificity values.*

4.1 VERBAL INTERACTION

		GER			
		no	yes		
ITA	no	43	5	48	Specificity 0.896
	yes	3	52	55	Sensitivity 0.945
		46	57	103	Accuracy **0.922**

4.2 PHYSICAL CONTACT

		GER			
		no	yes		
ITA	no	96	3	99	Specificity 0.970
	yes	1	3	4	Sensitivity 0.750
		97	6	103	Accuracy **0.961**

Moving to the four sub-scales of aggression ('**verbal aggression by dreamer**', '**verbal aggression to dreamer**', '**physical aggression by dreamer**', '**physical aggression to dreamer**'), they all show a strong inter-rater overlap. In fact, they share the same accuracy value: **0.98**. Albeit with variations in specificity and sensitivity (Tab. 5).

*Tab. 5. Contingency tables of aggression subscales. Next to each one the respective accuracy, specificity, and sensitivity values. Top left, '**verbal aggression by dreamer**' scale; top right, '**verbal aggression to dreamer**' scale; bottom left, '**physical aggression by dreamer**' scale; bottom right, '**physical aggression to dreamer**' scale.*

5.1 VERBAL AGGRESSION by dreamer

ITA \ GER	no	yes		
				Accuracy **0.981**
no	99	1	100	Specificity 0.990
yes	1	2	3	Sensitivity 0.667
	100	3	103	

5.2 VERBAL AGGRESSION to dreamer

ITA \ GER	no	yes		
				Accuracy **0.981**
no	100	2	102	Specificity 0.980
yes		1	1	Sensitivity 1.000
	100	3	103	

5.3 PHYSICAL AGGRESSION by dreamer

ITA \ GER	no	yes		
				Accuracy **0.981**
no	100	2	102	Specificity 0.980
yes		1	1	Sensitivity 1.000
	100	3	103	

5.4 PHYSICAL AGGRESSION to dreamer

ITA \ GER	no	yes		
				Accuracy **0.981**
no	100	2	102	Specificity 0.980
yes		1	1	Sensitivity 1.000
	100	3	103	

Finally, we have the sub-scales of the special themes. The '**explicit listening**' scale shows good accuracy with **0.75**. The same applies to the '**stimulus incorporation**' scale with **0.84**. In contrast, the '**laboratory incorporation**' scale seems to be less satisfactory with **0.55**. Looking at the contingency tables, it is easy to see that the subscales of special topics are those with the greatest variability, proving to be the least accurate dichotomous indices in the analysis of the content of the dream reports (Tab. 6).

*Tab. 6. Contingency tables of special themes subscales. Next to each one the respective accuracy, specificity, and sensitivity values. Top left, '**explicit listening**' scale; top right, '**stimulus incorporation**' scale; bottom left, '**laboratory incorporation**' scale.*

6.1 EXPLICIT LISTENING

ITA \ GER	no	yes		
				Accuracy **0.748**
no	39	20	59	Specificity 0.661
yes	6	38	44	Sensitivity 0.864
	45	58	103	

6.2 STIM INCORPORATION

ITA \ GER	no	yes		
				Accuracy **0.845**
no	76	10	86	Specificity 0.884
yes	6	11	17	Sensitivity 0.647
	82	21	103	

6.3 LAB INCORPORATION

ITA \ GER	no	yes		
				Accuracy **0.553**
no	36	19	55	Specificity 0.655
yes	27	21	48	Sensitivity 0.438
	63	40	103	

Limits

The limitations of this study are various, both because of intrinsic issues of the object of study (i.e. dreams) and because of issues related to the used scales.

First of all, as we mentioned earlier, we have no way of directly studying the content of the dream, so we are forced to use a mediator: the dream report. In the study by Peters et al. (2023), the dream reports were collected verbally, via audio recording. They were then transcribed and processed. This methodological choice on the one hand allows the preservation of various non-verbal signals of the dreamer's communication, such as pauses, lapses, vocalisations of uncertainty (e.g. ‘emh’), and inconsistencies in the narrative. On the other hand, it preserves the 'dream time' by following the events of the story, rather than the order of those chronologically perceived by the dreamer (not failing, however, to leave his or her indications, with respect to this perception). However, this makes the dream much less comprehensible, more confusing, and thus also more difficult to assess. Causing the content analysis to show its side to the very threat it seeks to avoid and contain: the individual interpretation of the rater. And I am not only referring to the final assessment of the content, but also the audio transcription requires a dose of interpretation that should not be underestimated.

Furthermore, this type of dream report loses a considerable amount of information due to the lack of description (perhaps too tedious) of certain elements. We must keep in mind that the audio recordings were made by waking the dreamer up in the middle of the night. This leads to an obvious slowing down of the dreamer's cognitive faculties, who will not describe in detail what he/she experienced because he/she will not be able to assess the salient elements to be communicated (e.g. bizarre features or emotions felt).

Secondly, the scale of 'bizarreness' is partially based on an overly vague and culturally determined concept. Its criteria, apart from those referring to physically impossible events in the real world, leave too much ground for personal interpretation. Similar is the question of emotion scales, whose criteria are even more vague. Regarding the scales on special topics, they have no existing statistical basis. They constitute the exploratory component of the study. Moreover, of these, the 'laboratory incorporation' scale has vague assessment criteria that arbitrarily appeal to interpretation. It refers to both direct and indirect

incorporation: while the former is quite easy to identify, the latter is not and leaves space for high inter-rater variability.

Finally, the dream reports were translated into Italian automatically and without adaptation other than the one performed by ChatGPT 4.0. This may lead to errors and maladaptation of meaning, as well as an additional loss of information, resulting in possible distortions in the assessment of the content.

Discussion

The purpose of this thesis is to understand whether the translation of dream reports compromises the content analysis. As is often the case in psychology, the answer is neither yes nor no.

Looking at the results for the dichotomous variables of interaction and aggression, we can be satisfied with the overlap between the two evaluations. In fact, the assessment in Italian was decidedly consistent with that in German, showing accuracy indices between ~0.92 and ~0.98 (Tab. 4; Tab. 5). The same can be said of the 'people number' scale with its correlation of ~0.95. The overlap between the ratings is more than satisfactory when looking at the graph in Fig. 9. This is due to an excellent decoding system for the people count, which rarely leaves any doubt. Thus, the slight differences presented are likely to be explained by normal inter-rater variability caused by personal errors. Furthermore, a partial distortion of the dream reports due to the translation of the A.I. may also play a role in this.

The Achilles' heel of this analysis is the variables of 'bizarreness', 'positive emotions' and 'negative emotions'. The former aims at quantifying a decidedly complex and culturally determined element, and unfortunately fails in its intent to be so applied even in Italian. In fact, the indices are not satisfactory: the scale's reliability does not seem to be preserved when the evaluation is carried out on translated content. Certainly, as with the other indices, there may be an element of textual distortion on the part of ChatGPT, but the discrepancy is so wide that it cannot be explained by this factor alone. On the one hand, the evaluation criteria for the 'bizarreness' scale were not sufficiently clear, leaving room for personal interpretation. This was not so much due to inadequate work on the part of the

authors, but rather because bizarreness is a complex concept and difficult to harness in unambiguous criteria. On the other hand, we might speculate that cultural factors relating to the meaning of the term 'bizarre' come into play. Indeed, looking at the charts relating to the frequencies of this variable in Fig. 6, we can see that the German rater seems to categorise more dreams in the first half of the scale (1-2) than the Italian rater, who instead categorised more dreams in the second half (3-4). The first criteria refer to impossible or strange events for the dreamer, whereas the others refer to physically impossible events. This difference, although interesting, is not very large, so it could be explained by differences in individual interpretation. A further question remains: would the inter-rater difference also emerge when applying the scale to dream reports whose original language is Italian? By this I do not only mean an ITA-GER reverse comparison, but also a comparison between sets of Italian evaluations on Italian dreams and Italian evaluations on translated dreams.

Moreover, the obvious difference in the overlapping of evaluations between dichotomous scales and the 'bizarreness' scale may be fuelled by a conceptual problem: unlike the other cases where the presence or absence of a specific factor is evaluated (e.g. physical contact or verbal aggression of the dreamer), we are here trying to assess a much more complex concept. It might be a good idea, in order to overcome this difference, to develop a new scale that reduces the concept of 'bizarreness' to a minimum, giving more specific criteria. In this way, we would have a useful tool to assess cultural differences in dreams.

Further studies are needed to identify the role of scale characteristics, individual differences and cultural differences in the assessment of bizarreness in content.

An even more problematic case is perhaps the one of emotion scales. They show decidedly insufficient agreement among the raters. The 'positive emotions' scale is the one that suffers most from translation, showing a very low percentage of agreement (~34%), a correlation that is not encouraging given the context (~0.44), and a very low weighted Cohen's Kappa (~0.25). As we can see in FIG7, the evaluation overestimates 0 (emotional neutrality) (Tab. 3). This effect can be explained by several factors. First of all, the two evaluations started from two different pre-elaborations of dream reports. Incorrect processing can lead to

a loss of information or bias in the assessment. Then, presumably, part of the discrepancy is explained by distortions in machine translation, which struggles to transpose the intensity of emotions in appropriate terms. An example of these factors is the following dream (text translated into English):

ITA	GER
I was in this sleep lab or something, or at least it looked quite similar. And you were there too, but there were also other people, some women. They were just there. And I was lying here, and at some point something happened. And I thought I had a lucid dream very briefly – so: in the dream. And then I called one of you or something, and then you came here, and then I explained it. And then there was something else about how I first briefly talked to a strange woman who was there, about some spiritual movement – really weird. And then I heard the signal, at first I was super confused, but for some reason, I was able to stay a bit in the dream, or let myself fall back into the dream a bit. That was somewhat controlled by me. I talked with [VL1] or something. +++ I was at a Buddhist-You-Festival for New Year's Eve again, for the third time, a meeting of young people over a few days who are interested in Buddhism and meditation. And it's in some kind of castle hotel or so. And it was a bit similar because these women who were also here, they were cooking or something. Or at least preparing stuff, as one would do there. At some point, I went for a walk with some guy I didn't know – to buy some stuff, food or so, but I didn't have enough money with me, and he lent me some or something. Then we passed a church. And then there was Mr. S., the director of the music school where I used to take piano lessons years ago. And Mr. S. – I found out a few months ago that he has cancer, quite seriously. In the dream, he looked totally fragile, old, and also a bit	So, I was back here in this sleep laboratory or something, or at least it looked quite similar. It looked like a Buddhist-You Festival. And you were there, but also other people, some women. They were just there. These women, who were here, were cooking or something. And I was lying here, and at some point something happened. And I thought I had briefly had a lucid dream. And then I think I called one of you or something, and then you came here, and then I explained it. I have no idea. And then there was something else, about how I had a brief conversation with a strange woman who was there, about some kind of spiritual movement – really weird. I think I had a conversation with [VL1] or something. So with this guy, I went for a walk to buy stuff, food or something, and I didn't have enough money with me, and then he lent me some or something. Then we passed a church. And there stood Mr. S., he is the director of the music school where I used to take piano lessons years ago. Anyway, he looked totally fragile, old, and a bit sad and bitter, and I felt terribly sorry for him because I thought: "Oh no. He's probably going to die soon." But I didn't want to stay there too long. It was not so pleasant, and then we moved on – as I said, we wanted to go shopping. But somehow we didn't end up going shopping there, but there was like a meadow or something, and there were people – kind of picnic-like, scattered, and they were sitting around. There were a few guys who had dressed up in a strange way, all in black and some weird stuff

sad and bitter, and I felt terribly sorry for him because I thought: "Oh no. He'll probably die soon." But I also didn't want to stay there too long. It wasn't that pleasant, and then we continued to shop. But somehow, we didn't end up shopping there but ended up on a meadow or something, and there were people – kind of picnic-like, scattered around, sitting there. There were a few guys who dressed up weirdly, all in black and strange things on their heads, a bit creepy. I didn't like that. But it was just a costume. I think my mother was even there. Anyway, I probably sat down somewhere.	on their heads, a bit creepy. I didn't like that. But it was just a disguise. I believe my mother was even there. I perceived the stimulus. I didn't wake up at the first stimulus. But at the second one I did. I don't know if it was a lucid dream. I think that would go in the direction of a lucid dream, right? Because it continued for a really short time and it felt a bit different than usual, because I really had this feeling – really like sinking, a bit of sinking back into sleep or into the dream. I experienced strong positive feelings and some negative feelings.

As can be seen, the texts differ considerably. The one on the right (GER evaluation) concludes with a direct comment on the emotions felt, this was eliminated from the processing on the left (ITA evaluation) because it is somewhat 'external' to the dream content and tends to be inconsistent with what was expressed during the verbalisation of the dream plot. The retention of this component inevitably leads to a bias in the assessment of the content, as it drives the rater to focus on that sentence rather than on the actual dream content. In fact, the GER rating for this dream was 3/4 for 'positive emotions' and 1/4 for 'negative emotions'. In contrast, the Italian one was 0/4 and 3/4. One has to wonder which of the two evaluations is more truthful: the one directly expressed or the one intuited from the dreamer's comments during the narration of the dream.

Moreover, here another critical issue emerges that was not previously considered: do the rules of dream processing fail to ensure a unambiguous text from the dream, or did those who processed these dream reports make individual errors that had a cascading effect on the final evaluations of the content? This, as well as many other factors, call into question the trustfulness of dream reports, highlighting the need to find an alternative method of analysing dreams than the one used here (audio recording and transcription by the experimenter).

Dealing specifically with the 'negative emotions' scale, the indices are still not promising, albeit better than the 'positive emotions'. The reasons for this may

be similar to what was reported for the previous scale, but the results may also imply a greater salience of the negative emotions, which are therefore more frequently mentioned within the reports, thus bridging the bias given by the processing. This would be consistent with what the Activation of Reward Model (RAM) proposes (Perogamvros & Schwartz, 2012), potentially refuting the Freudian conception of dreams as wish fulfilment (Freud, 1900). In this regard, it would be interesting to observe possible cross-cultural differences in the frequency and intensity of positive and negative emotions in future studies.

Finally, the ratings on the special topics scales also proved to be fairly consistent. Except for the 'lab incorporation' scale, which shows an accuracy level of ~0.55, and a probability of 'false positive' of ~0.56. This is explained by poor evaluation criteria that leave ample room for personal interpretation. The results obtained from the special topics comparison seem to emphasise again that, with comprehensive and adequate criteria, the dichotomous scales manage to capture the measured phenomenon well both in the original language and in the translated reports.

Conclusion

So, does the translation of dream reports negatively influence the content analysis? It is possible, but to state this we should be able to reduce interference from many other factors.

This research question is rooted in what is one of my concerns: linguistic relativity. Dreams and language are two complicated and vast topics. And when you are forced to study one, using the other as a tool, it is like wearing a double lens that risks distorting reality. This is why I am very sceptical about the effectiveness of dream reports. Surely, there is a more reliable way of collecting them than the experimenter transcription. Perhaps already letting the dreamer write down the dream himself could make the content more truthful. In fact, one might speculate that language may contribute to the integrative function between the visual and emotional episodes postulated by Seligman & Yellen (1987). Thus, by involving writing, one is forced into a more coherent integration than mere verbalisation can do overnight. However, it must be clarified whether such

integration can be defined as part of the actual dream or not. If not, language would inevitably distort the content, so it would be interesting to evaluate a dream report by drawing, for example. This would make it possible, on one hand, to describe certain features of the objects that would otherwise be difficult to explain in words (an example of this in Fig. 11); and on the other, to carry out on paper what the mind already does when it generates a dream: content condensation (Freud, 1900). Clearly this type of dream report is not very feasible, it is more likely to integrate the space for a possible drawing in a sheet to guide the writing of the dream. In the future, we may no longer have to draw on language to study dreams, thanks to their transmission on a screen (Miyawaki et al., 2008). But until then, we have to deal with it.

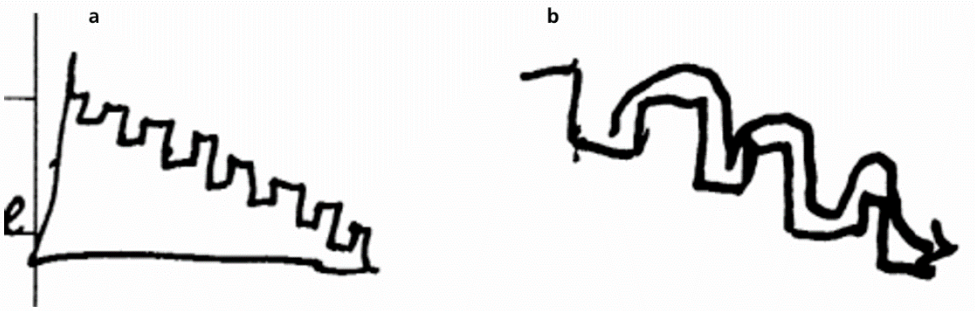

Fig. 11. Drawings made by a dreamer to explain elements in its dream: a) to describe the rows of wooden seats in the stadium where it was with its children; b) to describe the bizarre fall of its son down the stairs (Schredl, 2003)

With regard to inter-linguistic differences, I feared that the translation and evaluation of the dreams by a person foreign to the German context would completely distort the results. This happened to some extent, but it is difficult to identify what role cross-cultural cognitive differences play in this. Certainly, some information or shades were lost in the process, but not so dramatically as to compromise the content analysis. If it had been a dream interpretation, the result would probably have been quite different, but it is still difficult to determine how much.

Regarding translation, ChatGPT 4.0 manages to perform its task sufficiently well. However, translation and manual adaptation by an interpreter (the word alone can be hilarious and paradoxical for our purpose) could provide a better text for analysis (catching even the details).

In conclusion, we can say that, for research purposes, it seems possible to translate and analyse content without running into substantial errors. Provided,

however, that the scales used are well defined, reliable and minimised. Otherwise, there is a risk of running into cultural differences in conceptualisation that may compromise the analysis.

Bibliography

Adcock, R. A., Thangavel, A., Whitfield-Gabrieli, S., Knutson, B., & Gabrieli, J. D. E. (2006). Reward-Motivated Learning: Mesolimbic Activation Precedes Memory Formation. *Neuron*, *50*(3), 507–517. https://doi.org/10.1016/j.neuron.2006.03.036

Alcaro, A., Huber, R., & Panksepp, J. (2007). Behavioral functions of the mesolimbic dopaminergic system: An affective neuroethological perspective. *Brain Research Reviews*, *56*(2), 283–321. https://doi.org/10.1016/j.brainresrev.2007.07.014

Alcaro, A., & Panksepp, J. (2011). The SEEKING mind: Primal neuro-affective substrates for appetitive incentive states and their pathological dynamics in addictions and depression. *Neuroscience & Biobehavioral Reviews*, *35*(9), 1805–1820. https://doi.org/10.1016/j.neubiorev.2011.03.002

Ameel, E., Storms, G., Malt, B. C., & Sloman, S. A. (2005). How bilinguals solve the naming problem. *Journal of Memory and Language*, *53*(1), 60–80. https://doi.org/10.1016/j.jml.2005.02.004

Antrobus, J. (1991). Dreaming: Cognitive processes during cortical activation and high afferent thresholds. *Psychological Review*, *98*(1), 96–121. https://doi.org/10.1037/0033-295X.98.1.96

APA Dictionary of Psychology. (2018, April 19). APA Dictionary of Psychology. https://dictionary.apa.org/dream

Balon, R. (1996). Bupropion and nightmares. *The American Journal of Psychiatry*, *153*(4), 579–580. https://doi.org/10.1176/ajp.153.4.579b

Barth, F. (1993). *Balinese Worlds*. University of Chicago Press.

Berner, W. (2018). Traumtheorie von Freud bis Bion. In *Von Irma zu Amalie. Der Traum und Seine Psychoanalytische Bedeutung im Wandel der Zeit* (pp. 83–96). Psychosozial.

Billman, D., Swilley, A., & Krych, M. (2000). Path and Manner Priming: Verb Production and Event Recognition. *Proceedings of the Annual Meeting of the Cognitive Science Society*, *22*. https://escholarship.org/uc/item/2f5769m9

Bion, W. R. (1962). A Theory of Thinking. In *Melanie Klein Today, Vol. 1* (pp. 178–186). Routledge.

Bion, W. R. (1967). *Cogitations*. Karnak.

Bischof, M., & Bassetti, C. L. (2004). Total dream loss: A distinct neuropsychological dysfunction after bilateral PCA stroke. *Annals of Neurology*, *56*(4), 583–586. https://doi.org/10.1002/ana.20246

Bloom, P. (1994). Generativity within language and other cognitive domains. *Cognition*, *51*(2), 177–189. https://doi.org/10.1016/0010-0277(94)90014-0

Bloom, P., & Keil, F. C. (2001). *Thinking Through Language*.

Bohleber, W. (2012). Neue Befunde zum Traum und Seine Bedeutung. *PSYCHE*, *66*, 769–775.

Boroditsky, L., Scmidt, L. A., & Phillips, W. (2003). Sex, syntax and semantics. In *Language in mind: Advances in the study of language and thought* (pp. 61–79). Boston Review. https://doi.org/10.7551/mitpress/4117.001.0001

Bowerman, M. (1996). The origins of children's spatial semantic categories: Cognitive versus linguistic determinants. In *Rethinking linguistic relativity* (pp. 145–176). Cambridge University Press.

Bradley, K. C., Dax, E. C., & Walsh, K. W. (1958). Modified Leucotomy: Report of 100 Cases. *Medical Journal of Australia*, *1*(5), 133–138. https://doi.org/10.5694/j.1326-5377.1958.tb86117.x

Braun, A. R., Balkin, T. J., Wesensten, N. J., Gwadry, F., Carson, R. E., Varga, M., Baldwin, P., Belenky, G., & Herscovitch, P. (1998). Dissociated Pattern of Activity in Visual Cortices and Their Projections During Human Rapid Eye Movement Sleep. *Science*, *279*(5347), 91–95. https://doi.org/10.1126/science.279.5347.91

Braun, A. R., Balkin, T. J., Wesenten, N. J., Carson, R. E., Varga, M., Baldwin, P., Selbie, S., Belenky, G., & Herscovitch, P. (1997). Regional cerebral blood flow throughout the sleep-wake cycle. An H2(15)O PET study. *Brain*, *120*(7), 1173–1197. https://doi.org/10.1093/brain/120.7.1173

Cartwright, R. (1991). Dreams that work: The relation of dream incorporation to adaptation to stressful events. *Dreaming*, *1*(1), 3–9. https://doi.org/10.1037/h0094312

Cartwright, R. (2005). Dreaming as a Mood Regulation System. In *Principles and Practice of Sleep Medicine* (pp. 565–572). Elsevier Saunders.

Cartwright, R., Agargun, M., Kirkby, J., & Friedman, J. K. (2006). Relation of dreams to waking concerns. *Psychiatry Research*, *141*(3), 261–270. https://doi.org/10.1016/j.psychres.2005.05.013

Cartwright, R., Luten, A., Young, M., Mercer, P., & Bears, M. (1998). Role of REM sleep and dream affect in overnight mood regulation: A study of normal volunteers. *Psychiatry Research*, *81*(1), 1–8. https://doi.org/10.1016/S0165-1781(98)00089-4

Casasola, M. (2005). Can Language Do the Driving? The Effect of Linguistic Input on Infants' Categorization of Support Spatial Relations. *Developmental Psychology*, *41*(1), 183–192. https://doi.org/10.1037/0012-1649.41.1.183

Cathala, H. P., Laffont, F., Siksou, M., Esnault, S., Gilbert, A., Minz, M., Moret-Chalmin, C., Buzaré, M. A., & Waisbord, P. (1983). Sleep and dreams in patients with parietal and frontal lobe lesions. *Revue neurologique*, *139*(8–9), 497–508.

Cheney, D. L., & Seyfarth, R. M. (1990). The representation of social relations by monkeys. *Cognition*, *37*(1), 167–196. https://doi.org/10.1016/0010-0277(90)90022-C

Choi, S. (2006). Influence of language-specific input on spatial cognition: Categories of containment. *First Language*, *26*(2), 207–232. https://doi.org/10.1177/0142723706060748

Choi, S., & Bowerman, M. (1991). Learning to express motion events in English and Korean: The influence of language-specific lexicalization patterns. *Cognition*, *41*(1), 83–121. https://doi.org/10.1016/0010-0277(91)90033-Z

Christie, S., & Gentner, D. (2012). Language and cognition in development. In *The Cambridge handbook of psycholinguistics* (pp. 653–673). Cambridge University Press. https://doi.org/10.1017/CBO9781139029377.044

Dang-Vu, T. T., Schabus, M., Desseilles, M., Albouy, G., Boly, M., Darsaud, A., Gais, S., Rauchs, G., Sterpenich, V., Vandewalle, G., Carrier, J., Moonen, G., Balteau, E., Degueldre, C., Luxen, A., Phillips, C., & Maquet, P. (2008). Spontaneous neural activity during human slow wave sleep. *Proceedings of the National Academy of Sciences*, *105*(39), 15160–15165. https://doi.org/10.1073/pnas.0801819105

Dehaene, S. (1997). *The Number Sense: How the Mind Creates Mathematics*. Oxford University Press.

Dehaene, S., Spelke, E., Pinel, P., Stanescu, R., & Tsivkin, S. (1999). Sources of Mathematical Thinking: Behavioral and Brain-Imaging Evidence. *Science*, *284*(5416), 970–974. https://doi.org/10.1126/science.284.5416.970

Domhoff, G. W. (1996). *Finding Meaning in Dreams: A Quantitative Approach*. Springer Science & Business Media.

Ermann, M. (1955). Die Traumerinnerung bei Patienten mit Psychogenen Schlafstörungen. Empirische Befunde und Einige Folgerungen für das Verständnis des Träumens. In *Traum und Gedächtnis*. LIT-Verlag.

Ermann, M. (2020). *Träume und Träumen*. Kohlhammer Verlag.

Feinberg, I., & Floyd, T. C. (1979). Systematic trends across the night in human sleep cycles. *Psychophysiology*, *16*(3), 283–291. https://doi.org/10.1111/j.1469-8986.1979.tb02991.x

Fosse, R., Stickgold, R., & Hobson, J. A. (2001). Brain-Mind States: Reciprocal Variation in Thoughts and Hallucinations. *Psychological Science*, *12*(1), 30–36. https://doi.org/10.1111/1467-9280.00306

Frank, M. C., Everett, D. L., Fedorenko, E., & Gibson, E. (2008). Number as a cognitive technology: Evidence from Pirahã language and cognition. *Cognition*, *108*(3), 819–824. https://doi.org/10.1016/j.cognition.2008.04.007

Freud, S. (1900). *L'interpretazione dei sogni* (I Grandi Pensatori). Bollati Boringhieri. www.bollatiboringhieri.it

Freud, S. (1916). Introductory Lectures on Psycho-Analysis. In *Myths and Mythologies*. Routledge.

Freud, S. (1933). *New introductory lectures on psycho-analysis* (p. 257). W W Norton & Co.

Fu, J., Li, P., Ouyang, X., Gu, C., Song, Z., Gao, J., Han, L., Feng, S., Tian, S., & Hu, B. (2007). Rapid eye movement sleep deprivation selectively impairs recall of fear extinction in hippocampus-independent tasks in rats. *Neuroscience*, *144*(4), 1186–1192. https://doi.org/10.1016/j.neuroscience.2006.10.050

Gaillard, J.-M., & Moneme, A. (1977). Modification of dream content after preferential blockade of mesolimbic and mesocortical dopaminergic systems. *Journal of Psychiatric Research*, *13*(4), 247–256. https://doi.org/10.1016/S0022-3956(77)90020-6

Gallistel, C. R. (1990). *The organization of learning* (pp. viii, 648). The MIT Press.

Gallistel, C. R. (2002). Language and spatial frames of reference in mind and brain. *Trends in Cognitive Sciences*, *6*(8), 321–322. https://doi.org/10.1016/S1364-6613(02)01962-9

Gennari, S. P., Sloman, S. A., Malt, B. C., & Fitch, W. T. (2002). Motion events in language and cognition. *Cognition*, *83*(1), 49–79. https://doi.org/10.1016/S0010-0277(01)00166-4

Gentner, D. (2003). Why we're so smart. In *Language in mind: Advances in the study of language and thought* (pp. 195–235). Boston Review. https://doi.org/10.7551/mitpress/4117.001.0001

Gentner, D., & Goldin-Meadow, S. (2003). *Language in Mind: Advances in the Study of Language and Thought*. The MIT Press. https://doi.org/10.7551/mitpress/4117.001.0001

Gentner, D., & Namy, L. L. (1999). Comparison in the Development of Categories. *Cognitive Development*, *14*(4), 487–513. https://doi.org/10.1016/S0885-2014(99)00016-7

Gilbert, A. L., Regier, T., Kay, P., & Ivry, R. B. (2006). Whorf hypothesis is supported in the right visual field but not the left. *Proceedings of the National Academy of Sciences*, *103*(2), 489–494. https://doi.org/10.1073/pnas.0509868103

Gleitman, L., & Papafragou, A. (2005). Language and Thought. In *The Cambridge handbook of thinking and reasoning* (pp. 633–661). Cambridge University Press.

Godwin, M. (1994). *The Lucid Dreamer: A Waking Guide for the Traveller Between Worlds*. Simon & Schuster. https://cir.nii.ac.jp/crid/1130000796059614080

Gordon, P. (2004). Numerical Cognition Without Words: Evidence from Amazonia. *Science*, *306*(5695), 496–499. https://doi.org/10.1126/science.1094492

Gordon, P. (2010). *Worlds without Words: Commensurability and Causality in Language, Culture and Cognition* (pp. 199–218). https://doi.org/10.1093/acprof:oso/9780195311129.003.0011

Gumperz, J. J., & Levinson, S. C. (1996). *Rethinking Linguistic Relativity*. Cambridge University Press.

Haber, S. N., & Knutson, B. (2010). The Reward Circuit: Linking Primate Anatomy and Human Imaging. *Neuropsychopharmacology*, *35*(1), 4–26. https://doi.org/10.1038/npp.2009.129

Hall, C. (1966). *The meaning of dreams* (pp. xxv, 244). McGraw-Hill.

Hall, C. S., & Van De Castle, R. L. (1966). *The content analysis of dreams* (pp. xiv, 320). Appleton-Century-Crofts.

Hare, B., Call, J., & Tomasello, M. (2001). Do chimpanzees know what conspecifics know? *Animal Behaviour*, *61*(1), 139–151. https://doi.org/10.1006/anbe.2000.1518

Hartmann, E. (1998). *Dreams and nightmares: The new theory on the origin and meaning of dreams* (pp. x, 315). Plenum Trade.

Haun, D. B. M., Rapold, C. J., Call, J., Janzen, G., & Levinson, S. C. (2006). Cognitive cladistics and cultural override in Hominid spatial cognition. *Proceedings of the National Academy of Sciences*, *103*(46), 17568–17573. https://doi.org/10.1073/pnas.0607999103

Heien, M. L. A. V., & Wightman, R. M. (2006). Phasic Dopamine Signaling During Behavior, Reward, and Disease States. *CNS & Neurological Disorders - Drug Targets- CNS & Neurological Disorders)*, *5*(1), 99–108. https://doi.org/10.2174/187152706775535669

Hespos, S. J., & Spelke, E. S. (2004). Conceptual precursors to language. *Nature*, *430*(6998), 453–456. https://doi.org/10.1038/nature02634

Hobson, J. A., & McCarley, R. W. (1977). The brain as a dream state generator: An activation-synthesis hypothesis of the dream process. *The American Journal of Psychiatry*, *134*(12), 1335–1348. https://doi.org/10.1176/ajp.134.12.1335

Hobson, J. A., Pace-Schott, E. F., & Stickgold, R. (2000). Dreaming and the brain: Toward a cognitive neuroscience of conscious states. *Behavioral and Brain Sciences*, *23*(6), 793–842. https://doi.org/10.1017/S0140525X00003976

Hobson, J. A., Pace-Schott, E. F., Stickgold, R., & Kahn, D. (1998). To dream or not to dream? Relevant data from new neuroimaging and electrophysiological studies. *Current Opinion in Neurobiology*, *8*(2), 239–244. https://doi.org/10.1016/S0959-4388(98)80146-3

Ikemoto, S. (2007). Dopamine reward circuitry: Two projection systems from the ventral midbrain to the nucleus accumbens–olfactory tubercle complex. *Brain Research Reviews*, *56*(1), 27–78. https://doi.org/10.1016/j.brainresrev.2007.05.004

Imai, M., & Gentner, D. (1997). A cross-linguistic study of early word meaning: Universal ontology and linguistic influence. *Cognition*, *62*(2), 169–200. https://doi.org/10.1016/S0010-0277(96)00784-6

Imai, M. & Mazuka. (2003). Reevaluating Linguistic Relativity: Language-Specific Categories and the Role of Universal Ontological Knowledge in the Construal of Individuation. In *Language in mind: Advances in the study of language and thought* (pp. 430–464). https://doi.org/10.7551/mitpress/4117.003.0022

Jung, C. G. (1954). The Practical use of Dream-Analysis. In *The Practice of Psychotherapy* (pp. 139–162). Pantheon.

Jung, C. G. (1969). General Aspects of Dream Psychology. In *The Structure and Dynamics of the Psyche* (pp. 237–280). Princeton University Press.

Kramer, M., & Hoffmann, R. (1993). *The Functions of Dreaming*. State University of New York Press. https://sunypress.edu/Books/T/The-Functions-of-Dreaming

Kuiken, D., & Sikora, S. (1993). The Impact of Dreams on Waking Thoughts and Feelings. In *The Functions of Dreaming* (pp. 419–476). State University of New York Press.

Levinson, S. C. (1996). Frames of reference and Molyneux's question: Crosslinguistic evidence. In *Language and space* (pp. 109–169). The MIT Press. https://doi.org/10.1146/annurev.anthro.25.1.353

Levinson, S. C. (1997). From outer to inner space: Linguistic categories and non-linguistic thinking. In *Language and Conceptualization* (pp. 13–45). Cambridge University Press.

Levinson, S. C., Kita, S., Haun, D. B. M., & Rasch, B. H. (2002). Returning the tables: Language affects spatial reasoning. *Cognition*, *84*(2), 155–188. https://doi.org/10.1016/S0010-0277(02)00045-8

Li, P., Dunham, Y., & Carey, S. (2009). Of substance: The nature of language effects on entity construal. *Cognitive Psychology*, *58*(4), 487–524. https://doi.org/10.1016/j.cogpsych.2008.12.001

Li, P., & Papafragou, A. (2005, January 1). *Spatial reasoning skills in Tenejapan Mayans*.

Lucy, J. (2010). Language Structure, Lexical Meaning, and Cognition: Whorf and Vygotsky Revisited. In *Words and the Mind: How Words Capture Human Experience*.

Lucy, J. A., & Gaskins, S. (2001). Grammatical categories and the development of classification preferences: A comparative approach. In M. Bowerman & S. Levinson (Eds.), *Language Acquisition and Conceptual Development* (pp. 257–283). Cambridge University Press. https://doi.org/10.1017/CBO9780511620669.011

Lupyan, G. (2006). Labels facilitate learning of novel categories. In *The Evolution of Language* (pp. 190–197). WORLD SCIENTIFIC. https://doi.org/10.1142/9789812774262_0025

Lupyan, G., Rakison, D. H., & McClelland, J. L. (2007). Language is not Just for Talking: Redundant Labels Facilitate Learning of Novel Categories. *Psychological Science*, *18*(12), 1077–1083. https://doi.org/10.1111/j.1467-9280.2007.02028.x

Majid, A., Bowerman, M., Kita, S., Haun, D. B. M., & Levinson, S. C. (2004). Can language restructure cognition? The case for space. *Trends in Cognitive Sciences*, *8*(3), 108–114. https://doi.org/10.1016/j.tics.2004.01.003

Malik, J., Lo, Y.-L., & Wu, H.-T. (2018). Sleep-wake classification via quantifying heart rate variability by convolutional neural network. *Physiological Measurement*, *39*(8), 085004. https://doi.org/10.1088/1361-6579/aad5a9

Malt, B. C., Sloman, S. A., Gennari, S., Shi, M., & Wang, Y. (1999). Knowing versus Naming: Similarity and the Linguistic Categorization of Artifacts. *Journal of Memory and Language*, *40*(2), 230–262. https://doi.org/10.1006/jmla.1998.2593

Malt, B., & Wolff, P. (2010a). The language-thought interface: An introduction. In *Words and the Mind: How words capture human experience* (pp. 3–16). Oxford University Press, USA.

Malt, B., & Wolff, P. (2010b). *Words and the Mind: How words capture human experience*. Oxford University Press, USA.

Mancia, M. (2004). The dream between neuroscience and psychoanalysis. *Archives Italiennes de Biologie*, *142*(4), Article 4. https://doi.org/10.4449/aib.v142i4.423

Maquet, P., Laureys, S., Peigneux, P., Fuchs, S., Petiau, C., Phillips, C., Aerts, J., Del Fiore, G., Degueldre, C., Meulemans, T., Luxen, A., Franck, G., Van Der Linden, M., Smith, C., & Cleeremans, A. (2000). Experience-dependent changes in cerebral activation during human REM sleep. *Nature Neuroscience*, *3*(8), 831–836. https://doi.org/10.1038/77744

Maquet, P., Péters, J.-M., Aerts, J., Delfiore, G., Degueldre, C., Luxen, A., & Franck, G. (1996). Functional neuroanatomy of human rapid-eye-movement sleep and dreaming. *Nature*, *383*(6596), 163–166. https://doi.org/10.1038/383163a0

Maquet, P., Ruby, P., Maudoux, A., Albouy, G., Sterpenich, V., Dang-Vu, T., Desseilles, M., Boly, M., Perrin, F., Peigneux, P., & Laureys, S. (2005). Human cognition during REM sleep and the activity profile within frontal and parietal cortices: A reappraisal of functional neuroimaging data. In S. Laureys (Ed.), *Progress in Brain Research* (Vol. 150, pp. 219–595). Elsevier. https://doi.org/10.1016/S0079-6123(05)50016-5

Massimini, M., Ferrarelli, F., Huber, R., Esser, S. K., Singh, H., & Tononi, G. (2005). Breakdown of Cortical Effective Connectivity During Sleep. *Science*, *309*(5744), 2228–2232. https://doi.org/10.1126/science.1117256

Massimini, M., Ferrarelli, F., Murphy, M. J., Huber, R., Riedner, B. A., Casarotto, S., & Tononi, G. (2010). Cortical reactivity and effective connectivity during REM sleep in humans. *Cognitive Neuroscience*, *1*(3), 176–183. https://doi.org/10.1080/17588921003731578

McDonough, L., Choi, S., & Mandler, J. M. (2003). Understanding spatial relations: Flexible infants, lexical adults. *Cognitive Psychology*, *46*(3), 229–259. https://doi.org/10.1016/S0010-0285(02)00514-5

McHugh, M. L. (2012). Interrater reliability: The kappa statistic. *Biochemia Medica*, *22*(3), 276–282.

Meier, B. (1993). Speech and thinking in dreams. In *Dreaming as cognition* (pp. 58–76). Harvester Wheatsheaf.

Memar, P., & Faradji, F. (2018). A Novel Multi-Class EEG-Based Sleep Stage Classification System. *IEEE Transactions on Neural Systems and Rehabilitation Engineering: A Publication of the IEEE Engineering in Medicine and Biology Society*, *26*(1), 84–95. https://doi.org/10.1109/TNSRE.2017.2776149

Miyawaki, Y., Uchida, H., Yamashita, O., Sato, M., Morito, Y., Tanabe, H. C., Sadato, N., & Kamitani, Y. (2008). Visual Image Reconstruction from Human Brain Activity using a Combination of Multiscale Local Image Decoders. *Neuron*, *60*(5), 915–929. https://doi.org/10.1016/j.neuron.2008.11.004

Montague, P. R., King-Casas, B., & Cohen, J. D. (2006). Imaging Valuation Models in Human Choice. *Annual Review of Neuroscience*, *29*(1), 417–448. https://doi.org/10.1146/annurev.neuro.29.051605.112903

Montero-Melis, G., & Jaeger, T. F. (2020). Changing expectations mediate adaptation in L2 production. *Bilingualism: Language and Cognition*, *23*(3), 602–617. https://doi.org/10.1017/S1366728919000506

Moser, U. (2003). Traumtheorien und Traumkultur in der psychoanalytischen Praxis (Teil I). *PSYCHE*, *57*(7), 639–657.

Munnich, E., Landau, B., & Dosher, B. A. (2001). Spatial language and spatial representation: A cross-linguistic comparison. *Cognition*, *81*(3), 171–208. https://doi.org/10.1016/S0010-0277(01)00127-5

Murri, L., Arena, R., Siciliano, G., Mazzotta, R., & Muratorio, A. (1984). Dream Recall in Patients With Focal Cerebral Lesions. *Archives of Neurology*, *41*(2), 183–185. https://doi.org/10.1001/archneur.1984.04050140081031

Nausieda, P. A., Weiner, W. J., Kaplan, L. R., Weber, S., & Klawans, H. L. (1982). Sleep disruption in the course of chronic levodopa therapy: An early feature of the levodopa psychosis. *Clinical Neuropharmacology*, *5*(2), 183–194. https://doi.org/10.1097/00002826-198205020-00003

Needham, A., & Baillargeon, R. (1997). Object segregation in 8-month-old infants. *Cognition*, *62*(2), 121–149. https://doi.org/10.1016/S0010-0277(96)00727-5

Newcombe, N. (2005). Language as Destiny? Or Not. In *Language and Cognition: Explorations in Cognitive Diversity* (Vol. 48, pp. 309–314).

Nielsen, T., & Levin, R. (2007). Nightmares: A new neurocognitive model. *Sleep Medicine Reviews*, *11*(4), 295–310. https://doi.org/10.1016/j.smrv.2007.03.004

Nofzinger, E. A., Mintun, M. A., Wiseman, M., Kupfer, D. J., & Moore, R. Y. (1997). Forebrain activation in REM sleep: An FDG PET study1. *Brain Research*, *770*(1), 192–201. https://doi.org/10.1016/S0006-8993(97)00807-X

Pace-Schott, E. F., Milad, M. R., Orr, S. P., Rauch, S. L., Stickgold, R., & Pitman, R. K. (2009). Sleep Promotes Generalization of Extinction of Conditioned Fear. *Sleep*, *32*(1), 19–26. https://doi.org/10.5665/sleep/32.1.19

Panksepp, J. (1982). Toward a general psychobiological theory of emotions. *Behavioral and Brain Sciences*, *5*(3), 407–422. https://doi.org/10.1017/S0140525X00012759

Panksepp, J. (2004). *Affective Neuroscience: The Foundations of Human and Animal Emotions*. Oxford University Press.

Papafragou, A., Hulbert, J., & Trueswell, J. (2008). Does language guide event perception? Evidence from eye movements. *Cognition*, *108*(1), 155–184. https://doi.org/10.1016/j.cognition.2008.02.007

Papafragou, A., Massey, C., & Gleitman, L. (2002). Shake, rattle, 'n' roll: The representation of motion in language and cognition. *Cognition*, *84*(2), 189–219. https://doi.org/10.1016/S0010-0277(02)00046-X

Papafragou, A., Massey, C., & Gleitman, L. (2006). When English proposes what Greek presupposes: The cross-linguistic encoding of motion events. *Cognition*, *98*(3), B75–B87. https://doi.org/10.1016/j.cognition.2005.05.005

Penn, D. C., Holyoak, K. J., & Povinelli, D. J. (2008). Darwin's mistake: Explaining the discontinuity between human and nonhuman minds. *Behavioral and Brain Sciences*, *31*(2), 109–130. https://doi.org/10.1017/S0140525X08003543

Perogamvros, L., & Schwartz, S. (2012). The roles of the reward system in sleep and dreaming. *Neuroscience & Biobehavioral Reviews*, *36*(8), 1934–1951. https://doi.org/10.1016/j.neubiorev.2012.05.010

Peters, E., Erlacher, D., Müller, F., & Schredl, M. (2023). Using hypnotic enhancement with auditory suggestion for lucid dream induction. *Somnologie*, *27*(3), 198–205. https://doi.org/10.1007/s11818-023-00414-7

Phillips, W., & Santos, L. R. (2007). Evidence for kind representations in the absence of language: Experiments with rhesus monkeys (*Macaca mulatta*). *Cognition*, *102*(3), 455–463. https://doi.org/10.1016/j.cognition.2006.01.009

Picchioni, D., & Hicks, R. A. (2009). Differences in the relationship between nightmares and coping with stress for Asians and Caucasians: A brief report. *Dreaming*, *19*(2), 108–112. https://doi.org/10.1037/a0016483

Pinker, S. (2003). *The Language Instinct: How the Mind Creates Language*. Penguin UK.

Pinker, S., & Jackendoff, R. (2005). The faculty of language: What's special about it? *Cognition*, *95*(2), 201–236. https://doi.org/10.1016/j.cognition.2004.08.004

Pinter, M. M., Pogarell, O., & Oertel, W. H. (1999). Efficacy, safety, and tolerance of the non-ergoline dopamine agonist pramipexole in the treatment of advanced Parkinson's disease: A double blind, placebo controlled, randomised, multicentre study. *Journal of Neurology, Neurosurgery & Psychiatry*, *66*(4), 436–441. https://doi.org/10.1136/jnnp.66.4.436

Pyers, J. E., & Senghas, A. (2009). Language Promotes False-Belief Understanding: Evidence From Learners of a New Sign Language. *Psychological Science*, *20*(7), 805–812. https://doi.org/10.1111/j.1467-9280.2009.02377.x

Redgrave, P., Prescott, T. J., & Gurney, K. (1999). Is the short-latency dopamine response too short to signal reward error? *Trends in Neurosciences*, *22*(4), 146–151. https://doi.org/10.1016/S0166-2236(98)01373-3

Regier, T., Kay, P., Gilbert, A., & Ivry, R. (2010). Language and Thought: Which Side Are You on, Anyway? In *Words and the Mind: How Words Capture Human Experience* (pp. 165–182). http://dx.doi.org/10.1093/acprof:oso/9780195311129.003.0009

Revonsuo, A. (2000). The reinterpretation of dreams: An evolutionary hypothesis of the function of dreaming. *Behavioral and Brain Sciences*, *23*(6), 877–901. https://doi.org/10.1017/S0140525X00004015

Roberson, D., & Hanley, J. R. (2010). Relatively speaking: An account of the relationship between language and thought in the color domain. In *Words and the mind: How words capture human experience* (pp. 183–198). Oxford University Press. https://doi.org/10.1093/acprof:oso/9780195311129.003.0010

Roesler, C. (2023). Dream interpretation and empirical dream research – an overview of research findings and their connections with psychoanalytic dream theories. *The International Journal of Psychoanalysis*, *104*(2), 301–330. https://doi.org/10.1080/00207578.2023.2184268

Schredl, M. (1991). *Traumerinnerungshäufigkeit und trauminhalt bei schlafgestörten, psychiatrischen patienten und gesunden*. Universität Mannheim.

Schredl, M. (1998). *Träume und Schlafstörungen. Empirische Studie zur Traumerinnerungshäufigkeit und zum Trauminhalt schlafgestörter Patientinnen*.

Schredl, M. (2000). The Effects of Dreams on Waking Life. In *Sleep and Hypnosis* (pp. 120–124).

Schredl, M. (2003). *The Problem of Dream Content Analysis Validity as Shown by a Bizarreness Scale*.

Schredl, M. (2006). Experimentell-psychologische Traumforschung. In *Schlaf und Traum. Neurobiologie, Psychologie, Therapie* (pp. 37–74). Schattauer.

Schredl, M. (2008). *Traum*. Ernst Reinhardt Verlag.

Schredl, M. (2010). *Dream content analysis: Basic principles*. https://doi.org/10.11588/IJODR.2010.1.474

Schredl, M. (2018). *Researching Dreams: The Fundamentals*. Springer International Publishing. https://doi.org/10.1007/978-3-319-95453-0

Schredl, M., & Hofmann, F. (2003). Continuity between waking activities and dream activities. *Consciousness and Cognition*, *12*(2), 298–308. https://doi.org/10.1016/S1053-8100(02)00072-7

Schultz, W. (2010). Multiple functions of dopamine neurons. *F1000 Biology Reports*, *2*, 2. https://doi.org/10.3410/B2-2

Schwartz, S. (2004). What Dreaming can Reveal about Cognitive and Brain Functions During Sleep? A Lexico-Statistical Analysis of Dream Reports. *Psychologica Belgica*, *44*(1–2), 5. https://doi.org/10.5334/pb.1015

Schwartz, S. (2010). Life Goes on in Dreams. *Sleep*, *33*(1), 15–16. https://doi.org/10.1093/sleep/33.1.15

Schwartz, S., & Maquet, P. (2002). Sleep imaging and the neuro-psychological assessment of dreams. *Trends in Cognitive Sciences*, *6*(1), 23–30. https://doi.org/10.1016/S1364-6613(00)01818-0

Seligman, M. E. P., & Yellen, A. (1987). What is a dream? *Behaviour Research and Therapy*, *25*(1), 1–24. https://doi.org/10.1016/0005-7967(87)90110-0

Sharf, B., Moskovitz, C., Lupton, M. D., & Klawans, H. L. (1978). Dream phenomena induced by chronic levodopa therapy. *Journal of Neural Transmission*, *43*(2), 143–151. https://doi.org/10.1007/BF01579073

Siclari, F., Baird, B., Perogamvros, L., Bernardi, G., LaRocque, J. J., Riedner, B., Boly, M., Postle, B. R., & Tononi, G. (2017). The neural correlates of dreaming. *Nature Neuroscience*, *20*(6), 872–878. https://doi.org/10.1038/nn.4545

Slobin, D. I. (1996). From 'thought and language' to "thinking for speaking. In *Rethinking Linguistic Relativity* (pp. 70–96). Cambridge University Press.

Slobin, D. I. (2003). Language and thought online: Cognitive consequences of linguistic relativity. In *Language in mind: Advances in the study of language and thought* (pp. 157–191). Boston Review. https://doi.org/10.7551/mitpress/4117.001.0001

Smith, L. B., Colunga, E., & Yoshida, H. (2003). Making an ontology: Cross-linguistic evidence. In *Early category and concept development: Making sense of the blooming, buzzing confusion* (pp. 275–302). Oxford University Press.

Smith, M. R., Antrobus, J. S., Gordon, E., Tucker, M. A., Hirota, Y., Wamsley, E. J., Ross, L., Doan, T., Chaklader, A., & Emery, R. N. (2004). Motivation and affect in REM sleep and the mentation reporting process. *Consciousness and Cognition*, *13*(3), 501–511. https://doi.org/10.1016/j.concog.2004.03.002

Solms, M. (1997). *Neurophysiologie des Träumens*. Klett-Cotta.

Solms, M. (2000). Dreaming and REM sleep are controlled by different brain mechanisms. *Behavioral and Brain Sciences*, *23*(6), 843–850. https://doi.org/10.1017/S0140525X00003988

Solms, M. (2014). *The Neuropsychology of Dreams: A Clinico-anatomical Study*. Psychology Press.

Spelke, E. S. (2003). *What Makes Us Smart? Core Knowledge and Natural Language*. https://direct.mit.edu/books/edited-volume/1917/chapter/52679/What-Makes-Us-Smart-Core-Knowledge-and-Natural

Sperber, D., & Wilson, D. (1986). *Relevance: Communication and Cognition*. Blackwell Publishers Ltd.

Sterpenich, V., Albouy, G., Boly, M., Vandewalle, G., Darsaud, A., Balteau, E., Dang-Vu, T. T., Desseilles, M., D'Argembeau, A., Gais, S., Rauchs, G., Schabus, M., Degueldre, C., Luxen, A., Collette, F., & Maquet, P. (2007). Sleep-Related Hippocampo-Cortical Interplay during Emotional Memory Recollection. *PLOS Biology*, *5*(11), e282. https://doi.org/10.1371/journal.pbio.0050282

Sterpenich, V., Albouy, G., Darsaud, A., Schmidt, C., Vandewalle, G., Vu, T. T. D., Desseilles, M., Phillips, C., Degueldre, C., Balteau, E., Collette, F., Luxen, A., & Maquet, P. (2009). Sleep Promotes the Neural Reorganization of Remote Emotional Memory. *Journal of Neuroscience*, *29*(16), 5143–5152. https://doi.org/10.1523/JNEUROSCI.0561-09.2009

Strauch, I., & Meier, B. (1996). *In Search of Dreams: Results of Experimental Dream Research*. SUNY Press.

Taylor, H. A., & Tversky, B. (1996). Perspective in Spatial Descriptions. *Journal of Memory and Language*, *35*(3), 371–391. https://doi.org/10.1006/jmla.1996.0021

Thomä, H., & Kächele, H. (1996). *Lehrbuch der psychoanalytische Therapie*. Springer. https://doi.org/10.1007/978-3-662-09564-5

Thompson, D. F., & Pierce, D. R. (1999). Drug-Induced Nightmares. *Annals of Pharmacotherapy*, *33*(1), 93–98. https://doi.org/10.1345/aph.18150

Tsunematsu, T. (2023). What are the neural mechanisms and physiological functions of dreams? *Neuroscience Research*, *189*, 54–59. https://doi.org/10.1016/j.neures.2022.12.017

Valli, K., & Revonsuo, A. (2009). The threat simulation theory in light of recent empirical evidence: A review. *The American Journal of Psychology*, *122*(1), 17–38. https://doi.org/10.2307/27784372

Voss, U., Holzmann, R., Tuin, I., & Hobson, A. J. (2009). Lucid Dreaming: A State of Consciousness with Features of Both Waking and Non-Lucid Dreaming. *Sleep*, *32*(9), 1191–1200. https://doi.org/10.1093/sleep/32.9.1191

Vygotsky, L. (2012). *Thought and Language* (revised and expanded edition). The MIT Press.

Wagner, U., Gais, S., & Born, J. (2001). Emotional Memory Formation Is Enhanced across Sleep Intervals with High Amounts of Rapid Eye Movement Sleep. *Learning & Memory*, *8*(2), 112–119. https://doi.org/10.1101/lm.36801

Walker, M. P., & van der Helm, E. (2009). Overnight therapy? The role of sleep in emotional brain processing. *Psychological Bulletin*, *135*(5), 731–748. https://doi.org/10.1037/a0016570

Wamsley, E. J., & Stickgold, R. (2010). Dreaming and offline memory processing. *Current Biology*, *20*(23), R1010–R1013. https://doi.org/10.1016/j.cub.2010.10.045

Watson, J. B. (1913). Psychology as the behaviorist views it. *Psychological Review*, *20*(2), 158–177. https://doi.org/10.1037/h0074428

Waxman, S. R., & Markow, D. B. (1995). Words as Invitations to Form Categories: Evidence from 12- to 13-Month-Old Infants. *Cognitive Psychology*, *29*(3), 257–302. https://doi.org/10.1006/cogp.1995.1016

Werner, C., & Langenmayr, A. (2005). *Der Traum und die Fehlleistungen. Psychoanalyse und Empirie Vol. 2*. Vandenhoeck und Ruprecht.

Wikan, U. (1992). Beyond the words. The power of resonance. *American Ethnologist*, *19*(3), 460–482.

Winawer, J., Witthoft, N., Frank, M. C., Wu, L., Wade, A. R., & Boroditsky, L. (2007). Russian blues reveal effects of language on color discrimination. *Proceedings of the National Academy of Sciences*, *104*(19), 7780–7785. https://doi.org/10.1073/pnas.0701644104

Windt, J. M. (2015). *Dreaming*. MIT Press.

Wittmann, B. C., Bunzeck, N., Dolan, R. J., & Düzel, E. (2007). Anticipation of novelty recruits reward system and hippocampus while promoting recollection. *NeuroImage*, *38*(1), 194–202. https://doi.org/10.1016/j.neuroimage.2007.06.038

Wolff, P., & Holmes, K. J. (2011). Linguistic relativity. *WIREs Cognitive Science*, *2*(3), 253–265. https://doi.org/10.1002/wcs.104

Wright, J., & Koulack, D. (1987). Dreams and Contemporary Stress: A Disruption-Avoidance-Adaptation Model. *Sleep*, *10*(2), 172–179. https://doi.org/10.1093/sleep/10.2.172

Wynn, K. (Ed.). (1995). Origins of Numerical Knowledge. *Mathematical Cognition*, *1*, 35–60. https://doi.org/10.4324/9781315277134

Zadra, A. (1996). Recurrent dreams and their relation to life events and well-being. *Trauma and Dreams*, 231–247.

Zimmerman, W. B. (1970). Sleep Mentation and Auditory Awakening Thresholds. *Psychophysiology*, *6*(5), 540–549. https://doi.org/10.1111/j.1469-8986.1970.tb02243.x