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DREAMING AND HEALTH PROMOTION: A THEORETICAL PROPOSAL AND SOME EPIDEMIOLOGICAL ESTABLISHMENTS

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Both neurobiological and cognitive psychological evidence suggests that dreams reflect the affective concerns and emotional balance of the dreamer. Moreover, there is increasing evidence for the thesis that dreams take part in the process of emotional regulation by creating narrative structures and new associations for memories with emotional and personal relevance and giving birth to a reduced emotional arousal or balanced mood state during post-dreaming wakefulness. As health means a state of complete physical, mental and social well-being, it is reasonable to assume that it is reflected in the quality of dream experiences. These theoretical considerations are exemplified by significant associations between dream emotions and health indexes emerging after the preliminary analysis of the Hungarostudy epidemiological database. Results suggest that items of the Dream Quality Questionnaire correlate with self-rated health, days spent on sick leave and most prominently with well-being. Negative dream emotions are negative predictors of health, while the opposite is true for positive ones. This effect is only partially explained by the illness intrusiveness index, the effect of dreams on daytime mood or well-being as measured by the well-being scale of the World Health Organization (WHO). Our results indicate that simple practical questions regarding habitual dream-affect, nightmares and night-terror-like symptoms convey information on the general mental and physical health of the subjects, which could be useful in medical practice.

Keywords: dreams, nightmares, REM sleep, health, personal satisfaction, emotions, well-being

Träumen und Gesundheitsförderung: Theoretische Überlegungen und einige epidemiologische Feststellungen: Neurophysiologische und psychologische Beobachtungen stützen die Annahme, dass sich emotional bedeutsame Themen und das emotionale Gleichgewicht in Träumen widerspiegeln. Immer zahlreichere Beweise belegen auch die Ansicht, der zufolge Träume

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in der Regelung des Gefühlslebens eine Rolle spielen, indem sie narrative Strukturen schaffen, emotionale Bedeutung tragende Elemente unseres Bestandes an Erinnerungen um neue Assoziationen bereichern und die emotionalen Spannungen des auf den Traum folgenden Wachzustandes mindern oder ausgleichen. Bedenkt man, dass der Begriff Gesundheit den Zustand körperlich-seelischen und sozialen Wohlbefindens bedeutet, so ist die Annahme nicht unbegründet, der zufolge dieses Wohlbefinden sich in den Eigenschaften des Traumes widerspiegelt. Diese theoretischen Überlegungen werden auch von der vorläufigen Analyse der Daten des Gesundheitspanels der Umfrage Hungarostudy gestützt, bei der wir auf bedeutende Beziehungen zwischen Traum- und Gesundheitsparametern stießen. Unsere Ergebnisse weisen darauf hin, dass der emotionale Gehalt des Träumens mit der Selbsteinschätzung des Gesundheitszustandes, der Zahl der Fehltage wegen Krankheit und dem subjektiven Wohlbefinden im Zusammenhang steht. Negative Gefühle während des Träumens korrelieren mit Krankheit, positive mit Gesundheit. Letztere Zusammenhänge können nur zum Teil mit krankheitsbedingten Belastungen, der direkten Wirkung von Träumen auf die Tagesstimmung oder die allgemeinen Zusammenhänge des Träumens erklärt werden. Unsere Ergebnisse weisen darauf hin, dass einfache Fragen nach der emotionalen Tönung der Träume, nach Albträumen und wiederkehrenden Albträumen Aufschluss über das allgemeine körperlich-seelisch-soziale Wohlbefinden der Person und somit über ihre Gesundheit geben kann.

Schlüsselbegriffe: Träumen, Albträume, REM-Schlaf, Gesundheit, persönliche Zufriedenheit, Gefühle, Wohlbefinden

1. Introduction

1.1. Dreams and science

Does the investigation of dreaming belong to the field of science? This question is worth attention, since the common cultural context covering the phenomenon of dreaming cannot be characterised by a proper scientific background, with corresponding motivation and methodological requirements. Nevertheless, the mysteries of dreaming are often 'immune' to direct scientific investigations, and therefore it is difficult to differentiate between the scientifically justified facts, the scientific assumptions, based on these facts, and the conjectures that lack scientific evidence. Accordingly, our aim is to focus on the first and the second case, while we try to liberate the phenomenon of dreaming captured by the belief system full of mysteries that still surrounds it, in spite of all the scientific investigation that has been carried out. Notwithstanding the fact that the world of science can also be considered to be a kind of belief system. In the present paper we try to make this world more utilitarian, by conclusions that may help medical practice, and foster the scientific elaboration of the issue.

1.2. Why dreaming?

The apparently chaotic content and formal characteristics of dreams make it even more difficult to extract valuable information (from them) that can pass the filter of the cri-

teria of clinical and experimental science. Using different approaches, some psychoanalytically oriented psychotherapists consider dreams to be a valuable tool for a deeper understanding of the feelings and attitudes of their patients, as well as a royal road to detect the subtle changes of the psychological state of the dreamer. However, it is difficult to extract these interpretations from the intersubjective context where they belong. Moreover, as a result of the disagreements among the psychoanalytic therapists, the questionable issues of the methods of dream interpretation became an even more debatable topic. Nevertheless, in our view these scientific circumstances do not necessarily mean that dreams would be only useless fragments of information. Hereinafter we review the evidence supporting the psychological relevance of dreams, contrasting the 'neural noise theory' according to which dreams are chaotic fragments of information, provoked only by autonomic physiological processes.

1.3. Dream images and brain function: Perception or imagination?

Dreams are hallucination-like experiences that are conceived as false perceptions by certain theories. For example, according to the activation-synthesis hypothesis, dreams result from the effects that the random-like discharges, originating from the brainstem, have on the cortex. Thus there is a meaningless random-like input, caused by physiological processes, and the cortex interprets this input in the light of the previously accumulated knowledge (HOBSON & MCCARLEY 1977). The stimulation of the motor cortex provokes motion experiences, the stimulation of the visual cortex leads to the appearance of vivid dream images, the stimulation of the auditory cortex enriches the dream scenario with dreamt voices, etc. (HOBSON 1988). Accordingly, the activation is provided by the brainstem, while the synthesis is carried out by the cortex. In spite of the fact that this assumption is a typical example of the brain-mind isomorphism, there is a hidden higher-order and in some aspect a kind of mental element in it, namely the process of synthesis, that can potentially reflect the schemes and experiences of a synthesising structure, the cortex (BÓDIZS 2000a). Even so, the first drafts of the theory – in a radically reductionist manner – excluded the relevance of the higher organising principles from the mechanism of dreaming, that in the light of the new, forcing scientific evidence could only occupy their deserved role later in a kind of eclectic hybrid theory (HOBSON et al. 2000). According to the activation-synthesis hypothesis, dream images are fragments of perception, and as such, they come into existence by the route of perception.

However, there is another theoretical trend that was preferred by FREUD (1999) already, at the so-called metapsychological level. This includes the ideas according to which dream images are not formed by the interpretation of meaningless inputs (the perception of meanings from meaningless stimuli), but by the imagination, visualisation of relevant thoughts and memories that already contain meaning. These ideas can be perfectly illustrated by the dream thoughts assumed by Freud: there is a thought whose meaning transforms into images, by a reverse path, that we can call today the route of imagination. This is an important difference, because the route of perception

depicts the dreamer as the passive endurer of chaos. As HOBSON (1988) denotes, the dreaming mind is like a dream machine that constantly generates dream images, thus the dreamer is only a part and an endurer of an automatic – and in a certain aspect – independent process. In contrast with this view, according to the route of the imagination, it is actually the dreamer who creates the chaos (naturally in the certain physiological state). So the dream – being an imagined idea – has meaning that contains information about the dreamer. According to the first theory we transform into dream machines and experience transient psychosis every night. In this context the psychosis is the metaphor of the loss of reality, but it also serves to explain the neurobiological aspects of dreaming (HOBSON 2004). According to this view, the qualitative aspects of the dream experience (that resemble psychosis) are the results of a general disinhibited state, where dopaminergic input is combined with the lack of serotonergic input (GOTTESMANN 1999). Others claim that the lack of self-reflective abilities in the dreaming mind, and the irrational, bizarre, illogical and discontinuous nature of dreams are caused by the selective deactivation of the dorsolateral prefrontal cortex, responsible for the functions of working memory, logical reasoning and goal-oriented behaviour (MUZUR et al. 2002). In turn, the theories jousting for the route of imagination emphasise that dreams reflect our thoughts, desires, attitudes, conflicts and feelings by using a sensorial, mainly visual language (SOLMS 1997; GREENBERG et al. 1992). Without negating the physiological bases of the dream process, these theories resemble the psychoanalytical theories that consider dreaming being a signal instead of noise (BÓDIZS 2003, 2005).

The route of perception and the route of imagination are two theoretical possibilities that do not necessarily exclude each other; nevertheless it is still worth examining which path constitutes the main compound of dream formation. It seems that the majority of dreams arise in the REM stage of sleep, or in phases that resemble the REM state in physiological terms (NIELSEN 2000). The analysis of REM sleep and the investigation of dream disturbances caused by brain lesions suggest that dreams principally arise from a ventral route of subcortical stimulation of the cortex. Since this network is independent of the route of perception, and primarily constitutes the neurological background of remembering and imagination, the majority of dreams probably come into existence by the route of imagination (BÓDIZS 2005). Furthermore, in some cases of brain damage in the parietal lobe that cause the cessation of dreaming, the waking visual imagination is also severely affected. For example, after the damage the patient cannot recall any dream, and at the same time is unable to imagine visually a well-known acquaintance or location. It is also noteworthy that in these cases the cessation of dreaming is not caused by memory deficits, because several patients who report the cessation of dreaming have intact memory functions (KAI-CHING YU 2006).

Apart from the neuropsychologically oriented research trends, (SOLMS 1997; KAI-CHING YU 2006) other dream researchers also emphasized the cognitive aspects of dreaming. In contrast with the reductionist theories this research tradition tried to avoid the old brain-mind problem by focusing principally on the mental phenomenon of dreaming (FOULKES 1999). At this level of explanation, dreaming is the manifest-

ation of our mental activity that continues to function after we fall asleep, and thus reflects our self-reflective conscious representations of the outer and inner world (FOULKES 1999; OCCHIONERO 2004). A similar view is outlined by the continuity hypothesis according to which dreaming reflects waking thoughts, mainly the emotional concerns of the dreamer (SCHREDL 2003a; SCHREDL & HOFMANN 2003; DOMHOFF 2001). These phenomenological approaches suggest that dreaming is not a totally different function of our conscious mind, but rather the manifestation of the same conscious functioning, influenced by the altered neurobiological milieu of the sleeping brain. Thus, dreams are like thoughts, depicted in a visual, metaphorical language.

If dream images are the fruits of imagination, then – according to the arguments discussed above – the meaning, but at least the relevance of dreams is worth the attention of science. We do not exclude the possibility that dreams can also arise by the route of perception, but we propose that this does not constitute the principal mechanism in the case of dreams that we recall in natural circumstances (outside the sleep laboratory) (BÓDIZS 2005).

1.4. Dream images and memories

Because of the highly selective and shallow reception and processing of external information during sleep (BÓDIZS & CSÓKA 2007), the role of memory systems start to dominate, and hence our existing knowledge and memories will be the building blocks of the dream scenario (BÓDIZS 2000b). The searching for memories in dreams has a long past in the history of dream research. FREUD (1999) noticed that in the majority of dreams there is an element that can be interpreted as a reference to the events of the preceding days. He called these elements day residues. The nature of day residues and their relations to other memories is still an important issue in current dream research. One of the main conclusions of the various investigations is that the recent memory elements found in the dream reports rarely reproduce the original context of the memory. The memories – with few exceptions – enter the dream scenario without their spatio-temporal context (NIELSEN & STENSTROM 2005). Dreams create new contexts and new narratives that are formed by the general, semantic knowledge of the dreamer. For example, if someone dreams about a birthday celebration, the dream will not portray a real birthday experienced in the past, but recreate a virtual birthday based on the memories, feelings, attitudes and factual knowledge of the notion *birthday*. Of course 'real' memory fragments can also appear in the dream, but a new narrative, a new context will provide the guideline for the dream. Neuroimaging studies (MAQUET et al. 2000) and phenomenological investigations of the content and structure of dreams (HARTMANN 1996; KAHN et al. 2002) suggest that in the hyperassociative quasi-chaos of dreaming, emotions can be the main organizers. Accordingly, the core emotional concerns of the dreamer, conscious and unconscious affective patterns, can be the deep structure of the dream (NIELSEN & STENSTROM 2005).

1.5. Dreams and emotional regulation

Neurophysiological evidence suggests that dreams are characterised by the interaction of memories and emotions (MAQUET et al. 2000). The synthesis of recent neuroimaging and psychological data have given birth to new theories according to which dreams facilitate the regulation of emotions. These assumptions are based on the neurobiological aspects of REM sleep, because the REM sleep-associated metabolism and blood flow of brain regions responsible for the processing of emotional memories and emotional behaviour exceeds the metabolism and blood flow and hence the activity associated with passive wakefulness (MAQUET et al. 2000). Therefore, it is rather surprising that in spite of the vivid and intense emotions, the dreamer is generally immune to any emotional turbulence. According to the physiological data, this should happen more frequently then we experience in everyday life. The typical example for the escalation of emotions is the nightmare that often awakens the dreamer. Patients with Posttraumatic Stress Disorder (PTSD) often report the presence of recurrent nightmares, and in some of these cases the dreamer re-experiences the traumatic event every night when he is falling asleep (GERMAIN & NIELSEN 2003). It is quite interesting that the intense emotional escalation is accompanied by the dysfunction of novel dream narrative formation because in contrast with the typical dreams, the nightmares of PTSD patients preserve the original spatio-temporal context of the frightening, traumatic event (STICKGOLD 2002). In this case, the dreaming mind ceases to create a new context and a new narrative for the traumatic memory. Could that be the reason for the emotional escalation (NIELSEN & LEVIN 2007)?

Another example for the intense emotional graduation in dreaming is the nightmares and bad dreams of patients suffering from Borderline Personality Disorder (BPD). Patients with BPD often suffer from nightmares, while the presence of frightening dreams correlates with low fantasy scores, measured by psychological tests. Thus, the occurrence of nightmares was frequent for those subjects who were characterised by an unimaginative waking life. In turn, the nightmares were characterised by a frightening story, wedged into a narrow associative channel, lacking the hyperassociative processes, inner reflections and directed thoughts typical in dreams of the healthy population. Thus here again we can detect the tendency when the dysfunction of the creation of new context and narrative leads to the escalation of (negative) emotions. This also suggests that active imagination and creative skills can be a defending factor against the occurrence of nightmares (SIMOR 2007).

It seems that the creation of a new narrative and new context is important for the emotional regulation in dreaming. According to the neurocognitive model of LEVIN & NIELSEN (2007) the new dreamt contexts of intense emotional memories can serve the role of fear-extinction, while others emphasise that the associative enriching and the integration of the emotional memories into a broader self-centered, semantic network is the 'royal road' for emotional regulation (HARTMANN 1996; CARTWRIGHT et al. 2006; STICKGOLD 2002; SIMOR 2007). Whichever mechanism is responsible for the emotional regulation, possibly both, research based evidences suggest that creating

new contexts for frightening dreams may facilitate the improvement of waking affect. In the course of the Imagery Rehearsal Therapy the patients suffering from nightmares are told to recall their frightening dreams in a relaxed waking state, and to imagine a positive outcome for their suffocating dream narrative. Afterwards they are told to imagine the new dream narrative again and again. This method not only diminishes the frequency of nightmares but also improves the general mental state of the patients (KRAKOW & ZADRA 2006). This suggests that dreams could have a general role in emotional regulation that can influence the waking affect. Neurobiological data support that the use of imagination, and the integration of rich associations and diverse memory elements into the dream narrative can facilitate coping with the adverse life events and stress caused by emotional conflicts (NIELSEN & LEVIN 2007). For example, bicultural subjects dispose of a richer repertoire of emotional expressions than persons owning only one cultural heritage. If biculturally competent subjects experience a significant loss, they not only use direct and aesthetic-artistic self-reflection more frequently, but they also experience more feeling-change in their dreams, which does not directly ensue from the dream narratives. This is not characteristic of monocultural subjects (ENG et al. 2005). Once again we find that the more expressive the subject is in waking, the more diverse their dream life is, and that in the light of the above mentioned results we consider this favourable for the regulation of emotions. Finally, we should mention the mood restorative effect of REM sleep (CARTWRIGHT et al. 1998) being probably the beneficial effect that the emotional regulation in dreaming exerts on waking functioning. However, in certain pathological conditions, such as depression, the mood restorative effect of sleep and dreaming fails to prevail, and accordingly sleep and dream disturbances are one of the more characteristic symptoms of depression (FLEMING 1994; GOTTESMANN & GOTTESMANN 2007; CARTWRIGHT et al. 2006). Furthermore, in a recent study, CARTWRIGHT et al. (2006) have shown that the dreams of a non-remittent depressed patient group differed from the dreams of depressed patients in remission. The dreams of the remitted patients were more elaborated and richer in associations, while the not remitted group failed to experience emotions in their dreams, and failed to connect their waking concerns to older memories, and to integrate their emotions in a broader network of associated self-relevant emotional memories. The failure of the emotional information processing mechanism was associated with a low morning mood.

1.6. Dreams and modern health conception

In sum we can conclude that dreams reflect the psychological balance of the dreamer. The dysfunctions of emotional regulation suggest that depressing dreams and recurrent nightmares indicate problems of adaptation. Considering the interaction between environment and personality, according to converging evidence environmental stress enhances the frequency of nightmares, primarily in those who are characterised by emotional instability (SCHREDL 2003b; NIELSEN & LEVIN 2007). The frequency of

nightmares and even more the distress caused by nightmares and disturbing dreams are prevalent in several psychopathologic states (MIRÓ & MARTÍNEZ 2005; LEVIN & NIELSEN 2007). In a longitudinal study NIELSEN and colleagues (2000) found that the prevalence of disturbing dreams is also frequent in adolescents with trait anxiety symptoms. The association between trait anxiety and the recall of disturbing dreams was demonstrable at ages 13 and three years later in the same subjects, the girls showing a bit worsening and the boys a certain improvement. Thus, the emotional charge of dreams provides information about the successes or failures of psychological adaptation. Therefore, dreams provide information about the environmental influence, the individual sensitivity and levels of coping of the dreamer. This information is more precise than the environmental impacts because it is not distorted by individual sensitivity and reactivity. At the same time it seems a potentially more reliable source of information than the queries concerning the psychological balance directly, because the latter can be much more biased by the individual expectations than dream mentation. Dreams are told from an outer perspective, and if we inquire about the emotional aspect instead of the content of dreams, we do not intrude into the subjective space that people may consider too intimate. If we ask someone how he felt yesterday at a family reunion or we ask how he felt yesterday in his dream, we can imagine that the former could provoke a much more partial answer. In contrast, the latter exempts the subject from the burden of the direct communication of the problem, but in some cases even the sole confession of the problem can cause difficulties. Exploring dream content may be even more useful in those individuals who are unable or unwilling to talk about their psychological state (PESANT & ZADRA 2006). In dreaming everyone can feel free without offending any interest.

1.7. Dreams and health in the light of the epidemiological investigations

We aimed to explore the interrelations between dreams and health indicators by analysing data from a national epidemiological investigation. Along with the questions concerning health and disease, subjects were asked about their dreams. The questions about dreaming were based on our clinical and research experience. These questions form the Dream Quality Questionnaire. Here we report our first experiences with this questionnaire, by performing a factor analysis and by using some relevant items in a health psychological survey and research. We aimed to find out whether we could establish the general state of health of the subjects, by exploring the usual dream recall frequency, the emotional load of dreams, the presence of frequent recurrent and non-recurrent nightmares and the bizarreness of dreams. Questions were foregrounded that concerned the change of the state of health (improved, without change, worsened), because these directly indicate the disharmony of psychobiological balance. Moreover, we examined the number of days spent in hospital in the last year, which we considered more or less objective indicators of high practical relevance.

2. Methods

2.1. Subjects

Large national representative surveys were conducted in the Hungarian population in 1983, 1988, 1995 and 2002 (KOPP et al. 2000; SKRABSKI et al. 2005). These samples represented the Hungarian population above age 18 according to gender, age, county and 150 sub-regions. Among the 12,640 persons in Hungarostudy 2002, those who agreed to participate in the follow-up study were 4528 persons who were interviewed again in 2005 and 2006 within the framework of the Hungarostudy Epidemiological Panel (HEP) follow-up study. Moreover, additional subjects were enrolled in the 2005/2006 survey in order to balance out some biased aspects of the sample. The total sample of the present study consists of 5009 subjects who answered the Dream Recall Frequency Scale (2682 women, 1832 men; 495 respondents' sex data are missing), ages varied between 22 and 100 (M = 50.7, SD = 16.4). When answering questions of the survey, subjects usually had the possibility to choose between different options including 'I do not know'. Those answers referring to the lack of information about dreaming (I do not know) were not included in the analyses of the item in question. Therefore, the number of subjects differed substantially from one analysis to another.

2.2. Measures

Individual differences in dream recall were assessed by the use of the 7-point Dream Recall Frequency Scale (SCHREDL 2004), which is a self-reported measure of usual dream recall rate (Appendix 1).

The Dream Quality Questionnaire consists of items concerning emotional load of dreams, the tendency of experiencing frequent non-recurrent and recurrent nightmares and fearsome nocturnal awakenings (night-terror-like symptoms), the effects of dreams on daytime mood, the vividness as well as the bizarreness of dreams. These were formed on the basis of our previous clinical and research experience and are subjected to a principal component analysis (see Appendix 2 for the original Hungarian and Appendix 3 for the translated English version). Well-being was measured by a short version (4 items) of the WHO Well-being Questionnaire, the highest quartile/others were categorised for the analysis, the cheerfulness item was analysed separately (not characteristic at all/other answers) (BECH et al. 1996; RÓZSA et al. 2003; SKRABSKI et al. 2005). Self-rated health was measured with the question: 'How do you rate your health in general?' There were five responses: very good; good; fair; poor; and very poor. The answers were grouped into poor and very poor/others categories (KOPP et al. 2004; SKRABSKI et al. 2005).

Illness intrusiveness was assessed with the Hungarian version of the Illness Intrusiveness rating Scale (NOVAK et al. 2005).

2.3. Statistical analyses

In order to explore the interrelations between dreaming and health, we conducted a series of Pearson correlations in the case of quasi-continuous dream-specific variables, and a series of logistic regression analyses in the case of dichotomous ones.

Note that due to the large number of subjects (*N*), almost all reported associations are significant at the level of $p < 0.01$. In similar cases when interpreting correlational data, the *r* value in itself needs to be taken into account. Furthermore, since the different calculations of the Pearson correlations are based on a varying number of cases *N*, we indicate the *N*'s for every *r*.

3. Results

3.1. Factor structure of the Dream Quality Questionnaire

To examine the latent structure of the 11 dream-specific items, we conducted a principal component analysis. Calculations resulted in the extraction of 3 components with eigenvalues greater than one, which accounted for 54.8% of the score variance (*Table 1*).

Table 1
Component matrix of the first principal component analysis of eleven dream-specific items (the Dream Quality Questionnaire)*

Items	*Component*		
	1	*2*	*3*
1. Expressly oppressive dreams	0.840		
2. Bad dreams	0.811		
3. Nightmares	0.713		
4. Recurrent nightmares	0.695		
5. Dreams affecting daytime mood	0.512		
6. Night terror	0.488		
7. Pleasant dreams	–0.412	0.782	
8. Expressly gratifying dreams	–0.417	0.744	
9. Neutral dreams			0.705
10. Vividness of dreams		–0.480	0.536
11. Dream bizarreness	0.310		0.396

* Extraction method: Principal Component Analysis; absolute values less than 0.3 are suppressed.

Since the Bizarreness of Dreams item was loaded almost equally on components 1 and 3, and as such cannot be decided to which component this item belongs, in the next analysis we excluded this item, and conducted a Varimax Rotation of the remaining items. With the exclusion of the Bizarreness of Dreams item, the explained variance increased to 59.3% (*Table 2*).

Table 2
Component matrix of the second principal component analysis of ten dream-specific items (the Dream Quality Questionnaire)*

Items	*Component*		
	1	*2*	*3*
1. Expressly oppressive dreams	0.819		
2. Bad dreams	0.785		
3. Nightmares	0.775		
4. Recurrent nightmares	0.748		
5. Dreams affecting daytime mood	0.543		
6. Night terror	0.473		
7. Pleasant dreams		0.875	
8. Expressly gratifying dreams		0.838	
9. Neutral dreams			0.829
10. Vividness of dreams		–0.404	0.562

* Extraction Method: Principal Component Analysis. Rotation Method: Varimax with Kaiser Normalization. Absolute values less than 0.3 are suppressed.

It can clearly be seen that items from 1 to 6 are forming component 1, and measure negative emotional load of dreams. Although this is not absolutely evident for item 5 (Dreams affecting daytime mood), the results cohere with the potential long lasting effect of disturbing dreams, the phenomenon of so-called nightmare distress. Component 2 unambiguously consists of two items (7 and 8) measuring the emotionally positive aspects of dreams. In component 3 two items (9 and 10) can be found, which measure emotionally neutral aspects of dreaming.

3.2. Interrelations between dreams and health

In the following section we present the results of our preliminary analyses conducted with the Dream Recall Frequency Scale and some relevant items of the Dream Quality Questionnaire focusing on the interrelationship between dreaming and health. There was no significant relationship between dream recall frequency and health indexes. We now focus our attention on expressly oppressive dreams, expressly gratifying dreams,

recurrent and non-recurrent nightmares and night-terror-like symptoms. As we can see in *Table 3* almost all the general health indicators correlated with the emotional load of dreams in the expected manner and direction. The frequency of oppressive dreams correlated with negative self-rated health and a worsening in the state of health. The expected positive correlation between the days spent on sick-leave and dreams with negative emotional charges were supported but in this case only a weaker relationship was found. The correlations between positive emotional dream charges and health-indicators follow the expected directions but with slightly lower values than in the case of negative dream charges.

Table 3
Correlations between health- and dream-specific items

	Expressly oppressive dreams	*Expressly gratifying dreams*
Self-rated health	–0.195*	0.168*
N	3741	3717
Self-rated health in proportion to age-group	–0.169*	0.138*
N	3742	3718
Days spent on sick-leave	0.098*	–0.054*
N	3408	3389
Sick-leave	0.059*	0.015
N	3319	3302

* $p < 0.01$

In order to investigate the relationships between the dichotomous dream-specific variables (nightmares vs. no nightmares, recurrent nightmares vs. no recurrent nightmares, night terrors vs. no night terrors) and quasi-continuous health-specific variables we conducted a series of logistic regression analyses. Odds ratios (OR), the upper and lower limits of their 95% confidence intervals (CI) in parentheses and the number of cases included in the analyses are indicated in *Table 4*. Note that odds ratios close to 1.0 indicate that unit changes in that independent (health-specific) variable do not affect the dependent (dream-specific) variable. Since there is no case where both upper and lower confidence limits are not with the same sign (here positive), we can consider all results as significant.

Some remarkable associations were found between change in the state of health and frequent nightmare experiences. The worse one's state of health becomes, the higher his/her chances are for frequent nightmare experiences (OR 1.989), recurrent nightmares (OR 1.793) and night-terror-like episodes (OR 2.729). Regarding days spent on sick-leave (OR between 1.003 and 1.006) it can be said that they do not affect the appearance of these nocturnal phenomena.

Table 4
Odds ratios and 95% CI from logistic regression models for nightmares, recurrent nightmares and night terrors

	OR (CI 95%)		
	No nightmares vs. Nightmares	*No recurrent nightmares vs. Recurrent nightmares*	*No night terror vs. Night terror*
Self-rated health	0.587 (0.528, 0.652) *N* = 3781	0.519 (0.432, 0.623) *N* = 698	0.517 (0.478, 0.559) *N* = 4958
Self-rated health in proportion to age-group	0.605 (0.538, 0.681) *N* = 3782	0.636 (0.536, 0.756) *N* = 698	0.537 (0.492, 0.586) *N* = 4959
Change in the state of health	1.989 (1.632, 2.424) *N* = 3785	1.793 (1.313, 2.449) *N* = 698	2.729 (2.361, 3.154) *N* = 4962
Days spent on sick-leave	1.003 (1.002, 1.005) *N* = 4491	1.003 (1.001, 1.006) *N* = 623	1.004 (1.003, 1.005) *N* = 4491
Sick-leave	1.006 (1.003, 1.008) *N* = 3349	1.003 (0.999, 1.007) *N* = 600	1.004 (1.002, 1.007) *N* = 4348

While interpreting the above results, we have to keep in mind that in this cross-sectional study, information on dreams and on health were collected at the same time, hence the correlation can result from the fact that the diseases and the subjective difficulties – causing problems of adaptation –, negatively affect the emotional aspects of dreams. Although this possibility does not contradict our hypothesis, we consider it an important question, because it may shed light on the causal relationship of the examined phenomena, and it is also relevant from a practical point of view. Therefore, in the following statistical analysis we took into consideration the values of the Illness Intrusiveness Rating Scale (NOVAK et al. 2005). We aimed to clarify whether the relationship between the negative emotional load of dreams and a worse health state reflects simply the stress and the hardships caused by the diseases, or whether there is a more general relationship between dreaming and the predisposition to illnesses. Illness intrusiveness evidently relates to the emotional aspects of dreaming. Taking into consideration these relations, we re-examined our data (*Table 5*).

A substantial decrease in the magnitude of correlations suggests that these relationships are attributable in some part to illness intrusiveness. The relationships between self-rated health and dreaming remained significant for both oppressive and gratifying dreams but, when checking for illness intrusiveness, emotionally positive dreams show a stronger relationship with one's state of health, opposite to that seen without the statistical control for the illness intrusiveness.

We conducted the same analyses (dreaming – health relationship with illness intrusiveness statistically controlled) for the dichotomous items of the Dream Quality Questionnaire (*Table 6*).

Table 5
Correlations between health- and dream-specific items controlling for illness intrusiveness

	Expressly oppressive dreams	*Expressly gratifying dreams*
Self-rated health	–0.068*	0.102*
DF	1498	1498
Self-rated health in proportion to age-group	–0.067*	0.086
DF	1498	1498
Days spent on sick-leave	0.015	–0.015
DF	1498	1498
Sick-leave	0.050	0.028
DF	1498	1498

* $p < 0.001$

Table 6
Odds ratios and 95% CI from logistic regression models for nightmares, recurrent nightmares and night terrors (effect of illness intrusiveness is held constant)

	No nightmares vs. Nightmares	*No recurrent nightmares vs. Recurrent nightmares*	*No night terror vs. Night terror*
Self-rated health	0.915 (0.777, 1.077) *N* = 1788	0.628 (0.480, 0.821) *N* = 448	0.772 (0.683, 0.871) *N* = 2289
Self-rated health in proportion to age-group	0.836 (0.714, 0.979) *N* = 1476	0.882 (0.699, 1.114) *N* = 440	0.738 (0.655, 0.831) *N* = 2290
Change in the state of health	1.033 (0.796, 1.341) *N* = 1790	1.512 (0.999, 2.288) *N* = 440	1.605 (1.314, 1.960) *N* = 2291
Days spent on sick-leave	1.000 (0.998, 1.002) *N* = 1606	1.001 (0.998, 1.003) *N* = 391	1.000 (0.999, 1.002) *N* = 2050
Sick-leave	1.004 (1.001, 1.007) *N* = 1548	1.002 (0.998, 1.006) *N* = 375	1.003 (1.000, 1.005) *N* = 1980

3.3. Effects of dreams on daytime mood

Even by their sole existence, emotionally negative dreams can prejudice the mental state, and the physical-mental well-being of the dreamer. Otherwise, the nightmares and some forms of fearsome nocturnal awakenings (night terrors, sleep panic attacks)

would not belong to the sleep and/or psychiatric disorders that require medical treatment. The next step was to reanalyse the relationships between dreaming and health by taking into account the effect that dreams exert on waking mood. This was done in order to test if the residual daytime effects of bad dreams per se explain the negative self-rated health associated with bad dreams (*Table 7*).

Table 7
Correlations between health- and dream-specific items (the effect of dreams on waking mood statistically controlled)

	Expressly oppressing dreams	*Expressly gratifying dreams*
Self-rated health	–0.171*	0.157*
DF	3259	3259
Self-rated health in proportion to age-group	–0.148*	0.134*
DF	3259	3259
Days spent on sick-leave	0.0926*	–0.047*
DF	3259	3259
Sick-leave	0.057*	0.0160^{+}
DF	3259	3259

* $p < 0.001$
$^{+}$ $p < 0.05$

As we can see in *Table 7* almost all the general health indicators correlated with the emotional charge of dreams in the expected manner and direction. Although the correlations are lower than without control for any variable (see *Table 3*), the results indicate that after controlling the effect of dreaming-induced daytime mood a significant correlation between health indicators and items measuring the emotional charges of dreams still remains significant. The same analysis was performed for the dichotomous variables (*Table 8*).

We found a similar pattern of associations to those introduced above (see *Table 4*). Note that in this case variables measuring sick-leave seem to be the most independent of dream-specific variables, and a change in the state of health (i.e. worsening) proved to have the strongest relationship with nightmares and night terrors.

3.4. Dreams and well-being

According to our theoretical introduction, dreams reflect the psychological balance of the individuals. In order to test this issue empirically, we examined the relationship between the items assessing dream quality and the items aimed to measure well-being.

Table 8
Odds ratios and 95% CI from logistic regression models for nightmares, recurrent nightmares and night terror (the effect of dreams on waking mood statistically controlled)

	OR (CI 95%)		
	No nightmares vs. Nightmares	*No recurrent nightmares vs. Recurrent nightmares*	*No night terror vs. Night terror*
Self-rated health	0.623 (0.559, 0.690) *N* = 3765	0.556 (0.460, 0.670) *N* = 691	0.536 (0.489, 0.580) *N* = 3735
Self-rated health in proportion to age-group	0.654 (0.580, 0.730) *N* = 3766	0.678 (0.566, 0.810) *N* = 691	0.550 (0.497, 0.610) *N* = 3735
Change in the state of health	1.722 (1.404, 2.110) *N* = 3769	1.592 (1.149, 2.20) *N* = 691	2.286 (1.938, 2.690) *N* = 3739
Days spent on sick-leave	1.003 (1.002, 1.000) *N* = 3429	1.003 (1.000, 1.001) *N* = 617	1.003 (1.002, 1.001) *N* = 3403
Sick-leave	1.006 (1.003, 1.000) *N* = 3339	1.003 (0.999, 1.000) *N* = 596	1.004 (1.001, 1.001) *N* = 3313

The frequency of expressly oppressive dreams was inversely related to the well-being scale of the World Health Organization (WHO). One-way analysis of variance resulted in $F = 129.84$; $p < 0.0001$ (see *Figure 1*). As expected, the frequency of expressly gratifying dreams was positively associated with well-being (one-way ANOVA: $F = 56.079$; $p < 0.0001$). The relationship between dichotomous items and well-being was analysed by logistic regression. Frequent non-recurrent and recurrent nightmares and night-terror-like symptoms were associated with a lower level of well-being (*Table 9*).

Table 9
Odds ratios and 95% CI from logistic regression models for nightmares, recurrent nightmares and night terrors in relation to the WHO well-being index

	No nightmares vs. Nightmares	*No recurrent nightmares vs. Recurrent nightmares*	*No night terror vs. Night terror*
WHO Well-being	0.839 (0.816, 0.860) *N* = 3775	0.877 (0.840, 0.910) *N* = 696	0.848 (0.831, 0.860) N = 4946

The above results suggest a particularly strong relationship between the emotional aspects of dreams and the well-being of the subjects. In our theoretical introduction we suggested that the information obtained from dream mentation could give us a more precise picture about the mental state of the individuals than the direct

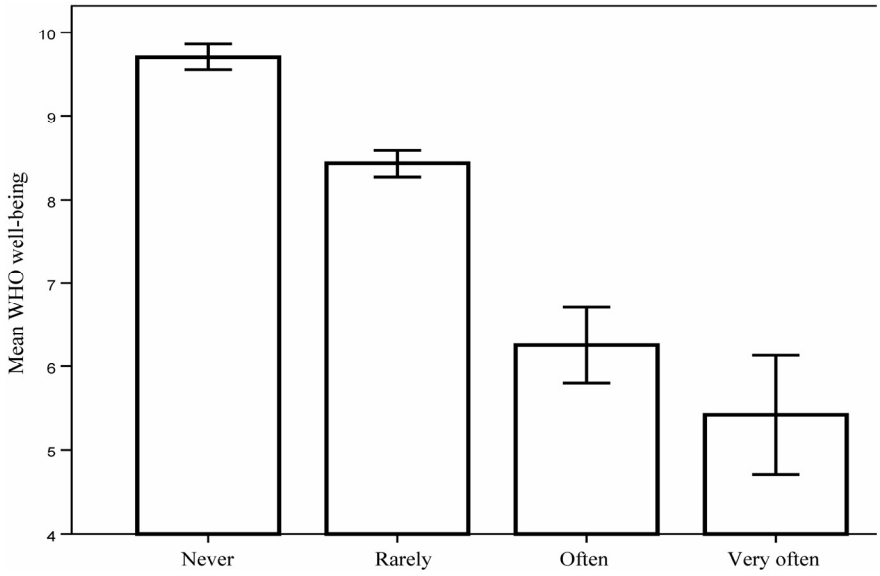

Figure 1
The relationship between the frequency of experiencing expressly oppressive dreams and well-being. The bars represent the mean values of the WHO well-being scale, and the error bars the confidence intervals of 95%

questions concerning the mood or well-being, because the latter could be biased by the expectations of the subjects. Physiological evidence suggests that the self-rated well-being index may influence the state of physical health (BÓDIZS 2006). At the same time – as we have seen – well-being is related to the emotional aspects of dreams, but this connection is far from being perfect. Thus, the emotional dimension of dreams reflects some other factors, which are unrelated to the directly rated well-being. We tried to show this difference in relation to the health indexes. We examined the relationship between health and dreams, taking into consideration that this relationship could partly be mediated by well-being. We wanted to know if dreams reflect the state of health equally like well-being or if dreams also provide other information that could be interesting. Our statistical analysis partially supported the latter possibility (*Table 10*).

Other dream variables which were dichotomous in nature were also correlated with self-rated health measures, while the effect of the WHO well-being index was statistically controlled (*Table 11*).

4. Discussion

Based on the psychobiological aspects of dream formation we consider the empirical investigation of the epidemiological context of dreams and health reasonable. Consider-

Table 10
Correlations between health- and dream-specific items controlling for the WHO well-being index

	Expressly oppressive dreams	*Expressly gratifying dreams*
Self-rated health	–0.071*	0.076*
DF	3258	3258
Self-rated health in proportion to age-group	–0.062*	0.061*
DF	3258	3258
Days spent on sick-leave	0.036^{+}	–0.003
DF	3258	3258
Sick-leave	0.038^{+}	0.032
DF	3258	3258

* $p < 0.001$
$^{+}$ $p < 0.05$

Table 11
Odds ratios and 95% CI from logistic regression models for nightmares, recurrent nightmares and night terrors (statistical control for WHO well-being)

	OR (CI 95%)		
	No nightmares vs. Nightmares	*No recurrent nightmares vs. Recurrent nightmares*	*No night terror vs. Night terror*
Self-rated health	0.751 (0.665, 0.847) *N* = 3771	0.596 (0.486, 0.732) *N* = 696	0.624 (0.571, 0.682) *N* = 4942
Self-rated health in proportion to age-group	0.782 (0.686, 0.891) *N* = 3772	0.742 (0.614, 0.897) *N* = 696	0.668 (0.607, 0.735) *N* = 3997
Change in the state of health	1.421 (1.151, 1.754) *N* = 3775	1.391 (1.000, 1.934) *N* = 696	2.062 (1.769, 2.403) *N* = 4946
Days spent on sick-leave	1.001 (1.000, 1.003) *N* = 3433	1.001 (0.999, 1.004) *N* = 622	1.002 (1.001, 1.003) *N* = 447
Sick-leave	1.004 (1.001, 1.007) *N* = 3341	1.001 (0.997, 1.005) *N* = 599	1.003 (1.001, 1.006) *N* = 4367

ing the number of the participants and the examined variables, our investigation is unique in this research field. Our findings serve the starting point for the further investigation of the relationship between dreams and health in the Hungarian population. In sum, we can draw the following conclusions:

1. Subjects' habitual dream qualities derived from the Dream Quality Questionnaire can be grouped into three components. The first is related to the negative emotional aspects of dreaming: frequent expressly oppressive dreams, bad dreams, non-recurrent and recurrent nightmares are parts of this factor. We call this factor Negative Dream Affect. The second component is related to the positive emotional aspects of dreaming. This factor is characterised by frequent experiencing of expressly gratifying and pleasant dreams. We call this factor Positive Dream Affect. The third component consists of neutral dream affect and dream vividness. We call this factor the Neutral Dream Affect factor. Above and further results suggest that dream quality can be tested by relatively simple psychometric instruments which could have a clinical and a research importance in future dream studies.
2. There is a reliable connection between the emotional aspects of dreams and the general indicators of health and disease, but not between habitual dream recall frequency and health.
3. The relationship between dreams and health is partly explained by illness intrusiveness, but there are several characteristics of dreaming (recurrent nightmares, the high frequency of expressly oppressive dreams) that are related to the general dimension of healthdisease, independently of those effects mediated by illness intrusiveness.
4. The relationship between dreams and health indexes is not mediated by the potential direct mood-altering effect of dreams.
5. There is a particularly strong relationship between the emotional aspects of dreams and the well-being of the individuals.
6. Nightmares and night-terror-like symptoms are potential predictors of health and sick-leave even after the statistical control for well-being. Hence, nightmares and fearful nocturnal awakenings suggest the influence of other factors apart from the lowered level of well-being associated with these phenomena.

On the basis of the theoretical assumptions presented in the introduction we have proposed that dreaming reflects the waking affect of the individuals and hence the investigation of dreaming may shed light on the general psychobiological state of the dreamer. Furthermore, the investigation of the emotional aspects of dreams and the prevalence of dream disturbances (nightmares, recurrent nightmares, fearsome awakenings) could be considered as useful tools for interviewing the subjects' general state of health, instead of the direct questions concerning the mental state of the subjects. This is because dream reports are less biased by social and communicational expectations. Our results indicate that there is an association between emotional aspects of dreams and general health indexes. This is in concordance with previous findings, showing a relationship between nightmares and certain somatic diseases like cardiac symptoms such as spasmodic chest pain and irregular heart beating (LEVIN & NIELSEN 2007). Furthermore, the association between cardiac symptoms and the prevalence of nightmares seems to be independent of the symptoms of sleep-disordered breathing (ASPLOUND 2003). Since sleep and dream disorders are relevant predictors of the

development of depression, the association between dream complaints and lowered levels of well-being may indicate the presence of sub-clinical depressive states. The extremely oppressive dreams may also disrupt sleep, facilitating insomnia, which is shown to be one of the major risk factors for the development of depression (RIEMANN & VODERHOLZER 2003).

Our results indicate that while the relationship between nightmares and health indexes is partly explained by illness intrusiveness, the emotional aspects of dreams, for example the frequency of expressly oppressive and expressly gratifying dreams reflect a general state of mental and physical health, independently from illness intrusiveness. Since this relationship is not the result of the effect that dreams exert on waking mood, our results suggest that the emotional aspects of dreams reflect the waking affect of the dreamer, and not the other way around. Our results cohere with previous findings showing that the investigation of the emotional aspects of dreams, or simply the assessment of the prevalence of disturbing dreams are more appropriate indicators of the mental state of health than the prevalence of nightmares which per definition contain the awakening criterion (BLAGROVE et al. 2004). We found that the frequent experience of disturbing dreams is associated with a lower level of well-being. This is in concordance with previous findings showing a connection between well-being and the emotional aspects of dreams (PESANT & ZADRA 2006; BLAGROVE et al. 2004). Additionally, our findings suggest that general health problems and the days spent on sick-leave are associated with the frequent experience of nightmares and disturbing dreams and this cannot be solely explained by the lowered levels of well-being, therefore the emotional aspects of dreams may reflect something more that we can measure by the self-rated well-being scale. Dreams are metaphorical, visual responses depicting mainly social emotions, waking concerns and self-referential thoughts of the dreamer by using weak and distant associations, and as such may portray the individuals' mental state from a broader perspective, than self-ratings obtained by common psychometric instruments.

Our study has several limitations, however. Reported associations between dreams and health are usually weak, explaining only a small percent of the variance. The number of subjects varied substantially from one test to another and there was a possibility for an increased Type I statistical error in our analyses. Moreover, we did not yet analyse the relationship between neutral dream affect and health in our preliminary study. However, in spite of the above limitations the hypothesis-based preliminary exploration of this unique large data set suggests that dreams can be analysed in health psychological studies and could convey information on the general mental and physical health of the subjects, which could be useful in medical practice.

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APPENDIX 1.

The Dream Recall Frequency Scale

(Hungarian Version)

(adapted from SCHREDL 2004)

1. Álmaira általában:

   7 – majdnem minden reggel emlékszik,
   6 – hetente többször emlékszik,
   5 – hetente egyszer emlékszik,
   4 – havonta 2–3-szor emlékszik,
   3 – havonta egyszer emlékszik,
   2 – 2–3 havonta egyszer emlékszik vagy,
   1 – soha nem emlékszik?

   ———————

   0 – X –

APPENDIX 2.

The Dream Quality Questionnaire

(Hungarian version)

1. Gyakran vannak rémálmai, amelyek fölébresztik?

   2 – igen
   1 – nem

   0 – X –

2. Ismétlődő tartalmú ijesztő álmai vannak?

   2 – igen, vannak
   1 – nem, nincsenek

   0 – X –

3. Kérem, a kártya segítségével mondja meg, hogy álmai érzelmi töltete milyen gyakran kifejezetten nyomasztó? És . . . ?

	Legtöbbször	*Gyakran*	*Ritkán*	*Soha*	*0 X*
Kifejezetten nyomasztó?	4	3	2	1	0 X
Kellemetlen?	4	3	2	1	0 X
Semleges?	4	3	2	1	0 X
Kellemes?	4	3	2	1	0 X
Kifejezetten örömteli?	4	3	2	1	0 X

4. Befolyásolják-e álmai napközbeni hangulatát? Kérem, a kártya segítségével válaszoljon!

   1 – nem jellemző
   2 – ébredés után rövid ideig (5–10 percig)
   3 – néhány órán keresztül
   4 – egész nap
   5 – akár napokon keresztül

   0 – X –

5. Álmai általában:

1 – élénkek és filmszerűek,
2 – kicsit elmosódottak vagy
3 – halvány benyomásokhoz hasonlóak?

0 – X –

6. Álmai tartalma általában:

1 – szokványos, hétköznapi történésekhez hasonló
2 – szokványos, hétköznapi történésekhez hasonló, furcsa, oda nem illő elemekkel
3 – rendkívüli, valóságtól elrugaszkodott

0 – X –

7. Előfordul, hogy az alvásából izzadtan fölriad, heves szívdobogása van, és egy rövid ideig nem tudja, hogy hol van?

2 – igen
1 – nem

0 – X –

APPENDIX 3.

The Dream Quality Questionnaire

(English version)

1. Do you frequently have nightmares that wake you up?

   2 – yes
   1 – no

   0 – X –

2. Do you have dreams with frightening and recurrent content?

   2 – yes, I have
   1 – no, I do not have

   0 – X –

3. By using the card I ask you to tell me how frequently the emotional load of your dreams is expressly oppressive? And . . . ?

	Usually	*Frequently*	*Rarely*	*Never*	*0 X*
Expressly oppressive?	4	3	2	1	0 X
Bad?	4	3	2	1	0 X
Neutral?	4	3	2	1	0 X
Happy?	4	3	2	1	0 X
Expressly gratifying?	4	3	2	1	0 X

4. Do your dreams influence your daytime mood? I ask you to answer by using the card!

   1 – uncharacteristic
   2 – for a short time (for 5–10 minutes) after awakening
   3 – for several hours
   4 – during a whole day
   5 – even across several days

   0 – X –

5. Your dreams are usually:

   1 – vivid and movie-like
   2 – somewhat blurred or
   3 – like vague impressions?

   0 – X –

6. The content of your dreams is usually:

   1 – similar to common, everyday happenings
   2 – similar to common, everyday happenings, with strange incongruous elements
   3 – extraordinary, far from reality

   0 – X –

7. Does it occur that you are startled out of your sleep, sweating, fluttering and without knowing where you?

   2 – yes
   1 – no

   0 – X –