

Factors Affecting the Continuity Between Waking and Dreaming: Emotional Intensity and Emotional Tone of the Waking-Life Event

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Many researchers are advocating the so-called “continuity hypothesis” of dreaming which simply states that dreams reflect waking-life experiences. For deriving specific hypotheses, Schredl (2003) formulated a mathematical model that specifies factors that affect the probability that certain waking-life experiences are incorporated into subsequent dreams. The findings of the present diary study indicate that emotional intensity but not emotional tone of the waking-life events affects the incorporation into subsequent dreams. It seems very promising to investigate factors that affect the continuity between waking and dreaming with different methodological paradigms in order to arrive at a comprehensive, empirically tested, and precise continuity hypothesis. (**Sleep and Hypnosis 2006;8(1):1-5**)

Key words: dream content, continuity hypothesis

INTRODUCTION

Many researchers (e.g., [1-3]) are advocating the so-called “continuity hypothesis” of dreaming which simply states that dreams reflect waking-life experiences. For deriving specific hypotheses, however, the continuity hypothesis in its general formulation is very imprecise. Schredl (4) postulated a mathematical model that specifies factors that affect the probability that certain waking-life experiences are incorporated into subsequent dreams (see Table 1). Although the ultimate

goal of the model is to develop a mathematical formula to predict the incorporation rate of daytime experiences into dreams based on these factors, the first step will be to accumulate empirical evidence that these factors are significant in the continuity between waking and dreaming.

For most of these factors, some direct or indirect evidence can be found in the literature (for an extensive review see: [4]). Studies (e.g., [3]) assessing the temporal references of dream elements found a decrease in the incorporations with an increased time interval between waking-life experience and dream occurrence. Botman and Crovitz (5) were able to fit a model with an exponential function. However, the method of assessing retrospectively the temporal references has several shortcomings (e.g., memory capacity of the participants,

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Table 1. Postulated factors which affect the continuity between waking life and dreaming [1]

Factors
<ul style="list-style-type: none"> • Exponential decrease with time (interval between daytime experience and dream occurrence) • Emotional involvement • Type of waking-life experience • Personality traits • Time of the night (time interval between sleep onset and dream onset)

especially if waking-life thoughts are also included.). Prospective studies yielded mixed results, see for example the dream lag-effect reported by Nielsen and Powell (6).

The small effect of experimental stress, e.g. manipulating the pre-sleep situation (e.g., [7]) and the much stronger effect of “real” stress (e.g., intense psychotherapy or awaiting a major surgery; [8]) and traumata (e.g., [9]) on dream content indicate that emotional involvement regarding the waking-life event affects the incorporation rate for these events into dreams. Specific evidence whether emotional valence affects the incorporation rate - by comparing the effects of positive and negative life events on dreams - has not yet been reported. Based on the principle of continuity there is no particular reason to assume an effect of emotional valence of the day-time experience on the incorporation rate in addition to the effect of emotional intensity - although many studies focused on the effect of negative emotions only (see [4]).

The findings of Hartmann (10) and Schredl and Hofmann (11) indicate that the type of waking-life activity plays an important role; highly focused cognitive activities like reading or writing occur less often in dreams than other activities - like walking in nature and talking with friends - despite their frequent occurrence in waking life. The basic assumption is that the cholinergic status of the brain during REM sleep is not well suited for these cognitive activities.

Only preliminary data (12,13) have been reported that personality dimensions like field dependence or thin boundaries might moderate the effects of waking life on dream content. Two studies (14,15) found that elements of dreams from the second half of

the night do have more remote time references than the dream elements stemming from dreams of the first REM periods.

Of particular interest for this study is that research directly linking parameters of emotional involvement to the incorporation rate into dreams in a systematic way has not yet been carried out. The present study applying a diary approach represents an attempt to fill this gap. It was predicted that events with higher emotional intensity are more likely to be included in dreams than events with lower emotional intensity. Emotional tone (positive or negative valence), on the other hand, should have no effect.

METHOD

Participants

The sample included 46 psychology students whose mean age was 20.7 years (SD=2.8). There were 40 women and 6 men.

Research instruments

Dream questionnaire

In addition to demographic data, actual dream recall frequency was elicited using a seven-point scale (“How often do you recall your dreams recently (several months)?”, 0=never, 1=less than once a month, 2=about once a month, 3=two or three times a month, 4=about once a week, 5=several times a week, 6=almost every morning). The retest reliability of this scale for an averaged interval of 55 days is high ($r=.85$; $N=198$; [16]). In order to obtain units of mornings per week, the scale was recoded using the class means (0→0, 1→0.125, 2→0.25, 3→0.625, 4→1.0, 5→3.5, 6→6.5).

Dream diary

Each participant kept a structured diary over a two-week period. The diary consisted of fourteen sheets with structured lists for recording daytime events and fourteen sheets for dream recording. Every evening, they were asked to list the five most important events of the day and rate them along a five-point scale measuring emotional tone (-2=very negative, -1=slightly negative, 0=neutral, 1=slightly positive, 2=very positive) and a four-point scale measuring emotional intensity (being affected by the event: 0=not at all, 1=small effect, 2=strong effect, 3=very strong effect). These scales were of a Likert-type format. On the following mornings, dream recall was rated (0=no recall, 1=no content, 2=recall of a dream). In addition to the recording of their dream(s) as completely as possible, participants were instructed to state whether events of previous days occurred in the dream (including a brief description of these events). If an event was listed on the previous pages eliciting the five most important events of the day, the participants should record the number of the corresponding sheet and event. This format excluded post-dream recordings of daytime events. And the participants were not asked to rate non-recorded daytime events retrospectively.

Procedure

Participants were recruited on the campus. Participation was voluntary and unpaid. Formal written consent was not obtained because the usual routine is that showing up and participating after being informed is sufficient for assuming consent. Participants

completed the questionnaire and the dream diary. Statistical analyses were carried out using the SAS for Windows 8.02 software.

RESULTS

The mean dream recall frequency (questionnaire recoded) was 1.77 ± 1.43 mornings per week (Figures are Mean \pm Standard deviation). On average, 5.72 ± 3.19 dreams were recorded by each participant over the two-week period. Out of 254 dreams, 105 dreams were rated as having incorporated at least one recent daytime event. Sixty-four of those dreams included daytime events that were recorded previously on the structured list of the diary. In six cases, the participant stated that two events of a particular day occurred within the dream (these were averaged regarding emotional tone and emotional intensity). And in two instances, two daytime events of different days (each one day apart) were reported (again averages have been computed and for the time interval the shorter one was chosen). Most events were recalled from the previous day ($N = 41$), 16 from the day before, 3 were two days ago, 2 three days ago and one was four and one five days ago, respectively. Overall, 3309 daytime events had been listed in the diaries. Mean number of reported events per day of the participants was 5.14 ± 0.57 . For all events, mean emotional tone was 0.37 ± 1.07 ($N=3283$) and mean intensity 1.46 ± 0.75 ($N=3285$). Examples are phone calls (friends, mother), accidents, quarrelling with the partner, watching a movie, attending a lecture, going to a party, stressful train rides.

In Table 2, the comparisons of the

Table 2. Comparison for incorporated vs. not incorporated waking-life events

Variable	Incorporated waking-life event	Other waking-life events of the same day	Effect size	
			d =	t = (p value)
Emotional tone (N = 62)	0.39 \pm 1.33	0.29 \pm 0.55	0.07	0.6 (.5684)
Emotional intensity (N = 64)	1.68 \pm 0.83	1.44 \pm 0.48	0.26	2.1 (.0210) ¹

¹one-tailed

emotional tone and emotional intensity of the incorporated event with the other events of the same day are depicted. If the participant reported that a particular event was incorporated into the dream, the emotional intensity and emotional tone of this event was statistically tested against the means of the other, not incorporated events of this day (or in two cases - see above - the not incorporated events of both days) that were not incorporated. To account for the interdependence in the data (N=64 observations for emotional intensity and N=62 observations for emotional tone [due to two missing values] reported by 31 participants), a mixed-effects model was computed (df=30 for the fixed-model factor). The t value of the repeated measurement factor which compared emotional intensity/tone of the incorporated event to the mean values of the not incorporated events is shown. As expected, the effect of emotional intensity was significant whereas emotional tone did not differ between the incorporated event and the event(s) that have not been incorporated into the dream.

DISCUSSION

The findings of the present study indicate that the emotional intensity of a daytime event rated by the person heightened the probability of this event being incorporated into subsequent dreams. A similar effect for emotional tone was not observed.

For interpreting the results, methodological issues must be considered. First, the measurement of daily activities was not very detailed (only the five most important events of the day along with very brief descriptions). So it was not possible to use external judges to rate the correspondence between dream content and daytime event and the correspondence between dream element and daytime event was rated by the participants themselves. Strauch and Meier (2), for example, have demonstrated that it is necessary to include the dreamers' ratings for

an appropriate assessing of temporal references of dream elements because external judges would need a very detailed description of the dreamers' waking lives to do the matching. In the present study, no criteria were given as to how to determine the correspondence between dream element and daytime event (similarities, missing concordances) - as is common in retrospective assessment studies (cf. [3]). So it will be interesting to study the effect of explicit criteria on the matching process. The method of eliciting a detailed description of what was experienced during the day in the course of the study has to be evaluated very carefully from a methodological viewpoint because it seems very plausible that the intense recording process itself might affect dreaming, i.e., it might not be possible to relate dream elements to their actual occurrence in waking life but to the recording process. Therefore, findings from studies using diaries with differently sophisticated approaches of measuring daily events should be compared. Another issue is the method of dream collection. Diary dreams are often recollections of dreaming occurring in the second half of the night, shortly before awakening (3). Since several studies (e.g., [17]) have demonstrated that dreams elicited from the first REM period include more references to the previous day than late night REM dreams, it will be very interesting to complement this study with a laboratory study. But again, this study would have to be designed very carefully because dreams elicited in the sleep laboratory are strongly affected by the setting (e.g., [3]). This might cover up effects of other daytime experiences but one could introduce measures of involvement regarding the laboratory setting and relate these measures with the occurrence of lab references in dreams.

A possible dream lag effect was not observed in the present study, the time intervals between daytime event and occurrence within a dream decreased rapidly

with time; supporting the hypothesis of an exponential decrease (cf. [5]); keeping in mind the shortcomings of retrospective assessments of temporal references.

The findings (no effect of emotional tone) do not directly challenge the threat simulation theory (18) which postulates that threatening events are incorporated into dreams more often than non-threatening events (due to the function of rehearsing threat situations to enhance chances of survival). It will be a crucial test for the threat simulation theory to use a similar approach as presented here in which the subjective threat of the waking-life events is measured and to investigate whether daytime threatening events are more often incorporated into dreams than non-threatening events. This will answer the question whether threat intensity is directly related to the incorporation

rate of these events.

To summarize, the study demonstrated an effect of emotional intensity on the incorporation rate of waking-life events into dreams and thus corroborates that one of the factors of the model formulated by Schredl (4) is of importance. Due to the small effect size ($d=0.26$), studies with larger samples will be needed to replicate and validate the present findings. It also seems very promising to design studies that investigate all factors of the model - preferably simultaneously - with different methodological paradigms (diary studies eliciting effect of everyday events on dreams, laboratory studies applying experimental manipulation of what is experienced during the day) in order to arrive at a comprehensive, empirically tested, and precise formulation of the continuity hypothesis.

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