

Similarities and Differences between Dreaming and Waking Cognition: An Exploratory Study

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Thirty-eight “practiced” dreamers (Study 1) and 50 “novice” dreamers (Study 2) completed questionnaires assessing the cognitive, metacognitive, and emotional qualities of recent waking and dreaming experiences. The present findings suggest that dreaming cognition is more similar to waking cognition than previously assumed and that the differences between dreaming and waking cognition are more quantitative than qualitative. Results from the two studies were generally consistent, indicating that high-order cognition during dreaming is not restricted to individuals practiced in dream recall or self-observation. None of the measured features was absent or infrequent in reports of either dreaming or waking experiences. Recollections of dreaming and waking experiences were similar for some cognitive features (e.g., attentional processes, internal commentary, and public self-consciousness) and different for other features (e.g., choice, event-related self-reflection, and affect). © 1997 Academic Press

Many dream theorists claim that dreaming cognition is qualitatively different from waking cognition. Freud (1953), for example, asserted that dreaming mentation is characterized by bizarreness and magical thinking (“primary process thinking”) in contrast to waking mentation with its high degree of rationality, order, and clarity (“secondary process thinking”). Freud’s view of dreaming and waking as “discontinuous” processes has been assimilated into many theories of dreaming. That view has also come to dominate research comparing mental activity across waking and sleeping (see Purcell, Moffitt, & Hoffmann, 1993, for a recent discussion). Thus, it is rather common for contemporary theorists to claim that dreaming is dissociated

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from waking (e.g., Domino, 1976; Hartmann, 1973), is regressive (Koukkou & Lehman, 1983), and is isolated from waking memory systems (Rechtschaffen, 1978).

Freud (1953) also proposed that sleep brought a suspension of ego control and a corresponding loss of the capacity for reflective awareness. Natsoulas (1986–1987) defines this direct (reflective) awareness as the fourth basic concept of consciousness of William James' "stream of consciousness" (see, especially, pp. 302–306). Reflective awareness refers to a conscious awareness of an ongoing internal or external event: "[the mind] not only knows the things that appear before it; it knows that it knows them" (James, 1890/1981, Vol. 1, p. 264) (also see Natsoulas, 1985, 1985–1986). For example, "I heard my child's musical laugh and was aware of how much pleasure I felt in that moment" (Kahan, 1994). William James claimed that reflective awareness is a hallmark of the waking adult mind (James, 1890/1981, p. 263).

Following the lead of Freud and James, a number of current dream theories emphasize the purported "deficiencies" of dream cognition, particularly the absence of reflective awareness during dreaming (e.g., Blagrove, 1992; Crick & Mitchison, 1983; Foulkes, 1990; Hobson, 1988; Kunzendorf, 1987–1988; Rechtschaffen, 1978; Weinstein, Schwartz, & Ellman, 1988).

Hobson's influential "activation-synthesis" model of dreaming (Hobson & McCarley, 1977; Hobson, 1988) attempts to explain the psychological features of dreaming in terms of the particular neurophysiological features of Rapid-Eye-Movement (REM) sleep. A central assumption of Hobson's model, reminiscent of Freud, is that abstract self-reference and a self-critical perspective are lost during dreaming. Although Hobson (1988) explains these presumed deficiencies in terms of the altered activity of the aminergic system during REM sleep, while Freud's explanation is psychodynamic (Freud, 1953), they share the central assumptions of discontinuity and deficiency. A testimony to the pervasive influence of Freud's theory of the dreaming mind and James' theory of the waking mind on contemporary dream psychology is the fact that little *empirical evidence* has been offered in support of the hypothesized deficiencies in dreaming cognition (also see Haskell, 1986).

A recent article (Kahan and LaBerge, 1994) makes the case that the occurrence of "lucid dreaming" presents a significant challenge to deficiency views of dreaming. In a lucid dream (van Eeden, 1913) the dreamer is aware of dreaming *while* dreaming and so is, by definition, evidencing reflective awareness. The following dream of F. W. H. Myers (1887) (as cited in Green, 1968) illustrates the onset of lucidity as well as the intentionality that often characterizes lucid dreams.

"I was, I thought, standing in my study; but I observed that the furniture had not its usual distinctness—that everything was blurred and somehow evaded a direct gaze. It struck me that this must be because I was *dreaming*. This was a great delight to me, as giving the opportunity of experimentation . . . As I walked downstairs I looked carefully at the stair-carpet, to see whether I could visualize better in dream than in waking life. I found that this was *not* so: the dream-carpet was not like what I knew it in truth to be; rather, it was a thin, ragged carpet, apparently vaguely generalized from memories of seaside lodgings." (p. 35)

Kahan and LaBerge (1994) argue that the phenomenon of lucid dreaming casts doubt on the common view that cognition during dreaming is *inherently* deficient. Laboratory studies have established lucid dreaming as a bona fide sleep phenomenon (for a review of this research, see LaBerge, 1985, 1990). In addition, numerous chron-

icles of the phenomenology of lucid dreaming provide clear examples of high-order cognitive abilities during sleep (e.g., metacognitive monitoring, volition, reflective awareness) (e.g., Saint-Denys, 1982; Fox, 1962; Gackenbach & Bosveld, 1989; Green, 1968; LaBerge, 1985; van Eeden, 1913).

We should note, further, that several recent studies of the incidence of reflective awareness during nonlucid dreaming indicate that the quality and variety of cognitive activity during dreaming have been underestimated (e.g., Bradley, Hollifield, & Foulkes, 1992; Kahan, 1994; Purcell, Mullington, Moffitt, Hoffmann, & Pigeau, 1986; Purcell, Moffitt, & Hoffmann, 1993). The bulk of this research was conducted by Sheila Purcell, Alan Moffitt, and Robert Hoffmann of Carleton University. Reflective awareness is one aspect of what Moffitt and his colleagues termed "self-reflectiveness"; the *set* of "self-organizing and self-regulating processes [that] occur within dreaming as well as waking" (Moffitt et al., 1988, p. 431).

The Carleton team developed "process levels" based on Rossi's (1972) theoretical self-reflectiveness continuum. For example, "1" indicates "dreamer not in the dream," "4" indicates "dreamer present predominantly as observer," and "9" indicates "dreamer can consciously reflect on the fact that he or she is dreaming" (Purcell et al., 1986, p. 425). Narrative reports were obtained from 24 college students awakened during different sleep stages and independent raters scaled the highest level of self-reflectiveness (SR) observed in the reports (Purcell et al., 1986; experiment 1). Higher SR scores were assigned to reports obtained from REM sleep than to reports from stages 2 and 4, which did not differ. The most frequently occurring SR category was "dreamer completely involved in the dream drama; no other perspective" (level 3), which is consistent with the position that dreaming involves little reflective awareness. However, instances of internal commentary (level 5), dual levels of awareness (level 7), intentionality (level 8), and explicit awareness of dreaming (lucidity) (level 9) occurred with sufficient frequency to raise questions about the supposed lack of reflective awareness during dreaming (also see Purcell et al., 1993, for a similar approach to indexing the level of control evidenced in narrative reports of nonlucid dreams). Purcell et al. (1986; experiment 2) also demonstrated that "the level of dream self-reflectiveness can be increased through systematic training, notably mnemonic strategies." These findings indicate that self-reflectiveness is better thought of as a cognitive skill that can intentionally be developed rather than as a fixed "cognitive style" characterizing both waking and dreaming cognition (e.g., Hendricks & Cartwright, 1978; Starker, 1974).²

A recent study by Kahan (1994) presents evidence that reflective awareness and other metacognitive experiences are often underreported in narrative dream reports. Kahan argues that dream metacognition may be better measured by asking subjects about particular qualities of their dream experience (see, especially, Pekala, 1991) than by using third person evaluations of the narrative reports (e.g., Purcell et al., 1986, 1993). In Kahan's investigation, 30 college students first increased their dream recall by keeping a dream journal for 1 week. For the next 2 weeks, subjects wrote

² Rossi (1972, 1986) presents the most comprehensive theory of the coevolution of self-reflectiveness in waking and dreaming cognition. Rossi's hypotheses concerning the developmental nature of self-reflectiveness have not, to our knowledge, been empirically tested.

narrative reports and evaluated the phenomenal qualities of eight of their dreams using the Dream Rating Scale. Subjects' dream reports were scored for self-reflectiveness by independent raters who had been trained in the use of the dream self-reflectiveness scale (Purcell et al., 1986). The frequency distribution of SR scores was highly consistent with the findings of Purcell et al. (1986). However, data from the Dream Rating Scale suggested that the incidence and types of dream cognition and metacognition may be underestimated when measurement is based solely on narrative reports. Subjects reported a greater variety of cognitive and metacognitive experiences during dreaming than was suggested by the distribution of SR scores. Kahan (1994) also argues that reflective awareness and behavior regulation (control) are separable dimensions of dreaming and should be measured independently (also see Hunt, 1989; Purcell et al., 1993).

In summary, recent research suggests that reflective consciousness and other high-order cognitive abilities do characterize dreaming. Also, other research suggests that waking cognition may *not* be characterized by a uniformly high level of reflective consciousness, rationality, or volition (e.g., Cartwright, 1981; Foulkes & Fleisher, 1975; Kleitman, 1963; Kripke & Sonnenschein, 1973; Langer, 1989).

The issue of the relationship between dreaming and waking cognition cannot be resolved without systematic comparisons across waking and sleeping (Kahan & LaBerge, 1994). We acknowledge the methodological challenges associated with obtaining equivalent measures of waking and dreaming experience (see Stoyva & Kamiya, 1968; Weinstein, Schwartz, & Arkin, 1991, for discussions of these methodological challenges). Measures of dreaming and waking cognition are both necessarily indirect. Also, an individual's recollections, whether of recent dreaming or waking events, must be reported in a waking state. Despite these conceptual and methodological challenges, cognitive psychologists have argued persuasively that an individual's subjective reports and retrospective evaluations are valid indices of underlying cognitive processes (see, especially, Johnson, 1988, 1992; Johnson, Foley, Suengas, & Raye, 1988; Johnson, Kahan, & Raye, 1984; Suengas & Johnson, 1988). If dreaming experience is evaluated retrospectively, then, minimally, waking experience should also be evaluated retrospectively.

The present pair of studies compared the cognitive and metacognitive features of waking and dreaming experiences as reported by individuals practiced in dreamwork (Experiment 1) and by "novice" dreamers (Experiment 2). The first study relied on a nine-item questionnaire to assess reflective consciousness and other cognitive and metacognitive experiences (see Flavell, 1979; Nelson & Narens, 1990). Four of the questions were designed to assess aspects of reflective consciousness; one question assessed internal commentary and three questions assessed public or private self-consciousness (after Fenigstein, Scheier, & Buss, 1975). Other questions measured choice, unexpected attention, focused attention, emotion, and the occurrence of unusual experiences. The same procedure was used in both studies. In the course of a week, subjects filled out parallel questionnaires for a dreaming and a waking experience and provided a written description of each experience. For the dream episode, subjects recorded the dream most clearly recalled upon awakening and then completed the questionnaire. For each question answered "yes," the subject described a relevant example from the target dreaming experience. For the waking episode,

subjects recorded their experiences from a prior 15-min period and then completed the same questionnaire.

Novice dreamers were tested in the second study and two types of instructions for the waking-state episodes were compared. We also deleted two questions on the original MACE and added a new question to reduce the likelihood that subjects would confound their evaluations of the recent dreaming or waking experience with judgments made in the course of completing the questionnaire.

PREDICTIONS

If dreaming cognition is qualitatively different from waking cognition ("deficiency" view), then reports of higher-order cognition (e.g., reflective consciousness, choice, focused attention) should be associated with samples of subjects' waking experience but not with samples of subjects' dreaming experiences. If dreaming cognition is largely continuous with waking cognition ("continuity" view), then reports of higher-order cognition should be observed for both waking and dreaming experience, although the frequency of such reports may not be identical across the two "states."

EXPERIMENT 1

Method

Participants. Subjects were 18 male and 20 female (age range 22 to 69; *M* age = 39) members of The Lucidity Institute, a group identified as having high interest in dreaming. Subjects voluntarily completed the study. This sample was defined as a "practiced" group because these individuals joined The Lucidity Institute due to their interest in dream work and dreaming, especially lucid dreaming (awareness of dreaming while dreaming). Subjects reported an average of 8 dreams during the week prior to completing the study (range = 0–28). With respect to the number of lucid dreams reported in the previous 6 months, 84% of the subjects reported at least 1 lucid dream, 73% reported at least 3 lucid dreams, and 49% reported at least 10 lucid dreams. These individuals also were sufficiently motivated to complete the study and mail in the questionnaires and dream reports.

Materials. A nine-item questionnaire which assessed metacognitive, affective, and cognitive experiences during dreaming and waking experience was developed, piloted, and revised (henceforth referred to as the MACE) (see Table 1). The dimensions we evaluated were: choice, internal commentary on an event, sudden attention, sustained attention, public self-consciousness, private self-consciousness (self-reflection) related to the target event, private self-consciousness (self-reflection) unrelated to the target event, emotion, and unusual experiences. Following each question, an example was provided for instantiation. The subject's task was to determine whether he or she had experienced the type of event described in the question and to respond with "yes" or "no." For questions answered "yes," the subject described the relevant experience on the questionnaire.³

³ We felt that having subjects briefly describe the particular event (e.g., choice, focused attention, internal commentary) represents an improvement over both traditional questionnaire measures and over experimenter-based ratings of the narrative report on the other hand (see, especially, Kahan, 1994).

TABLE 1
The Metacognitive, Affective, and Cognitive Experience (MACE) Questionnaire

Questions common to practiced and novice dreamers

Q 1: (Dimension = Choice)

“At any time did you choose between alternative actions after consideration of the options?”

(e.g., I decided to finish my homework instead of going to the movies).

Yes No If YES, please describe:

Q 2: (Dimension = Internal commentary)

“Did you internally comment on any event, or wonder about anything?” (e.g., I wondered who locked the door).

Yes No If YES, please describe:

Q 3: (Dimension = Unexpected attention)

“Did any element or event capture your attention unexpectedly?” (e.g., The telephone rang and I answered it).

Yes No If YES, please describe:

Q 4: (Dimension = Focused or sustained attention)

“Did you focus for a period of time on accomplishing a particular objective?” (e.g., I looked all over for my keys).

Yes No If YES, please describe:

Q 5: (Dimension = Public self-consciousness)

“Were you concerned about the impression you made, how you looked, or how you appeared to others?” (e.g., I was afraid I’d seem foolish if I asked a question).

Yes No If YES, please describe:

Q 6: (Dimension = Emotion)

“Did you feel any emotions during the experience?” (e.g., I was angry at my roommate for messing up the room).

Yes No If YES, please describe:

Q 7: (Dimension = Event-related private self-consciousness/self-reflectiveness)

“Did you think about your own thoughts, feelings, attitudes, motivations, or behavior?” (e.g., I thought about the fact that I’m always concerned about getting to places on time).

Yes No If YES, please describe:

Questions answered only by practiced dreamers (Exp. 1)

Q 8: (Dimension = Event-unrelated private self-consciousness)

“Did you have any thoughts about something unrelated to the situation you were in?” (e.g., I thought about something I’m going to have to do next month).

Yes No If YES, please describe:

Q 9: (Dimension = Unusual experience)

“Did you experience anything unusual?” (e.g., I got unusually angry at my roommate for messing up the room).

Yes No If YES, please describe:

Questions answered only by novice dreamers (Exp. 2)

Q 8: (Dimension = thwarted intention)

“Did you experience any unusual difficulty in accomplishing anything you were trying to do?” (e.g., The library was closed so I couldn’t get a book I needed).

Yes No If YES, please describe:

Design and procedure. Lucidity Institute members were invited to participate in the study via the Institute's quarterly newsletter.⁴ The newsletter provided an overview to the study, instructions, and report forms. No deception was involved, in that subjects were told that the study compared waking and dreaming.

Samples of waking and dreaming experiences were obtained in an informally counterbalanced order; if a participant's last name had an even number of letters, he or she completed the dream recording first, but if his or her last name had an odd number of letters, he or she completed the waking recording first.

For the dream experience, subjects waited until they awakened from a well-remembered dream. Upon awakening, the participant recorded as much detail as possible from the previous roughly 15 min of the dream and then completed the MACE. For each question, the participant checked "yes" or "no" to indicate whether he or she had a similar experience during the dream. For each question checked "yes," the subject described, in writing, an example of that experience as it occurred during the dream (see Table 1).

Subjects instructed to evaluate a waking experience first *immediately* recorded in detail as much as could be recalled from the previous 15 min and then completed the MACE. Subjects instructed to complete the waking experience *after* the dreaming experience waited until they had about 15 min available for writing, then read the waking experience instructions, recorded their experiences of the previous 15 min, and completed the MACE. Subjects mailed the completed questionnaires and narrative reports to The Lucidity Institute.⁵

Results

Table 2 presents the percentage of practiced dreamers who responded "yes" to each question on the MACE they completed for a dreaming episode and a waking episode. Dependent groups *t* tests revealed significant differences for four of the nine questions. Choice between alternatives (Q 1) and reflection on events unrelated to the target event (Q 9) were reported more often for waking episodes than for dreaming episodes, $t(1, 37) = -3.22, -3.16$, $SEMs = .08, .09$, $ps = .003, .003$, respectively. Public self-consciousness and unusual experiences were reported more often for dreaming episodes than for waking episodes, $t(1, 37) = 2.46, 5.10$, $SEMs = .09, .10$, $ps = .02, .001$, respectively. Marginally significant differences in percentage "yes" responses were observed across waking and dreaming episodes for the questions concerning presence of an emotion (Q 6) and reflection on events related to

⁴ The perceiving and dreaming mind (1993, Winter) *NightLight*, 5, 5–8.

⁵ The reader may wonder why we did not ask whether the results would be different in a laboratory setting where non-REM as well as REM could have been collected. Future research may well have as its goal "representative" sampling of REM, non-REM, and waking experiences in a laboratory setting (see, for example, Antrobus, 1991). For our present purposes, we felt that there were distinct advantages to obtaining reports of waking and dreaming experiences in a more "naturalistic" context. In addition to the obvious practical advantages of home-based data collection, several dream theorists have recently argued that dreams recalled under naturalistic (home) conditions are more detailed and have a broader emotional range than do dreams recalled under laboratory conditions (see, especially, Hobson, 1995, pp. 148–150; Van de Castle, 1994, pp. 283–287).

TABLE 2
 Percentage of Practiced Dreamers ($N = 38$) Responding "Yes" to Questions Assessing
 Metacognitive, Affective, and Cognitive Features of Dreaming and Waking Experience

Feature	Dreaming episode	Waking episode	D:W Ratio
Choice ^a	.53	.79	.67
Internal commentary	.92	.87	1.06
Unexpected attention	.79	.63	1.25
Focused attention	.76	.84	.91
Public self-consciousness ^a	.53	.32	1.66
Emotion ^b	.87	.71	1.22
Self-reflection			
Event-related ^b	.40	.55	.71
Event-unrelated ^a	.21	.50	.42
Unusual experiences ^a	.84	.34	2.46

^a $p < .05$.

^b p between .06 and .10.

the target event (Q 8), $t_s(1, 37) = 1.78, -1.64, SEMs = .09, .10, ps = .08, .11$, respectively.

Discussion

Consistent with "deficiency" theories of dreaming cognition, choice and reflection were reported less often for dreaming than for waking episodes. However, subjects reported these experiences with considerable frequency for dreaming as well as waking, suggesting that the differences between waking and dreaming cognition may be more *quantitative* than qualitative.

Further support for the view that dream events are more "bizarre" than waking events (e.g., Hobson, 1988; Hunt, Ruzycki-Hunt, Pariak, & Belicki, 1993) comes from evidence that unusual experiences were reported more often for dreaming than for waking episodes.

Consistent with "continuity" theories of dreaming cognition, however, are marked similarities across waking and dreaming observed for certain types of reflective consciousness. We found that internal commentary was reported as frequently for dreaming episodes as for waking episodes (see Table 2). And, contrary to a deficiency view, reports of concern about one's appearance (public self-consciousness) were actually more characteristic of dreaming than of waking episodes. Other cognitive activities that were reported equally often for both waking and dreaming episodes were unexpected attention and focused attention. The findings related to attention are provocative in light of previous claims that attention operates differently during dreaming than during waking (e.g., Hobson, 1988; Rechtschaffen, 1978).

It is possible that the incidence of reflective consciousness during dreaming reported by subjects in the first study is due to the fact that these individuals are practiced in dream recall and dream work and have "trained" themselves in these metacognitive skills. The purpose of the second study was to investigate whether the results of Study 1 would hold for a group of novice dreamers; individuals who are, at least initially, less practiced in reporting subjective experience.

EXPERIMENT 2

Method

Participants. Fifty undergraduates (26 males and 24 females) from a private northern California university participated for partial credit in an introductory psychology course. Subjects' ages ranged from 18 to 37, with an average age of 19. This sample was defined as the "novice" group because these individuals were generally younger and reported little experience with dream work (8% reported having kept a dream journal, and only 6% reported having had one or more lucid dreams within the past 6 months).

Materials. The MACE was modified slightly for Experiment 2. Retaining the first seven questions made informal comparisons across the two subject groups possible. Questions eight (unrelated thoughts) and nine (unusual experiences) were deleted because we felt that answering these questions might rely too heavily on judgments made during the waking state, while the individual was completing the questionnaire, thereby introducing a confound into the subject's answers. A new question was added (Q 8) which assessed "thwarted intention" (whether subjects experienced any unusual difficulty accomplishing an intended task) (see Table 1).

Design and procedure. The procedure for sampling waking and dreaming experience was more formalized than that in Experiment 1. Groups of 6 to 10 students met with one of two experimenters. Experimenters were advanced undergraduates who were trained in the experimental protocol and the use of the questionnaires; experimenters were not otherwise involved in the study. The experimenters, blind to the experimental hypothesis, described the goal of the study as comparing experiences that occur during waking and sleeping. A demographic questionnaire and the MACE were distributed and the procedure for completing the questionnaires was explained. The experimenter also read the MACE instructions aloud and emphasized that students should work through the MACE slowly and carefully. For the dreaming condition, subjects selected either Saturday or Sunday morning and, immediately after awakening, recorded the dream most clearly recalled and then completed the MACE. For the waking condition, subjects were randomly assigned to receive either "Saturday/Sunday" (Sat/Sun) instructions or "Will Call" instructions. The group receiving Will Call instructions was included to determine whether subjects' reports of waking experiences varied when waking events were sampled at a less predictable time.

Subjects who received Sat/Sun instructions selected either Saturday or Sunday as an "experimental" day. At 2 PM on the selected day, the subject recorded his or her experiences from the prior 15-min period and then completed the MACE. Subjects were instructed to do whatever was necessary to remember to record their waking experience at the designated time but not to "set up" the activities of those 15 min in advance. Subjects receiving Will Call instructions provided a phone number and times they could be reached. These subjects then received a call within the next few days from an experimenter. Immediately after the phone call, the subject recorded his or her experiences of the prior 15 min and completed the MACE.

The order in which subjects completed the Dreaming and Waking versions of the MACE was counterbalanced across subjects; a randomized half of the subjects in

TABLE 3
Dimensions of Dreaming and Waking Experiences of Novice Dreamers ($N = 50$) for Which the Percentage of "Yes" Responses for the Waking Condition Varied with Instructions

Dimension	Instruction ^a	Dreaming episode	Waking episode	D:W Ratio
Sudden attention	Sat/Sun	.68	.40	1.7
	Will Call	.68	.76	.89
Focused attention	Sat/Sun	.68	.48	1.42
	Will Call	.60	.80	.75

^a $n = 25$ in each of the instruction conditions.

each instruction condition completed the Dreaming questionnaire first, while the other half completed the Waking questionnaire first.

Results and discussion. The first analysis determined whether the pattern of yes/no responses for the Dreaming/Waking questionnaires varied with instructional condition. Subjects' yes/no judgments were coded as 1 and 0, respectively. The percentage of "yes" responses to each question was analyzed as a function of state (dreaming or waking) and instructional condition (Sat/Sun, Will Call). MANOVA was used to analyze the resulting 2 (State) \times 2 (Instructions) mixed design. The within-subjects factor was State because all subjects completed questionnaires for both a dreaming and a waking episode. The between-subjects factor was Instructions because subjects were randomly assigned to one of the two instructional conditions.

Instructions (which varied for the waking episode only) influenced subjects' judgments for the two questions dealing with attentional processes. Table 3 presents the percentage of "yes" responses for the two instructional conditions. A significant Instruction \times State interaction effect was observed for the reported occurrence of "focused attention," $F(1, 48) = 8.00$, $MSe = 1.00$, $p = .007$. Subjects receiving the Sat/Sun instructions reported fewer instances of "focused attention" associated with the waking report than with the dreaming report, whereas subjects receiving the Will Call instructions reported more instances of "focused attention" associated with the waking report than with the dreaming report (see Table 3). Reports of "focused attention" did not vary for dreaming episodes across the two instructional conditions.

In addition, a marginally significant interaction effect was observed for "sudden attention," $F(1, 48) = 3.13$, $Mse = .81$, $p = .08$. Subjects' reports of "sudden attention" associated with the dream episode did not differ for the two instructional conditions, whereas subjects' reports of "sudden attention" associated with the waking episode tended to be higher with Will Call ($M = .76$) than with Sat/Sun instructions ($M = .40$).

The higher incidence of attention ["sudden," "focused"] reported for the waking episode was likely due to the data collection procedure for the Will Call condition. An experimenter telephoned the subject and instructed him or her to record the experience of the previous 15 min and then evaluate the experience using the questionnaire. The ringing of the telephone was probably a salient aspect of the waking episode and likely contributed to the high incidence of reports of "sudden attention." Similarly, the conversation with the experimenter and the review of the experimental instructions may account for subjects' reports of a high incidence of "focused atten-

TABLE 4
Dimension of Dreaming and Waking Experiences of Novice Dreamers ($N = 50$) for Which the Percentage of "Yes" Responses for the Waking Condition Did Not Vary with Instructions

Feature	Dreaming episode	Waking episode	D:W Ratio
Choice ^a	.46	.84	.55
Internal commentary	.88	.80	1.1
Public self-consciousness	.34	.22	1.55
Emotion	.92	.80	1.15
Self-reflection			
Event-related	.48	.62	.77
Unusual difficulty	.46	.50	.92

^a Features in bold are common to Exp. 1 and Exp. 2.

tion" associated with the waking episode. The original intent in varying the waking instructions was to minimize the likelihood that subjects would preplan their waking experience for study purposes. We wished, instead, to "sample" waking experience at an unexpected time. However, the sampling procedure itself appears to have influenced the subjects' waking attention by interrupting their experience with a phone call. It is important to note that no other differences were observed across the instructional conditions, suggesting that the waking events sampled with the Sat/Sun instructions were not preplanned by the participants.

Table 4 presents the percentage of novice dreamers who responded "yes" to each question on the MACE as completed for a dreaming episode and a waking episode where responses for the waking condition did not vary with instructions. Dependent groups *t* tests revealed significant differences between subjects' "yes" responses for dreaming and waking episodes for one question. Choice was reported less often for dreaming episodes than for waking episodes, $t(1, 49) = -4.23$, $SEM = .9$, $p < .001$. Marginally significant differences between waking and dreaming episodes were observed for questions concerning the experience of an emotion and self-reflection related to the event, $t_s(1, 49) = 1.77, -1.63$, $SEMs = .07, .09$, $ps = .08, .11$, respectively.

COMPARISONS ACROSS PRACTICED AND NOVICE DREAMERS

Comparisons of the practiced and novice dreamers were possible for seven questions on the MACE. For each of these seven questions, a 2 (Group: Practiced, Novice) \times 2 (State: Dreaming, Waking) analysis of variance based on a mixed model was conducted to determine whether subjects' ratings of their dreaming and waking experiences varied with subject group.

With the exception of the two questions pertaining to attentional processes, no systematic differences between practiced and novice dreamers were observed. Therefore, for the other five questions common to the two groups, data from practiced and novice dreamers were combined and the percentage of "yes" responses for dreaming and waking experiences are presented in Table 5. Combining these data should increase the power of the analysis and may help to resolve some of the marginally significant effects observed in the two studies.

TABLE 5
Dimensions of Dreaming and Waking Experiences for Which the Pattern of "Yes" Responses Did Not Vary for Practiced (Exp. 1) and Novice (Exp. 2) Dreamers ($N = 88$)

Dimension	Dreaming episode	Waking episode	D:W Ratio
Choice ^a	.50	.82	.61
Internal commentary	.90	.84	1.07
Public self-consciousness ^a	.44	.27	1.63
Emotion ^a	.89	.76	1.17
Self-reflection ^a	.44	.59	.75

^a Comparison is significant at $p < .05$.

Dependent groups t tests revealed differences in subjects' evaluations of waking and dreaming episodes on four of the five dimensions. "Choice" and "Self-reflection" were more often reported for waking episodes than for dreaming episodes, $t(1, 86) = 26.35, 5.30, MSes = 4.47, .96, ps = .001, .02$, respectively. "Public self-consciousness" and "emotion" were more often reported for dreaming episodes than for waking episodes, $t(1, 86) = 7.93, 6.42, MSes = 1.18, .83, ps = .006, .01$, respectively. The occurrence of "internal commentary" did not differ for waking and dreaming episodes, $t(1, 86) = 2.82, MSe = .19, p > .05$.

GENERAL DISCUSSION

Our findings reveal both similarities and differences in subjects' assessment of particular metacognitive, affective, and cognitive features of their dreaming and waking experiences. The pattern of findings was similar for practiced and novice dreamers, indicating that evidence of high-order cognition during dreaming is not restricted to individuals who have developed or have special involvement in their dreaming skills.

Choice and self-reflection were more often associated with waking than with dreaming reports, although these cognitive events were ascribed to about 50% of the dream experiences (see Table 5). It may be that choice and self-reflection are *more* characteristic of retrospective evaluations of waking cognition than with retrospective evaluations of dreaming cognition. However, this does not mean that choice or self-reflection are rarely or never associated with episodic recall of dreaming experiences.

Internal commentary was as likely to be associated with a dreaming as with a waking report, again suggesting that certain types of metacognition may be more characteristic of dreaming cognition than has previously been asserted (e.g., Blagrove, 1992; Rechtschaffen, 1978; Hobson, 1988).

Although public self-consciousness was reported less often than the other aspects of cognition, subjects reported a higher incidence of public self-consciousness associated with their dreaming experiences than with their waking experiences. Clearly contrary to Hobson's (1988) claim that a self-critical perspective is absent in dreaming are reports of concern about how one looked or appeared to others. However, we cannot assert that waking experience is *generally* characterized by a lower incidence of public self-consciousness than is dreaming experience. The present findings

may reflect the likelihood that participants obtained their waking samples when they were alone because solitary moments would be more appropriate to completing the questionnaire materials than would social times.

Emotion was more often associated with subjects' evaluations of their dreaming experiences than with their waking experiences. This is consistent with Hobson's (1988) suggestion that an intensification of emotion is associated with many dreams (also see Kramer, 1993).

In the present studies, subjects chose one well-remembered dream. For practiced dreamers especially (Study 1), this procedure could bias in favor of salient or otherwise memorable mentation which might include a disproportionate amount of metacognition. However, this concern presumes that as one improves his or her dream recall, the qualities of the recalled dreams inevitably change. Purcell et al. (1986) have demonstrated that the degree of dream self-reflectiveness, for example, can be increased with training, but it is an empirical question as to whether simply "working" with one's dreams and having a high level of dream recall increases the incidence of metacognitive activities. True, the practiced dreamers reported a higher incidence of lucid dreams than did the novice dreamers, which is consistent with a hypothesis that the practiced dreamers would evidence a higher incidence of metacognition in dreams. In fact, there were few differences across novice and practiced dreamers on the measured metacognitive and cognitive dimensions.

Another concern with the present studies is that the report of the dreaming experience may be more removed in time from the dream experience than is the report of the waking experience. On the other hand, it is likely that subjects reported the dreams they awakened from, as these tend to be more easily recalled than dreams from earlier in the night. These time relations between experience and reports are hypothetical, however, in that the actual time delay between when the dreaming experience occurred and when the subject reported and evaluated that experience is unknown.

SUGGESTIONS FOR FUTURE RESEARCH AND CONCLUSIONS

In future research, multiple and random samples of an individual's waking and dreaming experiences are necessary to determine how well the results we present here broadly characterize waking and dreaming experience. Interrupting an individual's waking and dreaming experience at unpredictable and varying times would insure that the samples are more representative of an individual's dreaming and waking experience. This procedure would also permit the control of the time delay between when an individual's experience was interrupted and when he or she described and evaluated that experience. Adding one or two "practice" nights prior to experimental sampling of dreaming (or waking) would counteract any possible "first night" effects. The further development and validation of measurement tools to scale metacognition over the sleep/wake cycle is also needed.

While caution must be exercised when generalizing from the present data, our present findings do suggest that episodic recollections of waking and dreaming experience are more similar than they are different. Episodic recall of dreaming experiences did not reveal global deficiencies in cognition relative to episodic recall of waking experiences. All of the measured dimensions of consciousness, cognition,

and emotion were evident in subjects' reports of both waking and dreaming experiences and the differences between reports of dreaming and waking cognition were more quantitative than qualitative. We believe the present studies invite further exploration of the variations in consciousness and cognition *within* states as well as between states.

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