Dream Analysis and Classification: The Reality Simulation Perspective

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Chapter 51

Abstract

The task of differentiating dreaming from other forms of imaginative cognition and of classifying different dream types and subtypes is largely incomplete. However, a growing interest in dreaming's capacity for simulating waking reality experience offers a viable point of departure for furthering this unfinished task. Most types of dream content measures (e.g., prevalence, frequency, intensity, structural coherence) are predicated, directly or indirectly, on this assumption about dreaming's capacity for simulating reality and provide converging support for the reality-simulation assumption. Even measures of dream bizarreness—which is quite common in dreams—may be understood as attempts to quantify failures of the simulation mechanism. Both simulated content and bizarreness measures may be viable approaches for completing the task of dream classification. However, a third level of analysis also related to reality simulation may prove key in this enterprise. This is the simulation of the subtle, perception-like nature of waking experience, namely, the process of seeking out and picking up apparent information, not the appreciation of the contents of this process. This level of subjective experience is only difficultly accessed by awaking, self-reflective subjects, so its study in dream experience may require greater use of targeted probe questions and less-conventional methods such as selecting subjects for their communication abilities and training them in self-observation.

THE INCOMPLETE TASK OF DREAM CLASSIFICATION

Dream psychobiologists have not traditionally regarded the classification and definition of dreaming as an empirical task; the result has been a diffuseness and artificiality of dream classifications that has had adverse effects on research.[1] Yet, in this new era of cognitive and social neuroscience research, the need is increasing for an empirically based consensus on how dreaming as an object of study should be characterized.

The tasks of differentiating dreaming from other forms of imaginative cognition and of differentiating types—and subtypes—of dreaming from each other are analogous to other empirically based taxonomy methods, such as the linnaean classification of basic life forms (Fig. 51-1). The features that distinguish dreaming as a unique imagery family and the features that distinguish among different dream genera within that family should be determined by systematic comparisons of samples from a variety of candidate families or genera using a sufficiently large array of defining features. The selection of which defining features to evaluate is driven by a variety of considerations, some practical and some theoretical. The classification of dreaming and dreaming subtypes shown in Figure 51-1 should be considered arbitrary for this very reason; it is based upon little available empirical work[2,3] and substantial theory.[4] The taxonomy of dreaming, in fact, remains incomplete.

Many researchers might have abandoned attempts to classify dreaming because of methodologic obstacles, such as the seemingly infinite array of definitional attributes that could be evaluated. They might also have been hindered by the proliferation of dream theories that has distracted attention from the need for a taxonomy.

DREAMING AS REALITY SIMULATION

Central to the classification task is the choice of potentially defining features to be evaluated. Of the multiplicity of features that might be assessed, I consider here one perspective that addresses a relatively obvious and increasingly accepted aspect of dream phenomenology, namely, that the subjective nature of dreaming consists of *a convincing simulation of waking reality experience.* The reality simulation perspective directs attention to the evaluation of attributes that capture the essence of reality simulation as a first step in discriminating dreaming from other forms of imaginative cognition. The reality simulation capacity has been emphasized by many past and present authors as illustrated by the descriptions listed in Table 51-1.

As excerpts in the table indicate, the realistic nature of dream contents has been appreciated by authors at least as early as Freud (1900). Excerpts also reveal differences in opinion as to the key features of reality simulation, such as "somatosensory invariants," "memory schemata," "orienting," "conceptions," "causally linked plots." These differences reflect the diversity of potentially defining features of dream imagery, even within this more delimited class of reality-simulation features. The following sections review how some of the available methods for assessing dream content deal with reality simulation during dreaming. Common and emerging methods of content analysis are considered first, followed by methods that focus on apparent failures of the simulation process (bizarreness). A concluding section considers one of the limits of reality simulation, namely, the portrayal of subtle perceptual activities, as an area for future development.

CONTENT ANALYSIS METHODS AS ASSESSMENTS OF REALITY SIMULATION

Many existing content analysis instruments are predicated on some version of the reality-simulation assumption, even if this is only rarely declared explicitly. These methods differ in how reality attributes are tallied or rated relative to the totality of the dream report and provide different estimates of how thoroughly a reality

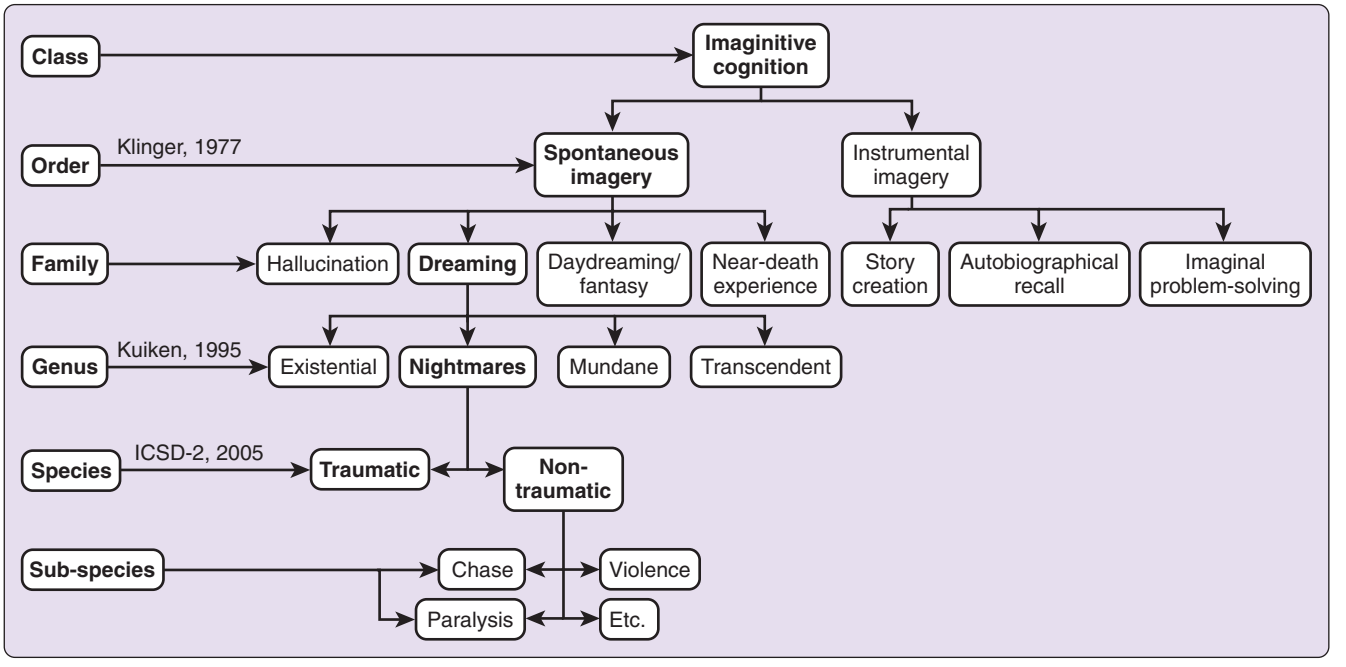

Figure 51-1 Linnaean classification of dreaming. The tasks of differentiating dreaming from other forms of imaginative cognition and of differentiating subtypes of dreaming from each other are analogous to taxonomy methods such as the classification of life forms developed by Linnaeus (first column). Features distinguishing dreaming as a unique imagery family and features distinguishing among different dream genera within that family should be determined by systematic comparisons of samples from a variety of candidate families or genera using a sufficiently large array of potentially defining features.

attribute is represented during dreaming. The most common types of measures are summarized in Table 51-2.

Prevalence

Many content rating systems isolate features of waking reality experience and evaluate their simple presence or absence in a dream report. The presence or absence of a self character, of pain, of sexual behavior, and so forth are common examples of isolated prevalence scales. A remarkable variety of isolated scales has been developed and assessed (Winget and Kramer[16] give a compilation of scales and their psychometric properties up to 1979). More extensive batteries of rating scales include many of the prevalence type (as well as others) and are designed to assess dreaming's realism features in a more global sense. Snyder's system[17] contains several dozen reality-based perceptual and cognitive attributes, whereas the larger, more widely used Hall/Van de Castle system[18] (see Chapter 50 for reviews) contains more than 500 attributes in 11 categories. The results of studies with both systems have been taken to support the conclusion that dreaming experience is continuous with waking life experience,[12,17] that overall it reflects waking reality experience. A problematic shortcoming of prevalence measures is that the total informational content of reports is not taken into account and the relative prominence of different features is not accounted for.

Frequencies

Many content-rating scales, including some from the Hall and Van de Castle battery, count the number of instances of a given attribute in a dream report and thus assess the relative prominence of features. The numbers of characters, distinct settings, or objects in a dream report are common examples of this type of measure. Frequency measures are usually reported relative to the entire dream report. Like prevalence measures, frequency counts have limited utility in comparing reports of different lengths or levels of complexity or of contrasting dream reports with different families of imaginative cognition.

Intensity

A common practice is to assess the intensity or predominance of content features using continuous rating scales. As applied to reality simulation, dream features might be evaluated for how vivid or true-to-life they appear or, conversely, how generally bizarre they seem. Ratings of emotional intensity in dream reports are very common instruments of this type. Intensity ratings might target global features, such as how realistic an entire dream is, or local features, such as the realism of a given character or object. They can therefore take into account the relative prominence of some features. The comparison of dream reports of different lengths can nonetheless remain problematic.

Length-Corrected Measures

Truly proportional measures count attributes in relation to a global measure of the total informational content in the dream report and thus resolve problems of differing report length to varying degrees. The Hall/Van de Castle system employs several proportional measures such as the percentage of aggressive actions out of all counted actions

Table 51-1 Sample Characterizations of Dreaming as a Simulation of Waking Reality Experience

REFERENCE	DESCRIPTION
Freud, 1900[5]	Dreams are true and real mental experiences of the same kind as arise in a waking state through the agency of the senses. (p. 115)
Foulkes, 1985[6]	Dreams are credible world analogues. (p. 37) The simulation of what life is like is so nearly perfect, the real question may be, why shouldn't we believe that this is real? (p. 37)
Tart, 1987[7]	In both dreaming and waking, an active, complex world simulation process is going on, basically identical in kind. ... In dreaming ... the kind of world, body, and self that can be simulated/experienced is vastly richer and more varied than in the waking state. (p. 155)
Hunt, 1989 [8]	The dream is a relatively true-to-life reconstruction of our human being-in-the-world. (p. 69) Dreaming is so much like waking that something very like clinical hallucinations can occur within it. (p. 71)
Nielsen, 1991[9]	A primary feature of the dreaming state ... is its compellingly real nature. (p. 236) Reality mimesis during the dream state ... depends upon the simulation of somatosensory invariants. (p. 235)
Revonsuo, 2000[10]	Dream experience ... constitutes an organized and selective simulation of the perceptual world. (p. 882)
Hobson, 2000[11]	[dreaming is] mental activity occurring in sleep characterized by vivid sensorimotor imagery that is experienced as waking reality despite such distinctive cognitive features as impossibility or improbability of time, place, person and actions. (p. 795)
Domhoff, 2003[12]	Dreaming draws on memory schemata, general knowledge, and episodic memories to produce reasonable simulations of the real world ... [that] express the dreamer's "conceptions" (p. 32) The content of young children's dreams is usually even more realistic (p. 31)
Nielsen & Stenstrom, 2005[13]	Episodic memories ... are altered in such a way that their autobiographical origins are obscured even though the subjective context within which they appear is a credible simulation of reality. (p. 1286) Dreams seem to take place in real, spatially coherent, environments with which the self interacts perceptually, for example, by orienting, seeking and assimilating sensory information, much as it does with the real world. (p. 1286)
Revonsuo, 2006[14]	The dream world is experienced as a spatially extended and animated world, containing objects, people, and events. ... The representation of the world in dreams is so amazingly realistic that it is fully justified to call it a "reality." (p. 105)
Cicogna, 2007[15]	If a dream is a multimodal hallucinatory simulation of the real world (Foulkes, 1985), oneiric distortions may pertain to all aspects of reality represented: images, combinations of environmental features, spatiotemporal organization, representation of self, nonself character representation, physical and logical constraints, etc. (p. 382)
Pace-Schott, 2009 (Chapter 48, this volume)	Dreams are organized into a multidimensional virtual experience temporally sequenced into a coherent plot of causally linked events. ... While dreaming may be phenomenologically more or less "like waking" (Dorus, Dorus, and Rechtschaffen, 1971), it is not waking itself but a remarkable, imprecise experiential simulacrum of waking.

or the percentage of known characters out of all counted characters. Such scores permit the comparison of dreams of different length and complexity. Other researchers assess dream attributes relative to a global information measure describing the length of the dream report. Length is often assessed as a total count of information-bearing words excluding redundancies, commentary, and postawakening associations and connections. The measure is commonly referred to as word information count (WIC).[19] A similar, less often used, baseline measure consists of the number of lines in the dream report. Others parse the dream report into basic conceptual units within which proportions may be compared using a common baseline; the temporal unit (TU), by which all activities that occur simultaneously are considered a single unit,[20] is one such procedure. These measures do not provide true proportions to the extent that the denominator of the ratio is not in the same metric (e.g., number of words in a report) as the numerator (number of characters). Division of intensity ratings by such correction factors is especially problematic. However, if a target attribute (e.g., visual realism) is also scored using a word count (e.g., number of words describing visual realism divided by number of words in the report[19]), then it may be considered a true proportion.

Table 51-2 Common Types of Measurements Used to Assess the Similarity of Dream Content to Waking Reality Attributes

MEASUREMENT TYPE	BASELINE	EXAMPLES	RATER TYPE
General Measures			
Prevalence	Presence per dream	Pain, sex, emotion, etc.	S, J
Frequency	Number per dream	Characters	S, J
Intensity	Rating of feature per dream	Vividness, bizarreness	S, J
Structural coherence	Number of story units Number of relational categories per story unit	Number of causal linkages	J
Temporal profile	Presence or rating over time	Emotion valence	S, J
Length-Corrected Measures (Proportion, Intensity)			
Word based	Number or rating per word count	Word information count (WIC), total recall count (TRC)	J
Line based	Number or rating per line of report		
Unit based	Number or rating per unit count	Temporal unit (TU)	J
Category based	Number or rating per category	Number of aggressive actions per number of actions Emotion appropriate to dream	S, J

J, judge rated; S, self rated.

Structural Coherence

To date, the preceding measures have focused largely on static components of experience that do not capture the complexity, transitions, or moment-to-moment flow so characteristic of waking reality experience. Other types of measures have been developed that tap such features to a limited extent. One grouping of approaches concerns evaluation of the logical coherence of dream content. Some systems assess the cause, effect, enabling, and simultaneity relationships among dream components and reflect what might be referred to as the narrative complexity or story-like coherence of dream simulations. These scores are generally proportionalized relative to a basic parsing unit, such as a story episode. Narrative analyses that derive from the discourse analysis tradition[21,22] purport to quantify the basic constituents of story units (e.g., scenes, characters, internal reactions) as well as the causal, enabling, and associational interactions among these constituents. They have been used to characterize differences between REM and NREM dreams,[23] between REM dreams from different times of the night,[24] and between dreams and myths.[25] A shortcoming of these approaches is that they have to date been applied to only a limited number of structures, primarily simple stories and scripts. However, waking reality experiences are composed of many such structures covering the entire range of psychological and social organization.

Temporal Profiles

The temporal profile is relatively rare for studies of dream content.[26] The measures not only assess frequencies of an attribute in a dream report but also quantify the temporal sequencing of the attribute. One such measure is the tally of positive (P) and negative (N) affect sequences through the dream; my group reported that PN sequences are more prevalent than NP sequences.[27] We have also developed a system to assess longer sequences, a temporal profile of emotional valence in home dream reports (Table 51-3). For every line of the report, subjects evaluate the positive or negative valence of dream emotion on a 9-point scale and thereby chart out the temporal fluctuations in dream negativity.

Implications for Dream Classification

The preceding review illustrates that measures of the presence, frequency, intensity, proportion, or coherence of reality features capture a large part of what is simulated during dream experience. But are such measures sufficient to define and classify dreaming as a unique form of imaginative cognition? One possible reply to the affirmative is that merely the sustained presence of simulated features, regardless of their modality (e.g., visual, auditory) or content type (e.g., characters, settings), is sufficient to distinguish dreaming from other imaginal forms. Another possibility is that the presence of such features is insufficient, that some narrative structure is required as well. However, both possibilities are questionable on the grounds that other forms of imaginative cognition also seem to involve simulation and narrative structure (e.g., daydreaming, autobiographical memory, hallucination).

DREAM BIZARRENESS AS REALITY SIMULATION ERROR

The reality simulation perspective also provides a point of departure for assessing the all-too-common portrayal of unusual, unrealistic, even phantasmagoric scenes, events, and characters in dreams. These more outré or bizarre features of dream content are typically assessed for their degree of *departure* from waking reality equivalents. Accordingly, dream content has been evaluated for how possible, probable, appropriate, or novel it is with respect

Table 51-3 Example Scoring of Emotional Valence in a Home Log Dream Using a Temporal Profile Method*

DREAM	NEG.....POS
I had rented a cottage with my extended family.	⓪①②③④⑤⑥❼
One day, I was alone and studying and there was	⓪①②③④❺⑥⑦
a lot of money on the table. A thief	⓪①❷③④⑤⑥⑦
got in and took the money and then looked at me.	⓪①❷③④⑤⑥⑦
I said to him, "Hey don't touch that; it belongs to us."	⓪①❷③④⑤⑥⑦
I don't remember how but then we were	❼①②③④⑤⑥⑦
lying on the table, him on top of me. He was strangling	⓪❶②③④⑤⑥⑦
me but all of a sudden I had the reflex to push my	⓪①②③④⑤❻⑦
fingers in his eyes. Then I have a memory blank but	⓪①❷③④⑤⑥⑦
later I was watching the news and they announced that	❼①②③④⑤⑥⑦
he was still at large.	⓪❶②③④⑤⑥⑦

*Subjects evaluate the attribute of emotional valence on a 0-7 scale (0 = negative, 7 = positive) for each line of the dream report. The result is a clear graphical representation of the temporal fluctuations of dream negativity (rightmost column).

Neg, negative; Pos, positive.

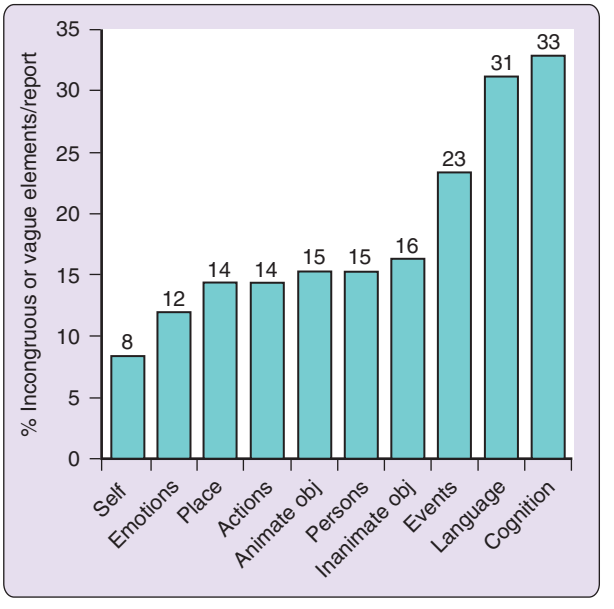

Figure 51-2 Proportions of bizarre (incongruous or vague) dream elements for each of 10 types of elements in dream reports. Self attributes, including emotions, are rarely bizarre, whereas language and cognition elements are bizarre about a third of the time (From Revonsuo A, Salmivalli C. A content analysis of bizarre elements in dreams. Dreaming 1995; 169-187.)

to waking experiences of the same kind. Revonsuo[14] and Cicogna and coworkers[15] both suggest that bizarre features of dream content are evidence for *errors* or *disruptions* in the reality simulation mechanism. Table 51-4 summarizes several of the more comprehensive methods for assessing dimensions of bizarreness in dream content.

Methods of Assessment

These descriptions illustrate that bizarreness is implicitly or explicitly assessed relative to waking reality standards. Thus, more thorough assessments of how reality features are accurately simulated during dreaming should contribute to a better understanding of how such features are *not* accurately simulated. Revonsuo and Salmivalli[35] have made some progress in this regard; by counting incongruous and vague dream elements (relative to waking reality counterparts) in addition to all other dream elements, they were able to determine that bizarreness affects an average of 20% to 22% of all dream elements in a report. As shown in Figure 51-2, bizarreness is more likely to affect some types of dream elements (e.g., language, 31%; cognition, 33%) than others (self, 8%; emotions, 12%). Other research indicates that bizarreness affects about half of human characters but is much less likely to affect their intrinsic structure, such as their visual appearance or familiarity (internal bizarreness, 37.1%) than it is to affect the context within which the characters appear, such as the places they appear or the actions they perform (contextual bizarreness, 62.9%).[36]

Despite such progress, an important shortcoming of most methods of bizarreness assessment is that the comparisons with waking reality features are made by judges who rely on their own conceptualizations of normative waking experience and have limited knowledge of subjects' idiosyncratic experiences. Comparisons of judge- and subject-based ratings for at least one bizarreness measure (appropriateness of emotions[32]) demonstrate acceptable reliability, but further work is clearly required. One method for improving access to subjects' idiosyncratic information is to encourage or train them to provide autobiographical information relevant to their dream reports.[35] Another preferable method is to employ probe questions that direct the subject's attention to specific dream attributes with a directive about how and with what they should be compared. To illustrate, one study[37] employed the following item to assess potential deficits in dreamed thinking processes: *Would your thinking when awake be the same as it was in the dream if the event that occurred in the dream occurred while awake? (Y, N, ?)*. It is important to distinguish this method from a second type in which subjects rate bizarreness relative to the context of the dream. The latter requires them to determine whether dream elements, such as characters, are bizarre relative to the ongoing context, such as the setting.[36] In the study just cited, a second question was employed to assess such contextual bizarreness: *Would your thinking when awake be the same as your thinking in the dream regarding the occurrence of the event itself? (Y, N, ?)*. Such comparisons may be difficult for naïve subjects to make and might require some degree of training to ensure adequate validity and reliability.

Table 51-4 Comprehensive Measures of Bizarreness in Dream Content*

BIZARRENESS DIMENSION	DEFINITION	CATEGORIES	RATER TYPE	REFERENCE
Novelty	Six-point nominal scale for rating each of four Hall/Van de Castle categories of dream event (physical surroundings, characters, social interactions and activities, overall dream)	▪ Exact replication of a previous experience ▪ Replication with minor changes ▪ Replication with major changes ▪ Never experienced, readily could have occurred ▪ Never experienced, very unlikely to have occurred ▪ Never experienced, extremely unlikely to have occurred	J	Dorus, 1971[28]
Impossibility or improbability	Probability of occurrence of feature is less than 5% of real-life counterpart Five categories of content (plot, characters, objects, actions, thoughts or feeling states) are subclassified	▪ Discontinuity: rapid transition from one thought, action, image, or dream setting to an unrelated one ▪ Incongruity: aspects of persons, places, activities do not fit together ▪ Uncertainty: explicit vagueness or ad hoc attempts to explain bizarre events in dream	J	Hobson, 1987[29] Mamelak, 1989[30] Scarone, 2007[31]
Feeling appropriateness	Similarity or difference between the kinds of feelings had in the dream and those expected had the dream occurred in waking life, rated on 5-point scale	▪ Practically identical ▪ Pretty much the same ▪ Similar in some ways but different in others ▪ Pretty much different ▪ Totally different	S, J	Foulkes, 1988[32]
Bizarreness	Calculated as the sum of three subscales	▪ Discontinuities: part of a report inconsistent with other parts, according to waking experience ▪ Improbable combinations: impossible or improbable elements according to waking experience ▪ Improbable identities: multiple, impossible or changing identities of characters or objects	J	Reinsel, 1992[33]
Bizarreness	Four types of elements (events, characters, feelings, situations) evaluated for five subtypes of each	▪ Physical impossibility: metamorphosis, change of place or time, admixture of objects and characters ▪ Physical implausibility: modification of specific features ▪ Behavioral implausibility: adoption of uncommon behaviors ▪ Functional implausibility: use of objects for strange functions ▪ Incongruity of dialogue, thought and feeling relative to situation	J	Cipolli, 1993[34]
Bizarreness	Elements of 14 categories (self, place, time, persons, animals, body parts, plants, objects, events, actions, language, cognition, emotions, sensory experiences) rated for three bizarreness types	▪ Incongruous element: (a) internally distorted or contextually incongruous; (b) exotic; (c) impossible; ▪ Vague element: identity or nature is indeterminate, unknown, or obscure ▪ Discontinuous element: sudden, unexpected appearance, disappearance, or transformation	J	Revonsuo, 1995[35]

*Most bizarreness measures require judges to assess the extent to which dream content departs from analogous events experienced in waking reality.

J, judge rated; S, self rated.

Implications for Dream Classification

Studies of dream bizarreness add a unique dimension to the problem of defining dreaming that might prove to distinguish it from other forms of imaginative cognition. In particular, it may be the co-occurrence of simulated reality features in combination with a relatively consistent presence of anomalies in simulation that lends dreaming its idiosyncratic character. For example, the presence of bizarre attributes may be much less likely to characterize autobiographic memory recall or even daytime fantasies. On the other hand, bizarreness affects only about 22% of dream features, which suggests that it alone may be insufficient as a defining attribute.

THE PERCEPTUAL LIMITS OF REALITY SIMULATION

The content and bizarreness measures considered thus far assess the more obvious successes and failures of reality simulation during dreaming, but they only remotely address the possibility that dreaming might simulate details of reality apprehension that fall beyond the introspective and reporting capacities of experimental subjects. Because subjects are not normally aware of all of the perceptual determinants of their reality experiences during wakefulness, they also might not be able to identify the determinants of their apparent reality experiences while dreaming.

In this regard, some writers[13-15] have begun to question how a multisensory simulation of perception is maintained both spatially and over time. This emphasis reflects an appreciation of how the apparent unity and continuity of dream subjectivity depends upon processes of spatiotemporal binding.[38] Revonsuo refers to this process as "consciousness-related binding," by which the unity of subjective percepts not linked to external stimuli—dreaming, for example—is preserved. Stenstrom and I[13] have described this as a process that determines the moment-to-moment stability of self-orientation or the impression that dreaming is occurring from a first-person point of view (here) and in the subjective present (now).

Numerous forms of subtle perceptual activity contribute to this spatially and temporally coherent here-and-now experience of reality while awake: all actions linked to perceptual search, such as looking, listening, touching, smelling, and so forth, are of this type. Less-obvious activities are the ubiquitous orienting reaction to novel stimuli, the appreciation of gravity and other orientational information, the background awareness of posture and kinesthesia, and the sense of proprioceptive feedback.[13] These perceptual activities operate largely outside of focal awareness and are typically subjugated to the central contents of consciousness—usually what is perceived to be seen, heard, felt, smelled, or tasted in the outer world. The background perceptual activities are nonetheless a constant contributor to the complex contour of subjective awareness.

Although it might appear that perceptual activity is abolished during dreaming simply because there is nothing from the external world to look at, listen to, or otherwise explore, evidence suggests that some subtle perceptual activity remains. Physiologic studies point to continued activity in most perceptual systems during REM sleep: rapid eye movements, middle ear muscle activity, fine motor activity in the extremities, phasic orienting reactions, and so on. One common hypothesis about rapid eye movements is that at least some eye movements are perception-like acts of looking at or scanning visual dream contents.[39] Others suggest that phasic ponto-geniculo-occipital (PGO) surges during REM sleep reflect orienting reactions to novel dream stimuli.[40] Studies that administer sensory stimuli during REM sleep, such as muscle pressure or electrical impulses, appear to influence this level of subtle perceptual activity, for example, by destabilizing the normal orientation of the apparent self.[41]

However, for the most part, the phenomenological correlates of subtle perceptual activity remain to be investigated. The following dream sequence reported in Revonsuo[14] illustrates the understated nature of this activity:

> I felt something under my foot; there was a stone on the floor. When I looked on the floor again after a moment, I noticed that there was a small red pill there. After a while I saw another one, but bigger. Monica said that they are medicine for the cat and that they have to be picked up. I started to help her in doing so. At this point there were lots of pills on the floor, or different colors, big and small. When I was collecting them and putting them into a metallic box, they had turned into watercolors.[14, pp. 243-244]

The sequence illustrates that acts of touching and looking both occur as they might in reality and, moreover, that the acts lead to the apparent acquisition of new "perceptual" information. In the first sentence, the act of touching with the foot reveals a stone on the floor; in the second, the act of looking reveals the presence of a red pill also on the floor. These sequences of *perceptual action* followed by *information acquisition* are completely consistent with the normal functioning of waking perceptual systems.[42] It should also be apparent that this type of activity on the part of the dreamer is often not reported; the phrases in this sample report that describe touching and looking could have been deleted without serious loss of understanding. In fact, we may ask whether sentence 3 in the report hints at the occurrence of yet a third act of looking that was reported imprecisely ("After a while I saw"). Similarly, throughout the remainder of the dream sequence, it is very likely that incompletely reported perceptual acts accompanied the apprehension of new information (e.g., "At this point there were"). In the final sentence, the acts of "collecting" and "putting" may be seen as at least partly perceptual in nature—and these acts resulted in even more new information being discerned.

Only probe questions about subtle perceptual activity that are directed at these specific junctures in the dream—and preferably administered to subjects while they are giving the report, not afterwards—could determine definitively if such activities were, in fact, represented in the background of dream experience. Targeted probe questions do, in fact, enhance the informational content of reports.[37] A stark example of this is the fact that *spontaneous* references to the dreamed self account for less than 3% of scored dream elements,[35] but probe questions reveal that self-presence occurs in almost 100% of reports.

It should also be apparent from the preceding that subjects who possess superior skills in self-reflection and communication may be likely to provide more accurate, more detailed reports of reality simulation information of this subtler kind. There is evidence that longer home dream reports with more informational content are produced if subjects are preselected for elevated language skills and trained for 1 night in the sleep laboratory to attend to such subtle perceptual details (using short video clips, hypnagogic images, and REM dreams as practice).[43] Similarly, if subjects are prompted to report bizarre dream contents, more of these contents appear in reports.[35]

Implications for Dream Classification

Apart from the simulation of specific dream contents, such as characters, settings, and objects, the defining characteristics of dreaming may be discovered in simulating the *process* of apparent perception. Much less effort has gone into developing instruments for quantifying features of perceptual processes, but the use of specific targeted probes as well as the selection and training of subjects may be needed to further explore this possibility.

CONCLUSION

Emerging interest in the reality simulation capacity of dreaming offers a viable point of departure for furthering the incomplete task of dream classification. A wide range of dream content measures has been developed to quantify the successful aspects of reality simulation during dreaming. Others have been produced to assess unsuccessful simulation features (bizarreness). Both types of measure have implications for how dreaming may ultimately be defined and classified. One possibility is that the relatively unbroken stream of simulations, regardless of modality (e.g., visual, auditory, kinesthetic) or content type (e.g., character, object, structural connection) gives dreaming its distinctive character. Another is that a mix of bizarreness and reality simulation distinguishes dreaming from other cognitive events. A third possibility is that the process of perceptual activity is simulated in such depth and detail during dreaming that it is indistinguishable from real perception. Although there is a shortage of measures for tapping this subtler level of reality simulation in dream content, further exploration of this possibility may well depend upon the use of specific target probes as well as the selection and training of subjects. With such developments, researchers might gain access to a heretofore unappreciated level of subjective experience that could give closure to the incomplete task of dream classification.

❖ Clinical Pearl

In some sleep disorders (e.g., sleep paralysis, narcolepsy), the simulation of waking state reality experience during dreaming may become so intense that the person is convinced of the reality of events and might even come to believe that dreamed events really happened.

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