Neuropsychiaric perspective and recommendations

Commentary on "The neurobiology of consciousness: Lucid dreaming wakes up" by J. Allan Hobson

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1. Introduction commentary

Dr. Hobson does an excellent job resurrecting the current idea of scientific investigation of human consciousness using laboratory lucid dreaming. However, in his introduction he states that it (lucid dreaming) is problematical. That is not the case in reality. The problem is that it is still difficult for scientists to grasp that one can be fully awake while in phasic REM sleep and if they do grasp it, to see lucid dreaming's scientific and clinical utility. Scientific laboratory studies of human consciousness (self reflective awareness) using lucid dreaming is relatively straightforward and has been established (although it wouldn't hurt to replicate some of the studies).

Modifications, amplifications and contractions, are provided here from the point of view of a laboratory (and otherwise) lucid dreamer and clinician in utilizing lucid dreaming for basic science and for investigative therapeutic purposes. I.e. basic science and clinical applications of lucid dreaming.

2. Definition section commentary

Lucid Dreaming, as referenced by Dr. Hobson as being dissociation by stating "in fact, lucid dreaming is an example of dissociation..." is not helpful and not supported by survey (empirical) or laboratory data (Brylowski, Levitan, & LaBerge, 1989; Gabbard & Twemlow, 1984; LaBerge, Nagel, Dement, & Zarcone, 1981; LaBerge, Nagel, Taylor, Dement, & Zarcone, 1981; LaBerge, Levitan, & Dement, 1986). Consensus on "dissociation", whether in psychiatry or the neurosciences is lacking. For example, given the extensive controversy with the diagnosis of multiple personality disorder (dissociative identity disorder) Dr. Hobson runs the risk of provoking unnecessary bias of skeptics of this promising area of inquiry by associating with this controversial term.

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Research in out of body experiences (later verified to be lucid REM sleep) shows that people who experience out of body experiences (empirically lucid dreams) are either similar to normal people or more normal than most normal people (Gabbard & Twemlow, 1984; Laberge, Levitan, Brylowski, & Dement, 1989).

A neutral way of examining lucid dreaming is descriptive which would lead to one asking; "how can an activity which increases awareness, uses memory, and brings self reflective awareness into a typically unconscious (nonconscious) condition, with typically automatic and unconscious behavior be pathological? How would this be dissociative/disintegrative rather than associative and integrative?"

Dr. Hobson links lucid dreaming to self-hypnosis and how it can "change the mind of our patients" specifically the "young one's". This author is unaware of any age-related lucid dreaming studies. However this hypothesis would fit with the observation that rapid eye movement sleep time decreases with age. This would contradict Dr. Hobson's conclusions of lucid dreaming being a state between wakefulness and sleeping (Van Cauter, Leproult, & Plat, 2000).

In fact, preliminary data that assumes lucid dreaming occurs in rapid eye movement sleep shows that cognitive, psychotechnical, and psychopharmacologic techniques to help with inducing lucid dreaming are effective when targeting REM physiology is the theoretical neurobiological basis for the development of the various techniques and strategies (LaBerge, 2010).

Unfortunately, Dr. Hobson seems to have fallen for the trap that lucid dreamers control the plot in their dreams. Careful analysis of the subjective experience of lucid dreamers would be more in line with the idea that lucid dreamers, when lucid, can choose to respond to the dream environment that is presented to them; i.e. behavior with conscious reflection/mindfulness. Is this not the primary motive of successful living and the goal of most psychotherapies? Specifically learning that you do not control the plot of your life in the dream anymore than you do in wakefulness? You have a choice of how you choose to respond.

Lucid dreaming in the laboratory allows the dreamer to remember that they are asleep and participating in/performing an experiment in order to investigate psychophysiological parallelism (or whatever the goal). This has been well established by LaBerge and others (e.g. LaBerge, Levitan, Brylowski, & Dement, 1989). It is a parallelism without the so-

cial consequences so that feelings, associations, and other reflections can be integrated without suffering the social or psychological consequences. It is this area that promises psychotherapeutic application for the learned skill of lucid dreaming of the phasic REM sleep variety (Brylowski & McKay, 1991; Brylowski, 1990a, b).

In short, given the controversy in psychiatry with regard to dissociative disorders and the lack of evidence of lucid dreaming being a pathological state, it would be more helpful to the field of lucid dreaming to regard it as an example of association that could provide a psychophysiological, cognitive behavioral integration technique in the context of whatever psychiatric therapy, if any, paradigm is being used. This perspective would open up neurobiologic and psychotherapeutic hypotheses that could be tested. For example, the hypothesis that a specific behavior when applied in a certain way while unconscious, confers psychological resilience can, with this model, be tested. Lucid dreaming as an example of integration that can be helpful to patients is exemplified later.

Basic science researchers have already documented (developed protocols) that three conscious states in the laboratory study of lucid dreaming are needed. (wakefulness with eyes open and eyes closed prior to initiating sleep recording, REM sleep with non-lucid dream recall and REM sleep with lucid dream recall verified by volitional signaling in (lucid REM sleep) (e.g. LaBerge et al. 1981).

Alternatively, the three states of waking, non-lucid dreaming, and lucid dreaming are part of the same continuum and not psychologically distinct (the typical EXPERIENCE of most lucid dreamers or people who are awake for that matter); however, for experimental purposes they are "physiologically distinct". Given the subjective disparity of the psychological experience of the three states and the established robust psychophysiological, and proof of concept psychoneurological (EEG), psychoneuroimmunological and other types of lucid REM sleep parallelism (e.g. LaBerge et al. 1981; LaBerge & Brylowski, 1987; Brylowski, 1987) that could or have been explored supports maintaining the current position as follows: Laboratory lucid dreaming should have the rigorous definition of phasic REM sleep, temporal dream recollection with consistency with eye movement signals to be counted as a laboratory lucid dream for analysis. This will allow comparison of data between labs.

3. Historical background commentary

Unfortunately, there are those in various professions who would, given that Buddhist, Muslim Christian, Jewish, Theosophists, Greek philosophers etc. who have described the experience of lucid dreaming but use contextual, experiential or language descriptors that are religious or cultural rather than scientific, support the need for very strict neurobiological research requirements for projects with human subjects who are lucid dreaming in laboratories.

The many thousand year history of this phenomenon/experience should not be overlooked because, by definition, it provides the rationale for expanding this area of human experience into limited and defined scientific area. In other words, we want to stick to the phenomenal issues in the neurobiological study of lucid dreaming with the subjective dream reports being part of the dataset as an absolutely integral part of the research methodology because these will allow for transition of the basic science data into the clinical research area (cf. Brylowski, 1987).

4. Laboratory studies commentary

Significantly absent from Dr. Hobson's analysis is that development of sleep research criteria in the 1960s (with modifications 2007) 16 motor reflex SUPPRESSION needed to be actively demonstrated during REM sleep because electroencephalogram activity looked as if one was awake while one was asleep (Hodes & Dement, 1964; Rechtschaffen & Kales, 1968; Iber et al. 2007). Therefore, the H-reflex study was done to establish motor suppression during REM sleep (Hodes & Dement, 1964). The development of signal verified lucid dreaming by LaBerge et al. (1981) showed that laboratory lucid dreaming is a rapid eye movement sleep phenomenon with extensive phasic activation. The H-reflex study, originally done to develop the convention of how sleep is staged and scored also showed that lucid dreaming was more phasic REM sleep, as there was more active muscle suppression with increased autonomic activation consistent with increasing phasic REM activation then of non-lucid REM sleep, other stages of sleep, or wakefulness (Brylowski et al., 1989; Hodes & Dement, 1964). LaBerge and his critics were not both right. LaBerge was correct. Laboratory lucid dreaming, as he was defining it and as verified by Brylowski et al., was phasic REM sleep, self reflective awareness in the context of a vivid dream by definition.

In short, there is no controversy. Laboratory lucid dreaming as defined by LaBerge, verified by Brylowski using the H-reflex study, shows that laboratory lucid dreaming (the type that should be used in neurobiological studies) is a phasic rapid eye movement sleep phenomenon as defined by current convention. Therefore, LaBerge's studies need to be replicated in multiple facilities and Brylowski's H-reflex study (using electric shock every 5 seconds throughout the night) needs to be replicated with multiple subjects and research site locations otherwise, the potential for a myriad of various subjective/altered states of consciousness may end up getting researched foregoing the possibility of pooling data, comparing results et cetera.

5. Conceptual Problems commentary

Connecting lucid dreaming to a pathological condition, such as REM behavioral disorder, is not helpful. Subjects who lucid dream in laboratories have typically taken extreme effort to be able to reproduce the event in the laboratory condition essentially on demand. Lucid dreaming can provide an avenue to explore basic science questions about consciousness as well as psychology, sociology, and even as an educational tool for mental health professionals. However, to begin to define dreaming as a hallucination by formal definition would not, in this reviewer's opinion, be helpful to this field of study (except maybe to the pharmaceutical industry).

6. A New Approach to LD commentary

All experimental subjects need to be vetted by performing the H-reflex lucid dreaming signal verified protocol experiment prior to engaging in other experiments. In other words, subjects (sleepers) and experimenters (observers and data analyzers) engaged in rigorous laboratory lucid dreaming experiments need to be certified as co experimenters in order to maintain a frame of reference. There is no convincing evidence in this reviewer's opinion, that laboratory lucid dreaming as defined by LaBerge and verified by Brylowski

with the H-reflex experiment is a 3rd state of consciousness sandwiched between waking and non-lucid dreaming. On the contrary, there is robust scientific evidence, that has yet to be refuted, that the laboratory lucid dreaming described to date is phasic REM sleep. That is why Hobson's concern with regards to appropriate cautions and safeguards is well founded.

Electroencephalographic or polysomnographic studies typically do not monitor multiple variables of autonomic activation (heart rate, finger pulse amplitude, respiration rate, penile tumescence etc.) and inhibition of muscle tone that persists in tonic and phasic REM sleep discriminates the REM state (with recently developed clinical exceptions Iber, Ancoli-Israel, Chesson, & Quan, 2007). To this critical reviewer, this means that the observer and the observed, i.e., subject (sleeper and analyzer) and experimenter (analyzer and sleeper) need to understand the parameters of defining laboratory lucid dreaming, i.e., physiologic evidence of phasic rapid eye movement sleep and a contemporaneous subjective dream report that were re-called by the subject blinded to the electrophysiologic data that is accurate in describing not only the subjective lucid dreaming experience as measured by psychophysiological parallelism including at a minimum eye movement signals AND any other dream behavior. Otherwise, the data should not be included in the analysis. In other words, the brain/mind can fluctuate through multiple different states simultaneously or sequentially (sometimes consciousness can be maintained through all these states), but if laboratory lucid dreaming is going to be useful for basic science understanding, by convention, everybody needs to agree on how to define it and what to compare it with, i.e., non-lucid phasic REM sleep and wakefulness utilizing the same behavior, i.e., eye movements, eyes closed, eyes open etc. Only then, can one confidently compare and contrast the neurobiological aspects of these subjectively distinct states of consciousness.

6.1. Quantitative EEG commentary

Earlier materials presented by LaBerge and Brylowski show this potential with pilot/proof of concept studies. This is not a novel approach. It should be noted that LaBerge's subject had been previously verified to have H-reflex suppression during phasic REM lucid dreaming (LaBerge & Brylowski, 1987).

6.2. EEG and brain imaging studies commentary

The importance of researchers agreeing on a laboratory lucid dream protocol cannot be understated. Researchers want to be sure that everybody is researching the same phenomenology, i.e., phasic REM sleep where one is self-reflectively aware, can signal eye movements, that there is autonomic activation and motor activity is paralyzed. Multiple experiments with lucid dream imaged respirations, singing and counting, eye movements, dreaming of sexual activity, support LaBerge's idea of psychophysiological parallelism during lucid REM sleep. This needs to be understood by researchers as well as subjects and laboratory lucid dreaming experiments need to be designed accordingly with concordant waking eyes close, waking eyes open and lucid REM sleep with subjective reports having temporal objective verification in order to be included in the research data. From a basic science point of view, we want significantly distinct data to analyze with a common frame of reference.

7. Summary and conclusions commentary

It is this reviewer's opinion that the field of lucid dreaming needs a common frame of reference, physiologically and psychologically defined with regard to laboratory lucid dreaming and clinical applications of lucid dreaming. Anyone who has treated a combat veteran with a personality disorder and substance abuse engaged in multiple maladaptive behaviors, nightmares etc. would have no idea what "ratcheting up frontal 40 Hz power and coherence" means or its basic science relevance to clinical applications. This is not unique to lucid dreaming nor would it be expected to be unique to lucid dreaming as currently defined because of psychophysiological parallelism i.e. current data provide robust evidence that the type of laboratory lucid dreaming as defined by LaBerge would be expected to be very similar to the waking state except for motor paralysis and, which seems obvious to this reviewer, endogenous as opposed to exogenous production of a perceived external environment (the dream or wakefulness respectively). These distinctions are important so as not to confuse and comingle the phenomenal, scientific, and secular aspects of laboratory signal-verified lucid dreaming in phasic REM sleep with the metaphysical, subjective, and very personal nature of the lucid dreaming experience for people who are not scientific laboratory lucid dreamers and/or in developing the experience for therapeutic purposes (PDM Task Force, 2006). In other words, it is the subjective dream reports that are operationalized from laboratory lucid dreaming that will be compared to subjective dream reports of patients using lucid dreaming to define which patients data and outcomes will be analyzed for improved, neutral, or detrimental effects of lucid dreaming in a clinical setting.

So, for example compare "I was walking down the street of my childhood and realize this is a dream because of... I signaled with eye movements LEFT RIGHT LEFT RIGHT and then flew into the air… While looking at the tops of houses I again signaled LEFT RIGHT LEFT RIGHT and then hyperventilated. I ended up sitting in a tree, signaled LEFT RIGHT LEFT RIGHT and then held my breath. Signaled LEFT RIGHT LEFT RIGHT again. I woke up." This laboratory report should accompany in a blind fashion a contemporaneous polysomnogram showing transition to REM sleep, EMGs suppression, waking EEG, various measures of autonomic activation such as heart rate or finger pulse etc. If that is the case, this would be considered a laboratory lucid dream. The psychophysiological paralellism of breathing was tested and found to be present or not. Contrast this with a clinical study of lucid dreaming in a combat veteran population (Brylowski & McKay, 1991):

In Group 1, one of the subjects had ten lucid dreams, a second subject had one. Lucid dreams were scored as such when the subject wrote in the journal "I realized I was dreaming because….therefore I chose to ….." Unfortunately, 7 of the 10 lucid dreams of one subject were lucid nightmares. The following exemplifies this:

> *"I was in a car watching the girls dance the mambo. Someone asked me what I wanted. I didn't answer but felt someone behind me. I turned and I was jumped by this Vietnamese and we fought hand to hand. I fell back to grab my piece and it would not fire. It's at this point I usually get bayoneted and awake with a start. Instead I realized it was a dream because this scene has repeated so many times in the past. This time after my weapon*

jammed I confronted the Vietnamese and said 'What are you doing? This is a dream! Who are you?' He just stared at me with an emotionless, empty look, smiled a sinister smile, and bayoneted me without mercy. I awoke with a jolt. Maybe it will be better next time."

This subject also conveyed a lucid dream that was highly pleasurable:

"I was bicycling in the road with my wife and we both noticed a snake in the road. Suddenly it disappeared. I thought ah ha! That means this is a dream. I looked at my wife and she looked at me and we road pleasurably down the road. We seemed to glide effortlessly along and the scenery became very clear and inexplicably beautiful. This was a very calm, serene, and inspiring lucid dream."

He commented that it would be easier to learn lucid dreaming from pleasant dreams because the emotions would be more tolerable. The therapists also noticed that the traumatic nightmares had such overwhelming affect that becoming lucid did little once the habitual dream content and affective and behavioral responses of the dream ego took over.

The potential for strategic application of lucid dreaming, in the above vignette for example, supports gradual and not direct exposure with nightmares. Interestingly, evidence-based psychiatric literature with regard to avoidant and hyperarousal phenomenology (with the research being conducted independent of and years subsequent to the above) support gradual exposure with regard to this (avoidant, hyperarousal etc.) dimension of symptoms (American Psychiatric Association, 2005).

The above example, I hope, illustrates (among other things) the importance of having strict laboratory defined lucid dreaming that includes the subjective experience of the dreamer as a co-experimenter so that the basic science data can be extrapolated to the clinical setting. This would allow for psychotherapeutic investigation that is actually based (more accurately referenced to) PHYSIOLOGY/NEUROBIOLOGY, self-report, consensus judgment etc. as opposed to just self-report, consensus judgment etc. In other words, investigating the neurobiology of Lucid dreaming has the potential of creating a genuine scientific field of biological psychiatry as opposed to the current pseudo-scientific field of biological psychiatry (Ross & Pam, 1995).

In summary, in reasonable medical probability, the type of lucid dreaming as described by Laberge, Brylowski, and others specifically defined this as a phasic REM sleep phenomenon consistent with the physiology of full-blown phasic REM sleep AND NOT an in between state of wakefulness and sleep. More recent quantitative EEG studies as referenced by Hobson essentially do nothing to refute this because the EEG would be expected to look as if it is awake. I.e. the point of these earlier (pre-Internet) studies. Laboratory lucid dreaming (in phasic REM sleep) subjects (professionals) should have their abilities verified using H-reflex suppression before graduating to other experiments, have contemporaneous consistent dream reports, be considered co-experimenters, etc. so that this field has a solid basic science foundation. This would allow for extrapolating into clinical applications, making rational assumptions for further hypothesis/experimentation development, and provide a rather elegant and simple paradigm to further align biological and psychotherapeutic psychiatry research, education, and treatment.

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