

False awakenings in light of the dream protoconsciousness theory: A study in lucid dreamers

Giorgio Buzzi

Neurological private practice, Ravenna, Italy

Summary. The results of a web-survey aimed at analyzing the phenomenology of False Awakenings (FAs) (sleep-related experiences in which the subjects erroneously believe that they have woken up, only to discover subsequently that the apparent awakening was part of a dream) were revised in light of Hobson's recent dream protoconsciousness theory. A web-questionnaire had been previously submitted to three web-sites dedicated to lucid dreamers, a kind of subjects in which FAs have been reported to occur with high frequency. Ninety subjects submitted complete forms within an established two-months period. All the respondents were habitual lucid dreamers, 41% reported experiencing FAs at least monthly, 79% had experienced a FA in the last month and 46% in the last week. Some stereotyped dream patterns were found to recur repeatedly in FAs, including representations of normal awakenings, start-of-the-day routines and other realistically depicted activities (exploring, wandering) within the sleep environment. This finding is consistent with Hobson's hypothesis that dream content feeds itself from innate schemes, enacted on the basis of subjective experiential memories. A possible evolutionary interpretation of FAs is proposed.

Keywords: false awakenings; REM sleep; dreams; protoconsciousness

1. Introduction

Recently, Hobson (2009) has proposed that REM sleep may constitute a protoconscious state, aimed at preparing the brain for its integrative functions, including consciousness. According to this "dream protoconsciousness theory", during REM sleep the developing brain would have a built-in model of external space and time. This intrinsic model would then be adjusted to conform to experiences of the outside world. At first, protoconscious REM sleep is supposed to be dreamless, and only during childhood we would "become able to integrate this experience and become aware of it".

Dream content would therefore feed itself from this innate scheme. However, in ordinary REM dreams the underlying virtual reality template would be hard to recognize because of the characters of dream content: dismantling of explicit memories (which are mainly present as day residues), bizarreness, sudden spatial-temporal transitions.

False awakenings (FAs) are sleep-related experiences in which the subjects erroneously believe that they have woken up, only to discover subsequently that the apparent awakening was part of a dream (Green, 1968; Green & McCreery, 1994). Early instances of FAs were reported by van Eeden (1913), who defined them "wrong waking up", and found them "demoniacal, uncanny and very vivid and bright", Delage (1919), and Fox (1962), who found FAs a highly potential gate-way to out-of-body-experiences.

Nielsen and Zadra (2005) state that "false awakenings are

nowhere classified as pathologic per se, but they are nevertheless dreaming disturbances that can produce anxious reactions".

To the author's knowledge, the prevalence of FAs in the general population has never been investigated, while they have been reported to occur frequently in association with lucid dreams (Green, 1968; Green & McCreery, 1994; LaBerge & DeGracia, 2000) and with sleep paralysis (Cheyne, 2004). LaBerge and DeGracia (2000) state that in their samples of lucid dreamers, FAs represent one of the typical ways in which lucid dreams terminate. Cheyne (2004) reports that in his data base of sleep paralysis cases about one third of respondents had experienced FAs. This suggests a likely association of FAs with an altered REM sleep state. In fact, both lucid dreams and sleep paralysis seem to be hybrid states with features of both REM sleep and waking (Voss et al., 2009 for lucid dreams; and e.g., Takeuchi et al., 1992, for sleep paralysis).

That a hyper-aroused sleep state probably underlies FAs is also suggested by the observation that FAs can be prompted in situations of high anticipation, for example, when a sleep disturbance is expected (Hearne, 1982). It has been suggested that, in these situations, "the sleeping mind becomes somewhat fixated on the coming event" (Hearne, 1982). This may explain the occasional occurring of FAs in sleep laboratories (Takeuchi et al., 1994; Nielsen & Zadra, 2005) where some kind of environmental disturbance can be expected.

Different from ordinary dreams, FAs have been reported to typically provide a realistic replica of normal perception. The subjects may experience a realistic representation of normal daily activities before really waking up in bed (Green & McCreery, 1994; Cheyne, 2004), with radical spatial-temporal discontinuities being typically absent or greatly attenuated (Cheyne, 2004). Given their purported realism (regarding both the dream action and the visuo-spatial scenario), FAs may provide a better tool – as compared with ordinary dreams – for studying the interplay between the underlying

Corresponding address:

Giorgio Buzzi, M.D., Neurological private practice
via F. Lovatelli, 74; 48123, Ravenna, Italy
E-mail: gbuzzi@linknet.it

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ing virtual reality template hypothesized by Hobson's theory and waking experience.

FAs have generally been discussed in the literature pertaining to lucid dreams, and their features have been illustrated by means of individual case reports (Green, 1968; Green & McCreery, 1994). The author is not aware of any previous formal study specifically addressing the phenomenology of this condition.

In 2004, the author made a survey on the phenomenology of FAs on three web forums for subjects experiencing lucid dreaming (unpublished material). In the present study, the data collected in that survey were reviewed in order to analyze the phenomenology of FAs in light of Hobson's dream protoconsciousness hypothesis.

2. Methods

A questionnaire relating to FAs was placed on a web page, and an advertisement about this study was posted on three web forums for subjects experiencing lucid dreaming (the three web sites are listed in Appendix). The participants use these forums to discuss issues pertaining to lucid dreams and to share their experiences. The owners of the web-sites gave written permission to announce the survey on their web forums. The questionnaire form –after a detailed explanation of the procedure–, contained the statement that all the collected information would have been used for research purposes (including possible publication); written informed consent was obtained by all respondents.

The following definition of FA was used to indicate the kind of phenomenon that was investigated: "False awakenings are sleep-related experiences in which the subjects erroneously believe that they have woken up, only to discover subsequently that the apparent awakening was part of a dream".

The frequency of FAs and lucid dreams in the participants was investigated. The possible answers were ranked according to a scale of 1 to 6, in which 1 = "once in life", 2 = "several in life", 3 = "several/year", 4 = "monthly", 5 = "weekly", and 6 = "several/week". The mean score value was calculated for FAs and for lucid dreams.

The questionnaire included items assessing age and sex of the respondents; the time elapsed since the last FA episode; the timing of the episodes (beginning, middle, or end of sleep); the kind of mental activity (dreamless sleep, normal dreams, lucid dreams, sleep paralysis, waking, other) typically preceding and following FAs; the typical visuo-spatial scenario; the presence of anomalies or details out of place; the typical dream plot; the perceptual character; the emotional tone; and the possible concomitant occurrence of other subjective experiences previously reported to be frequently associated with FAs. The latter included: sleep paralysis, which was investigated by means of the question: "during the experience (FA) do you ever feel paralyzed?"; out-of-body experiences ("...do you ever feel like you had temporarily left your body?"); autoscopic experiences ("...do you ever see your own body from another location?"); the sensed presence of an intruder. For all these items the possible answers were: "never – sometimes – often – always".

Data were entered into an Excel database (Microsoft, Redmond, WA) and analyzed with GraphPad InStat (version 3.00 for Windows, GraphPad Software, San Diego California USA) using Fisher's exact test and Spearman correlation, as appropriate.

An additional text box where respondents could comment or elaborate about their experiences, or report accounts of their FAs was provided.

In the present report I will summarize the main phenomenologic aspects of FAs, and then I will focus on the data relevant to a possible interpretation of FAs in light of Hobson's dream protoconsciousness theory: the dream scenario and the dream plot.

The visuo-spatial scenario of FAs was investigated by means of the questions: (1) "What is the typical scenario of your FAs?" The possible answers were: your own bedroom; another familiar place (please specify); a non-familiar place (please specify); varies. (2) "If you did experience any false awakenings while you were sleeping not in your habitual bedroom, the scenario of these false awakenings was..." The possible answers were: the place where you were actually sleeping (hotel, the house of a friend, etc) (please specify); your habitual bedroom; another place (please specify); does not apply (I did never experience any false awakenings while I was sleeping not in my habitual bedroom).

FAs' dream plot was investigated by means of the question: "What do you typically do in your false awakenings?" The possible answers were: I just act like in a normal awakening or in normal daily life; I engage myself in other activities within the sleep environment (please specify); other (please specify); varies.

The same aspects were then analyzed in the accounts of FAs freely reported by the respondents.

It should be noted that participants in the survey were self-selected for their interest in (or frequency of) FAs, so the sample does not represent all lucid dreamers participating in Internet forums.

3. Results

Ninety respondents (75 males, $M = 24 \pm 11$ years, range 14–75 years) submitted complete forms during an established two-months period. In addition, 38 respondents volunteered 1 to 6 detailed reports of FAs that they experienced during the period the survey was online, for a total of 68 reports.

Thirty-seven subjects (41%) reported experiencing FAs at least monthly. Seventy-one subjects (79%) had experienced a FA in the last month, 41 (46%) in the last week, and 17 (19%) in the last 24 hours (Table 1).

All the subjects had experienced both FAs and lucid dreams and there was a positive correlation between the reported frequencies of the two kinds of experience ($r = 0.51$, $p < .001$), with the mean frequency score of lucid dreams being significantly higher than that of FAs (4.2 ± 1.5 vs. 3.2 ± 1.4 , $p = .008$).

Forty subjects (44%) reported habitual transitions from FAs to lucid dreams. Thirty-six (40%) subjects reported habitual transitions from lucid dreams to FAs.

Twenty-three (26%) subjects reported that their FAs usually started from a lucid dream, 22 (24%) from a non-lucid dream, 13 (14%) indifferently from a lucid or from a non-lucid dream, 14 (16%) from disturbed dreams or dream-like experiences (vivid dreams, nightmares, sleep paralysis), 8 (9%) from dreamless sleep, 10 (11%) were unable to answer this question.

Twenty-nine (32%) respondents reported experiencing FAs in the middle of the sleep period, 21 (23%) at the end of the sleep period, 40 (44%) in both situations (7 of these subjects also reported the occasional occurrence of FAs at sleep onset).

Table 1. Reported frequencies of FA episodes and time from the last episode (number and percentages of subjects).

Frequency of episodes			Time from last episode		
category	n	%	category	n	%
one in life	7	7.8	last 24 h	17	18.9
several	27	30.0	last week	24	26.7
yearly	19	21.1	last month	30	33.3
monthly	20	22.2	last year	15	16.7
weekly	12	13.3	> 1 year	3	3.3
> 1/ week	5	5.6	unknown	1	1.1

The typical perceptual character of FAs was “as clear and distinct as any everyday experience” for 44 (49%) respondents; “more perceptually vivid than reality” for 5 (5.5%) ; “dimly lit or vaguely delineated” for 25 (28%); and variable for 16 (18%). The answer was not influenced by the time lapsed from the last FA experienced by the respondents. Subjects consistently experiencing hypnopompic FAs were less likely to report a dim perceptual character as compared with subjects consistently experiencing hypnagogic FAs (9% vs 48%, $p = .04$). The same timing effect (higher dream vividness for later REM dreams) has been previously reported for ordinary REM dreams (Nielsen, 2005).

Thirty-seven subjects (41%) had experienced sleep paralysis in concomitance with FAs (27 sometimes, 8 often, 2 always), 35 (39%) out-of-body experiences (21 sometimes, 13 often, 1 always), 27 (30%) autoscopical experiences (18 sometimes, 7 often, 2 always), 42 (47%) a sensed presence (31 sometimes, 8 often, 3 always).

The emotional tone of FAs was “unremarkable” for 30 (33%) respondents; “oppressive/menacing/uncanny” for 17 (19%); pleasant/peaceful for 17 (19%); and variable for 26 (29%).

Subjects consistently experiencing “oppressive/menacing/uncanny” FAs were more likely to report a sensed presence in their FAs ($p = .003$). They also tended to re-

port more frequently sleep paralysis episodes in concomitance with FAs, but without reaching statistical significance ($p = .08$). FAs reported by these subjects seem to correspond to “type 2 FAs” previously described by Green (1968) as well as Green and McCreery (1994).

Subjects consistently experiencing “pleasant/peaceful” FAs tended to report more frequently habitual transitions from FAs to lucid dreams, as well as autoscopical experiences in concomitance with FAs, but without reaching statistical significance ($p = .08$ and $p = .07$, respectively), possibly due to the small sample size.

The habitual bedroom was reported to represent the typical FA scenario by 68% of respondents, and a possible FA scenario by 21%. Less frequently, subjects reported that they use to “awake” in other familiar places (typically, other rooms of the subject’s house; relatives’ or friends’ house; subject’s former bedrooms; school; and workplaces). Fifty-three (59%) respondents had experienced at least one FA while sleeping in a place different from the habitual bedroom. In this case, the typical FA scenario corresponded to the place where the subjects were actually sleeping in 38% of cases, and to the subject’s habitual bedroom in 41% of cases (Table 2).

From an analysis of respondents’ comments and spontaneous reports, it appears that FAs typically provide a realistic

Table 2. Typical visuo-spatial scenarios in FAs occurring in subjects’ habitual bedrooms and in FAs occurring elsewhere (number and percentages of subjects).

FA scenario	Subjects sleeping in the habitual bedroom (n = 90)		Subjects sleeping elsewhere (n = 53)	
	n	%	n	%
1. The place where actually sleeping	61	67.8	20	37.7
2. Other familiar places	8	8.9	22 ¹	41.5
3. Non familiar places	2	2.2	3	5.7
4. Varies:				
1+2	13	14.4	3	5.7
1+3	2	2.2	0	0
2+3	0	0	3	5.7
1+2+3	4	4.4	2	3.8

Note. ¹ almost always the habitual bedroom.

Table 3. Typical dream plots in FAs (number and percentages of subjects).

Dream plots	N	%	Recurrently reported examples
1. Normal awakenings / daily activities	31	34.4	Realistic nocturnal awakenings, start-of-the-day routine
2. Other activities in the sleep environment	22	24.4	Exploring, wandering
3. Other	20	22.2	Reviewing a previous dream
4. Varies:			
1+2	11	12.2	
1+3	4	4.4	
2+3	1	1.1	
1+2+3	1	1.1	

and detailed representation of the sleeping environment. Statements like the following ones recur quite frequently in respondents' accounts:

"... I have some awareness that my eyes are closed, but I can see my surroundings very clearly. My bedroom is exactly as it is in reality"

"... my bedroom seems the same as it is during waking, only the lights don't work"

"... Everything seemed as clear and accurate as reality. Nothing out of place. Including what I was wearing".

The following is an example of how accurate the reproduction of the sleep environment can be in FAs:

"I woke up with my hands crossed behind my head -this is a very unusual position for me to lay in. I looked down and saw the quilt (comforter) was laying across my torso in such a way that by glancing at it, it looked like there were two blankets on me. My eyes then lifted and I saw the shadows on the wall in front of my bed. Having lived in my house for five years, I was pretty familiar with the shadows cast in my room at night. But tonight there was a shadow that I didn't recognize. It was such a bizarre shape for where it was located. The shadow was in the shape of a box, and was a combination of a shadow on the wall and the dark area of the small hallway before my bedroom door. I stared at this shadow, knowing that this was my "queue" that I was in another dream. Nothing moved in the room. I waved my hand in front of my face (a trick that I use to tell whether I am asleep or awake) My hand did not appear. I got out of bed and went into the bathroom. Staring at the mirror in the bathroom, I could tell something was wrong (...)"

However, minor anomalies and bizarre situations ("dream-signs") were often detected, including: some details out of place (60 respondents); something that didn't work properly (most often, the well known "light-switch phenomenon": the subject tries in vain to turn on a light) (38 respondents); incongruities between interior and exterior environment (33 respondents); discontinuities of spatial and/or temporal transitions (29 respondents)

The most typical dream plot in FAs was: a realistic representation of normal awakenings and/or habitual daily life activities, for 31 (34%) respondents; other activities in the

sleep environment (most commonly, wandering about or exploring; see below), for 22 (24%) respondents; a combination of the two above for 11 (12%); other (most commonly, reviewing a dream experienced just before; see below) for 20 (22%) (Table 3).

An analysis of the 68 spontaneous FA reports permits to identify, within the broad categories of dream plots proposed by the questionnaire, some scenarios which tend to recur quite stereotypically, including:

1. Representations of normal awakenings:

Nocturnal awakenings:

- habitual, semi-automatic nightly actions, either staying in bed or in the immediate surroundings (e.g., looking at a digital clock; trying to turn on the light; etc)
- habitual nightly routines (e.g., going to the bathroom or to the kitchen to get a glass of water and then getting back to bed)

Final awakening:

- habitual, semi-automatic actions/thoughts of the awakening (e.g., "I think I should get up and start my day then I actually wake"; "I think that I am awake, just sit up and see that I am in my room, then wake up again in reality"; etc)
- start-of the day routine (see below, discussion)

2. Wandering – Spatial-exploratory behaviour, with or without a previous representation of a normal awakening (e.g., "often I wander around trying to see if I'm actually awake"; "if I can maintain dreaming in this state I will try to explore as much as possible"; etc)

3. Reviewing a dream experienced just before, with or without a previous representation of a normal awakening (see below, discussion).

These typical dream sequences can occur in different combinations within a single FA, e.g.:

"Usually starts with me waking up in bed. I get up and go check on my children to see if they are sleeping. I may go into the living room or wander about. Then I go back to sleep and when I wake up for real I realize that some

things were out of place and that I had yet another FA” (normal nocturnal awakening and wandering)

“I remember sitting on the edge of the bed thinking about the dream I had just experienced. I looked around the room for anything out of place. Nothing seemed different. I was sure that I was awake. Then I heard a noise and wondered if I was dreaming again. I hit myself and hurt. Decided I was awake and went into the front of the house (where the noise was coming from). While in the front of the house, I heard the noise again. The sound was coming from outside. I opened the door and looked outside at the front yard. Something struck me as being out of place. I can’t remember exactly what it was. I knew though that I was dreaming again. My heart raced. I felt trapped in the dream cycle” (review of a previous dream and spatial exploratory behaviour).

A FA can be made up exclusively of one or more typical sequence(s), or such sequences can be included in broader and more varied dream plots.

Finally, in FAs the same scene can re-enact itself more times identically:

“I ‘wake up’ and think: ‘I just had a FA...’. But I really am in another FA. This can happen like four or five times in a row before I either go lucid or really wake up”.

Twenty-eight respondents reported this kind of experience.

4. Discussion

The reliability of data collected by means of the web-survey technique can be questioned. However, in studies regarding the phenomenology of sleep paralysis and associated hypnagogic/hypnopompic experiences (Cheyne et al., 1999; Cheyne, 2002), large web surveys yielded results very similar to those obtained by means of questionnaires administered to large student samples. The main differences between web and student samples were found in the intensity ratings for the subjective experiences associated with sleep paralysis, which were consistently more intense in the web samples. The authors suggest that this may be due to the fact that people more troubled by a disorder are more likely to search for information (e.g., through the Internet) about their experiences (Cheyne et al., 1999). Other significant sample differences were found in age and sex composition; in spite of such differences, the authors concluded that the similarity of the basic structure of the analyzed experiences across web and student samples was remarkable.

On the other hand, an important advantage of the use of the web sample must be mentioned, namely, that in the present study 79% of participants were reporting on FAs that had happened within the last month (Table 1). Other types of surveys would likely have resulted in much longer delays of reporting and potentially less reliable accounts.

The striking realism of FAs has been previously pointed out, for both the background visuo-spatial scenario and the dream plot (Green, 1990; Green & McCreery, 1994).

As shown in this study, in the great majority of cases the visuo-spatial scenario of FAs is represented by the habitual sleep environment and its immediate surroundings, or by the place where the subject is actually sleeping (Table 2). FAs typically provide a realistic and detailed replica of the real environment.

As regards the dream plot, the present study suggests

that some fixed patterns tend to recur quite stereotypically in FAs. These include representations of normal awakenings and other realistically depicted activities (wandering, exploring) within the sleep environment and its immediate surroundings (Table 3).

One of these patterns is so common that it has become the paradigm of FAs, i.e., the start-of-the-day routine. Green & McCreery (1994) write: “(in a FA) the dreamer may appear to awake realistically in his own bedroom and finds his room, which may seem to be familiar in all its details, around him; and if he does not realise that he is dreaming, a more or less plausible representation of the process of dressing, breakfasting and setting off to work may then follow”. Cheyne (2004) writes: “In a conventional false awakening, one wakes up one morning, trots off to the washroom, brushes one’s teeth, makes coffee, prepares to leave for work, and then... notices that something is not quite right... and then wakes up in bed”.

The same scenario may unfold repeatedly. One of the respondents in the present survey wrote:

“Perhaps the worst FA experience for me, or the most irksome anyway, is the “start your day FA”. I wake up, shower, shave, dress, make breakfast, have a few cups of coffee, and am heading out the door to go to work, when suddenly... I wake up. There have been times that this process has repeated itself a dozen times, when I finally actually do wake up I am exhausted with the effort of getting ready for work so many times, and I remain suspicious and dubious as to whether I am really awake for quite some time”.

Other typical scenarios include “waking up” during the night and trying to turn the light on, going to the bathroom and getting back to bed, wandering about, exploring the sleep environment. Such scenarios tend to recur quite stereotypically both in the same subject and among the subjects.

As pointed out by Green and McCreery (1994), these dream narratives may or may not be preceded by the representation of a normal process of awakening. Anyway, they typically occur on the background of a realistically depicted sleep environment. Discontinuities of spatial and/or temporal transitions in FAs were noted only by 29 (32%) respondents.

What is the meaning of these recurrent, sometimes identically re-enacting, realistic dream scenarios? If FAs were nothing but ordinary dreams in which one happens to be waking up, then the question would be somehow tautological. Indeed, FAs differ substantially from ordinary dreams. Cheyne (2004) states:

“False awakening contradicts, as does lucid dreaming, the notion of a one-way understanding between dreams and waking consciousness. The false awakening experient is, in a sense, acutely aware of the waking world, actively believing that s/he is in it and, explicitly, out of the dream world. Thus, although the consciousness of false awakening is non-lucid with regard its own status, it is, unlike the conventional dream, implicitly aware of the existence of two worlds. The confusion is simply about which one the experient is in”.

FAs seem to escape the phenomenon of “dream amnesia” which, in ordinary dreams, may explain such features as sudden and complete scene shifts and the frequent

occurrence of impossible events and plots (Hobson et al., 2000). On one hand, FAs –different from ordinary dreams– are usually well remembered in waking. Many respondents report that when they wake up after one or more FAs, they typically question if they are really awake, due to the vivid and persisting memory of the preceding experience: “... *I awoke. Really awake. I questioned it for so long that I must have been in bed for five minutes trying to gather enough courage to walk down the hall and see if I was really awake*”. Some FAs are so realistic that the subjects may become aware of them accidentally: “*Last night I was sure that I awoke four times to record my dreams on a recorder, but I found only two on my recorder*”.

On the other hand, elements related to explicit memories seem to be much more accessible during FAs than during ordinary dreams. In addition to the above reported meticulous realism of FAs, it is worth mentioning the fairly rational state of mind of the dreamer (Green & McCreery, 1994), who often realizes that something is wrong (details out of place, incongruities, etc) in spite of the lack of insight into his or her condition.

A hyper-aroused REM sleep state is likely to underlie FAs, as suggested by their frequent association with lucid dreams and with sleep paralysis (see Introduction). In the present study, 44% of the respondents reported experiencing habitual transitions from FAs to lucid dreams, and 40% reported habitual transitions from lucid dreams to FAs. Forty-one percent of the respondents reported experiencing sleep paralysis during their FAs at least sometimes. Accordingly, the peculiar polysomnographic pattern observed in a unique case of laboratory-documented FA (Takeuchi et al., 1994) was indicative of an anomalous, hyper-aroused REM sleep state. During an experiment of nocturnal sleep interruption, a subject had an experience characterized by visual and motor hallucinations (he believed that someone had entered the bedroom; reported a detailed vision –despite the darkness– of his green sweater hanging on the bedroom wall and, finally, he believed that he had risen from the bed), consistent with a FA. The polysomnogram showed an electroencephalographic mixed pattern of stages REM and wakefulness, and muscle-tone inhibition (typical of REM sleep). The most interesting element of the reported pattern consisted in the appearance –30 sec. after the onset of REM sleep– of “alpha EEG trains that were blocked by rapid eye movements as though the subject were actually looking at something”. According to the authors, this pattern probably “reflected visual information processing similar to that occurring during waking” (the subject reported seeing his sweater despite the darkness).

Given that FAs are not ordinary “dreams of awakenings”, why do they tend to express recurrently the above reported dream contents ?

Here I would like to suggest a hypothesis which is in line with Hobson’s dream protoconsciousness theory.

FAs seem to be moulded on some fixed templates which lead them to express stereotyped patterns of realistically depicted activities within the sleep environment and its surroundings. Such templates (neural circuitries) could well correspond to the hypothesized REM-sleep related inborn virtual model of external world. According to Hobson’s hypothesis, this virtual world model would be “complete with an emergent imaginary agent (the protoself) that moves (via fixed action patterns) through a fictive space (the internally engendered environment)” (Hobson, 2009). The virtual

world model would then be adjusted on the basis of the outside world. In other words, protoconscious REM sleep would have innate schemes which simulate the external space, and (I suggest) innate schemes of ancestral action patterns such as representations of normal awakenings, spatial exploratory behaviour, wandering. In FAs, these innate schemes would be enacted on the basis of subjective experiential memories. For example, each subject may replay, in his/her FAs, a typical “start-of-the-day routine” on the basis of his/her real-life start-of-the-day habitual sequence of actions, within a visuo-spatial scenario simulating the subject’s familiar environment.

The fact that FAs tend to express highly realistic and detailed experiential memories (visuo-spatial memories of familiar environments, autobiographic memories of general – more than episodic– events such as nocturnal awakenings, start-of-the-day routine, etc) suggests that in this state the ordinary REM sleep machinery aimed at dismantling explicit memories is not properly at work. This could be the trivial effect of a disturbed REM sleep.

Alternatively, FAs could represent a vestigial REM sleep in which such machinery hasn’t developed yet. Later in phylogenesis, the block of hippocampal outflow during REM sleep would have prevented the replay of “predictable, over-learned patterns” and favoured “the formation of new associative links necessary for understanding the meaning of events in our lives” (Stickgold, 2002). On the other hand, the resulting characteristics of ordinary REM dream imagery (dismantling of explicit memories, bizarreness), would have made the interactions between subjective experiences and the supposed inborn schemata much more cryptic.

A clue that in FAs the hippocampal outflow is not blocked (and that there’s no dismantling of explicit memories) comes from another curious phenomenon reported by several respondents, i.e., the frequent review, in FAs, of a dream that the subject had experienced just before. This can occur either in the form of a reflection on the dream (“*I remember sitting on the edge of the bed thinking about the dream I had just experienced. I looked around the room for anything out of place. Nothing seemed different. I was sure that I was awake*” –indeed, the subject was experiencing a FA); or in the form of telling someone about the dream (“*My FAs are always preceded by a regular dream (not lucid). In the FAs I often recount to people I meet in the dream (usually friends of family) how strange the dream I just had was and tell them details about it. I’ve also had a few times where I’ve had a FA from a FA, only to repeat to someone in the dream how I just had a dream, tell them the story, then told them that I woke up (while dreaming) only to wake up again*”); or of writing the dream in a dream-diary.

FAs may therefore indicate the occasional re-appearing of a vestigial (or, anyway, anomalous) REM sleep in the context of disturbed / hyper-aroused sleep (lucid dreaming, sleep paralysis, or situations of high anticipation). This peculiar form of REM sleep permits the replay of unaltered experiential memories, thus providing a unique opportunity to study how waking experiences interact with the hypothesized predictive model of the world. In particular, it could permit to catch a glimpse of the protoconscious world without the distorting effect of ordinary REM sleep.

In accordance with the proposed hypothesis, a high prevalence of FAs could be expected in children, whose “REM sleep machinery” might be less developed. The present survey did not permit to test this point for two reasons: first,

the age range of the participants (all aged above 13 years); second, because habitual lucid dreamers represent a very particular group of subjects, which seem to be much more prone to experience FAs as compared with the general population. Several years ago, however, in a survey of children's experiences, Blackmore (1996) investigated the occurrence of FAs in 126 school children aged 8-13, by means of the question: "have you ever thought you had woken up and then realised that you were only dreaming you had woken up?". A surprisingly high percentage of children (57%) answered "yes". The author states that "it is difficult to know how well they understood the question and how good their memory was for their experiences. However, this is an enormous number, and several of them provided descriptions that fitted the definition absolutely". The possible relation between age and the occurrence of FAs deserves further investigation.

The present study is based on a survey which was performed some years before the publication of the dream protoconsciousness theory. A study more specifically addressed to explore the phenomenology of FAs in light of Hobson's hypothesis is of course warranted. Undoubtedly, FAs represent a fascinating, yet largely unexplored state of consciousness which deserves more attention by the dream research community.

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Appendix.

The survey was conducted (in October and November 2004) on the following websites:

- The Lucidity Institute, <http://www.lucidity.com/forum/>
- Dream Views – Lucid dreaming Forum, <http://www.dreamviews.com/forum/index.php>
- LD4all (Lucid dreaming for all), <http://ld4all.com/>

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