

# Themes of continuity

Commentary on “The continuity and discontinuity between waking and dreaming: A Dialogue between Michael Schredl and Allan Hobson concerning the adequacy and completeness of these notions”

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**Summary.** Hobson and Schredl's (2011) discussion on continuity and discontinuity between waking life and dreaming raised important issues about the nature of continuity. We will address several of the points from the debate, drawing on some preliminary data that has been collected investigating the nature of continuity between dreaming and waking. The present commentary will address the following: factors that affect continuity; themes of continuity; the protoconsciousness theory; 'disguised' continuity; discontinuity; and continuity of emotions. The findings presented will propose that emotionality and metaphor are key aspects to continuity; that the continuity hypothesis and protoconsciousness theory are complementary if one takes into account how dreams both reflect waking-life concerns and help the dreamer to progress with them; and that it may be useful to try to identify and talk about types and gradations of continuity and discontinuity, rather than simply continuity and discontinuity as two opposing concepts.

## Factors that affect continuity

Hobson and Schredl agree that the continuity hypothesis of dreaming, which is that “we dream of our waking-life experiences” (p.3), is incomplete and too broad. Schredl (2002, 2010a) emphasises that empirical research is needed to establish factors that affect the incorporation of specific waking-life experiences into dreams, and noted that there are some patterns to wake-dream continuity that have already been demonstrated. Studies such as Hartmann's (2000), Schredl's (2000), and Schredl and Hoffman's (2003), demonstrated that activities like reading, writing, arithmetic, and computer-use are under-represented in dreaming compared to waking life and to other dream activities such as walking and sexual activity, while other activities like driving and talking with friends are over-represented in dreams. Elsewhere, Schredl (2006) has found that emotional intensity but not emotional valence affects wake-dream continuity. It has also been shown that dreams that have been most affected by waking-life emotions are the most influential on waking mood the following day (Schredl & Reinhard, 2010). We have also reinforced the crucial role that emotionality plays on mediating the incorporation of waking-life experiences into dreams (Horton, Smith & Proctor, 2011; Malinowski & Horton, 2011).

In his mathematical proposal for factors affecting continuity, Schredl (2002) proposed five potential factors that may influence wake-dream continuity: emotional involvement, type of waking-life experience, personality traits, time intervals, and time of night. We are currently investigating the first three of these factors. In a study that is yet to be

analysed, a questionnaire is being devised in order to test whether continuity is a personality trait: i.e., whether some people experience more continuity than others, and if so, whether this personality trait is related to others traits, such as boundariness (Hartmann, 1991). In a dream-diary study, we focused on the factors of emotional involvement and type of waking-life experience. Thirty-two participants kept dream and waking diaries, reporting up to five major daily activities, five personally significant events, five major concerns, and five novel experiences each day, and rated each waking activity and dream for emotionality and stressfulness (Malinowski & Horton, 2011).

We found that emotionality but not stressfulness was a factor in wake-dream continuity, such that waking activities that were incorporated into a dream were significantly more emotional but not significantly more stressful than waking activities that were not incorporated into a dream. This was surprising, since many studies previously have shown an effect of stress on dreams (see Schredl, 2002, for a review). However, some of the former 'stress' experiments may not have been measuring the effects of stress, since stress is a negative and aversive state (Kasl, 1995), and some of the studies measured the effect of waking-life experiences that were not necessarily negative and aversive, such as watching erotic films (Cartwright, Bernick, Borowitz, & Kling, 1969) and pregnancy (Maybruck, 1990). Such experiences may be emotional, but not necessarily stressful. Ours was the first attempt to measure the separate effects of emotionality and stressfulness. Additionally, while some studies have found effects of stressful events on dream content, others have not. Delorme, Lortie-Lussier & De Koninck (2002) also found no direct effect of a stressor (examinations amongst a student population), and they suggested that the stressor may have been too benign to elicit a measurable effect on dreams. Perhaps the stressors in the participants' lives in our study were also too benign: overall, daily activities were rated as significantly less stressful than they were emotional. This is in line with the Disruption-Avoidance-Adaptation

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model of wake-dream continuity (Wright & Koulack, 1987), which posits that only potent stressors that cannot be mastered easily during wakefulness are incorporated into sleep. The results from laboratory versus home-based studies further suggest that benign stressors may be indirectly incorporated into dreams (Schredl, 2002), so if the present study mainly elicited benign stressors they may not have been easily recognisable in dreams.

It was also found that major daily activities (typically such activities as travelling to and from places, eating meals, being at work, watching television, etc.) were incorporated significantly less frequently than the combination of personally significant events, major concerns, and novel experiences, while the latter three showed no increased or decreased frequency compared to the combination of the rest. The results demonstrate that every-day, perhaps routine kinds of activities are incorporated less frequently than other types (here personally significant events, major concerns, and novel experiences). However, the results do not give an indication of which types of non-routine activities are incorporated more frequently than other types: none of the non-major daily activities were found to be incorporated more than major daily activities individually; the difference was only significant if they were combined. While it is perhaps unsurprising that routine activities are incorporated less frequently into dreams than other types, it is surprising that the other types showed no differentiation, especially major concerns, since concerns have been shown to influence wake-dream continuity in the past (Davidson, Lee-Archer & Sanders, 2005; Domhoff, Meyer-Gomes & Schredl, 2006; Hartmann, 1999). As with stress, the results may again be understood in light of the notion that participants in a two-week diary study may not report waking experiences that are concerning enough to be incorporated into dreams (Hartmann, 1996), or are benign enough to be incorporated in a non-direct way. The incorporation of particularly concerning waking experiences, and non-direct incorporations of waking experiences, may therefore be difficult to measure through standardised experimental ratings, and thus need to be investigated in an alternative manner.

It was next therefore decided to take a data-driven, bottom-up approach, rather than the typical theory-driven, top-down approach to studying continuity. As stated by Schredl in the discussion (Hobson & Schredl, 2011), continuity is thematic; thus the approach for our study was to search for the themes of continuity. While many studies have so far demonstrated various aspects of wake-dream continuity (Davidson, Lee-Archer & Sanders, 2005; Domhoff, Meyer-Gomes & Schredl, 2006; Hartmann, 1999, 2000; Horton, Smith & Proctor, 2011; Malinowski & Horton, 2011; Schredl, 2000, 2002, 2006; Schredl & Hoffman, 2003; Schredl & Reinhard, 2010) it was felt that consideration of dreams in their entirety was needed: we wanted to allow the dreams themselves, and the dreamer's experiences of the dreams, to determine which aspects of continuity would be the focus of the final discussion. Also, in agreement with Hobson, who has highlighted that continuity research often focuses on wake-dream continuity at the cost of evaluating discontinuity (Hobson, 2005, 2009; Hobson & Schredl, 2011), we wished to consider both continuity and discontinuity. Thus, an in-depth study was conducted in order to investigate the themes pertaining to continuity. Four participants kept dream diaries for two months and were interviewed twice for up to two hours per interview, during which they were

questioned on specific dreams and dreaming in general, using Schredl's (2010b) 'Listening to the dreamer' approach, which was modified to consist of four rather than five stages. First, participants were asked clarifying questions about their dreams to enable them to recall the dream in as much detail as possible. Second, they were asked to elaborate on the individual elements of the dream and the dream overall with regards to any wake-dream relations they perceived. In this way, while continuity could be detected, discontinuity was also noted. Third, they were asked to identify any basic action patterns and emotions in the dream. Finally, they were asked whether they saw any further wake-dream parallels between basic dream pattern or emotion and waking life.

### Themes of continuity

An extensive thematic analysis was conducted, using the procedures outlined in Braun & Clarke (2006). Five main themes were found (Malinowski, Fylan & Horton, in prep.). The first was 'Experiences and Thoughts'. The continuity of experiences and thoughts is one of the main ways continuity has been researched previously, so it was unsurprising that this would be found to be a key theme. There were several important sub-themes within this. The first was that experiences were reported very fragmentarily: i.e., small pieces of information from waking life were incorporated into dreams that were nothing like the waking-life experiences, ranging from whole episodes of waking life (that were not, nevertheless, identical in the dream) down to single images or simply participants' waking knowledge. The fragmentary incorporation of waking experience into dreams has been demonstrated elsewhere and was also found in the previously reported study (Malinowski & Horton, 2011; see also Fosse, Fosse, Hobson & Stickgold, 2003; Schwartz, 2003). The next sub-themes were work, studies, and learning, as well as hobbies that were extra-curricular but posed some sort of work-like problem (for example, writing a difficult character for a novel, or translating a text for a friend). Finally, aspects of the media were dreamt of frequently (and also fragmentarily), especially characters, mostly from television rather than books, and often science-fiction above other genres. This could have important implications. Suggestions have been made (Hobson & Schredl, 2011; Schredl & Hoffman, 2003) to explain the fact that activities such as reading and other cognitively-focused activities are incorporated less frequently than other types of activities, such as that some types of activity are preferentially incorporated due to their emotional salience, or that the structural and chemical state of the REM brain means that we literally are unable to do such activities as arithmetic in our dreams. The findings of the present study could suggest another factor: since it was primarily visual material from the media rather than verbal that was incorporated – even for a participant who stated that they read more than they watch television – perhaps we preferentially incorporate material from waking-experiences that are visual in nature. Findings that dreaming has distinct patterns in the motor, visual, and limbic systems of the brain (Schwartz, Dang-Vu, Ponz, Duhoux, & Maquet, 2005), and that 100% of dreams contain visual perceptions (Schredl & Wittmann, 2005), support this notion, as well as supporting the notion that dreams selectively incorporate emotional experiences (in line with heightened limbic activation), and may also go some way to explaining the prepon-

derance of activities such as walking (due to motor activation). A final important point to note about the first theme is that experiences from the past, right back to childhood, were also found in dreams, but, crucially, they were present to thought: either the dream pertained to a childhood issue that was still relevant, or the participants had thought about the person or situation from the past recently. Schredl (2010a) has highlighted the necessity for continuity research to take waking thoughts into account as well as experiences, and the present study addresses this.

### Protoconsciousness theory

In the discussion of protoconsciousness theory, Hobson suggested that dreaming may be a preplay of waking, rather than a replay. Schredl concurred, suggesting that “it could make sense, that ‘old’ waking life material is put together in a creative way in order to prepare the person for future experiences in waking life” (Hobson & Schredl, 2011, p.4), which relates to a problem-solving theory of dreams. These ideas relate to the second theme that was found in our thematic analysis (Malinowski, Fylan & Horton, in prep.): ‘Personal Issues and Concerns’. The main finding from this theme was that participants were not only dreaming of issues that were particularly concerning to them – such as major life changes, sexuality, and unresolved or unfulfilled parts of their waking lives – but three of the four participants discussed dreaming of their personal issues in the sense that the dreams helped them with these issues, in various ways. For example, one participant who was experienced in working with her dreams considered that they provided direct answers to waking-life problems, though they needed to be worked out. Another participant who was less experienced but enjoyed thinking about his dreams thought many of his dreams were exploring his waking-life issues, and suggesting new ideas that he was then able think about in waking. Another of the participants who did not work with her dreams at all saw an indirect relationship between her waking-life problems and dream ‘solutions’ – the ‘answers’ would not be obvious, but the issues were clearly being explored in dreams. This theme, then, emphasized the actively useful nature of dreaming rather than dreams being mere reflections of waking life experiences. The notion that dreams do not just reflect waking life but help the dreamer progress with it is essential for continuity theory. An issue that is troubling us from waking life carries over into our dreams; the dream helps us progress with and prepare to deal with that waking-life issue; next time, we may be better able to deal with it. In this way, continuity theory and protoconsciousness theory are complementary.

### ‘Disguised’ Continuity

The third theme was ‘Metaphor’, which could also be described, as in the discussion, as “disguised transformations of prior waking experience” (Hobson & Schredl, 2011, p. 3). It may not be necessary to term such representation of waking-life experiences as ‘disguised’, however, since this term may imply that dreams are purposefully hiding something from the waking brain, and thus is reminiscent of Freudian notions of “psychic censorship” (Freud, 1900, p.375). It could more simply be the case that metaphor is used ubiquitously in dreams as well as in waking life to help us to translate abstract ideas into concrete means of expression (Lakoff, 1993). Additionally, metaphorical picturing

of waking-life experiences enables waking-life concerns, thoughts and emotions to be pictured visually, which, as has been discussed, is an important aspect of dreaming. Experiences of such metaphorical continuity were common for our participants, even for those who were explicitly reluctant to search for continuity. For example, one participant who said he preferred not to probe dreams for waking-life connections saw in a dream he had about cardinals playing football – which actually involved them kicking each other in the crotch – his own “interpretative portrayal” of Belgian politics. Another participant, who similarly said that she was resistant to looking at dreams in terms of where they came from in waking life, related a dream about a semi-failed launch of a spaceship to her confusion about whether her new career had really “taken off” (her words) or not. The participants saw these connections immediately – they were not ‘disguised’ because they did not have to be painstakingly uncovered; rather, they were fairly obvious representations of a waking-life thought (opinion on Belgian politics) and a waking-life situation (career launch). Thus, we prefer to term such continuity ‘representative’ or “figurative” (Domhoff, 2001, p.28), rather than ‘disguised’. It is not suggested here that the dream purposefully disguises the dream’s relation to waking life as some sort of repression tactic, but simply imagines the waking-life experience in the way the dreaming brain does best: in metaphor, and in pictures.

### Continuity of Emotions

The fourth theme was ‘Continuity of Emotions’. This differed from the other themes because it was not necessarily a mapping of waking experiences onto dreams, but the appearance of waking emotions in dreams. The dream usually differed from the waking-life experience that gave rise to the emotions, whether because the dream experience had somewhat altered the waking experience, or because the two were nothing alike except in emotion, or because there was no specific experience to be matched at all, only the emotion. Thus, this theme is very much related to Schredl’s assertion that “flying dreams, [are] clearly discontinuous to waking life because flying unaided is not possible, [but] on the emotional level (feeling of elation) there might be continuity” (Hobson & Schredl, 2011, p.3). Three of the four participants in the study stated that dreams were more likely to relate to emotions in their waking lives than specific experiences. The fourth found emotions in dreams so important that she had a dream character who always stood for her emotions in her dreams, a ‘Lady of the Lake’-like figure, as well as believing that certain elements of dreams such as the sea represented emotions. The fact that this was one of the few things that all four participants completely agreed on suggests again a very important role for the continuity of emotions. This theme is also related to representative continuity: a dream or a dream element may represent a single emotion or a set of emotions. For example, one participant had a long dream about fighting a female ‘Rainmaker’ with magical spells, whom he defeated but not with his own ‘Rainmaker’ skills, and whom he feared he may have killed. While none of the elements of the dream were very similar to specific waking life experiences, he saw the dream as an exploration of the guilt he had towards his feelings about his sexuality, and the potential that exists for him to cause harm in the process of realising his sexual desires.

The continuity of emotional waking experiences is some-



thing that has been explored experimentally (Malinowski & Horton, 2011; Schredl, 2006), and indeed many researchers postulate that dreams help us to consolidate and process emotional waking experiences (Hu, Stylos-Allan & Walker, 2006; Desseilles et al., 2010; Horton & Malinowski, this issue; Payne & Nadel, 2004; Schredl & Hoffman, 2003; Stickgold, Hobson, Fosse, & Fosse, 2001; Vandekerckhove & Cluydts, 2010; Wagner, Gais & Born, 2001; Walker & van der Helm, 2009). Walker and van der Helm suggest a ‘Sleep to Remember, Sleep to Forget’ (SRSF) model, which posits that dreams enable waking memories to be consolidated and integrated, and the emotions associated with these memories to be ameliorated. This very process appears to have occurred for one of the participants within the thematic analysis study (Malinowski, Fylan & Horton, in prep.), who had a dream about invigilating an exam and not being able to find the exam room whilst she was with a group of students. She had just left a lecturing job in which that situation was not uncommon for her, and she had had many such dreams in the past. However, the dream that she discussed was different, because she had very little anxiety in it, and that was puzzling for her, because it was so unusual not to be anxious about it in the dream. She said: “the fact that I had (...) this dream but it wasn’t an anxiety dream, or at least not to the same extent, may have been significant, I was kind of neutralising it, and perhaps putting it away.” It is significant that she had the neutralising dream only after she had left that job, perhaps showing how amelioration – in this case, at least – could only occur once there was no chance of being back in the situation.

### Discontinuity

Finally, the fifth theme identified was the continuity of physical things from waking life: mainly people and places, and a few objects. An interesting finding from this theme was that continuity of the physical things from waking life appeared on what may be conceptualised as a sliding scale from continuity to discontinuity. The continuity-to-discontinuity scales (Tables 1 and 2) posited below are limited to the dreams discussed by participants in the study and are not exhaustive. Given the small number of participants it should be anticipated that other types of continuity and discontinuity exist. The scale presented is suggested as a preliminary way of conceptualising the sliding scale from continuity to

discontinuity. For each type of continuity / discontinuity, at least one example was present in participants’ dreams (see Tables 1 and 2).

The continuity scales may be compared with a previous attempt to categorise bizarreness. In Revonsuo and Salmivalli’s (1995) content analysis of bizarreness, the authors identified dream elements (including people and places, but also many other elements such as language, emotions, and time) and rated them as non-bizarre or bizarre. To be rated as non-bizarre the element had to be “congruous with waking reality” (p.174); i.e., on the continuity scale it would exhibit “total continuity”. Bizarre elements were either incongruous, vague, or discontinuous. Incongruous could mean either “an element which has a feature that does not belong to it in waking reality or which appears in a context in which it would not appear in waking reality” (p.174); exotic; or impossible. The similarities of incongruous with the category of “irregular continuity” are obvious, such as inappropriate behaviour or use of element, and famousness (read: exoticness). “Vague” elements in the bizarreness scoring system were “an element or a feature of an element whose identity or precise nature is indeterminate, unknown, or obscure in some way” (p.174). Though there are clear differences, this category shares some similarities with “uncertain continuity”, i.e. the sense of vagueness or uncertainty. Finally in the bizarreness scale there are “discontinuous” elements of dreams. Unlike in the “discontinuity” category of the continuity scale, however, the bizarreness scale refers to discontinuity as temporal: elements that appear or disappear or transform suddenly.

Although there are differences in the scales, there are also clear similarities. It should be noted that the continuity scales posited were not developed with the bizarreness scale in mind; the similarities became apparent afterward. There are also, however, important differences. The first is that while the bizarreness scale is conceptualising a scale from non-bizarre to bizarre, the continuity scale is conceptualising a scale from continuous to discontinuous, which are related, but not identical. Continuity and bizarreness may appear to oppose each other on the surface, if continuity is defined in terms of literal incorporations of waking experiences into dreams. An analysis of the data from Malinowski & Horton (2011) found a negative correlation between the bizarreness of dreams (as measured using Revonsuo and Salmivalli’s (1995) system) and the literalness of dreams (as measured

Table 1. Types of continuity of dream characters.

Types	Descriptions
Total Continuity	Character(s) look, behave, and occupy a role in accordance with their waking equivalent, and have been seen recently
Irregular Continuity	Character(s) are from waking life but: have not been seen in waking life for many years; occupy an inaccurate role or behave inappropriately; or are famous
Uncertain Continuity	Character(s) may be from waking life but: the similarity is unclear or passing; or they are combined with other people (from waking-life or not)
Representative Continuity	Character(s) conform to an easily recognisable type of person from waking-life but are not specific people from waking life, and they may represent their type only or something else (such as something abstract) also; or they are recognised but also occupy a metaphorical role
Discontinuity	Character(s) are not related at all to waking-life

Table 2. Types of continuity of dream locations.

Types	Descriptions
Total Continuity	Place looks and is used in accordance with its waking equivalent, and has been visited recently
Irregular Continuity	Place is from waking life but: has not been visited for many years; or is used inappropriately according to the memory of the place
Uncertain Continuity	Place may be from waking life but: the similarity is unclear or passing; or it is a combination of more than one place, at least one of which is from waking-life
Representative Continuity	Place conforms to an easily recognisable type of place from waking-life but is not specific to a place from waking life; or acts as a symbol / represents something else other than itself
Discontinuity	Place is not related at all to waking-life

using a comparable literalness scoring system), but the correlation coefficient was very low (-0.09) and non-significant, indicating that they are very far from being in complete opposition to one another. The only continuity category that was not present in any comparable form in the Revonsuo and Salmivalli system was “representative continuity”, and this category demonstrates a way in which continuity and bizarreness may exist together. A dream character or place that is representative may be discontinuous from waking life (in that they are unknown), or bizarre (perhaps exotic to the dreamer) but represent something known from waking life. Dream characters in the thematic analysis (Malinowski, Fylan & Horton, in prep.) represented many parts of waking life, such as aspects of the dreamer’s own personality, waking life situations, and abstract ideas. Thus, a dream element could be discontinuous or bizarre, but if it is representing something from waking life, then it is continuous too.

Some of the “anomalous content” of dreams (Hobson & Schredl, 2011, p. 3), then, is created by the dreaming brain to produce something never before experienced in waking life, but that relates to it in specific ways, such as via the representation of something from waking life, or via the emotions of the dream matching a waking emotional preoccupation. Another reason for anomalous content in dreams may be that some unrecognisable people and places (and other elements) in dreams may conform to easily recognisable types. Often this was the case for participants in the thematic analysis, for example: “he just looked like a very stereotypical and poorly sketched second hand dude”. Participants stated that unknown “dream people” were regular features of dreams, and they were often described as ‘generic’, ‘stereotypical’, or ‘archetypal’. The same was true for dream locations. Like extras or scenery in a film, such stereotypical characters or generic locations may help contextualise the dream situation, conforming to the type of person or location the dreamer expects to see in such a situation. Thus participants dreamt of ‘generic’ school children, actors, bookshop assistants, lecturers, beaches, and so on.

The above are only some of the ways in which ‘anomalous’ dream elements might appear in dreams: as representations of waking-life experiences; via emotional similarities; and by conforming to recognisable types. However, there are other types of anomalous dream elements, identified in the Revonsuo and Salmivalli (2005) content analysis of bizarreness,

such as temporally discontinuous elements, which cannot be explained by this; and furthermore, dreams are always novel and often unexpected creations (Hartmann, 2010). In order to understand the nature of such discontinuity, anomaly, or bizarreness (however it should be termed), as well as the creativity of dreams, it may be useful to study dreams in their entirety with the dreamer, obtaining rich, detailed data. Such data can then co-exist with and help to further understanding of data from other areas of dream research. For example, bizarreness may occur because the dreaming brain is structurally activated to produce bizarre thoughts (Hobson, Hoffman, Helfand & Kostner, 1987), but understanding of dream bizarreness is incomplete without reference to the dreams themselves and the patterns therein (which may be researched, as in here, via thematic analysis), and without speculating as to what the purpose of this mode of thought might be. Hartmann (1996, 2010, 2011), for example, has suggested that the brain during REM sleep is geared up towards autoassociative processing, unlike in waking when it is geared up towards linear processing, which enables the brain to make broad connections in a ‘safe place’ (a dream); thus, it activates many diverse memories and interweaves new ones into the memory system, which creates something new each time. Hobson also discusses this “autocreativity” (Hobson & Schredl, 2011, p.4) of dreams, and it is essential to keep sight of this in continuity research: many disparate elements in dreams, some literally from waking life, some vaguely like waking life, and some not from waking life, converge to produce something new each time. If continuity research does not take discontinuity and creativity into account, an enormous amount of the dream is lost.

## Conclusions

The present commentary drew on preliminary data from an experimental dream-diary study and a qualitative interview-based study to discuss several important aspects of continuity: factors that affect continuity, themes of continuity, the relation between continuity and protoconsciousness theory, representative continuity, continuity of emotions, and discontinuity / bizarreness. We demonstrated that as well as experimenting with factors of continuity, which is useful in isolating aspects of waking life that are more continuous with dreams than others such as emotional experiences, continuity may also be studied from a data-driven approach like

thematic analysis. Thematic analysis is a subjective search for thematic patterns within texts (here, transcribed interviews). It is somewhat like factor analysis (which can also be considered a highly subjective analysis), but is qualitative in epistemology. Rather than being based on the statistical clustering of factors it is based on a subjective interpretation of the most prevalent and important themes, in this case with four participants, by two experimenters. Some of the most important aspects of continuity the study found and may be experimented with further are: media and the visual nature of the waking stimulus; the helpful (as opposing merely reflective) nature of continuity in dreams; 'representative' continuity; emotionality (which has already begun to be researched: Malinowski & Horton, 2011; Schredl, 2006); and types of continuity. More research needs to be conducted by different researchers, and with different participants, using qualitative methods to search for findings in different groups, and quantitative methods to corroborate the findings using scientific methods.

## References

- Braun, V., & Clarke, V. (2006). Using thematic analysis in psychology. *Qualitative Research in Psychology*, 3, 77-101.
- Cartwright, R. D., Bernick, N., Borowitz, G., & Kling, A. (1969). Effect of an erotic film on the sleep and dreams of young men. *Archives of General Psychiatry*, 20, 262-271.
- Davidson, J., Lee-Archer, S., & Sanders, G. (2005). Dream imagery and emotion. *Dreaming*, 15 (1), 33-47.
- Delorme, M.-A., Lortie-Lussier, M., & De Koninck, J. (2002). Stress and coping in the waking and dreaming states during an examination period. *Dreaming* 12 (4), 171-183.
- Desseilles, M., Thanh Dang-Vu, T., Sterpenich, V., & Schwartz, S. (2010). Cognitive and emotional processes during dreaming: a neuroimaging view. *Consciousness and Cognition*, in press: doi:10.1016/j.concog.2010.10.005.
- Domhoff, G. W. (2001). A new neurocognitive theory of dreams. *Dreaming*, 11 (1), 13-33.
- Domhoff, G. W., Meyer-Gomes, K., & Schredl, M. (2006). Dreams as the expression of conceptions and concerns: a comparison of German and American college students. *Imagination, Cognition and Personality*, 25 (3), 269-282.
- Fosse, M. J., Fosse, R., Hobson, J. A., & Stickgold, R. J. (2003). Dreaming and episodic memory: a functional dissociation? *Journal of Cognitive Neuroscience*, 15 (1), 1-9.
- Freud, S. (1900). *The Interpretation of Dreams*. Hertfordshire: Wordsworth.
- Hartmann, E. (1991). *Boundaries in the Mind*. New York: Basic Books.
- Hartmann, E. (1996). Outline for a theory on the nature and functions of dreaming. *Dreaming*, 6 (2), 147-170.
- Hartmann, E. (1999). Dreams contextualize emotion – a new way of understanding dreams and dream symbolism. *Psychoanalytic dialogues*, 9 (5), 779-788.
- Hartmann, E. (2000). We do not dream of the 3 R's: implications for the nature of dreaming mentation. *Dreaming*, 10 (2), 103-110.
- Hartmann, E. (2010). The dream always makes new connections: the dream is a creation, not a replay. *Sleep Medicine Clinics*, 5 (2), 241-248.
- Hartmann, E. (2011). *The Nature and Functions of Dreaming*. Oxford: Oxford University Press.
- Hobson, J. A. (2005). In bed with Mark Solms? What a nightmare! A reply to Domhoff (2005). *Dreaming*, 15 (1), 21-29.
- Hobson, J. A. (2009). REM sleep and dreaming: towards a theory of protoconsciousness. *Nature Reviews Neuroscience*, 10 (11), 803-813.
- Hobson, J. A., Hoffmann, S. A., Helfand, R., & Kostner, D. (1987). Dream bizarreness and the activation-synthesis hypothesis. *Human Neurobiology*, 6, 157-164.
- Hobson, J. A., & Schredl, M. (2011). The continuity and discontinuity between waking and dreaming: A dialogue between Michael Schredl and Alan Hobson concerning the adequacy and completeness of these notions. *International Journal of Dream Research*, 4 (1), 3-7.
- Horton, C.L., & Malinowski, J. (This issue). Re-defining discontinuity: implications for the functions of dreaming. *International Journal of Dream Research*.
- Horton, C.L., Smith, M.D., Proctor, C. (2011). The emotionality of dream memory sources: intensity and valence influences likelihood of incorporation. *International Journal of Dream Research*, 4 (1), S45.
- Hu, P., Stylos-Allan, M., & Walker, M. P. (2006). Sleep facilitates consolidation of emotional declarative memory. *Psychological Science*, 17 (10), 891-898.
- Kasl, S. L. (1995). Theory of stress and health. In C. L. Cooper (Ed.), *Handbook of Stress, Medicine and Health* (pp.13-26). CRC Press: Boca Raton.
- Lakoff, G. (1993). How metaphor structures dreams: the theory of conceptual metaphor applied to dream analysis. *Dreaming*, 3 (2), 77-98.
- Malinowski, J., Fylan, F., & Horton, C. L. A thematic analysis of continuity between waking-life and dream. In prep.
- Malinowski, J., & Horton, C.L. (2011). Do we dream to process emotional waking experiences? The incorporation of emotional stimuli in dreams. *International Journal of Dream Research*, 4 (1), S48.
- Maybruck, P. (1990). Pregnancy and dreams. In: S. Krippner (Ed.), *Dreamtime and Dreamwork: Decoding the Language of the Night* (pp.143-151). Jeremy P. Tarcher: LA.
- Payne, J. D., & Nadel, L. (2004). Sleep, dreams, and memory consolidation: the role of the stress hormone cortisol. *Learning and Memory*, 11 (6), 671-678.
- Revonsuo, A., & Salmivalli, C. (1995). A content analysis of bizarre elements in dreams. *Dreaming*, 5(3), 169-187.
- Schredl, M. (2000). Continuity between waking life and dreaming: are all waking activities reflected equally often in dreams? *Perceptual and Motor Skills*, 90, 844-846.
- Schredl, M. (2002). Continuity between waking and dreaming: a proposal for a mathematical model. *Sleep and Hypnosis*, 5 (1), 26-40.
- Schredl, M. (2006). Factors affecting the continuity between waking and dreaming: emotional intensity and emotional tone of the waking-life event. *Sleep and Hypnosis*, 8 (1), 1-5.
- Schredl, M. (2010a). Characteristics and contents of dreams. *International Review of Neurobiology*, 92, 135-154.
- Schredl, M. (2010b). Listening to the dreamer. Dream group at The 27th Annual Conference of the International Association for the Study of Dreams, Crowne Plaza Resort, Asheville, North Carolina, June 27- July 1, 2010.
- Schredl, M., & Hoffmann, F. (2003). Continuity between waking activities and dream activities. *Consciousness and Cognition*, 12, 298-308.
- Schredl, M., & Reinhard, I. (2010). The continuity between waking mood and dream emotions: direct and second-order effects. *Imagination, Cognition and Personality*, 29 (3), 271-282.

- Schredl, M., & Wittmann, L. (2005). Dreaming: a psychological view. *Schweizer Archiv Für Neurologie Und Psychiatrie*, 156, 484-492.
- Stickgold, R., Hobson, J. A., Fosse, R., & Fosse, R. (2001). Sleep, learning, and dreams: off-line memory processing. *Science*, 294 (5544), 1052-1057.
- Schwartz, S. (2003). Are life episodes replayed during dreaming? *Trends in Cognitive Science*, 7 (8), 325-327.
- Schwartz, S., Dang-Vu, T. T., Ponz, A., Duhoux, S., & Maquet, P. (2005). Dreaming: a neuropsychological view. *Swiss Archives of Neurology and Psychiatry*, 156 (8), 426-439.
- Vandekerckhove, M., & Cluydts, R. (2010). The emotional brain and sleep: an intimate relationship. *Sleep Medicine Reviews*, 14, 219-226.
- Wagner, U., Gais, S., Born, J. (2001). Emotional memory formation is enhanced across sleep intervals with high amounts of rapid eye movement sleep. *Learning and Memory*, 8, 112-119.
- Walker, M. P., & van der Helm, E. (2009). Overnight therapy? The role of sleep in emotional brain processing. *Psychological Bulletin*, 135 (5), 731-748.
- Wright, J., & Koulack, D. (1987). Dream and contemporary stress: a disruption-avoidance-adaptation model. *Sleep* 10 (2), 172-179.

Commentary on "The continuity and discontinuity between waking and dreaming: A Dialogue between Michael Schredl and Allan Hobson concerning the adequacy and completeness of these notions". Caroline L. Horton and Josie E. Malinowski. Hobson and Schredl's dialogue (2011) raised important questions concerning the operationalisation of continuity across sleep and wake, especially in contrast to discontinuity, and questioned the potential functionality of such continuity. We expand on these issues by focussing in particular upon the incorporation of different kinds of waking life experiences into dreams as both a methodological tool and a means by which the function of memory consolidation processes in sleep can be better understood. Having both, continuity and non-continuity between our dream and wake lives, helps explain both the cognitive connection and the disconnection between our dream and wake worlds. Continuity between our dream and wake worlds may also be said to occur if dreams simulate and prepare us for social engagement when awake as in the theory of Revonsuo et al. (2016) and Tuominen et al. (2019). Continuity can also help with emotional well-being, Pesant and Zadra (2006), Cartwright (2010), Walker and van der Helm (2009), Walker (2017). All the above results were replicated when we calculated the two kinds of thinking on a per dream report basis as on the per dream event basis, reported above. Themes of continuity: Commentary on "The continuity and discontinuity between waking and dreaming: A Dialogue between Michael Schredl and Allan Hobson concerning the adequacy" J Malinowski, CL Horton. *International Journal of Dream Research* 4 (2), 86-92, 2011. 17. 2011. The self and dreams during a period of transition. CL Horton, CJA Moulin, MA Conway. *Consciousness and Cognition* 18 (3), 710-717, 2009. 16. 2009. The Memory Experiences and Dreams Questionnaire (MED-Q): A validated measure of dream remembering. CL Horton, MA Conway. *Imagination, Cognition and Personality* 29 (1), 3-29, 2009. 14