Commentary

The phantom limb in dreams ☆

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Abstract

Mulder and colleagues [Mulder, T., Hochstenbach, J., Dijkstra, P. U., Geertzen, J. H. B. (in press). Born to adapt, but not in your dreams. Consciousness and Cognition.] report that a majority of amputees continue to experience a normally-limbed body during their night dreams. They interpret this observation as a failure of the body schema to adapt to the new body shape. The present note does not question this interpretation, but points to the already existing literature on the phenomenology of the phantom limb in dreams. A summary of published investigations is complemented by a note on phantom phenomena in the dreams of paraplegic patients and persons born without a limb. Integration of the available data allows the recommendation for prospective studies to consider dream content in more detail. For instance, “adaptation” to the loss of a limb can also manifest itself by seeing oneself surrounded by amputees. Such projective types of anosognosia (“transitivism”) in nocturnal dreams should also be experimentally induced in normally-limbed individuals, and some relevant techniques are mentioned.

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“If you look hard enough, you will find that what you just discovered has already been reported in the early German literature.” (Strong, 1986; p. 2864) ¹

It is with mixed feelings that I comment on the report by Mulder, Hochstenbach, Dijkstra, and Geertzen (in press), recently published in this Journal. On the one hand I am quite enthusiastic about the authors’ approach, and they are to be commended for having raised the interesting question of how amputees experience themselves in night dreams, i.e. whether their dream bodies are amputated or still intact. Mulder et al. (in press) have recognized that answering this question bears much relevance to issues of brain plasticity and the reorganization of body schema after the loss of a limb. On the other hand I am disappointed that no reference

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¹ This insight has previously been cited in the context on research on phantom limbs (Herman, 1998; p. 78).

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is made to the many studies that have asked the same question before. Ultimately, my disappointment is about a certain Zei
gerst, namely the inclination of many modern authors (and obviously also Journal editors and referees) to rely on computerized literature searches for the compilation of publications relevant to a given topic. The use of “search engines” may be helpful for locating articles on mainstream issues, but such machines pitifully fail, once an author’s topic is just a bit off the tracks. Their failure may be especially obvious when, on top of the obstacles by elapsed time, language barriers hinder the bibliographic work.

I here show that the findings by Mulder et al. (in press), in particular the fact that some amputees continue to dream themselves with an intact body, even many years after the loss of a limb, are largely compatible with those of earlier authors, whose work I briefly introduce. I also discuss some investigations of the dream body of non-amputees that are nevertheless pertinent to the issue of brain plasticity and functional reorganization. Finally, throughout this brief note, I wish to point out some future directions in the research on body schema manifestations in nocturnal dreams.

1. Anticipations of Mulder et al. (in press)

Table 1 lists, along with the study by Mulder et al. (in press) itself, some earlier investigations of the loss of a limb as represented in the ampute’s dreams. The monography by Katz (1921) contains a small-scale study on the phantom limb in dreams in 14 amputees, who could provide sufficiently detailed reports to allow a classification of their body-related dreams into “intact body” (IB), “amputated body” (AB) or mixed-type dreams. The first-hand dream reports he cites illustrate, however, the difficulties of classifying a dream according to presence or absence of an amputation. While in some instances, the unequivocal presence of a lost limb is obvious (one arm amputee reports that he dreamt “having smashed a moscito by clapping both hands”, p.53), corporeal awareness appears rather fluctuating in a hand amputee who repeatedly dreamt that his hand would be torn off from the arm in a heavy storm (Katz, 1921, p. 52). One dream reported in Frank and Lorenzoni (1992, p.77) even more explicitly points to the difficulty of deciding whether a dream belongs more to the IB or rather to the AB type. A 26-years-old man, who had lost a leg in an accident at age 14, had a recurrent dream during the times he took his driver’s lessons. In that dream he would be the car-driver, and he invariably experienced himself with two legs. However, as invariably he would loose control over the car because his foot would fail to manage the breaks. Here then, the lost leg is optically represented (and it may matter that this individual experienced a phantom leg during waking life), but functionally absent. Stetter (1950), a leg amputee himself, investigated the dreams of war amputees, the majority of whom had lost one or both lower extremities. He found an equal representation of IB, AB and mixed-type dreams and men-

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<th>Reference</th>
<th>Number of amputees in study</th>
<th>Percentage of amputees without dreams</th>
<th>Percentage of amputees who dream themselves</th>
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n.r., not reported.

<sup>a</sup> Persons who either did not remember their dreams at all or who did not remember dreams about their bodies.

<sup>b</sup> 100% = all amputees with relevant dreams.

<sup>c</sup> 100% = those 62 amputees with a phantom during waking life.

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tioned that the locus of amputation did not appear to be associated with a particular dream type. His report contains a passing note on the integration of a prosthesis within a dream. History of prosthesis use seems an important variable to be assessed in future studies, as it reportedly modifies phantom percept and cortical reorganization in significant ways (O’Connor, 1997; Giummara, Gibson, Georgiou-Karistianis, & Bradshaw, 2007). Also, one of Stetter’s (1950) subjects dream narratives is particularly interesting in that it specifically deals with the manifestation of phantom limb pain in a dream. A leg amputee’s phantom foot pain was symbolically represented as induced by a rat, which was gnawing at the foot while he was swimming. Incidentally, an identical symbolism was evident in the waking interpretation of phantom limb pain in a schizophrenic patient (Stip & Perreault, 1993). This suggests that future comparisons between healthy amputees’ dreams about lost limbs and psychotic patients’ waking elaborations of phantom limb sensations may be promising.

Appenzeller and Bicknell (1969) originally set out to investigate the effects of nervous system lesions on the phenomenology of phantom limbs. Although they reported dream loss in one patient and stroke-related cessation of a phantom leg percept in another, they do not seem to have inquired whether cerebral lesions might specifically affect a patient’s phantom experiences during night dreams. Poeck (1969), whose data regarding the different manifestations of phantom limbs in dreams is in rough accordance with those of the other authors (Table 1), emphasized the more general context in which he thought these data would have to be seen: he compared the amputee’s body experiences in dreams with that of other groups of persons with altered sensorimotor functions, such as Parkinsonian patients, persons with acquired blindness or paraplegia (see last section and Newton, 1970).

The study by Frank and Lorenzoni (1989) is an especially careful investigation of the phantom limb in dreams. The authors selected a homogenous group of men, who all had suffered a traumatic limb amputation, 92% of them experienced phantom sensations in the waking state. The relatively high percentage of amputees with a complete body also during dreams (83%, see Table 1) may be explained by the fact that the authors selected their subjects for the presence of a continuous phantom limb during waking life (this also holds for the study by Appenzeller & Bicknell, 1969, who found a comparably high number of IB type dreams). Frank and Lorenzoni (1989) paid special attention to the modality of the phantom limb in dreams. They found that dream phantoms are mostly represented visually, and provide a case report where the phantom hand is seen “as small as a child’s hand” (p. 183). Only rarely is the dream manifestation exclusively somesthetic, as in a 62-years-old man who had lost his upper left arm at age 21:

“... he sees that his left arm is amputated but he senses it when it is touched and he can use it for manual activities” (p. 185).

In addition to the studies listed in Table 1, more passing notes on the phantom limb in dreams can be found in the work of many non-English language authors. These comprise Charcot (1888), Schilder (1923), Betheim (1926), Riechert (1934), Lhermitte (1939) and Mitscherlich (1947). Chadderton (1978) reports a comparable incidence of IB and AB dream types in a very large number of amputees from 19 veteran organizations in 14 countries. He does not provide, however, any exact percentages. Price (1976) focused on dreams after leprosy-induced limb loss and communicated, in more recent times, the dreams of three amputees, who received a limb reattachment treatment (Price, 1998). Price and Twombly (1978) speculated about the impact of amputees’ nocturnal dreams about physical intactness on medieval restoration fantasies regarding lost limbs. Finally, the issue of the phantom limb in dreams as a function of the time elapsed since amputation, central to Mulder et al. (in press), has been addressed in a series of letters to the British Journal of Psychiatry (Burd, 1984; Lindesay, 1984; MacDonald, 1984). Burd (1984) discussed the case of a bilateral arm amputee whose psychological adjustment to the loss of his extremities coincided with the time when he began to dream himself operating with two hook hands also in his dreams (Ebbecke, 1950; for similar observations). MacDonald (1984) cogently added that one does not need to collect data in amputees to study the time course of plasticity in one’s body schema as it is experienced in dreams. He reported that when he had first grown a beard, it took him 18 months - a period considered critical for the successful adjustment to the loss of a limb (Frank et al., 1984) - until he began to dream himself bearded.  

2 A beautiful self-observation by a 47-year-old congenitally blind man suggests that a change in tactile habits may be faster integrated in the haptic dream mentation of the blind: it took him only 3 months to switch, in his dreams, from the German Mark to the Euro, after the latter had replaced the former in January 2002 (http://www.anderssehen.at/alltag/berichte/traum2.shtml; last accessed 6 December 2007).
2. Dreams and innate components of body schema

The group studied by Mulder et al. (in press) included nine subjects with congenital absence of a limb. Unfortunately, the dreams of this special group were not specifically, and separately, commented on. This is too bad, as these subjects’ corporeal awareness during night dreams would seem to be relevant to the authors’ study title - “Born to adapt, but not in your dreams”. Whether a phantom limb was experienced during dreams would be especially informative if one knew about presence or absence of a phantom during the dysmelic patient’s waking life (Price, 2006).

We have investigated 16 persons with congenital absence of a limb (Funk & Brugger, 2008). Only one of these experienced phantom limbs during waking life. We carefully questioned all subjects about their bodily appearance during night dreams. Our yet unpublished data indicate that of the 15 subjects without phantom experiences in daily life, seven have dreamt at least once of having an intact body. Paradoxically, the only subject, who reported vivid phantom sensations during most of her waking time, could remember only one single dream in which she had an intact body (she had been born without forearms and legs). In that dream, a nightmare in fact, she visited a church in the ominous city of Lourdes and felt that arms and legs grew out of her stumps; she felt most horrified by this experience. Tangentially, the topic of the phantom limb in dreams of subjects with limb aplasia was treated by Valentin (1836), Sohn (1914), Poeck (1964) and Burchard (1965).

As noted by Mulder et al. (in press), the influence of an amputee’s daily observation of other people moving their limbs should be considered in future studies. We have previously emphasized the potential importance of a fronto-parietal mirror system for the genesis of phantoms of congenitally absent limbs (Brugger et al., 2000; Funk, Shiffrar, & Brugger, 2005; Brugger & Funk, 2006), and it is true that dreams about our body, whether “normally” limbed or amputated, are most probably shaped by both sensorimotor and visual impressions formed during waking life. Comparisons between sighted and blind people, with or without amputations, seem appropriate here (see Kujath, 1940; for some relevant thoughts and valuable references).

3. Future directions

The literature is in clear need of systematic analyses of physiological parameters collected during dreams about the presence or absence of an amputated limb. A recent case report using all-night videopolysomnography in an arm-amputee with REM sleep behavior disorder is exemplary (Vetrugno, Arnulf, & Montagna, in press): arm use during dreams was accompanied by a complete absence of the unpleasant phantom sensations experienced during the waking state and, crucially, by stump movements that seemed to be congruent with the dreamt bimanual activity (e.g. steering a car, pouring drinks from a bottle into a glass). These measurements, obtained 19 years after amputation, are not only compatible with the major message of the studies summarized in Table 1, but allow informed speculations about the neural structures involved in the suppression of unpleasant phantom sensations.

Within the tradition of group studies, one of the most intriguing issues for future research appears the careful analysis of the broader dream content in which the motif of adaptation to (or rejection of) massive changes in body shape is embedded. Far from wishing to stimulate a revival of once popular psychodynamic superstitions regarding the genesis of phantom limbs, the field could nevertheless profit from appreciating the contents of a dream in ways propagated by contemporary neuroscience authorities (e.g., Schwartz, 2004; Schwartz & Maquet, 2002; Doricchi, Iaria, Silvetti, Figliozzi, & Siegler, 2007). For instance, some observations already available may be of relevance for neuropsychological theories of denial. Anosognosia for hemiplegia designates the unawareness or even active denial of limb sensorimotor impairment (Vuilleumier, 2004) and is clearly more frequently observed after right parietal damage, i.e. for symptoms on the left side of the body.

In this respect, the study by Shukla, Sahu, Tripathi, and Gupta (1982; see Table 1) mentions an interesting finding. These authors found a higher incidence of IB type dreams in left-sided compared to right-sided amputees (70% vs. 38% for upper, 46% vs. 33% for lower limbs). Not interpreted by Shukla et al. (1982), this laterality effect is compatible with a more dream-like elaboration of specifically left-sided (especially upper) limb functional impairments in waking life (Ramachandran, 1995; Brugger, 2007).
Two of the three women with chronic spinal cord injury studied by Alkadhi et al. (2005) independently reported very similar typical dreams (unpublished data). Both noted the regular presence of their wheelchair in their dreams. Both emphasized, however, the fact that they would never or only rarely be seated in this chair. They would rather push the empty wheelchair! One subject experienced a recurrent dream in which she had to carry the heavy and bulky wheelchair up a steep and narrow staircase. These dreams may be conceived as anosognosic in the first line, yet especially the latter example evidences some implicit knowledge of the impairment (see Ramachandran, 1995; for implicit insight in patients with anosognosia). According to Bors (1951) it is this symbolic realization of the deficit that differentiates the dreams of spinal cord patients from those of amputees. Other published notes on phantom phenomena in the dreams of paraplegic patients can be found in Bors, Engle, Rosenquist, and Holliger (1950), Ettlin, Seiler, and Kaeser (1980) and Money (1960).

The occurrence of anosognosia in dreams not only sheds light on the potential functionality of dreams, but opens up an avenue for the experimental study of coping and denial in healthy subjects. Early attempts pointing in this direction were undertaken by Mourly Vold (1900), who forced the limbs of sleeping subjects into certain postures and noted that they would frequently see the persons in their dreams to take the respective postures (“transitivism”, a form of projective anosognosia). Kouklak (1969) and Schönhammer (2005) provide a review of similar experiments. One technique known to influence the phenomenology of phantom limbs in the waking state is caloric vestibular stimulation (Andre, Martinet, Paysant, Beis, & Le Chapelain, 2001 in amputees; Le Chapelain, Beis, Paysant, & Andre, 2001 in paraplegic patients). This method involves the immersion of the external ear channel with water of a defined temperature and activates the vestibular projection areas in the brain (Miller & Ngo, 2007, for an overview of a wide range of applications). It has successfully been used to alleviate anosognosia and associated delusional phantom phenomena in hemiplegia (Ramachandran, 1995; Bisiach, Rusconi, & Vallar, 1991). Caloric vestibular stimulation may prove a promising tool to investigate the plasticity of body schema in the dreams of amputees and people with congenital absence of a limb.

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References


3 Much earlier than caloric, rotatory vestibular stimulation has been used to study alterations in amputees’ phantom percept (Adler & Hoff, 1930). It remains to be empirically established what type of technique is most suitably applicable in the sleeping subject.


