

## Dream Mentation Production and Narcolepsy: A Critique

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Studies of the mechanisms of dream mentation production continue to stimulate interest among cognitive neuroscientists. The two dream mentation models assessed in Fosse's study (this issue), the "activation-only" model (e.g., Antrobus, 1991; Foulkes, 1993, 1985) and the Activation, Input source, Modulation (AIM) model (Hobson et al., 2000), are presently the two predominant approaches to the problem of dream production. My recent review of these approaches (Nielsen, 1998, 2000) concluded that several types of evidence for which REM and NREM cognition can be directly compared tend to favor the AIM type of model. However, differences between the theoretical tenets and predictions of the two models are complex, and direct comparisons of them in experimental contexts are relatively rare.

Fosse's work therefore represents an important advance in the development of methodologies for testing the two types of model comparatively. His approach is to examine several distinct measures of sleep mentation in combination to determine how the profile of measures varies across different sleep conditions. In this case, he examined dreams drawn from REM sleep that occurred both at night and during afternoon naps, and dreams from persons with ( $n = 15$ ) and without ( $n = 9$ ) narcolepsy. Antrobus (2000) proposed that such an approach could possibly be used to resolve the long-standing problem of conducting fair comparisons of dreams from REM and NREM sleep for evidence of qualitative differences. The profile of mentation characteristics studied by Fosse included visual vividness, report length, bizarreness and reflective consciousness. These characteristics are, in theory, isomorphically related to physiological features of REM sleep and should, in principle, either covary in unison with global fluctuations in brain activation or covary differentially with the three components of the AIM model.

Findings supported both the activation-only and the AIM models to different degrees. Specifically, within subjects most variables fluctuated with circadian activation level and thus supported the activation-only model. However, between subjects the variables fluctuated *differentially*—a finding consistent with the AIM-derived notion that narcolepsy patients may have higher than normal levels of aminergic modulation during REM sleep. Presumably, the higher levels of reflective consciousness seen in the dreams of the narcolepsy group are due to higher aminergic reactivation of pre-frontal cortical areas during REM sleep. On the other hand, the lower levels of (bi-

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zarre) discontinuities in their reports may be due to *both* increased aminergic modulation and decreased cholinergic PGO-activity. These are intriguing possibilities that should be confirmed by more detailed analyses of neurophysiological changes (preferably, direct measures of aminergic activity using advanced brain imaging techniques) and a larger selection of cognitive measures. Such analyses might help clarify previous findings that are not necessarily consistent with the AIM model. For example, it is not clear whether the explanation of increased aminergic activation in narcolepsy can also parsimoniously explain why the dreams of narcolepsy patients have a greater number of characters than do the dreams of control subjects (Schredl, 1998).

A problem inherent to the use of this method of content profiling to compare dream reports from different types of subject populations is that observed effects may be due to factors other than those thought to directly influence dream production. For example, consistent with the widely accepted continuity hypothesis (Hall & Nordby, 1972), the high levels of self-reflectiveness observed in the dreams of the narcolepsy group could be due simply to a selective incorporation of their daytime concerns about social self-consciousness—self-consciousness induced by, say, repeated public attacks of cataplexy. This would constitute a context-dependent modification of sleep mentation among the narcolepsy patients rather than a change in a primary attribute of their dream production. It also remains unknown how central to dream production are some of the physiological anomalies known to characterize REM sleep in narcolepsy. For example, could the increased number of body movements and more frequent transitions into both stage 1 sleep and wakefulness in narcolepsy (Montplaisir, 1976) cause patients to incorporate more ambient sensory information into their dreams, thus augmenting self-reflectiveness? Fosse's findings will likely gain added weight as they are complemented by studies that demonstrate similar types of divergences in variable profiles *within* subject groups, for example, between REM and NREM types of mentation within the same subjects.

Fosse's work represents an important advance in other respects as well. First, it contributes to what is a surprising lack of information about the nighttime dreams of patients with narcolepsy. Most of what is known about sleep mentation in narcolepsy is based upon studies of hypnagogic imagery and sleep onset REM episodes. Some early studies did note an apparent distinctiveness of the nighttime dreams of patients with narcolepsy, for example, that they are frightening and vivid and contain features common also to hypnagogic imagery (Broughton & Ghanem, 1976; Guillemainault, 1989; Krishnan et al., 1984). Bourguignon (1976) noted that narcolepsy dreams evidenced more markedly aggressive or sexual content, e.g., themes of strangulation, incest, erotic experiences, and rape. However, Broughton (1982), at the time he reviewed evidence for various forms of disturbed dreaming in the literature, found no systematic studies of the content of nighttime dreams in narcolepsy and no studies comparing this content to that of hypnagogic dreams in persons with and without narcolepsy. The situation has improved only slightly since then and has confirmed only some of the earlier impressions. It is now known that, compared with insomnia patients, patients with narcolepsy report more frightening, recurrent dreams (Lee et al, 1993). However, compared with the laboratory dreams of healthy controls, patients with narcolepsy do not report more dreams with negatively toned emotions, but they do report more dreams with bizarre content and more dreamed characters (Schredl,

1998). Fosse found both less *and* more bizarreness in narcolepsy dreams, depending upon the bizarreness subtype examined, and his use of highly specific instruments for coding bizarreness may help to explain discrepancies with other research such as Schredl's (Schredl 1998).

Another advance made by Fosse's work is the use of ambulatory polysomnography (PSG) to collect mentation reports from subjects' home environments. The fact that dreams collected at home do not differ much from those collected in the laboratory (Domhoff, 1969) suggests that advances in the ease and reliability of ambulatory PSG techniques may eventually allow the latter to replace the more costly laboratory methods (Foulkes, 1979; Lloyd & Cartwright, 1995; St-Onge et al., 1999). On the other hand, the additional fact that the rare differences that are sometimes observed between home and laboratory dreams, e.g., home dreams have more aggression and sexual interactions than laboratory dreams (Domhoff 1969), are so directly pertinent to the presumed nature of narcolepsy dreams (i.e., aggressive, sexual), makes the comparative study of such dreams with home recording techniques that much more imperative.

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