LETTER TO THE EDITOR

Does the mind sleep? An answer to "What is a dream generator?", Pace-Schott (2004), Sleep and Hypnosis, 6:2, 43-53.

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We thank Dr. Pace-Schott for his friendly comments (1) on our article (2). We agree completely with his opinion regarding limitations of EEG-analysis within psychophysiological dream research. We also join Dr. Pace-Schott in questioning the appropriateness of the one-and-two-generator discussion (3). In sleep and waking the brain-mind system is permanently modulated by factors as described by the AIM-model (4). It makes no sense to break this one system down into independent divisions, e.g., two brain-generators. In a first step, the effect of the factors AIM is best described by studies focusing on each of them separately. Our study was limited to the measurement of factor A. Our results imply that changes in cortical activation are associated with changes in NREM dream reports. We suggest a study assessing the effect of cholinergic drugs on the bizarreness of dream reports to clarify the significance of factor M.

However, the explanation of the NREM-dream recall rate reported in our study by means of covert-REM sleep (3) (cREMS) is implausible for several reasons. The concept of cREMS is useful in modeling REMS-homeostasis (5,6). Its application to dream recall, however, must be considered a comeback of the antiquated dreaming=REM-equation (7).

First, there is no reason to assume that our subjects may have demonstrated elevated cREMS. As all awakenings took place in NREMS, one would only expect an elevated amount of covert NREMS (identifiable by markers as single sleep spindles in REM-sleep (8)). Additionally, as all awakenings were performed after 10 min in the respective sleep stage, no proximity to REMS-episodes as modeled by Nielsen (3, p.865) is to be assumed. Nielsen acknowledges that it is especially difficult for the theory of cREMS to explain dream recall after awakening out of SWS. The recall rate for SWS and S2, however, did not differ significantly in our subjects (59 vs. 61%, respectively).

Secondly, Dr. Pace-Schott interprets a flattening and acceleration of EEG-waves as a marker of cREMS. Carrying this to the extreme, one would have to consider every sleep stage (or even the waking state?) except S4 as cREMS. Contradicting this, we argue that activation – as depicted by the AIM-model (4) – may be a dream affecting factor per se, not a general marker of (c)REMS. If activation were a marker of cREMS, we should have found differences in activation between awakenings with and without recall. Conversely, this was not the case. Finally, explaining the NREMS dream recall rate of 60% in our subjects by cREMS, one would have to assume that there is

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more cREMS than ordinary REMS. Obviously, it makes no sense to name a process after a specific stage of sleep if this process occurs more often outside than inside that sleep stage. One should call the process sleep dependent or dream generating process, but not a (c)REMS dependent process. The most appropriate name should be consciousness intensifying process. A dream recall rate of 60% after NREMS caused by cREMS processes would imply that there is even more cREMS than NREMS. CREMS would be the predominant condition of human sleep.

Before making conclusions from dream reports to dream generation, one has to consider some of the steps between these two endpoints, such as the encoding of the mental experience, awakening, recall, motivation, and reproduction. Commenting on memory processes only: the reduced recall of events in close proximity to and during sleep is well known. The high rate of white dream reports in our study (73% of all awakenings without dream report), especially after awakenings out of S2 (92%), can be interpreted in this direction. Additionally, the short dream reports of our subjects evoke the impression of incomplete descriptions.

In conclusion, explaining the difference between awakenings with and without dream recall by failures of the memory process seems to be much more plausible than explaining it by unknown factors which switch the consciousness of the sleeping human on and off. Of course, the assumption that the mind never sleeps is not easily proven.

We assume that continual cognitive activity is modulated by factors as described by the AIM-model (4). In spite of considerable intra-stage variability, REMS- and NREMS-dream reports differ within formal and qualitative report parameters; e.g., they contain more or less descriptions of emotions. Instead of arguing whether those differences may be true qualitative differences or rather quantitative differences in qualitative dimensions, research regarding sleep-related memory processes seems to be of uttermost importance.

Conduit (9) reported improved recall for external events experienced during REMS compared to NREMS. It would be of interest to test the possibility of elevating NREMS dream recall by training. Studies of details of the sleep-waking transition as the possibly most essential moment for dream recall should be performed. Generally, a shift in the research paradigm is necessary: the comparison of awakenings with and without dream recall does not result in information about dreaming, but rather about conditions of successful dream recall. Putting it in the words by Borbely and Wittmann (10, p.911): "Sleep, not REM sleep, is the royal road to dreams".

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