Towards a theory of sleep onset and insomnia that considers conative, affective and cognitive processes, and from which treatments are derived

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I. Somnolent Processing Theory and the Sleep Onset Control System

We propose to develop not merely a new theory, but a new research programme on sleep onset and insomnia. The somnolent information processing (SIP) theory aims to explain, from the designer stance, how the human mind implicitly controls the transition from wake to sleep. Beyond the standard two processes (homeostatic and circadian), it posits conative, affective and cognitive influences on the sleep-onset control system (SOCS). The theory calls for the specification of a broad "H-CogXAff" architecture of mind.

Claim 1: **Perturbance** is insomnolent (see below)
Claim 2: **Energy and tension** are insomnolent (Thayer's dimensional theory of mood).
Claim 3: **Alarms** in stress responses are insomnolent
Claim 4: A decline in **situational awareness**, or sense making, including active, globally incoherent mentation, is not merely a consequence of impending sleep, but is pro-somnolent.
Claim 5: Several specific **sensory states** contribute to somnolence (posture, distal body temperature, light, noise levels.)

Hypothesis 1: The **N1 cognition emulation hypothesis**: N1-like IP can facilitate sleep-onset
Hypothesis 2: Thought control is not *intrinsically* insomnolent.

The theory rejects the pseudo-concept of "cognitive arousal".

II. Perturbance (an AI emotion concept)

Perturbance is a mental state in which *insistent* motivators tend to disrupt, maintain control of and otherwise influence executive functions.

III. The Cognitive Shuffle: Mental Strategies for Sleep Onset

Cognitive shuffling is a new family of cognitive treatments for insomnia based on SIP that involves shuffling mental content. It is meant to implement the N1 cognition emulation hypothesis, being both counter-insomnolent (interfering with perturbance, Claim 1), and pro-somnolent (cf. Claim 4). **Serial diverse imagining** (SDI) is a type of cognitive shuffling involving much imagining (visual, kinesthetic, etc.). A mobile app facilitates SDI by presenting audio recordings of pseudo-randomized concrete words or descriptions every few seconds (8 by default). The participant's task is to imagine each distinct item.

This document and notes at http://summit.sfu.ca/item/17139

IV. Research questions

With the incipient SIP theory we propose a research programme that attempts to reverse engineer the SOCS and to develop new treatments. Developing and testing treatments will help researchers elaborate and test the theory, as will simulating it. This raises new research questions, some of which are listed here: http://www.sfu.ca/~lpb/insomnia/sdi-future-research.html

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