

Hypothesis

Nightmares, Dream Engineering, and Evolutionary Thresholds of Dysfunction

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Abstract

Why do humans produce dysphoric dreams and nightmares at all? This paper develops a cautious evolutionary theory of unpleasant dreaming by extending the logic of evolutionary psychiatry to dream life. Research on dream continuity suggests that dreams are not detached from waking mental life, but instead reflect current concerns, emotional preoccupations, memory fragments, and bodily states. Work on threat simulation, emotional processing during sleep, and the neurocognitive structure of nightmares further suggests that some disturbing dreams may not be mere malfunctions. Rather, they may be costly outputs of systems involved in salience tracking, threat rehearsal, emotional adaptation, or flexible model updating. At the same time, nightmare research shows that recurrent and trauma-linked nightmares can become clinically serious, producing sleep disruption, daytime distress, and functional impairment. This paper argues that the proper distinction is not between “useful dreams” and “pathological nightmares” in any simple sense, but between unpleasant dream processes that remain self-limiting and those that cross a threshold into maladaptive feedback loops. On that basis, dream engineering is defended not as routine suppression of unpleasant dreaming, but as a selective and limited intervention appropriate when recurrence, rigidity, carryover, and impairment indicate dysfunction. A structured research agenda is proposed to test this threshold model and to distinguish adaptive bad dreams from pathological nightmares.

Keywords: dreams; nightmares; dream engineering; evolutionary psychiatry; threat simulation; continuity hypothesis; nightmare disorder; imagery rehearsal therapy; targeted memory reactivation; feedback dynamics; evolutionary thresholds of dysfunction

1. Introduction

Nightmares pose a theoretical puzzle. They are among the most distressing forms of ordinary mental life, yet they are widespread across the population (Nielsen & Levin, 2007) and seem to emerge from systems that are deeply embedded in normal sleep and cognition (Nir & Tononi, 2010). One tempting conclusion is that nightmares are merely useless by-products of a dreaming mind. Another is that they are straightforward symptoms of disorder. Neither view is fully satisfactory.

Dream research has often supported some degree of continuity between dreaming and waking life, in the sense that dreams can reflect waking activities, recent concerns, emotional conflicts, and salient autobiographical material (Carr, 2025). At the same time, this continuity is not complete. Dreams also frequently contain bizarre, discontinuous, distorted, and weakly integrated elements, suggesting that waking concerns are often transformed rather than simply reproduced during sleep. However, disturbing dreams



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remain theoretically important because even their distortions and discontinuities may reveal something about the functions, biases, and vulnerabilities of sleeping cognition.

At the same time, work on nightmare disorder makes it clear that unpleasant dreaming cannot simply be romanticized. Trauma-linked nightmares, repetitive dysphoric dreams, and awakenings marked by intense autonomic arousal can be profoundly damaging (Gieselmann et al., 2019). Clinical research has linked nightmares to insomnia, post-traumatic stress symptoms, emotional dysregulation, suicidality, and major impairment in daily functioning (Davis et al., 2011; Nadorff et al., 2015; Campbell & Germain, 2016; Lancel et al., 2021). This means that any theory of bad dreams must explain both why unpleasant dreaming might persist as part of normal human design and why, in some cases, it becomes pathological enough to justify intervention.

This paper develops a cautious framework for answering that question. Its central proposal is that some unpleasant dreams may be intelligible in evolutionary terms without implying that they are always useful, healthy, or desirable. As in evolutionary psychiatry, the existence of a distressing mental phenomenon does not by itself prove disorder (Nesse, 2019). Some aversive states may reflect the ordinary operation of systems that were often useful, even if they are prone to false alarms, exaggeration, mismatch, or dysregulation. Applied to dream life, this suggests that bad dreams and some nightmares may sometimes reflect ordinary threat-sensitive or emotionally loaded dream processes rather than dysfunction per se. The present paper therefore treats nightmare pathology as arising not from aversive content alone, but from recurrent coupling among nocturnal distress, next-day arousal, bedtime apprehension or fear of sleep, and later recurrence (Nielsen & Levin, 2007; Spoomaker & Montgomery, 2008).

We define a feedback loop as any across-night process in which the consequences of one night's dream alter the likelihood or intensity of dysphoric dreaming on subsequent nights. Moreover, a threshold concept is used in a heuristic and testable sense: a bad dream becomes more likely to count as dysfunctional when recurrence, rigidity, physiological activation, next-day carryover, and functional impairment begin to cluster and reinforce one another. Put differently, the framework distinguishes relatively low-coupling cases, in which distress remains transient and self-limiting, from higher-coupling cases, in which nightmare-related distress meaningfully increases the probability of subsequent episodes. This is intended as an operational research framework rather than a claim that one universal cutoff applies to all dreamers.

More concretely, the present framework tracks a reduced set of state-like variables across nights: nightmare distress, next-day arousal or distress, bedtime apprehension or fear of sleep, sleep disruption or continuity, and later recurrence. Physiological activation and thematic rigidity are treated as additional indicators that can refine this core set when data permit. In this context, "loop gain" refers to the effective strength with which a nightmare on one night increases next-day arousal and pre-sleep vulnerability, thereby raising the likelihood or intensity of subsequent episodes. Empirically, it can be approximated by within-person associations linking nightmare distress at night t to next-day arousal, bedtime apprehension before the next sleep period, and nightmare probability or intensity at night $t + 1$ (Spoomaker & Montgomery, 2008; Dumser et al., 2023).

The aim of the paper is therefore not to claim that nightmares are adaptive full stop. It is to formulate a threshold model: unpleasant dreams may often be normal outputs of evolved and functionally intelligible processes, but recurrent nightmares can cross into dysfunction when they become rigid, replicative, impairing, and self-reinforcing. The present model does not claim that nightmares are adaptive or offer a wholly separate etiological theory. Its more specific contribution is to organize existing insights within a dynamic threshold framework that links interpretation, assessment, prediction, and

selective intervention by distinguishing self-limiting dysphoric dreaming from higher-coupling nightmare dysfunction. Nightmares refer to the more intense subset of dysphoric dreams that are especially likely to involve awakening, marked distress, or clinically significant next-day carryover. Nightmare disorder, in turn, refers not to a single nightmare episode, but to recurrent and impairing nightmare patterns.

2. Theoretical Background

Any evolutionary account of dreaming must begin with restraint. Evolutionary explanation is often misused when recurring human phenomena are too quickly labeled adaptations. Evolutionary psychologists have insisted that adaptation claims require more than recurrence or intuitive plausibility (Buss, 2019). They require a clearly specified problem, a credible pathway by which selection could have favored a mechanism that addressed it, and some evidence that the mechanism bears traces of special design rather than mere accident or by-product.

To keep the level of inference clear, the discussion below distinguishes among three kinds of claims. Some are relatively well-supported empirical findings, such as the continuity between dreaming and waking concerns, the clinical burden of recurrent nightmares, and the efficacy of imagery rehearsal therapy. Others are plausible functional interpretations, such as the possibility that some dysphoric dreams participate in emotional adaptation or threat-sensitive processing. Still others are more speculative evolutionary hypotheses, such as strong versions of threat simulation or anti-overfitting accounts. The argument of this paper does not depend on any single adaptive theory being accepted in full; it depends only on the more modest claim that unpleasant dreams may sometimes be functionally intelligible and that nightmare pathology is better identified by recurrence, carryover, and impairment than by aversive content alone.

That warning is especially important in the dream literature. Not every feature of dreaming needs to be an adaptation, and not every bad dream needs to have a function. Some properties of dream life may be by-products of memory consolidation, REM physiology, predictive processing, or neural reactivation (Diekelmann & Born, 2010; Nir & Tononi, 2010). Others may arise from the imperfect operation of otherwise useful systems (Nielsen & Levin, 2007). The present argument is deliberately narrower. It does not claim that every nightmare exists because it was selected for. It claims only that unpleasant dreaming may often be intelligible within an evolutionary framework, and that this framework can help distinguish normal aversive outputs from pathological breakdowns.

The first pillar of the argument is a qualified version of the continuity hypothesis. Waking activities and concerns are often reflected in dream activities more systematically than a random model would predict (Schredl & Hofmann, 2003). Broader work in dream science likewise suggests that dreams commonly incorporate recent experience, long-standing concerns, unresolved conflicts, and emotionally salient material. However, this evidence does not imply that dreams are uniformly continuous with waking life in a simple sense. Dream reports also frequently contain bizarre, discontinuous, and weakly integrated features, indicating that waking material is often transformed, recombined, or distorted rather than merely replayed. For present purposes, dreaming is treated as meaningfully related to waking consciousness and waking concerns, even though that relation is often indirect, fragmented, or imagistically altered (Nir & Tononi, 2010).

The second pillar comes from sleep and emotion research. Sleep contributes to emotional processing by reworking affectively charged experiences in a neurochemical environment distinct from wakefulness (Walker & van der Helm, 2009). And sleep is important for memory transformation, consolidation, and reorganization (Diekelmann & Born, 2010). Taken together, these lines of work suggest that dreaming may not simply display stored information but may participate in reorganizing and recontextualizing it.

The third pillar comes from nightmare theory itself. Nielsen and Levin (2007) developed a neurocognitive model in which nightmares are not alien intrusions into sleep, but dysregulated extensions of normal dream and emotion systems. In their account, ordinary dream generation, emotional memory, and fear processing can sometimes combine in ways that produce severe dysphoric dreaming. This is a crucial idea because it implies continuity not only between waking and dreaming, but also between normal and pathological dreaming.

Finally, evolutionary psychiatry offers a general framework for interpreting aversive states. Many negative emotions are not diseases in themselves, but defensive or regulatory responses that natural selection left in place because they often helped organisms avoid danger, conserve resources, or respond adaptively to loss (Nesse, 2019). The important implication is methodological: before treating distress as malfunction, one should ask what kind of system might generate it and why such a system would exist at all. That logic can be extended to dreams without assuming that every disturbing dream is beneficial.

The present framework also has affinities with several adjacent research programs that deserve explicit acknowledgement. Predictive-processing accounts of dreaming treat sleep mentation as the activity of a generative model operating under altered sensory precision and reduced exteroceptive constraint (Hobson & Friston, 2012; Koslowski et al., 2023). Computational psychiatry likewise emphasizes the use of formal models to infer latent processes from behavioral and physiological data, often with the goal of improving mechanistic interpretation and person-specific prediction (Stephan & Mathys, 2014; Huys et al., 2016). Meanwhile, network and dynamical-systems approaches to psychopathology conceptualize disorders in terms of mutually reinforcing symptoms, resilience loss, and transitions between more and less stable regimes (Borsboom, 2017; Bringmann et al., 2022; Scheffer et al., 2024). These studies do not determine the present model, but they help situate it as a nightmare-specific application of broader efforts to understand psychopathology in terms of coupling, propagation, stability, and intervention timing.

3. An Evolutionary Interpretation of Bad Dreams

If unpleasant dreams are sometimes functionally intelligible, what problem might they be solving? Several candidate answers have been proposed, and none needs to exclude the others.

One influential but contested answer comes from threat-simulation theory (Revonsuo, 2000). In this view, dreaming may have evolved, at least in part, as a virtual environment for rehearsing threatening events and defensive responses. This account remains theoretically important because it offers a clear evolutionary explanation for the prevalence of danger, pursuit, aggression, and misfortune in dreams. At the same time, the evidence is mixed. Many dream threats are bizarre, socially distorted, unrealistic, or only loosely related to ecologically valid survival scenarios, which weakens any straightforward interpretation of dreams as literal rehearsal for real-world threat avoidance. Empirical challenges have also been raised against the strong prediction that greater exposure to real-life threat should reliably produce more realistic or more adaptively resolved threat dreams (Malcolm-Smith et al., 2008). For that reason, threat simulation is treated here not as an established general

theory of dreaming, but as one possible partial explanation for why dysphoric dream content may overrepresent danger and conflict.

A second possibility is emotional adaptation. Research on sleep and emotion suggests that the sleeping mind continues to work on salient affective material rather than merely shutting it down (Walker & van der Helm, 2009). Dreams may therefore function as spaces in which unresolved concerns are reactivated, recombined, and partially metabolized (Nielsen & Levin, 2007). Dysphoric content would then be expected whenever salient waking concerns are threatening, shame-laden, grief-filled, or uncertain. In such cases, unpleasantness would not be a sign that the process has failed. It might be an expected cost of emotional work.

A third possibility concerns generalization and model flexibility. Dreaming may help prevent overfitting by exposing the brain to internally generated variability that broadens learning and supports more flexible generalization (Hoel, 2021). This idea does not focus specifically on nightmares, but it is useful because it suggests that dream distortion, exaggeration, and simulation need not be defects. They may be part of how the mind avoids becoming too rigidly tuned to recent waking inputs. Under this interpretation, some disturbing dreams may reflect not just rehearsal of threat, but the broader maintenance of cognitive flexibility under uncertain conditions.

These functional interpretations remain hypotheses rather than settled facts. The evidence is stronger for continuity, emotional salience, and the clinical reality of nightmares than for any single adaptive account of dream function. Still, the combined literature supports a cautious conclusion: unpleasant dream content is not so anomalous that it must be interpreted as meaningless or pathological by default. If dreaming participates in threat processing, emotional adaptation, or flexible internal simulation, then bad dreams may often be costly but intelligible outputs of those systems.

These candidate interpretations should not, however, be treated as standing on equal evidential footing. The strongest support at present concerns the continuity of dreaming with waking concerns, the role of emotional salience in sleep-dependent processing, and the clinical reality of recurrent nightmares. By contrast, stronger adaptive readings of threat simulation remain contested, emotional adaptation remains a plausible but not decisively established functional interpretation, and anti-overfitting accounts are more speculative still. For that reason, the present argument does not depend on any one of these hypotheses being accepted in full. Its more modest claim is that unpleasant dreaming may sometimes be functionally intelligible, while the evidential burden remains different across the various explanatory candidates.

4. Good Reasons for Bad Dreams

The phrase “good reasons” must be understood carefully. It does not mean that bad dreams are good for the dreamer in a straightforward sense. Nor does it mean that every nightmare should be preserved because it is evolutionarily wise. Rather, it means that aversive dreaming may arise from systems that exist for defensible reasons, even if their outputs are sometimes excessive, mistimed, or harmful.

A limited comparison can be made here with other aversive states such as anxiety, pain, and fever. However, the analogy should not be pushed too far. Anxiety, pain, and fever are more clearly established defensive or regulatory phenomena, with better-understood biological mechanisms and stronger functional evidence (Nesse, 2019) than is currently available for dreams. It is not that bad dreams are directly equivalent to such states, but that unpleasantness alone does not establish dysfunction. Even when the function of a process remains uncertain, it may still be inappropriate to classify every aversive episode as pathological by default.

Applied to dreams, this suggests several possible categories of bad dreams. Some may be regulatory. They may accompany periods of stress, transition, grief, conflict, or uncertainty and subside as waking conditions change. Others may be false alarms. If dream-affect systems are biased toward sensitivity because missing a danger is more costly than over-simulating one, then some dysphoric dreams may reflect overcautious design rather than disorder. Still others may be products of mismatch. Systems shaped in ancestral ecologies may respond poorly to modern chronic stress, media saturation, trauma exposure, or fragmented sleep patterns. Finally, some bad dreams may be genuinely dysregulatory when nocturnal distress persists and amplifies across nights (Nielsen & Levin, 2007; Spoormaker & Montgomery, 2008).

This framework is meant to avoid both over-medicalizing disturbing dreams and romanticizing suffering merely because it may have an evolutionary rationale. A possible function does not preclude dysfunction, especially when otherwise useful systems overshoot (Wakefield, 1992; Nesse, 2019).

5. Thresholds of Dysfunction

The crucial theoretical move is therefore not to ask whether bad dreams are adaptive or pathological in the abstract, but when they cross a threshold into dysfunction. That threshold is best understood dynamically.

One useful way to frame this distinction is as a cross-night feedback system. In a relatively stable regime, a disturbing dream may transiently elevate arousal, but the resulting increase dissipates before the next sleep period; dream content varies, sleep remains largely intact, and waking functioning is not significantly compromised. In such cases, unpleasant dreaming may be costly but contained.

In a destabilized regime, by contrast, nocturnal threat imagery contributes to next-day distress, heightened vigilance, and anticipatory anxiety at bedtime, which in turn increase the probability of further dysphoric dreaming (Nielsen & Levin, 2007; Spoormaker & Montgomery, 2008). The threshold proposed here refers to a shift from transient perturbation to recurrent amplification. It is not meant as a single categorical cutoff that applies identically to all individuals. Rather, it denotes a strengthening of cross-night coupling, such that one night's nightmare meaningfully increases the likelihood or intensity of subsequent episodes. Clinically, this shift is reflected in persistence, rigidity, carryover, sleep disruption, autonomic activation, and impairment.

For present purposes, the model does not require direct access to neural state variables. It can be operationalized using diary- and physiology-based proxies: nightmare frequency and nightmare-related distress as the nocturnal output; next-day arousal or distress and bedtime apprehension as carryover terms; sleep continuity as a moderating variable; and autonomic activation and thematic rigidity as additional markers of a higher-coupling regime. On this basis, loop gain can be estimated as the extent to which variation in nightmare distress on one night predicts increases in next-day arousal and subsequent nightmare probability within the same individual. This makes the framework testable with intensive longitudinal designs rather than leaving it at a purely metaphorical level.

This is also the point at which the present account moves beyond a purely integrative summary. Building on neurocognitive and harmful-dysfunction approaches, the threshold model treats recurrence and next-day carryover as core indicators of cross-night propagation, physiological activation and thematic rigidity as reinforcing markers, and functional impairment as the principal clinical criterion. Threshold crossing is therefore dimensional rather than categorical and is most likely when these indicators converge within persons over time.

This framework helps explain why trauma-linked nightmares are especially serious. Research on post-traumatic nightmares shows that they are often repetitive, vivid, awakening-prone, and closely tied to re-experiencing (Carr, 2025). Their content may become rigid rather than exploratory, replicating a traumatic scene rather than transforming it. Nielsen and Levin's (2007) neurocognitive model is especially helpful here because it treats severe nightmares as failures of fear-extinction and affective integration within normal dream processes. The dream no longer serves as a flexible simulation space. It becomes a repetitive and destabilizing replay mechanism. In trauma-linked cases, the convergence of repetitive content, autonomic activation, sleep disruption, and daytime impairment provides a particularly strong indication for intervention.

6. Dream Engineering as a Cautious, Limited Response

Once nightmares are understood in threshold terms, dream engineering can be re-framed. Its goal should not be to eliminate all unpleasant dreaming, still less to impose continuous positivity on the sleeping mind. Its proper goal is to intervene selectively when nightmare processes become self-reinforcing, rigid, and impairing.

This is why imagery rehearsal therapy remains the strongest clinical anchor (Krakow et al., 2001). Rescripting recurrent nightmares can reduce nightmare frequency and distress, especially in trauma-exposed populations. What is striking about this treatment is that it does not simply suppress dreaming. It modifies the narrative, emotional tone, and action possibilities associated with the nightmare. In other words, it restores flexibility and agency where rigid recurrence had taken hold.

More recent work on cue-based interventions extends this logic. Targeted memory reactivation can modify sleeping cognition by re-presenting cues associated with prior learning (Oudiette & Paller, 2013). Dream content can be biased through targeted dream incubation at sleep onset (Horowitz et al., 2020, 2023). And imagery rehearsal can be enhanced by targeted memory reactivation under some conditions, suggesting that rescripted dream material can be reinforced during sleep itself (Schwartz et al., 2022).

These findings are promising, but they also support a restrained approach. Cueing during sleep is not risk-free. Auditory or other sensory cues may fragment sleep, trigger micro-awakenings, or increase arousal if they are delivered at the wrong time, are too intense, or are introduced in individuals who are already highly hyperaroused. A further risk is cue contamination: if a cue repeatedly occurs close to nightmare awakenings or distress, it may become associated with threat-related arousal rather than with the intended corrective signal. In that case, cueing may cease to function as an adjunctive stabilizer and may instead become part of the maladaptive cycle it was meant to weaken. For this reason, cue-based protocols should prioritize conservative cue intensity, careful timing, and explicit monitoring of sleep continuity, awakenings, and next-day distress (Oudiette & Paller, 2013; Carr et al., 2020; Carr, 2025).

Lucid dreaming warrants similar caution. Although it may offer in-dream corrective action for some individuals, its effectiveness depends on successful induction and on the dreamer's ability to exert meaningful control once lucidity is achieved. Both conditions vary substantially across individuals. Moreover, some induction methods rely on sleep interruption or increased presleep cognitive activation, which may be counterproductive in nightmare sufferers whose primary difficulty is already elevated arousal. Failed induction attempts, partial lucidity without effective control, or repeated awakenings may increase frustration, rebound anxiety, or sleep instability rather than reduce nightmare burden. Lucid dreaming should therefore be regarded as a selective adjunct for appropriate individuals rather than as a universal remedy (Mallett et al., 2022; Ouchene et al., 2023).

The ethical implication follows directly: intervention should be selective and guided by evidence that the dream process is no longer flexible or self-correcting.

A further reason for caution is that dream engineering raises ethical and translational issues beyond immediate efficacy. Because these methods may alter sleeping cognition, acceptable use should depend on explicit informed consent, transparency about the intended target of the intervention, and clarity that the aim is not covert influence or open-ended memory manipulation. Even when the goal is therapeutic, repeated cueing or rescripting could in principle produce unintended associative effects, alter sleep-stage continuity, or have longer-term consequences that remain poorly understood. Individual differences are also likely to matter substantially. Baseline hyperarousal, trauma history, sleep fragmentation, cue tolerance, and the individual's ability to use the intervention as intended may all influence whether dream engineering is helpful, negligible, or destabilizing. For that reason, these methods are best conceptualized as selective, consent-based, and closely monitored adjuncts rather than general tools for routine dream optimization.

7. Research Agenda

The theory proposed here generates a concrete research program centered on thresholds, dynamics, and differential diagnosis.

The first hypothesis is a continuity-dysphoria hypothesis. Dysphoric dreams should be more likely when waking life contains salient unresolved concerns (Solomonova et al., 2021), and the thematic structure of those dreams should often be continuous with those concerns (Schredl & Hofmann, 2003). Longitudinal diary studies (Pesant & Zadra, 2006) could test this by pairing dream reports with daily measures of stress, conflict, uncertainty, and emotional salience.

The second hypothesis is an adaptive-discomfort hypothesis. Occasional bad dreams should not necessarily predict deterioration (Nielsen & Levin, 2007). In some cases, they may be followed by neutral or even mildly improved morning adjustment, especially when dysphoric dream activity remains non-repetitive rather than escalating into a nightmare-like disturbance (Barbeau et al., 2022; Nielsen & Levin, 2007). This would support the view that some dysphoric dreaming is self-limiting and possibly regulatory rather than pathological (Scarpelli et al., 2019).

The third hypothesis is a threshold-crossing hypothesis. Nightmare disorder should be predicted less by aversive content per se than by the strength of cross-night coupling among nightmare distress, next-day arousal, fear of sleep, and later recurrence (Spoormaker & Montgomery, 2008; Dumser et al., 2023). Operationally, this coupling can be estimated within individuals by modeling whether nightmare distress on night t predicts next-day distress or presleep apprehension, and whether those carryover variables in turn predict nightmare probability or intensity on night $t + 1$. This could be tested initially through multilevel time-series designs combining brief dream diaries, presleep state measures, and next-day mood and functioning assessments. At a more intensive level, the same design could be extended with actigraphy, autonomic monitoring, or both, where feasible.

The fourth hypothesis is a trauma-rigidity hypothesis. Compared with non-trauma bad dreams, trauma-linked nightmares should show greater thematic similarity to the trauma and more re-experiencing-like qualities (Mellman et al., 2001; Simos & Berle, 2023), stronger autonomic activation (Mäder et al., 2023), and greater daytime carryover or impact on wellbeing (Campbell & Germain, 2016; Simos & Berle, 2023). Prospective post-trauma cohort studies would be especially valuable here, since they could identify which early nightmare features predict chronicity or later PTSD (Mellman et al., 2001; Wang et al., 2024).

The fifth hypothesis is a selective-intervention hypothesis. Cue-based dream engineering should not help equally across all cases. It should provide the greatest benefit when combined with rescripting in cases marked by persistence, repetition, and strong carryover, that is, where each nightmare appears to increase next-day distress and the probability of later recurrence (Schwartz et al., 2022; Dumser et al., 2023). In lower-coupling cases, the same intervention may be unnecessary or could become less effective or potentially destabilizing if poorly timed cueing disrupts normal sleep regulation or interacts unfavorably with ongoing sleep-dependent processing (Oudiette & Paller, 2013; Carr et al., 2020).

Methodologically, the field needs measures that distinguish frequency from rigidity, distress from impairment, and isolated episodes from persistent dynamics. The proposed five domains (recurrence, thematic rigidity, physiological activation, next-day carryover, and functional impairment) should therefore be assessed jointly using existing nightmare, sleep, trauma, and diary measures. The empirical task is not to introduce new symptom categories, but to test whether the configuration of these domains discriminates among transient bad dreams, false-alarm bad dreams, trauma-linked nightmares, and nightmare disorder.

Importantly, not every study in this research program needs to begin with high-intensity measurement. A practical sequence would be to start with scalable diary-based designs using self-reported nightmare frequency, nightmare-related distress, sleep quality, presleep apprehension, and next-day mood or functioning. These lower-burden studies would already be sufficient for the initial within-person test specified in the threshold-crossing hypothesis. Actigraphy, autonomic monitoring, and laboratory sleep protocols can then be added in later-stage studies, in selected subsamples, or when the aim is to refine mechanisms rather than to establish the basic pattern. Where sampling density permits, such data could also be analyzed with person-specific computational or temporal-network models and with dynamical-system tools aimed at estimating coupling strength, symptom propagation, and resilience loss from time series.

The model also makes itself vulnerable to empirical challenge. It would be weakened if aversive content or raw nightmare frequency predicted clinical dysfunction as well as, or better than, the proposed coupled profile; if the five domains failed to cluster differently across transient bad dreams, trauma-linked nightmares, and nightmare disorder; or if interventions reduced nightmare burden without altering carryover or recurrence dynamics. Conversely, the framework gains support to the extent that within-person studies show that increases in carryover, presleep apprehension, and subsequent recurrence jointly mark the transition from transient distress to self-reinforcing dysfunction.

Laboratory studies can also play an important role at later stages of the research program. Sleep-onset incubation and stage-specific cueing can be tested experimentally (Oudiette & Paller, 2013; Horowitz et al., 2020), and rescripting-based targeted memory reactivation has already shown promise in nightmare disorder (Schwartz et al., 2022). The key question is not merely whether dream content changes, but whether the intervention weakens the association between nightmare episodes and subsequent distress over time. Does it lower bedtime dread and presleep arousal, improve sleep continuity, reduce next-day distress, and weaken recurrence over time (Giesemann et al., 2019; Dumser et al., 2023)? Those are the outcomes that matter most for a threshold model. Table 1 operationalizes the threshold framework by listing the core assessment domains, their measurable indicators, feasible assessment methods, and explicit empirical predictions.

Table 1. Operationalization of the threshold model: core domains, measurable indicators, feasible assessment methods, and empirical predictions.

Domain	Self-Limiting Pattern	Threshold-Crossing Pattern	Measurable Indicators	Feasible Assessment Methods	Explicit Empirical Prediction
Recurrence	Bad dreams occur intermittently and do not clearly predict later episodes.	One episode increases the likelihood or intensity of later episodes across nights.	Nightmare frequency; nightmare-distress ratings; lagged association between night t and night $t + 1$.	Brief morning dream diary; nightly nightmare-distress rating; multilevel diary design.	In higher-coupling cases, nightmare distress on night t will predict greater nightmare probability or intensity on night $t + 1$.
Thematic rigidity	Dream content varies across episodes, even when negatively toned.	Dream themes become repetitive, fixed, trauma-linked, or narratively inflexible.	Theme overlap across reports; narrative similarity; trauma correspondence.	Coded dream reports; brief weekly narrative coding; blinded thematic ratings.	Trauma-linked nightmares and nightmare disorder will show greater within-person thematic stability than transient bad dreams.
Physiological activation	Aversive dreams produce limited or short-lived arousal.	Nightmares are accompanied by strong autonomic activation and awakening-related arousal.	Subjective arousal on awakening; heart rate; skin conductance; abrupt awakenings.	Morning arousal rating; wearable heart-rate data; optional autonomic monitoring in subsamples.	Higher nocturnal arousal will predict stronger next-day carryover and greater later recurrence.
Next-day carryover	Distress dissipates by the next day and does not substantially alter the next sleep period.	Nightmare episodes increase next-day distress, vigilance, bedtime apprehension, or fear of sleep.	Next-day distress; vigilance; bedtime dread; presleep apprehension/fear of sleep.	Morning and evening ecological ratings; daily diary; short presleep questionnaire.	Next-day carryover will mediate the link between nightmare distress on night t and nightmare recurrence on night $t + 1$.
Functional impairment	Unpleasant dreams do not meaningfully disrupt daytime functioning.	Recurrent nightmares degrade sleep quality, daytime functioning, or avoidance patterns.	Sleep quality; daytime fatigue; concentration problems; work/study interference; sleep avoidance.	Brief impairment scale; sleep diary; optional actigraphy for sleep continuity.	Similar nightmare frequency will predict greater clinical relevance when accompanied by high carryover, rigidity, and impairment.

8. Conclusions

The main contribution of this paper is to propose that unpleasant dreams and nightmares should not be understood as pathology by default. Some may arise from systems that are functionally intelligible even when aversive. But plausible function is not proof of adaptation, and evolutionary rationale is not clinical justification. The crucial distinction is therefore dynamic rather than moralized: some bad dreams remain flexible, transient, and self-limiting, whereas others become rigid, repetitive, and self-reinforcing. That is the point at which the language of dysfunction becomes appropriate.

This threshold model has both scientific and clinical value. Scientifically, it suggests that nightmare research should move beyond the simple opposition between adaptive theories and disorder models. The same system can generate both useful and harmful outputs depending on context, loop strength, and regulatory stability. Clinically, it suggests that dream engineering should be limited, targeted, and justified by recurrence, carryover, and impairment rather than by aversiveness alone.

The broader implication is that a mature science of dreams should resist both blanket medicalization and automatic adaptationism. The relevant questions are what system is operating, whether the process remains self-limiting, and when it has crossed into maladaptive escalation. That is the sense in which there may be good reasons for bad dreams, and also good reasons, in some cases, to change them.

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