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BRIGHT LIGHT THERAPY IN SELECTED NEUROPSYCHIATRIC AND SLEEP-RELATED CONDITIONS: A NARRATIVE REVIEW

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ABSTRACT

Bright light therapy (BLT), defined as timed exposure to high-intensity light, is an established nonpharmacological treatment for seasonal affective disorder (SAD) and is increasingly being investigated in other areas of neuropsychiatry and sleep medicine. This narrative review synthesizes evidence published between 2015 and 2025 on the clinical applications of BLT in SAD, non-seasonal major depressive disorder, bipolar depression, shift-work-related circadian misalignment, sleep and selected non-motor symptoms of Parkinson's disease. Relevant English-language literature was identified through PubMed and Google Scholar, with emphasis on systematic reviews, meta-analyses and randomized controlled trials. The strongest evidence supports BLT in winter-pattern SAD, where it remains first-line acute treatment associated with clinically meaningful symptom improvement. In non-seasonal major depressive disorder, pooled findings indicate a small-to-moderate antidepressant effect, although outcomes are more heterogeneous and seem to be influenced by treatment timing, chronotype and ambient light exposure. In bipolar depression, adjunctive BLT administered under mood-stabilizer coverage shows benefit and is generally well tolerated, with low short-term rates of manic or hypomanic switching when conservative protocols are used. In shift-work-related circadian disruption, BLT is associated with modest sleep benefits and measurable circadian phase delay, supporting its use as a strategy for circadian adaptation. In Parkinson's disease, available studies suggest benefit for sleep disturbance and excessive daytime sleepiness, whereas effects on mood and other non-motor symptoms remain less consistent. Overall, BLT appears to be a clinically meaningful and feasible intervention across multiple conditions, although broader implementation is limited by protocol heterogeneity, biologically active control-light designs and limited long-term follow-up.

KEYWORDS

Bright Light Therapy, Seasonal Affective Disorder, Major Depressive Disorder, Bipolar Depression, Shift Work, Parkinson's Disease, Circadian Rhythm, Sleep Medicine

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1. Introduction

Light is a primary environmental signal shaping human circadian organization and sleep-wake regulation. Retinal light input- particularly via melanopsin- mediated phototransduction- engages the suprachiasmatic nucleus (SCN) and influences downstream physiological rhythms, including sleep timing and melatonin- related signaling [1,2]. Because circadian phase and amplitude interact with arousal and affective processing, light exposure is also biologically relevant to mood regulation, providing a rationale for structured light-based interventions in neuropsychiatry and sleep medicine [3,4].

Bright light therapy (BLT) refers to the controlled clinical administration of bright light at specific times of day in order to modify circadian timing and/or produce alerting effects. In clinical practice, BLT is most commonly delivered using a light box that provides high illuminance at eye level, with typical protocols in affective disorders centered on approximately 10,000 lux for about 30 minutes shortly after waking. In some non-seasonal depression trials, exposure has been extended to approximately 30-60 minutes per day depending on protocol and tolerability [1,2,4,27]. In neurological populations such as Parkinson's disease, studies have also used polychromatic white light in the approximate range of 5,000-10,000 lux, with exposures ranging from about 30-120 minutes per day, delivered via light boxes and, in some trials, wearable or head-mounted devices designed to support adherence in home settings [5,6,7,8]. Across indications, timing remains a central determinant of effect: morning exposure is commonly used when circadian phase advance or stabilization is desired, whereas evening or nighttime exposure may be applied when delaying circadian phase is the clinical objective, as in some shift-work-related adaptation strategies [9].

The growing clinical interest in BLT also reflects a broader need for effective, scalable interventions beyond pharmacotherapy. In mood and sleep disorders- and particularly in populations with chronic illness or multimorbidity- pharmacological treatment may be limited by side effects, drug- drug interactions, tolerability issues and patient preference. The cumulative burden of multiple medications can complicate management. In contrast, BLT is generally described as feasible and convenient for patients because it can be delivered at home and incorporated into daily routines [2,6]. Safety profiles across reviewed conditions are typically characterized by mild, transient adverse effects (e.g., headache, eye discomfort/strain, nausea, dizziness), with indication-specific cautions-particularly in individuals with photosensitivity or ocular disease and in bipolar-spectrum presentations where conservative protocols and monitoring are emphasized [1,10,11].

Historically, the strongest evidence base supports BLT in winter-pattern seasonal affective disorder (SAD), where reduced photoperiod and altered daytime light exposure are central features and BLT is positioned as a first-line nonpharmacological treatment [1, 12]. More recently, BLT has been investigated across additional clinical conditions, in which circadian disruption, sleep-wake instability, or both may contribute to symptom burden, including non-seasonal major depressive disorder, bipolar depression, shift-work-related circadian misalignment and sleep-related non-motor symptoms of Parkinson's disease [4,5,10,13,14,15,27]. However, interpretation of this literature is complicated by substantial variation in treatment timing, intensity, duration, device type and comparator design. Against this background, the present narrative review synthesizes evidence published between 2015 and 2025 on the use of BLT across these clinical settings, with particular attention to protocol characteristics, feasibility and the main constraints on clinical inference.

2. Methodology

A narrative literature review was conducted using the PubMed and Google Scholar databases to identify English-language publications from 2015 to 2025 addressing the clinical use of bright light therapy in neuropsychiatry and sleep medicine, with particular emphasis on evidence published between 2021 and 2025. The search strategy included the following terms: bright light therapy; BLT; light therapy; seasonal affective disorder; major depressive disorder; bipolar depression; circadian rhythm; Parkinson's disease. Priority was given to systematic reviews, meta-analyses and randomized controlled trials. Studies without accessible full text and interventional studies lacking a control condition were excluded from the main synthesis. Trials evaluating wavelengths other than full-spectrum bright white light were not prioritized in the primary clinical synthesis.

3. Research results

3.1. Seasonal Affective Disorder (SAD)

Seasonal affective disorder (SAD), most commonly winter-pattern, is generally understood as a recurrent depressive condition in which reduced photoperiod and diminished daytime light exposure interact with biological vulnerability to produce predictable seasonal mood symptoms. Bright light therapy (BLT) directly addresses this environmental light deficit and is therefore regarded as a first-line nonpharmacological intervention in contemporary clinical syntheses [1,12]. Mechanistically, morning retinal light input engages melanopsin-mediated pathways and related phototransduction processes that entrain the suprachiasmatic nucleus, influence downstream circadian rhythms, including sleep timing and melatonin-related signaling and may additionally affect mood through arousal- and serotonin-related pathways [1,2]. This biological rationale is consistent with the clinical observation that sleep and vegetative symptoms often improve early during treatment, supporting circadian phase-shift and stabilization models of SAD pathophysiology [2].

Across controlled trials and pooled evidence, BLT demonstrates a consistent antidepressant effect in winter-pattern SAD and remains the best-supported clinical application of light therapy within neuropsychiatry [12,16,17]. Meta-analytic and comparative findings indicate that BLT is superior to inactive or control conditions and is associated with clinically meaningful acute improvement over standard daily treatment courses, typically delivered across 4-6 weeks [12,16,17]. At the same time, the literature also suggests that although the overall direction of benefit is robust, interpretation is still influenced by study heterogeneity, sample size limitations and variation in methodological quality [12,17]. Head-to-head and broader comparative analyses generally support BLT as one of the leading nonpharmacological treatment options for SAD, reinforcing its established first-line status while also indicating that evidence quality and long-term follow-up remain important limitations of the current evidence base [2,12,16].

From a practical standpoint, the SAD literature shows substantial convergence around a standard regimen of approximately 10,000 lux administered shortly after waking for about 30 minutes daily, with subsequent adjustment of timing or duration according to clinical response and tolerability [1,2]. Adherence is an important determinant of effectiveness in real-world settings and the relative simplicity of home-based administration contributes to the intervention's clinical appeal [2]. BLT is generally well tolerated, with adverse effects typically described as mild and transient, most commonly including headache, eye strain or fatigue and nausea. Nevertheless, caution remains appropriate in patients with photosensitive conditions, ocular disease, or vulnerability to hypomanic or manic activation [1,12].

Overall, the evidence base supports BLT as an efficacious and clinically established acute treatment for winter-pattern SAD, with particular relevance for the rapid improvement of sleep-related and vegetative symptoms. Compared with the other indications reviewed in this paper, the evidence in SAD is both the strongest and the most consistent, which makes it the clearest example of BLT as a clinically actionable chronobiological intervention. Future studies should focus on greater protocol standardization, clarification of maintenance strategies and relapse prevention and longer-term follow-up to better define durability of benefit and the potential value of device- or spectrum-related refinements beyond established white-light regimens [12,18].

3.2. Non-seasonal Major Depressive Disorder (MDD)

Non-seasonal major depressive disorder (MDD) is frequently accompanied by sleep-wake disturbance, diurnal mood variation and other features consistent with circadian dysregulation, which has motivated increasing clinical interest in BLT beyond seasonal-pattern depression [3,4,19,27]. Mechanistically, timed retinal light input engages melanopsin-dependent signaling and related phototransduction pathways that entrain the SCN, strengthen circadian amplitude and phase alignment of downstream rhythms, including sleep timing and associated neuroendocrine and autonomic outputs and may additionally influence affective processing through non-SCN projections to mood-relevant circuitry [3,4,19,21,27]. These circadian and arousal-related models provide a coherent rationale for why morning light, by producing a net phase advance and/or stabilizing circadian timing, may accelerate antidepressant response in circadian-vulnerable presentations [3,4,21,27].

Across randomized trials and pooled analyses, BLT in non-seasonal depressive disorders is most commonly delivered via a light box at approximately 10,000 lux for 30-60 minutes per day, usually in the morning and meta-analyses converge on a small-to-moderate reduction in depressive symptom severity relative to placebo or control conditions [3,4,27]. Although the literature remains heterogeneous and is generally characterized by low certainty because of blinding constraints, variability in light parameters, differences in sample characteristics and limited long-term follow-up, several recurring patterns deserve emphasis. First, morning scheduling is repeatedly associated with more consistent benefit than non-morning exposure, in keeping with a phase-advancing and circadian-stabilizing mechanism [4,27]. Second, short-to-medium treatment protocols, often lasting approximately 2-5 weeks, are common among trials reporting stronger effects, suggesting that BLT may be particularly relevant for accelerating early improvement trajectories [3,27]. Third, earlier subgroup analyses often indicated clearer effects when BLT was used as a stand-alone intervention, whereas adjunctive efficacy appeared more variable, likely reflecting heterogeneity in background pharmacotherapy, baseline treatment resistance, placebo design and environmental light context [3,4,20,27].

Chronotype appears to be a particularly relevant moderator. Evening chronotype is overrepresented in unipolar depression and has been associated with poorer outcomes, plausibly reflecting circadian delay or misalignment and social jetlag; within this subgroup, appropriately timed BLT, often coupled with gradual timing advance, may more effectively turn circadian timing into a therapeutic target, with remission-oriented advantages reported in chronotype-enriched trial designs [4,19,21,27]. Conversely, in settings characterized by high ambient natural daylight and limited seasonal variation in photoperiod, the incremental benefit of add-on BLT over placebo light may be attenuated, suggesting that baseline light exposure and photoperiod may interact with chronotype and medication status to shape the observable treatment margin [20]. More recent pooled analyses focusing on adjunctive BLT report significantly higher odds of both response and remission compared with control conditions, supporting BLT as a viable augmentation strategy despite the inconsistencies reported in earlier adjunctive subgroup findings [19].

Overall, BLT appears most clinically defensible in non-seasonal MDD as a time-sensitive chronobiological intervention, particularly when circadian phenotype, especially eveningness or delay and treatment context, including ambient light exposure and concomitant pharmacotherapy, are taken into account. Future studies should standardize light parameters and placebo comparators, stratify participants according to chronotype and circadian misalignment as well as environmental light exposure and assess symptom durability after discontinuation in order to clarify whether BLT is best deployed as monotherapy, augmentation, or a targeted intervention for circadian-delayed subgroups[3,4,19,20,21,27].

3.3. Bipolar depression

Bipolar depression is strongly linked to circadian and sleep-wake dysregulation, which provides a biologically plausible target for BLT. Timed retinal light input entrains the central circadian pacemaker, reshapes downstream rhythms, including melatonin signaling and sleep timing and may secondarily modulate arousal and monoaminergic systems relevant to depressive symptom expression [10,14,22]. In bipolar disorder, however, the same chronobiological leverage that may relieve depressive symptoms also carries a theoretical risk of behavioral activation if the induced phase shift is too strong; accordingly, contemporary bipolar BLT protocols typically emphasize adjunctive use under antimanic or mood-stabilizing medication coverage and conservative dosing strategies [10, 13,14].

Across controlled trials and pooled analyses, adjunctive BLT shows a consistent antidepressant signal in bipolar depression, with clinically meaningful reductions in depressive severity and higher response rates compared with control conditions [10,13,14,22,23]. Contemporary randomized evidence indicates that midday BLT with gradual titration can yield high remission rates without an observed increase in manic or hypomanic switching in carefully selected, mood-stabilized patients [10, 13]. Parallel randomized data using morning BLT also demonstrate rapid reductions in depressive ratings, higher response and remission rates relative to dim-light comparators and improvements in sleep quality, with generally mild adverse effects when BLT is delivered as add-on treatment [10,23]. Meta-analyses converge on a small-to-moderate overall benefit for clinician-rated depressive symptoms and a significantly greater likelihood of clinical response, whereas remission findings appear more variable, likely because of heterogeneity in light parameters, study duration and limited statistical power [10,14].

Importantly, pooled switch rates remain low and are not clearly elevated relative to control conditions in the short-term randomized literature, although this reassuring safety profile should be interpreted in the context of careful patient selection, concurrent mood-stabilizer coverage, close monitoring and conservative protocol design [10,14] Thus, the current evidence supports adjunctive BLT as a promising therapeutic option for bipolar depression when it is implemented cautiously and within an appropriately protected treatment context. Future studies should further standardize timing and titration strategies, enlarge sample sizes and extend follow-up durations to better define durability of antidepressant benefit and to clarify manic-switch risk under real-world conditions [10,14].

3.4. Shift-work-related circadian misalignment

Circadian rhythm sleep-wake disorders (CRSWDs) are characterized by a misalignment between endogenous circadian timing and the sleep-wake schedule imposed by social, occupational, or environmental demands. This misalignment is particularly relevant in shift-work-related circadian disruption, in which sleep is attempted during the biological day and wakefulness is required during the biological night. Light therapy is especially pertinent in this context because light is a primary circadian zeitgeber and its phase-shifting effects are highly timing dependent: exposure in the early morning tends to advance circadian phase, whereas exposure in the evening or at night tends to delay it, thereby shifting sleep propensity earlier or later depending on the clinical objective. Accordingly, CRSWD protocols often combine strategically timed bright light with light avoidance at competing times, such as limiting evening light in delayed sleep patterns, in order to prevent counterproductive phase shifts [9].

Across sleep conditions, meta-analytic evidence suggests that light therapy produces small-to-moderate improvements in sleep outcomes, with circadian-related sleep problems showing clinically meaningful responsiveness; however, these effects may diminish when analyses are restricted to more rigorous randomized designs. In a systematic review and meta-analysis spanning multiple categories of sleep problems, circadian rhythm sleep disorders showed pooled effects in the small-to-moderate range, whereas subgroup analyses limited to randomized controlled trials yielded smaller effects, underscoring both the likelihood of genuine benefit and the possibility of design-related inflation in less controlled studies [9].

In shift workers, the most consistent pattern is that appropriately timed light can produce measurable circadian delay and modest improvements in sleep quantity and efficiency, changes that are directionally consistent with facilitating daytime sleep after night work. A recent shift-worker-specific meta-analysis found that light therapy increased total sleep time by approximately 33 minutes, improved sleep efficiency by approximately 3 percentage points and produced a significant circadian phase delay of approximately 1.7 hours. By contrast, effects on wake after sleep onset were not significant overall, suggesting that the principal sleep benefit may lie in extension and consolidation of the sleep window rather than in a reliable reduction in nocturnal awakenings [15].

Dose-response analyses further indicate that outcomes differ according to whether the primary target is acute sleepiness during the night shift or circadian phase adaptation. In a dose-response meta-analysis of shift workers, light therapy demonstrated a small-to-medium effect on reducing sleepiness and a large effect on circadian phase shift; moderator analyses suggested that medium-intensity, shorter-duration nighttime exposure may be comparatively efficient for sleepiness reduction, whereas higher intensity is more consistently associated with larger phase-shifting effects, although the optimal duration for phase shifting remains less clearly defined [24]. Converging with these findings, the shift-worker meta-analysis reported a nonlinear, inverted-U relationship between illuminance and total sleep time, suggesting a potential "sweet spot" at moderate intensity for extending sleep duration, whereas sleep efficiency improved more linearly as total light dose (lux × hours) increased [15].

From a practical standpoint, the combined meta-analytic evidence suggests that when the primary goal is reducing sleepiness during the night shift, protocols emphasizing moderate-intensity light for shorter periods at night may offer the most efficient balance of effect and feasibility [24]. When the goal is circadian adaptation, particularly phase delay to support daytime sleep after night work, brighter light appears more consistently linked to larger phase shifts and pooled data indicate that light therapy can reliably delay circadian phase in shift workers [15,24]. Translation to real-world workplace settings, however, remains constrained by wide protocol variability and incomplete reporting of key light characteristics, including spectral composition. In addition, some evidence suggests that very prolonged exposures, for example those exceeding 6 hours, may increase adverse effects such as headache and ocular discomfort, supporting the use of targeted rather than excessive dosing strategies [15].

3.5. Parkinson disease (sleepiness/sleep quality + mood/non-motor symptoms)

Sleep-wake disturbances, including insomnia, fragmented sleep and excessive daytime sleepiness, as well as affective symptoms, are common non-motor features of Parkinson's disease and are increasingly conceptualized as partly circadian in origin. In this context, bright light therapy (BLT) has been explored as a low-burden, home-deliverable intervention intended both to strengthen circadian entrainment and to provide acute alerting effects. Across available Parkinson's disease studies, protocols vary substantially, but most commonly involve polychromatic white light in the approximate range of 5,000-10,000 lux, delivered via light boxes or wearable/head-mounted devices, with exposure durations ranging from about 30 to 120 minutes per day and intervention periods extending from approximately 2 weeks to 3 months. Morning-only, evening-only and combined morning-plus-evening schedules have all been represented in the literature [5,6,7,8,25].

Across the small but growing body of literature on BLT in Parkinson's disease, most studies report improvement in subjective sleep-related outcomes, although the clearest and most clinically persuasive signal for excessive daytime sleepiness appears in samples selected for clinically meaningful baseline sleepiness, such as Epworth Sleepiness Scale (ESS) scores of 11-12 or higher. In the randomized clinical trial by Videnovic et al. (2017), participants enrolled specifically for excessive daytime sleepiness (ESS ≥ 12) showed a significant reduction in daytime sleepiness with timed BLT, whereas broader sleep-quality measures improved in both active and dim/red control conditions, suggesting that alertness-related outcomes may provide a more BLT-specific signal even when improvements in sleep quality are more difficult to distinguish from nonspecific or control-light effects. A similar pattern was observed in a head-mounted BLT study requiring ESS > 11, in which ESS improved significantly after BLT and participants with greater baseline sleepiness appeared most likely to benefit, although changes in Parkinson's Disease Sleep Scale (PDSS) and Pittsburgh Sleep Quality Index (PSQI) were not robust in that sample [6]. Additional controlled studies, including trials in which mood or broader non-motor symptoms were the primary focus, also support BLT-related improvements in subjective sleep quality and Parkinson's disease-specific sleep disturbance measures [7,25], which is consistent with the proposed role of BLT in strengthening circadian entrainment and stabilizing sleep-wake regulation [5,7]. At the same time, several datasets indicate that control-light conditions can also improve subjective sleepiness and sleep measures and some trials have not demonstrated a clear between-condition advantage for ESS or global sleep scales[7,8], which likely contributes to the mixed pooled estimates for daytime sleepiness seen in quantitative syntheses [11,26].

Evidence for mood-related benefit in Parkinson's disease remains mixed but suggestive. Meta-analytic summaries report small improvements in depressive symptoms associated with BLT across included trials [11,26]. However, the most rigorous depression-focused randomized controlled evidence indicates that BLT may not outperform placebo or control light on primary depression outcomes in Parkinson's disease, even when both groups improve over time. This raises the possibility that low-intensity control light may not be physiologically inert and/or that expectancy effects and the structuring of daily routines contribute meaningfully to improvement [25]. Beyond depression, smaller or pilot-level studies suggest possible within-person improvements during BLT phases in anxiety, quality of life and autonomic symptoms in some samples, although these changes are not consistently superior to dim-light comparator conditions in direct between-group analyses [6,8].

Mechanistic interpretations largely converge on circadian restoration and retina-brain signaling. BLT is a potent zeitgeber capable of shifting or stabilizing circadian phase and increasing circadian amplitude; in Parkinson's disease, where circadian disruption is common, improvements in sleep may therefore reflect better alignment between internal rhythms and the desired sleep-wake schedule. Supporting this possibility, one study linked sleep improvement to changes in circadian phase estimated through peripheral clock gene expression, consistent with a circadian-timing pathway [7]. Additional proposed mechanisms include modulation of neuroendocrine rhythms, such as cortisol-related effects reported alongside clinical outcomes and influences on retinal and visual physiology relevant to both circadian phototransduction and non-motor symptom expression [8,25]. At present, however, these mechanistic interpretations remain hypothesis-supporting rather than definitive, because many studies are small and do not simultaneously quantify circadian markers, such as melatonin phase, light-exposure adherence and clinical outcomes.

Across trials and reviews, BLT appears feasible as a home-based intervention in Parkinson's disease, including when delivered via wearable or head-mounted devices intended to support adherence [6,11]. Reported adverse events are generally mild and transient and include headache, dizziness and eye discomfort, although pooled data suggest that adverse effects may occur more often than with placebo or control light [11,8]. Overall, the current literature suggests that BLT is a promising adjunctive intervention for sleep disturbance and excessive daytime sleepiness in Parkinson's disease, particularly in sleepiness-enriched samples, whereas effects on mood and other non-motor symptoms remain less consistent. Given the substantial heterogeneity in light parameters, comparator conditions and outcome measures, and the frequent use of control conditions that may still be biologically active, future studies would benefit from tighter standardization of dose and timing, incorporation of objective circadian and sleep measures such as actigraphy and melatonin phase and clearer subgrouping according to dominant target symptom, for example insomnia, excessive daytime sleepiness, or depression [5,11,26].

4. Discussion

The findings of this narrative review indicate that bright light therapy (BLT) is a clinically meaningful, time-sensitive intervention whose efficacy depends on indication, timing and patient context. The strongest evidence concerns winter-pattern seasonal affective disorder (SAD), where pooled data consistently support BLT as a first-line acute treatment. This reinforces the clinical importance of directly addressing seasonal light-exposure deficit and supports routine use of standardized morning protocols in appropriately selected patients, particularly when sleep and vegetative symptoms are prominent [1,2, 12, 17]. From a practical perspective, the convergence on a typical regimen of approximately 10,000 lux shortly after waking for about 30 minutes provides a clear and replicable foundation for clinical implementation, while the generally mild adverse-effect profile further supports its role as a feasible nonpharmacological option [1, 2, 12].

Beyond SAD, the reviewed literature suggests that BLT is best understood not as a uniform antidepressant add-on, but as a targeted chronobiological strategy whose usefulness depends on phenotype and treatment context. In non-seasonal major depressive disorder, meta-analytic findings support a small-to-moderate reduction in depressive symptoms, yet the heterogeneity of outcomes underscores the importance of timing, circadian phenotype and environmental light context. The repeated association between morning exposure and greater benefit, together with the potential moderating role of chronotype, suggests that BLT may be most clinically valuable when it is used to address circadian delay or misalignment rather than simply added indiscriminately to existing treatment regimens [4,19,20,27]. This interpretation is further supported by evidence that high ambient natural daylight and limited seasonal photoperiod variation may reduce the observable incremental benefit of add-on BLT in some settings [20].

In bipolar depression, controlled studies support adjunctive BLT as an effective option when delivered cautiously under mood-stabilizer coverage, with pooled short-term switch rates remaining generally low [10,13,14]. Clinically, this positions BLT as a potentially valuable strategy for depressive episodes in which additional nonpharmacological intervention is desired, while also emphasizing that protocol selection and monitoring are inseparable from safe implementation in bipolar-spectrum populations. The favorable results reported with both midday titration protocols and morning schedules suggest that timing in bipolar depression should be treated as a modifiable clinical parameter rather than a rigid rule, chosen to balance antidepressant benefit against activation risk in the individual patient [10,13,23]

For shift-work-related circadian misalignment, the combined meta-analytic evidence indicates that BLT can produce modest but clinically relevant sleep improvements alongside measurable circadian phase delay, supporting its use as a practical tool for circadian adaptation when exposure is aligned with the desired phase shift [15,24]. In Parkinson's disease, the pattern of benefit is most convincing for sleep disturbance and excessive daytime sleepiness, particularly in sleepiness-enriched samples, whereas effects on mood and other non-motor symptoms remain more variable. The frequent improvement observed in control-light arms highlights a central interpretive challenge in the Parkinson's disease literature and, more broadly, in light-therapy trials: comparison conditions that appear methodologically convenient may still be biologically active and may therefore narrow the apparent treatment margin between BLT and control conditions [5,11,25,26].

Several cross-cutting limitations emerge across indications. First, there is substantial heterogeneity in treatment timing, illuminance, duration, total daily dose, device type and comparison conditions, all of which complicate direct comparison between studies and limit precision in clinical translation [10,11,12,15]. Second, many trials rely heavily on subjective symptom measures without integrating objective circadian or sleep markers, such as actigraphy or melatonin phase, making it more difficult to determine whether observed benefits truly reflect circadian realignment, nonspecific alerting effects, expectancy, or a combination of these mechanisms [7,8,11]. Third, long-term follow-up remains limited across the literature, constraining conclusions regarding maintenance strategies, relapse prevention and durability after treatment discontinuation [10,12,15].

At the same time, the broader clinical appeal of BLT lies in its relative feasibility, home-based deliverability and compatibility with emerging wearable or head-mounted devices that may improve adherence and expand access in real-world settings [6,811]. This translational potential is especially relevant for patients in whom pharmacotherapy is limited by side effects, multimorbidity, drug-drug interactions, or patient preference. However, the move toward broader implementation should not proceed on the basis of convenience alone; rather, it should be accompanied by greater protocol standardization, clearer subgroup targeting and more rigorous comparator design. Taken together, the literature supports viewing BLT as a targeted chronobiological intervention whose value is greatest when matched to the relevant clinical phenotype, circadian objective and safety context, rather than as a one-size-fits-all treatment across neuropsychiatry and sleep medicine.

5. Conclusions

The reviewed evidence from 2015 to 2025 supports bright light therapy as a clinically meaningful and time-sensitive intervention across multiple domains of neuropsychiatry and sleep medicine. The strongest and most consistent findings are observed in winter-pattern seasonal affective disorder, where BLT remains a first-line nonpharmacological treatment and demonstrates reproducible antidepressant efficacy within standard daily treatment courses [1,12,17].

Beyond seasonal affective disorder, pooled evidence indicates that BLT can reduce depressive symptom severity in non-seasonal major depressive disorder, particularly when administered in the morning and when important individual and contextual moderators, such as chronotype and ambient light exposure, are taken into account [4,19,20,27]. In bipolar depression, adjunctive BLT under mood-stabilizer coverage appears beneficial and is associated with low short-term switch rates when conservative protocols are used, supporting its role as a promising augmentation strategy when accompanied by appropriate monitoring [10,13,14]. For shift-work-related circadian misalignment, meta-analytic findings demonstrate modest improvements in sleep outcomes alongside reliable circadian phase delay, reinforcing the importance of goal-dependent timing and dosing [15,24]. In Parkinson's disease, BLT is feasible and appears beneficial for sleep-related outcomes and excessive daytime sleepiness, particularly in sleepiness-enriched samples, whereas effects on mood remain mixed and are strongly influenced by control-condition design [5,11,25].

Across indications, the central clinical implication is that timing and patient phenotype, including chronotype, baseline sleepiness, environmental light context and vulnerability to bipolar switching, are critical determinants of both efficacy and safety. Future research should prioritize standardized treatment protocols, rigorous and physiologically credible control conditions, objective circadian and sleep measures and longer-term follow-up in order to better define durability of benefit, maintenance strategies and the patient subgroups most likely to respond to BLT across different clinical settings [10,12,15].

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