INTRODUCTION

Perfectionism is among the most prominently discussed personality traits in relation to sleep disturbance (e.g., Akram, 2018; Bos & Macedo, 2019; van der Laar et al., 2010). Indeed, different mechanisms indicate a close link between perfectionism and sleep disturbance. For example, perfectionism is associated with worry and rumination (Piotrowski, 2019). These cognitive tendencies increase pre-sleep arousal and, thereby, contribute to sleep disturbance (e.g., Amaral et al., 2018; Harvey, 2000; Lundh & Broman, 2000). Additionally, perfectionism is thought to stimulate dysfunctional sleep-interpreting processes (e.g., regarding the consequences of prolonged sleep onset; Lundh & Broman, 2000), which interfere with sleep (Espie, 2002; Harvey, 2002). Perfectionistic persons may also put too much effort into attempting to fall asleep (van der Laar et al., 2010) and try to control a bodily status that cannot be controlled deliberately, which, in turn, exacerbates sleep difficulties (cf. the attention–intention–effort [AIE] pathway model; Espie et al., 2006).
Despite these strong theoretical links and almost three decades of research, a coherent picture of the perfectionism—sleep disturbance link is still missing. Empirical research has identified positive (e.g., Araújo et al., 2017), non-significant (e.g., Akram et al., 2015), and, seldom, negative relations (e.g., Molnar et al., 2020) between perfectionism measures and sleep disturbance indicators. The multidimensional nature of perfectionism may explain this seemingly puzzling heterogeneity in findings. Specifically, the two-dimensional perfectionism model (e.g., Stoeb & Otto, 2006) differentiates two broader dimensions, namely perfectionistic concerns (also labelled evaluative concerns perfectionism) and perfectionistic striving (also labelled personal standards perfectionism). This perfectionism model is commonly accepted and frequently used for research syntheses (e.g., Burças & Crețu, 2020; Dahlenburg et al., 2019; Grugan et al., 2021; Ocampo et al., 2020; Osenk et al., 2020; Robinson & Wade, 2021; Smith et al., 2019, 2021; Stricker et al., 2019; Vacca et al., 2021). Previous work showed that, compared to perfectionistic strivings, perfectionistic concerns are more consistently and strongly related to mental health difficulties (e.g., Burças & Crețu, 2020; Vacca et al., 2021). Thus, this systematic review used the two-dimensional perfectionism model to integrate the previously inconclusive empirical literature on perfectionism and sleep disturbance, reveal potential underlying mechanisms, and highlight future research directions.

1.1 | Multidimensional perfectionism

Perfectionism is a multidimensional personality trait defined as the tendency to hold excessively high standards for oneself paired with overly critical self-evaluations (Flett & Hewitt, 2002). Various measures exist that capture different components of perfectionism, including the Frost Multidimensional Perfectionism Scale (FMPS; Frost et al., 1990), the Hewitt and Flett (1991) Multidimensional Perfectionism Scale (HFMPs), the Almost Perfect Scale-Revised (APS-R; Slaney et al., 2001), the Perfectionism Inventory (PI; Hill et al., 2004), and the Multidimensional Inventory of Perfectionism in Sport (MIPS; Stoeb et al., 2006; for a review, see Flett & Hewitt, 2015).

A wealth of factor-analytical and conceptual work indicates that two broader dimensions underlie the different perfectionism measures: perfectionistic concerns (characterised by concerns about imperfections) and perfectionistic strivings (characterised by the tendency to set unrealistically high standards for oneself; e.g., Bieling et al., 2004; Dunkley et al., 2006; Frost et al., 1993; Stoeb et Otto, 2006; Stoeb, 2017). Perfectionistic concerns encompass the impression that others expect perfection of oneself (Hewitt & Flett, 1991), concern over the consequences of making mistakes and doubts about one’s competencies (Frost et al., 1990; Hill et al., 2004), a perceived discrepancy between one’s standards and actual performance (Slaney et al., 2001), and negative reactions to imperfection (Stoeb et al., 2006). Perfectionistic strivings encompass the belief that oneself needs to be perfect and the tendency to hold overly high personal standards (Frost et al., 1990; Hewitt & Flett, 1991; Hill et al., 2004; Slaney et al., 2001; Stoeb et al., 2006). The two perfectionism dimensions relate differentially to relevant outcomes. Perfectionistic concerns are robustly associated with maladaptive outcomes (e.g., Smith et al., 2021). In contrast, relations of perfectionistic strivings with maladaptive outcomes are smaller and sometimes inconsistent (e.g., Burças & Crețu, 2020). For that reason, perfectionistic strivings have sometimes been labelled “adaptive” or “positive” perfectionism (e.g., Lombardo et al., 2013; Xie et al., 2020). However, these labels are often rejected (e.g., Smith, Sherry, et al., 2018; Stoeb, 2017) because perfectionistic strivings may also be maladaptive as they contribute to various forms of psychopathology (Limburg et al., 2017).

The two-dimensional perfectionism model provides a comprehensive framework for structuring perfectionism research. However, not all subscales from perfectionism measures are included in the two-dimensional perfectionism model (e.g., Burças & Crețu, 2020; Osenk et al., 2020; Smith et al., 2019, 2021; Stricker et al., 2019; Stoeb, 2017): The FMPS parental expectations, FMPS parental criticism, and PI perceived parental pressure subscales measure childhood antecedents of perfectionism development, not current perfectionistic tendencies (e.g., Damian et al., 2013; Rice et al., 2005). The HFMPs other-oriented perfectionism and the PI high standards for others subscales are directed towards other individuals, not the self (e.g., Stoeb, 2014). Finally, the FMPS organisation, PI organisation, and APS-R order subscales constitute correlates but not defining components of perfectionism (e.g., Frost et al., 1990; Stoeb, 2017).

1.2 | Sleep disturbance

Sleep disturbance can take on various facets, including dissatisfaction with the overall quality of one’s sleep, difficulty falling asleep, early morning awakening, and problems in sleep continuity (e.g., difficulty returning to sleep), often resulting in low sleep efficiency (i.e., the ratio of time spent asleep to time in bed) and deficits in the total amount of sleep obtained (sleep duration; e.g., Buysse, 2014; Buysse et al., 2006).

In this systematic review, we focus on these core indicators of sleep disturbance (mostly pertaining to insomnia) rather than parasomnias (e.g., restless legs syndrome). This was because perfectionism is often viewed as a risk factor for difficulties initiating and maintaining restorative sleep, whereas relations with other sleep-related problems (e.g., parasomnias) are not well understood or researched.

Measures of sleep disturbance include retrospective multi-item self-report instruments (Bastien et al., 2001; Buysse et al., 1989), sleep diaries, structured clinical interviews, objective sleep markers (e.g., polysomnography), and single-item scales assessing singular aspects of disturbed sleep (e.g., Leguizamo et al., 2021). Other measures capture daytime correlates of sleep disturbance, such as fatigue, sleepiness, or impaired mood. These daytime correlates are important for measuring the distress and impairment caused by sleep disturbance. However, daytime phenomena are usually seen as potential effects rather than defining components of sleep disturbance (Buysse et al., 2006). Other consequences of chronically disturbed sleep include various health difficulties, including depression.
(e.g., Baglioni et al., 2011) or metabolic syndrome (Jennings et al., 2007), and neurocognitive deficits (e.g., Durmer & Dinges, 2005). In the light of these severe consequences of sleep disturbance, the quest for its potential causes, such as perfectionistic tendencies, is a significant public health concern (Barnes & Drake, 2015).

1.3 | The link between multidimensional perfectionism and sleep disturbance

A growing body of popular (e.g., Ramlakhan, 2016) and scientific literature (e.g., Bos & Macedo, 2019) links perfectionism to sleep disturbance. In their seminal work on cognitive processes in insomnia, Lundh and Broman (2000) outlined two main pathways through which perfectionistic concerns and perfectionistic striving (referred to as “perfectionistic standards” by Lundh & Broman, 2000) may contribute to sleep disturbance: perfectionistic strivings are thought to stimulate maladaptive sleep-interpreting processes, characterised by a low tolerance for suboptimal sleep (due to unrealistic standards). Perfectionistic concerns, in turn, are primarily associated with sleep-interfering processes, namely cognitive and emotional arousal stimulated by increased worry, rumination, and stronger negative reactions to adverse life events (Lundh & Broman, 2000). This theoretical assumption about perfectionistic concerns receives support from the substantial associations of perfectionistic concerns with worry, rumination (e.g., Piotrowski, 2019), physiological arousal (Besser et al., 2008), and negative reactions to failure (e.g., van der Kaap-Deeder et al., 2016). Lundh and Broman’s (2000) hypotheses about the role of perfectionism in sleep disturbance also blend in well with later, classical cognitive models of insomnia, which highlight the role of arousal and dysfunctional interpretative processes for sleep disturbance (e.g., Espie, 2002; Harvey, 2002).

Further mechanisms may additionally contribute to the chronic sleep disturbance in persons with perfectionistic tendencies. Such mechanisms include a vicious cycle of maladaptive sleep-related cognitions, arousal, and poor sleep, as well as excessive (sleep impairing) efforts to fall asleep (cf. the AIE model; Espie et al., 2006; Akram et al., 2020; van der Laar et al., 2010). Alternatively, the influence of perfectionism dimensions on the development of psychopathology (e.g., depression and anxiety; Smith et al., 2018, 2021) may indirectly stimulate and perpetuate sleep disturbance.

Besides the usually assumed influence of perfectionism on sleep disturbance, other mechanisms that link the two constructs are possible. For example, poor sleep may influence personality development (e.g., Stephan et al., 2018), and sleep disturbance and personality may display bidirectional relations (Lau et al., 2021). Alternatively, third variables, such as broader personality dispositions (e.g., conscientiousness) may simultaneously influence the development of perfectionism (Stoebber et al., 2009) and sleep disturbance (e.g., Stephan et al., 2018).

Based on the theoretical links between perfectionism and sleep disturbance, various empirical studies have investigated the associations between the two constructs. This line of research has yielded strongly heterogeneous results, including positive (e.g., Schmidt et al., 2018; Xie et al., 2020), non-significant (e.g., Lin et al., 2019; Trudel-Fitzgerald et al., 2017), and, seldom, negative (e.g., Molnar et al., 2020) relations between perfectionism measures and sleep disturbance. The wealth of perfectionism subscales may have contributed to the current confusion about the perfectionism–sleep link. Hence, in this systematic review, we used the widely accepted two-dimensional perfectionism model.

From a scientific and public health perspective, there are several reasons why clarification of the multidimensional perfectionism–sleep disturbance link is needed. First, sleep disturbance is increasingly recognised as a cause of poor health (e.g., Anothaisintawee et al., 2016). Thus, identifying risk factors for sleep disturbance is an emerging priority (Barnes & Drake, 2015; Bartel et al., 2015). Second, mean levels of perfectionism in young populations have linearly increased over recent decades (for meta-analyses see Curran & Hill, 2019; Smith et al., 2019). Hence, understanding its detrimental health consequences has become an increasingly relevant concern (e.g., Limburg et al., 2017; Smith et al., 2021). Third, interventions exist that reduce perfectionism (for meta-analyses see Galloway et al., 2021; Lloyd et al., 2015). Thus, perfectionism may be a modifiable risk factor for sleep disturbance. Therefore, it has been suggested to include perfectionism interventions in psychotherapeutic programmes targeting disturbed sleep (e.g., Jansson-Fröjmark & Linton, 2007; Johann et al., 2018; Küskens et al., 2021; Richardson & Gradisar, 2020). Yet, a better understanding of the perfectionism–sleep disturbance link is needed to implement effective interventions.

1.4 | The present study

Due to the strong heterogeneity in empirical findings, the link between perfectionism and sleep has remained unclear. Differentiating two perfectionism dimensions and covering a broad width of sleep disturbance measures, this systematic review integrated the available research. With this, we aimed to allow more robust conclusions about the role of perfectionism in sleep disturbance, reconcile seemingly conflicting primary findings, identify research gaps, and offer recommendations for future research directions. More specifically, we addressed the following research questions: (i) how are indicators of perfectionistic concerns and perfectionistic strivings related to sleep disturbance? and (ii) which variables mediate the relations between perfectionism dimensions and sleep disturbance?

2 | METHODS

2.1 | Search procedure and inclusion criteria

Figure 1 shows the flow diagram depicting the study search and inclusion process. We conducted a standardised literature search in PsycINFO, Education Resources Information Center (ERIC), and MEDLINE in April 2021. For the literature search, we used the search string "perfectionis*" and (sleep* or insomn* or dream*) or
nightmare*) in the abstract and title without setting any additional limits. We also conducted an additional exploratory literature search by following up on the references from included studies and entering our keywords in Google Scholar.

We applied the following inclusion criteria: (i) the study includes at least one self-report measure of perfectionistic concerns or perfectionistic strivings. Indicators of perfectionistic concerns and perfectionistic strivings were selected based on widely accepted recommendations (Stoeber & Otto, 2006; Stoeber, 2017). Specifically, indicators of perfectionistic concerns were the FMPS concern over mistakes and doubts about actions scale, the HFMPS socially prescribed perfectionism scale, the APS-R discrepancy scale, the MIPS negative reactions to imperfection scale, and the PI concern over mistakes scale. Indicators of perfectionistic strivings were the FMPS personal standards scale, the HFMPS self-oriented perfectionism scale, the APS-R standards scale, the MIPS striving for perfection scale, and the PI striving for excellence scale. We also included short forms, adaptations, and translated versions of these scales (e.g., the Child-Adolescent Perfectionism Scale [CAPS]-14; Flett et al., 2016). (ii) The study includes at least one indicator of sleep disturbance (e.g., pertaining to sleep quality, sleep duration, sleep initiation, early morning awakening, sleep efficiency, or sleep continuity). Included sleep disturbance indicators were the Insomnia Severity Index (ISI; Bastien et al., 2001), the Pittsburgh Sleep Quality Index (PSQI; Buysse et al., 1989), the Karolinska Sleep Diary (KSD; Åkerstedt et al., 1994), the Uppsala Sleep Inventory (USI; Liljenberg et al., 1988), self-developed sleep disturbance scales/items, structured clinical interviews, and objective sleep markers. (iii) The study results are reported in English, German, French, or Spanish. (iv) The study reports original quantitative data on the relation (e.g., correlations or group comparisons) between perfectionistic concerns and/or perfectionistic strivings with sleep disturbance (i.e., no re-analysis of data published more completely elsewhere). When the relevant relations were not reported, we contacted the corresponding author of the respective article via email. Of the six contacted authors, four replied, and two provided the requested information, allowing the inclusion of two additional studies in this systematic review (Table 1).

2.2 Study selection and data extraction

We determined study eligibility in two steps. In Step 1, the first author and the second author independently examined the titles and
abstracts of all studies obtained in the literature search (n = 100). Based on this screening, 46 articles were selected for further evaluation. In Step 2, the first author and the second author inspected the full texts of the remaining articles and independently decided whether to include (n = 24) or exclude (n = 22) an article based on the inclusion criteria. Of the 24 included articles, 23 articles were identified in the systematic database search, and one article was identified in the additional exploratory search (Faber & Schlarb, 2018). Table S1 displays an overview of the studies excluded in Step 2 with reasons for exclusion. In all, 13 studies were excluded because they did not contain a measure of sleep disturbance or perfectionistic concerns/striving (Bartczak & Ogińska-Bulik, 2012; Berglund, 1986; Ellis & Fox, 2004; Frost & Henderson, 1991; Györfy & Girasek, 2014; Hyman et al., 2002; Kowal & Pritchard, 1990; Palaia et al., 2011; Regen et al., 2015; Sivertsen et al., 2014, 2015; Toy, 2009; Wojtowicz & Banez, 2015). Four studies were excluded because the relevant relations were neither reported in the manuscript nor provided via email (Archer et al., 2007; Huang et al., 2015; Toy, 2009; Wojtowicz & Banez, 2015). Two studies were excluded because the data had been reported more completely elsewhere (Azevedo et al., 2009, 2010). Two additional studies were excluded because they were only available in languages not familiar to the study authors (i.e., Chinese and Serbian; Lin et al., 2012; Totić-Poznanović et al., 2012). Finally, one study was excluded because it did not report empirical findings (Brenner et al., 2019).

After determining inclusion/exclusion, the first author coded the country of data collection, sample characteristics, measures, main findings for each perfectionism dimension, and main findings of the 24 included studies. The second author independently checked these data. The inter-rater agreement was 92.93% in Step 1 and 97.83% in Step 2. Any discrepancies were resolved by consulting the original articles.

2.3 | Study quality assessment

We assessed the methodological quality of all included primary studies. Based on a previously used quality assessment tool (Grugan et al., 2021) and general recommendations for assessing primary study quality (Petticrew & Roberts, 2008), we developed an instrument for quality assessment tailored specifically for the present review. We included the following quality dimensions: (i) measurement of multidimensional perfectionism, (ii) measurement of sleep disturbance, (iii) research design, (iv) sample size, (v) sample design, and (vi) peer-review status. Table S2 displays details of the study quality assessment criteria. We computed an overall methodological quality score (MQS; range: 0–8) from the dimension-specific quality evaluations. The first and second authors independently assessed the methodological primary study quality (95.83% inter-rater agreement). We resolved any disagreements by consulting the original studies.

3 | RESULTS

3.1 | Study characteristics

Table 1 displays an overview of the samples, measures, and main findings of the 24 included studies. The median (range) publication year was 2017 (1994–2021), which attests to the timeliness of our systematic review. Of the included studies, 14 were conducted in Europe (Akram et al., 2015; Akram et al., 2017; Akram et al., 2020; Andersson et al., 2005; Araújo et al., 2017; Brand et al., 2015; Faber & Schlarb, 2018; Flaxman et al., 2018; Jansson-Frömmark & Linton, 2007; Johann et al., 2017; Lombardo et al., 2013; Lundh et al., 1994; Maia et al., 2011; Schmidt et al., 2018), five in North America (Molnar et al., 2020; Ogus, 2006; Raft, 2012; Trudel-Fitzgerald et al., 2017; Vincent & Walker, 2000), three in Asia (Lin et al., 2019; Palo & Das, 2021; Xie et al., 2020), one in Australia (Richardson & Gradisar, 2020), and one across various countries (Leguizamo et al., 2021). The median (range) sample size per study was 613 (35–2,286).

Regarding sample characteristics, five studies included clinical samples (Andersson et al., 2005; Johann et al., 2017; Lundh et al., 1994; Raft, 2012; Trudel-Fitzgerald et al., 2017), five studies included tertiary education student samples (Araújo et al., 2017; Brand et al., 2015; Maia et al., 2011; Molnar et al., 2020; Schmidt et al., 2018), 12 studies included other adult samples (e.g., community or working adults; Akram et al., 2015; Akram et al., 2017; Faber & Schlarb, 2018; Flaxman et al., 2018; Jansson-Frömmark & Linton, 2007; Leguizamo et al., 2021; Lombardo et al., 2013; Lundh et al., 1994; Molnar et al., 2020; Ogus, 2006; Palo & Das, 2021; Vincent & Walker, 2000), three studies included adolescent samples (Lin et al., 2019; Richardson & Gradisar, 2020; Xie et al., 2020), and one study included a mixed sample of tertiary education students and community adults (Akram et al., 2020).

Regarding perfectionism measures, 12 studies relied solely on the FMPS (Akram et al., 2020; Andersson et al., 2005; Brand et al., 2015; Faber & Schlarb, 2018; Flaxman et al., 2017; Jansson-Frömmark & Linton, 2007; Johann et al., 2017; Leguizamo et al., 2021; Lombardo et al., 2013; Lundh et al., 1994; Schmidt et al., 2018; Trudel-Fitzgerald et al., 2017), followed by the HFMPS (four studies; Maia et al., 2011; Ogus, 2006; Palo & Das, 2021; Raft, 2012), the APS-R (two studies; Lin et al., 2019; Xie et al., 2020), and the CAPS-14 (one study; Richardson & Gradisar, 2020). Five studies used multiple perfectionism measures (Akram et al., 2015, 2017; Araújo et al., 2017; Molnar et al., 2020; Vincent & Walker, 2000).

Regarding sleep disturbance measures, seven studies used the PSQI (Araújo et al., 2017; Faber & Schlarb, 2018; Johann et al., 2017; Lin et al., 2019; Lombardo et al., 2013; Molnar et al., 2020; Xie et al., 2020), seven studies used the ISI (Akram et al., 2015, 2020; Andersson et al., 2005; Brand et al., 2015; Richardson & Gradisar, 2020; Schmidt et al., 2018; Trudel-Fitzgerald et al., 2017), eight studies used self-developed scales (Akram et al., 2017; Brand et al., 2015; Leguizamo et al., 2021; Lundh et al., 1994; Maia et al., 2011; Ogus, 2006; Palo & Das, 2021; Raft, 2012), one study used other...
| Study | Country | Sample, n | Perfectionism measure | Sleep disturbance measure | MQS | Main findings |
|-------|---------|-----------|-----------------------|--------------------------|-----|---------------|
| Leguizamo et al. (2021) | Various countries | 310 high-performance athletes | FMPS | Self-developed two-item scale | 3 | Negative correlation of concern over mistakes with perceived sleep quality ($r = -0.17^{**}$) and hours of sleep ($r = -0.11$). Negative correlation of doubts about actions with perceived sleep quality ($r = -0.14^{*}$). (\+)
| Akram et al. (2020) | UK | 624 community adults and students | FMPS | ISI | 4 | Positive relation of doubts about actions ($\beta = 0.27^{***}$), but not concern over mistakes with insomnia severity after controlling for the other FMPS scales. (\+)
| Faber and Schlarb (2018) | Germany | 489 community adults | German FMPS | German PSQI | 4 | Lower concern over mistakes and doubts in participants with good sleep quality compared to participants with impaired sleep or chronic sleep problems ($\chi^2 = 30.78^{***}$). (\+)
| Schmidt et al. (2018) | Switzerland | 180 Swiss university students | French FMPS | French ISI | 3 | Positive correlations of concern of mistakes ($r = 0.23^{**}$) and doubts about actions ($r = 0.27^{**}$) with insomnia symptoms. (\+)
| Flaxman et al. (2018) | UK | 148 government employees | FMPS | Daily diary with four items from the KSD | 3 | No significant correlation of concern over mistakes and doubts with sleep quality. (\+)
| Johann et al. (2017) | Germany | 334 sleep laboratory patients | FMPS | PSQI, polysomnography parameters | 5 | Positive relation of concern over mistakes with a lower total sleep time and a higher number of awakenings in the first, but not in the second night. Doubts about actions not significantly related to polysomnography parameters. (\+)
| Trudel-Fitzgerald et al. (2017) | Canada | 853 cancer patients (298 male, 555 female) | French-Canadian FMPS | French-Canadian ISI | 4 | Positive correlation of concern over mistakes ($r = 0.14^{**}$) and doubts about actions ($r = 0.13^{*}$) with insomnia severity 2 months later in male but not in female participants. (\+)
| Brand et al. (2015) | Switzerland | 346 university students | German FMPS | German ISI, single items based on PSQI | 4 | Positive correlations of concern over mistakes and doubts with insomnia severity ($r = 0.20^{**}$) and awakenings after sleep onset ($r = 0.12^{*}$), but not with sleep quality, sleep duration, or sleep onset latency. (\+)
| No significant correlation of personal standards with perceived sleep quality or hours of sleep. (\+)
| No significant relation of personal standards with insomnia severity after controlling for the other FMPS scales. (\+)
| No significant difference in personal standards between participants with a good sleep quality and participants with impaired sleep or chronic sleep problems. (\+)
| No significant correlations between personal standards and insomnia symptoms. (\+)
| No significant correlation of personal standards with sleep quality. (\+)
| Positive correlation of personal standards with a lower total sleep time, longer wake time after sleep onset, and higher number of awakenings in the first, but not in the second night. (\+)
| No significant correlation between personal standards and insomnia severity. (\+)
| Positive correlation of personal standards with insomnia severity ($r = 0.14^{**}$) and awakenings after sleep onset ($r = 0.12^{*}$), but not with sleep quality, sleep duration, or sleep onset latency. (\+)
| Study                        | Country | Sample, n | Perfectionism measure | Sleep disturbance measure | MQS | Main findings                                                                 |
|-----------------------------|---------|-----------|-----------------------|---------------------------|-----|-------------------------------------------------------------------------------|
| Lombardo et al. (2013)      | Italy   | 819 general population adults | Italian FMPS | Italian PSQI | 4   | Positive correlation of concern over mistakes and doubts with current ($r = 0.18^{**}$) and future ($r = 0.15^{**}$) insomnia symptoms. (+) |
| Lundh et al. (1994)         | Sweden  | 383 community adults, 70 patients with insomnia | Swedish FMPS | 13 items adopted from the USI and BNSQ | 4   | Positive correlation of concern over mistakes ($r = 0.28^{**}$) and doubts about actions ($r = 0.26^{**}$) with sleep problems. Higher concern over mistakes ($t = 4.91^{***}$) and doubts about actions ($t = 3.42^{**}$) in patients with insomnia compared to community adults (+) |
| Jansson-Fröjmark and Linton (2007) | Sweden  | 1936 community adults | Swedish FMPS | Insomnia diagnosed based on the BNSQ and the USI | 5   | Concern over mistakes related to current (OR = 1.03) and future insomnia (1-year follow-up; OR = 1.02) beyond personal standards, no significant relation after controlling for depression and anxiety. (+) |
| Andersson et al. (2005)     | Sweden  | 256 patients with tinnitus | FMPS | ISI | 4   | Positive correlation of concern over mistakes ($r = 0.15$), but not doubts about actions with insomnia severity. (+) |

**TABLE 1** (Continued)

| Multidimensional perfectionism assessed with the HFMPS |
|-------------------------------------------------------|
| Palo and Das (2021) | India | 419 professionals | HFMPS | hours of sleep (single item) | 3   | Socially prescribed perfectionism not significantly related to hours of sleep. (○) |
| Richardson and Gradisar (2020) | Australia | 281 adolescents | CAPS-14 | 6-item modified ISI | 4   | Positive correlation of socially prescribed perfectionism with insomnia severity ($r = 0.33^{**}$). (+) |
| Raft (2012) | USA | 35 community adults with DSM-IV-TR insomnia | HFMPS | Single-item scales (self-developed) | 1   | After controlling for self-oriented perfectionism and other-oriented perfectionism, negative relation of socially prescribed perfectionism with difficulty staying asleep ($β = -0.11$) but no significant relation with the number of hours spent sleeping and difficulty falling asleep. (-) |

No significant correlation between self-oriented perfectionism and hours of sleep. (○)
| Study                        | Country       | Sample, n | Perfectism measure | Sleep disturbance measure | MQS | Main findings                                                                 |
|------------------------------|---------------|-----------|--------------------|--------------------------|-----|------------------------------------------------------------------------------|
| Maia et al. (2011)           | Portugal      | University students (N = 870 at T1 to 305 at T3) | Portuguese HFMPS         | Self-developed 2-item scale | 4   | Positive correlation of socially prescribed perfectionism with difficulty initiating sleep and difficulty maintaining sleep across three time points (r = 0.16** to 0.33**). Sleep disturbances did not predict socially prescribed perfectionism one or 2 years later beyond baseline socially prescribed perfectionism, prior, and concurrent sleep disturbances. (+) |
| Small, inconsistent positive correlations of self-oriented perfectionism with difficulty initiating sleep and difficulty maintaining sleep across three time points (r = 0.05 to 0.19**). Sleep disturbances did not predict self-oriented perfectionism 1 or 2 years later beyond baseline self-oriented perfectionism, prior, and concurrent sleep disturbances. (+) |
| Ogus (2006)                  | Canada        | 594 teachers, 317 physicians, 298 managers | HFMPS                 | 1 item assessing work-related sleep difficulties | 3   | Positive correlations of socially prescribed perfectionism with work-related sleep difficulties in teachers (r = 0.36***), physicians (r = 0.31***), and managers (r = 0.34***). (+) |
| Positive correlations of self-oriented perfectionism with work-related sleep difficulties in teachers (r = 0.26***), and managers (r = 0.25***), but not in physicians. (+) |
| Multidimensional perfectionism assessed with the APS-R | Lin et al. (2019) | China 1664 adolescents | Chinese APS-R | Chinese PSQI | 4 | Positive correlation of discrepancy with the PSQI total score (r = 0.25**) and all PSQI subscales (r = 0.11** to 0.21**), except habitual sleep efficiency and used sleep medicine. (+) | No significant correlations between standards and the PSQI scales. (○) |
| Multidimensional perfectionism assessed with multiple measures | Xie et al. (2020) | China 2286 adolescents | Chinese APS-R | Chinese PSQI | 4 | Positive correlations of discrepancy with all PSQI subscales (r = 0.11** to 0.23**), except habitual sleep efficiency. (+) | No significant correlations between standards and the PSQI subscales. (○) |
| Molnar et al. (2020)         | Canada        | 335 university students (Sample 1), 296 community adults (Sample 2) | APS-R, HFMPS | PSQI | 4 | Sample 1: Positive correlations of discrepancy with sleep disturbance (r = 0.23**), sleep latency (r = 0.14**), and sleep medication use (r = 0.19**). Sample 2: Correlations of socially prescribed perfectionism with lower sleep duration (r = 0.16), sleep disturbance (r = 0.16), sleep latency (r = 0.18**), lower sleep quality (r = 0.18**), and sleep medication use (r = 0.16**). (+) | No significant correlations of standards and personal standards with the PSQI subscales in bivariate correlation analyses. Indirect relation of standards with lower sleep disturbances and shorter sleep latency through lower stress, after controlling for discrepancy, sex, chronic illness, and age. Indirect relation of self-oriented perfectionism with lower sleep disturbances, shorter sleep latency, lower sleep efficiency, and better sleep quality through lower stress, after controlling for socially prescribed perfectionism, sex, chronic illness, and age. (−) |
| Study                        | Country         | Sample, n | Perfectionism measure | Sleep disturbance measure | MQS | Main findings                                                                 |
|------------------------------|-----------------|-----------|-----------------------|---------------------------|-----|--------------------------------------------------------------------------------|
| Akram et al. (2017)          | UK              | 78        | FMPS, HFMPS           | Screening questionnaire    | 2   | Increased concern over mistakes ($d = 0.60^*$) and doubts about actions $d = 0.60^*$, but not socially prescribed perfectionism, in participants with insomnia compared to normal sleepers. (+) |
| Araújo et al. (2017)         | UK, Switzerland | 483       | MIPS, FMPS            | PSQI                       | 4   | Positive correlation of negative reactions to imperfection ($r = 0.26^{{{**}}}^*$) and concern over mistakes and doubts ($r = 0.36^{{{***}}}^*$) with the PSQI. (+) |
| Akram et al. (2015)          | UK              | 76        | FMPS, HFMPS           | ISI                        | 3   | Positive correlation of doubts about actions ($r = 0.26^*$), with insomnia severity at baseline, but not at follow-up. Positive effect of doubts about actions on insomnia symptoms one year later ($\beta = 0.28^*$). Concern over mistakes and socially prescribed perfectionism not significantly related to insomnia severity. (+) |
| Vincent and Walker (2000)    | Canada          | 58        | FMPS, HFMPS           | Chronic insomnia           | 3   | Higher concern over mistakes ($d = 0.76^*$), doubts about action ($d = 0.94^*$), and socially prescribed perfectionism ($d = 0.63^*$) in participants with chronic insomnia than in healthy controls. (+) |

Note: APS-R, Almost Perfect Scale – Revised (Slaney et al., 2001); BNSQ, Basic Nordic Sleep Questionnaire (Gislason et al., 1988); CAPS-14, Child-Adolescent Perfectionism Scale (based on the HFMPS; Flett et al., 2016); DSM-IV-TR, Diagnostic and Statistical Manual of Mental Disorders, fourth edition, text revision; FMPS, Frost Multidimensional Perfectionism Scale; HFMPS, Hewitt and Flett (1991) Multidimensional Perfectionism Scale; ISI, Insomnia Severity Index (Bastien et al., 2001); KSD, Karolinska Sleep Diary (Åkerstedt et al., 1994); MQS, methodological quality score; OR, odds ratio; PSQI, Pittsburgh Sleep Quality Index (Buysse et al., 1989); SCID, Clinical Interview for DSM-IV; USI, Uppsala Sleep Inventory (Liljenberg et al., 1988).

(+) indicates at least one positive association between perfectionistic concerns/perfectionistic strivings and sleep disturbance.

(○) indicates no statistically significant association between perfectionistic concerns/perfectionistic strivings and sleep disturbance.

(−) indicates at least one negative association between perfectionistic concerns/perfectionistic strivings and sleep disturbance.

*p < 0.05, **p < 0.01, ***p < 0.001.

*These findings were provided by the study authors upon request.
validated multi-item measures (Jansson-Frömark & Linton, 2007), one study used sleep diary data (Flaxman et al., 2018), one study used polysomnography (Johann et al., 2017), and one study (Vincent & Walker, 2000) diagnosed chronic insomnia based on a combination of self-report, sleep diary data, and a modified Clinical Interview for Diagnostic and Statistical Manual of Mental Disorders, fourth edition (DSM-IV).

3.2 | Methodological study quality and critical considerations

Table S3 provides the details of the study quality assessment for all included studies. The overall mean (SD, range) MQS was 3.58 (0.88, 1–5) between the included studies. Regarding the research design, no study used an experimental approach, and only one study used a longitudinal design controlling for baseline levels (Maia et al., 2011). Regarding sample size, 18 studies (75%) used adequate sample sizes, whereas six studies (25%) used sample sizes that were too small according to common recommendations. In all, 21 studies used convenience samples and three (8%) used random samples. In all, 22 (92%) of the included studies were published in peer-reviewed journals and two studies (8%) were doctoral dissertations.

3.3 | The link between perfectionistic concerns and sleep disturbance

Perfectionistic concerns were robustly related to sleep disturbance (see seventh column of Table 1). In all, 21 of the included studies (88%) reported significant positive relations of at least one perfectionistic concerns indicator with at least one sleep disturbance indicator. The positive association of perfectionistic concerns with sleep disturbance was evident across all geographic regions and sample types (adolescent, tertiary education student, clinical, and working/community adult samples). Regarding perfectionism measures, the perfectionistic concerns–sleep disturbance link showed in the HFMPs, FMPS, APS-R, CAPS-14, and MIPS. Regarding sleep disturbance measures, positive perfectionistic concerns–sleep disturbance correlations showed in the PSQI, ISI, self-developed scales, and polysomnography, but not sleep diary data (Flaxman et al., 2018). Relations with distinct components of sleep disturbance (e.g., assessed with the PSQI subscales) varied more strongly in magnitude and statistical significance than relations with composite scores of sleep disturbance measures (e.g., Brand et al., 2015; Lin et al., 2019; Molnar et al., 2020; Xie et al., 2020).

Only three studies (13%) reported no significant relation between perfectionistic concerns and sleep disturbance (Palo & Das, 2021; Raft, 2012; Vincent & Walker, 2000). In one such study, HFMPs socially prescribed perfectionism was unrelated to a single-item assessment of sleep duration in 419 Indian professionals (Palo & Das, 2021). In a different study, HFMPs socially prescribed perfectionism was negatively related to difficulty staying asleep (after controlling for two other perfectionism scales) in 35 community adults with DSM-IV-text revision (DSM-IV-TR) insomnia (Raft, 2012). Finally, concern over mistakes and doubts were unrelated to sleep quality assessed with a daily diary in 148 government employees (Flaxman et al., 2018). The null findings in the Palo and Das (2021) study may be due to the unvalidated single-item sleep disturbance measure. Similarly, in the Raft (2012) study, the sample size was tiny, which might explain the unexpected negative relation of HFMPs socially prescribed perfectionism with difficulty staying asleep. In contrast, the findings of Flaxman et al. (2018) indicate that the perfectionistic concerns–sleep disturbance link might not show in sleep diary data. This assumption is further supported by the Vincent & Walker (2000) study, which found no significant correlation of concern over mistakes and doubts about actions with sleep diary data in 58 Canadian community adults. Overall, the methodological quality of studies reporting a positive relation of perfectionistic concerns with at least one indicator of sleep disturbance (mean [SD] MQS 3.71 [0.72]) was descriptively higher than that of studies that reported exclusively non-significant relations (mean [SD] MQS 2.70 [1.53]). However, this difference did not reach statistical significance (t[22] = 2.06, p = 0.052).

3.4 | The link between perfectionistic strivings and sleep disturbance

The empirical findings on relations between perfectionistic strivings and sleep disturbance were highly heterogeneous (see eighth column of Table 1). Most studies (n = 16; 67%) reported no significant relations between perfectionistic strivings measures and sleep disturbance. Seven studies (29%) reported at least one positive relation between a perfectionistic strivings measure and an indicator of sleep disturbance. Finally, one study (4%) reported negative relations between perfectionistic strivings and sleep disturbance (Molnar et al., 2020).

Regarding perfectionism measures, non-significant relations of perfectionistic strivings and sleep disturbance were evident across the FMPS, HFMPs, APS-R, and MIPS. In contrast, studies reporting positive relations between perfectionistic strivings and sleep disturbance used the FMPS or HFMPs, but not the APS-R or MIPS.

Regarding sleep disturbance measures, non-significant relations showed across validated self-report instruments of sleep disturbance, sleep diaries, and single-item sleep disturbance measures. Regarding different populations, non-significant relations emerged in adolescent, tertiary education student, adult community/working, and clinical samples. No measure of sleep disturbance was noticeably consistently related to perfectionistic strivings. Additionally, the statistically significant relations between perfectionistic strivings and sleep disturbance were comparatively small.

Concerning methodological quality, studies reporting positive relations between perfectionistic strivings and sleep disturbance (mean [SD] MQS 3.57 [1.27]) and studies reporting non-significant
relations (mean [SD] MQS 3.57 [0.73]) did not differ, (t[21] = 0.02, p = 0.983). Importantly, the sample sizes of studies reporting non-significant relations (mean [SD] sample size 667 [697]) were descriptively larger than of studies reporting positive relations (mean [SD] sample size 504 [399]). Thus, there was no indication that low statistical power resulting from small sample sizes in studies with non-significant findings might explain the null findings for perfectionistic strivings and sleep disturbance.

3.5 Mediators of the perfectionism–sleep disturbance link

Table 2 displays an overview of the included mediation studies (n = 8). For perfectionistic concerns, dysfunctional cognitive processes, and psychological distress mediated relations with sleep disturbance. Dysfunctional sleep-related cognitions (e.g., “I am worried that I may lose control over my abilities to sleep.”) mediated the effect of FMPS doubts about actions on insomnia severity (Akram et al., 2020), worry and rumination mediated the effect of FMPS concern over mistakes and doubts on poor sleep quality (Flaxman et al., 2018), and worry and rumination mediated the effect of APS-R discrepancy on poor sleep quality (Lin et al., 2019). Regarding psychological distress, anxiety mediated the effect of FMPS doubts about actions on insomnia severity (Akram et al., 2020), perceived stress mediated the effects of APS-R discrepancy and HFMPs socially prescribed perfectionism on sleep disturbance (Molnar et al., 2020) and anxiety, but not depression, mediated the effects of FMPS concern over mistakes and doubts about actions on the probability to experience insomnia (Akram et al., 2017). Moreover, anxiety mediated the effect of insomnia on doubts about actions 1 year later (without controlling for baseline levels of doubts about actions; Akram et al., 2015). One additional study (Schmidt et al., 2018) found that a measure capturing a combination of counterfactual thoughts and emotions at bedtime mediated the effects of FMPS concern over mistakes and doubts about actions on insomnia severity. For perfectionistic strivings, perceived stress mediated the indirect negative effect of APS-R standards and FMPS personal standards on sleep disturbance (Molnar et al., 2020). Additionally, vulnerability to stress mediated the relation of self-oriented perfectionism (critical and striving) with insomnia in female participants, and anxiety mediated the relation of self-oriented perfectionism (critical) on insomnia in male participants (Akram et al., 2015). Importantly, none of the included mediation studies investigated longitudinal processes controlling for baseline levels of perfectionism or sleep disturbance.

4 DISCUSSION

The assumption that perfectionism is closely linked to sleep disturbance is broadly accepted. Yet, previous empirical work on this question has produced conflicting results. In this first systematic review addressing multidimensional perfectionism and sleep disturbance, we clarified the link between the two constructs using the two-dimensional perfectionism model. For perfectionistic concerns (i.e., worrying about the consequences of imperfections), a robust relation with sleep disturbance emerged. For perfectionistic strivings (i.e., setting exceedingly high standards for oneself), comparatively small and inconsistent relations with sleep disturbance emerged. Finally, cross-sectional mediation studies indicated that dysfunctional cognitive processes and psychological distress might underlie the perfectionistic concerns–sleep disturbance link.

4.1 Theoretical and practical implications

The differential relations of perfectionistic concerns and perfectionistic strivings with sleep disturbance highlight the importance of distinguishing between the two perfectionism dimensions in sleep research. Formerly, unidimensional perfectionism conceptualisations (e.g., Huang et al., 2020) and the multitude of perfectionism measures might have contributed to confusion about the perfectionism–sleep disturbance link. In this systematic review, the heuristic two-dimensional perfectionism model (e.g., Stoeber & Otto, 2006) provided a clearer picture.

Persons with high perfectionistic concerns appeared to be prone to experiencing problems falling asleep, problems in sleep continuity, problems regarding sleep duration, and dissatisfaction with their sleep quality. These robust relations with sleep disturbance indicators mirror previous findings that relate perfectionistic concerns to various forms of poor mental (e.g., Limburg et al., 2017) and physical health (e.g., Molnar et al., 2006). Regarding mechanisms underlying the perfectionism–sleep disturbance link, the available cross-sectional mediation studies suggest that dysfunctional cognitive processes and psychological distress are potential mediators. Notably, not all forms of psychological distress (i.e., anxiety, but not depression; Akram et al., 2017) mediated the perfectionism–sleep disturbance link. These differential patterns may have emerged because anxiety often precedes sleep disturbance, whereas depression is frequently viewed as a consequence of sleep disturbance (Akram et al., 2017; Ford & Kamerow, 1989).

Perfectionistic strivings were only weakly and, mostly, non-significantly related to sleep disturbance. Notably, almost all studies that identified significant relations found perfectionistic strivings to be related to more pronounced sleep disturbance (e.g., Lundh et al., 1994). Only one study (Molnar et al., 2020) found negative relations of perfectionistic strivings and sleep disturbance. This relation was only present when perfectionistic concerns and other covariates were controlled for. Thus, as in other contexts (e.g., Limburg et al., 2017), there was little evidence that perfectionistic strivings are “positive” or “adaptive” in the context of sleep.

The studies reporting null-relations of perfectionistic strivings and sleep disturbance used large samples and great width of measures. Hence, the statistically non-significant relations are unlikely to be a methodological artefact. It appears more plausible that perfectionistic strivings have positive and negative effects on sleep disturbance that might neutralise: on the one hand, perfectionistic
strivings contain elements of conscientiousness and extraversion (Stricker et al., 2019) that contribute to better sleep (e.g., Stephan et al., 2018) and on the other hand, perfectionistic strivings also contain an element of neuroticism (Stricker et al., 2019) associated with increased sleep disturbance (e.g., Stephan et al., 2018). Previous research shows that contextual factors determine whether adaptive or maladaptive consequences of perfectionistic strivings prevail (e.g., Chang et al., 2008). Also for sleep disturbance, this systematic review identified some hints pointing to required conditions for effects of perfectionistic strivings to emerge. In one study with sleep laboratory patients (Johann et al., 2017), FMPS personal standards were related to sleep disturbance in the first night (i.e., presumably under increased stress due to the unfamiliar sleep laboratory setting), but not in the second night (i.e., presumably under reduced stress). Similarly, in a study with working adults (Ogus, 2006), positive relations of HFMPS self-oriented perfectionism with sleep disturbance emerged in managers and teachers, but not in physicians. Interestingly, in this study, physicians also reported the lowest levels of burnout compared to the other two professions. Thus, persons with high

| Study | Country | Sample, n | Perfectionistic concerns/strivings measure | Sleep disturbance measure | Main mediation findings |
|-------|---------|-----------|------------------------------------------|--------------------------|-------------------------|
| Akram et al. (2020) | UK | 624 community adults and students | FMPS | ISI | Dysfunctional sleep-related cognition and anxiety mediated the positive effect of doubts about actions on insomnia severity |
| Molnar et al. (2020) | Canada | 335 university students (Sample 1), 296 community adults (Sample 2) | APS-R, HFMPS | PSQI | Perceived stress mediated the positive effects of discrepancy and socially prescribed perfectionism as well as the negative effects of standards and self-oriented perfectionism on sleep disturbance |
| Richardson and Gradisar (2020) | Australia | 281 adolescents | CAPS-14 | Six-item modified ISI | For female participants, vulnerability to stress accounted for the relation of self-oriented perfectionism (critical) and self-oriented perfectionism (striving), but not socially prescribed perfectionism with insomnia. For male participants, anxiety diagnosis accounted for the relation of self-oriented perfectionism (critical) with insomnia |
| Lin et al. (2019) | China | 1664 adolescents | Chinese APS-R | Chinese PSQI | Worry and rumination mediated the positive effect of discrepancy on poor sleep quality |
| Schmidt et al. (2018) | Switzerland | 180 Swiss university students | French FMPS | French ISI | Counterfactual thoughts and emotions at bedtime largely mediated the positive effects of concern over mistakes and doubts about actions on insomnia severity |
| Flaxman et al. (2018) | UK | 148 government agency employees | FMPS | Four items from the KSD | Worry and rumination mediated the negative effect of concern over mistakes and doubts on sleep quality |
| Akram et al. (2017) | UK | 78 community adults (39 with insomnia, 39 normal sleepers) | FMPS, HFMPS | Screening questionnaire assessing DSM-5 insomnia criteria | Anxiety, but not depression, partially mediated the positive effects of concern over mistakes and doubts about actions on the probability to experience insomnia |
| Akram et al. (2015) | UK | 76 British community adults (57 at follow-up) | FMPS, HFMPS | ISI | Anxiety mediated the effect of insomnia on doubts about actions 1 year later |

Note: APS-R, Almost Perfect Scale – Revised (Slaney et al., 2001); DSM-5, Diagnostic and Statistical Manual of Mental Disorders, fifth edition; FMPS, Frost Multidimensional Perfectionism Scale; HFMPS, Hewitt and Flett’s (1991) Multidimensional Perfectionism Scale; ISI, Insomnia Severity Index (Bastien et al., 2001); KSD, Karolinska Sleep Diary (Åkerstedt et al., 1994); MIPS, Multidimensional Inventory of Perfectionism in Sports (Stoeber et al., 2006); PSQI, Pittsburgh Sleep Quality Index (Buysse et al., 1989); USI, Uppsala Sleep Inventory (Liljenberg et al., 1988).
perfectionistic strivings might be particularly vulnerable to sleep disturbance when they experience increased stress. However, in a different study (Molnar et al., 2020), self-reported stress over the last month did not moderate the perfectionistic strivings–sleep disturbance link in university students and community adults.

Regarding differential relations of perfectionistic strivings measures with sleep disturbance, it appears noteworthy that HFMSP self-oriented perfectionism and FMPS personal standards, but not APS-R standards, were sometimes positively related to sleep disturbance. Thus, as in other fields (Blasberg et al., 2016), APS-R standards may capture less maladaptive perfectionism elements in the context of sleep disturbance. More broadly, this finding shows that different subscales used as indicators of the broader perfectionistic concerns/strivings dimensions possess unique correlates and characteristics (also see Smith et al., 2019; Stricker et al., 2019).

The differential relations of perfectionistic concerns and perfectionistic strivings with sleep disturbance also bear some broader implications for cognitive models of sleep disturbance. The cognitions associated with perfectionistic concerns may play a more pronounced role in sleep disturbance than the cognitions associated with perfectionistic strivings. Specifically, the robust and substantial perfectionistic concerns–sleep disturbance link supports the assumed role of worry and rumination in sleep disturbance (Espie, 2002; Harvey, 2002; Lundh & Broman, 2000). However, given the weak perfectionistic strivings–sleep disturbance link, there was less evidence for the assumed importance of exceedingly high personal standards in maladaptive sleep interpreting cognitions (Lundh & Broman, 2000). Having said that, perfectionism scales assess the general tendency to hold exceedingly high standards. Hence, as perfectionism levels may differ between life domains (Haase et al., 2013), persons with sleep difficulties may hold high standards specifically for sleep.

Besides theoretical advances, the present study also bears some practical implications. Yet, we urge to interpret any practical implications as preliminary because future research with stronger study designs is needed to establish causal links between perfectionism and sleep disturbance (see the critical considerations and future research directions section). Given the substantial perfectionistic concerns–sleep disturbance link, therapists working with patients with insomnia may benefit from exploring potentially underlying perfectionistic concerns. Likewise, therapists working with patients reporting increased perfectionistic concerns might proactively explore sleep disturbance. Regarding psychotherapeutic treatment, cognitive behavioural therapy for insomnia (CBT-I) could be enriched by interventions targeting perfectionistic concerns. Perfectionism interventions typically include elements of cognitive restructuring (e.g., modifying perfectionistic interpretations and negative performance-based self-evaluations) and behavioural experiments (e.g., testing whether worries about the consequences of being imperfect prove true; Lloyd et al., 2015). Cognitive restructuring and behavioural experiments are already central elements of CBT-I (Jansson-Fröjmark & Norell-Clarke, 2018). Hence, perfectionism interventions could be easily integrated into programmes targeting sleep disturbance. Similarly, also CBT for perfectionism could be routinely enriched with elements of CBT-I for patients that report comorbid sleep difficulties (e.g., psychoeducation about sleep-related processes or relaxation techniques).

4.2 Critical considerations and future research directions

The present systematic review revealed several gaps in the empirical literature on perfectionism and sleep disturbance. Current research gaps and recommendations for promising future research directions centre around measurement issues, moderating variables, longitudinal research designs, and mediating processes.

Regarding the measurement of sleep disturbance, only one study assessed objective sleep markers (Johann et al., 2017). Self-reported sleep disturbance relates substantially to objective sleep markers (e.g., Akerstedt et al., 1994). Yet, personality traits are systematically linked to misperceptions of one’s sleep (Fernandez-Mendoza et al., 2011). Thus, sole reliance on self-reports for assessing the perfectionism–sleep disturbance relationships may be problematic. The finding that the perfectionistic concerns–sleep disturbance link did not show in sleep diary data (Flaxman et al., 2017) hints at a potential recall bias in persons with high perfectionistic concerns that distorts retrospective self-reports of sleep disturbance covering longer time intervals. To avoid any self-report biases associated with perfectionistic tendencies, more research using behavioural and polysomnographic sleep markers is needed. Studies combing objective and subjective sleep disturbance measures could also clarify whether perfectionism systematically explains discrepancies between objective sleep disturbance indicators and perceptions of one’s sleep (sleep state misperception).

Little is known regarding conditions that moderate the perfectionism–sleep disturbance link. Previous work suggests that perfectionistic strivings are particularly problematic in the face of failure (Stoeber et al., 2014). Hence, future moderator studies could test whether the perfectionistic strivings–sleep link hinges on the severity of sleep disturbance (i.e., experiences of repeated failure in sleep initiation or maintenance). The two-dimensional perfectionism model also allows insights into the interaction of perfectionism dimensions. Whether perfectionistic strivings are dysfunctional or not partly depends on the presence of perfectionistic concerns (e.g., Taylor et al., 2016). In the context of sleep, future moderator studies could test whether exceedingly high standards for one’s sleep only become problematic if one is prone to worrying about the consequences of failing to meet these standards. Additionally, some researchers assumed a moderating role of stress for the perfectionism–sleep relation (e.g., Johann et al., 2017, but see Molnar et al., 2020). Future laboratory studies are needed to manipulate stress levels and other contextual factors experimentally.

A different significant limitation of the current literature is the lack of longitudinal research controlling for baseline levels. Due to
the missing longitudinal investigations, the temporal ordering and causal relation of perfectionism and sleep disturbance are unclear. To date, only one study (Maia et al., 2011) has studied longitudinal relations of perfectionism and sleep disturbance with controlling for baseline. However, this study simultaneously entered concurrent and prior sleep disturbance as predictors of multidimensional perfectionism, complicating the interpretation of longitudinal effects. Additionally, no study has investigated the effects of perfectionism on sleep disturbance after controlling for baseline sleep disturbance. Longitudinal effects of perfectionistic concerns on mental health difficulties (e.g., Smith et al., 2021) and broader personality traits on sleep disturbance (e.g., Križan et al., 2019) are well established. Hence, longitudinal effects of perfectionistic concerns on sleep disturbance appear plausible. Yet, sleep disturbance may also shape personality development (Stephan et al., 2018), and third variables, such as environment effects (e.g., through adverse childhood experiences), may influence perfectionism and sleep simultaneously (Križan et al., 2021). Longitudinal research with multiple time-points, including assessments of potentially confounding factors, is needed to establish whether perfectionism and sleep disturbance are causally linked. Moreover, incremental utility studies are required to test whether perfectionism explains the development of sleep disturbance beyond well-established personality dimensions (e.g., neuroticism).

Regarding processes underlying the perfectionism–sleep disturbance relation, the available mediation studies provide only limited insights. To date, no mediation exists that controls for baseline levels. This is problematic because cross-sectional tests of assumed longitudinal processes introduce methodological biases (e.g., Maxwell & Cole, 2007). Another central limitation of current mediation studies lies in the statistical techniques employed to infer mediation. Some mediation studies (e.g., Akram et al., 2015) used simple hierarchical regression models, which have significant shortcomings (i.e., they do not test the assumed indirect effects; Hayes, 2018). Only recently, more advanced, and rigorous statistical techniques have been used to test variables that mediate the perfectionism–sleep disturbance link (e.g., Akram et al., 2020; Molnar et al., 2020). Future longitudinal mediation studies may benefit from applying state-of-the-art techniques for assessing mediation (e.g., Hayes, 2018; Nguyen et al., 2021). This future work could explicitly test assumptions made in the theoretical literature on perfectionism and sleep. For example, mediation studies are needed to test whether the general tendency to hold excessively high personal standards (i.e., perfectionistic strivings) translates into more specific sleep-related mal-adaptive thought patterns (e.g., regarding the required amount of sleep), and whether these cognitions explain potential effects of perfectionistic strivings on sleep disturbance (Lundh & Broman, 2000). Similarly, future longitudinal studies could test whether the influence of perfectionistic concerns on cognitive and emotional arousal mediates the link with sleep disturbance (Lundh & Broman, 2000). On a more general level, these future mediation studies could also clarify the role of perfectionism within broader cognitive theories of insomnia, e.g., by testing to which degree perfectionism confers a risk factor for hindering sleep interpreting and sleep interfering processes (Espie, 2002; Harvey, 2002).

### 4.3 Limitations

The present systematic review has some limitations. First, we predominantly relied on the peer-reviewed literature. Thus, publication bias might have distorted our conclusions. Yet, we included some unpublished results, and many of the included studies reported non-significant relations. Second, we did not pre-register the procedure for the systematic review. Third, the samples included in this systematic review were highly heterogeneous. On the one hand, this is a strength of this review. For example, we could show that the relation of perfectionistic concerns with sleep disturbance replicates across student, clinical, and community populations. On the other hand, differences in sample composition might partly explain the heterogeneity in findings, particularly for perfectionistic strivings. Further research using a standardised set of instruments across diverse samples is needed to isolate sample composition and measurement effects. A fourth limitation is our reliance on self-report measures of perfectionism. This approach was inevitable because no validated behavioural perfectionism indicators exist, and no informant-report studies were available. However, one innovative study has demonstrated increased perfectionistic tendencies (e.g., making additional written comments in psychometric testing) in patients with insomnia compared to healthy controls (Regen et al., 2015). Hence, there is some preliminary evidence that the perfectionism–sleep disturbance link exists beyond self-reports. Yet, further validation of behavioural perfectionism measures is needed to draw robust conclusion. Fifth, we qualitatively rather than quantitatively aggregated findings on the perfectionism–sleep disturbance link. We chose this approach because the broad spectrum of sleep disturbance measures did not allow meaningful statistical aggregation.

### 5 Conclusion

This systematic review showed that two perfectionism dimensions are differentially related to sleep disturbance. Perfectionistic concerns were substantially associated with sleep disturbance. In contrast, perfectionistic strivings were only weakly and inconsistently associated with sleep disturbance. Dysfunctional cognitive processes and psychological distress may mediate the perfectionistic concerns–sleep disturbance link. For neither perfectionism dimension, we found convincing evidence for positive or adaptive effects on sleep. Future longitudinal and intervention research is needed to clarify whether addressing perfectionism may aid in treating sleep disturbance.

### Conflict of Interest

No potential conflict of interest was reported by the authors.
REFERENCES

References marked with an asterisk (*) were included in the systematic review.

Akersstedt, T., Hume, K. E. N., Minors, D., & Waterhouse, J. I. M. (1994). The subjective meaning of good sleep, an intradividual approach using the Karolinska Sleep Diary. Perceptual and Motor Skills, 79, 287-296. https://doi.org/10.2466/pms.1994.79.1.287

Akkermans, D., Schotman, P. D., Vermeulen, I. H., & Zwinderman, A. H. (2012). The fallibility of the Dutch-translation of the Pediatric Sleep Questionnaire (PSQ-D). Sleep Medicine Reviews, 16, 271-276. https://doi.org/10.1016/j.smrv.2011.08.002

Alarcón-Staude, M., & Piqueras, M. (2019). Multidimensional perfectionism and insomnia: A systematic review. Sleep Medicine Reviews, 48, 1-13. https://doi.org/10.1016/j.smrv.2019.05.001

Alpers, C. J., & Zuberbier, T. (2014). An overview of adverse drug reactions in sleep and circadian rhythm disorders. Sleep Medicine, 15, 1163-1170. https://doi.org/10.1016/j.smrv.2014.08.002

Andersson, G., Åkerstedt, T., Gillberg, I., & Gillberg, C. (2003). Sleep disturbances in young children: a population-based study of prevalence, risk factors, and association with behavior and development. Sleep, 26, 160-169. https://doi.org/10.1093/sleep/26.2.160

Asevedo, M. H., Bos, S. C., Soares, M. J., Pereira, A. T., Maia, B., Gomes, A. A., & Macedo, A. (2010). Longitudinal study on perfectionism and sleep disturbance. The World Journal of Biological Psychiatry, 11, 476-485. https://doi.org/10.3109/15622970903304467

Baglioni, C., Battagliese, G., Feige, B., Spiegelhalder, K., Nissen, C., Voderholzer, U., Lombardo, C., & Riemann, D. (2011). Insomnia as a predictor of depression: A meta-analytic evaluation of longitudinal epidemiological studies. Journal of Affective Disorders, 135, 10-19. https://doi.org/10.1016/j.jad.2011.01.011

Barnes, C. M., & Drake, C. L. (2015). Prioritizing sleep health: Public health policy recommendations. Perspectives on Psychological Science, 10, 733-737. https://doi.org/10.1177/1745691615598509

Bartczak, M., & Ogińska-Bulk, N. (2012). Workaholism and mental health among Polish academic workers. International Journal of Occupational Safety and Ergonomics, 18, 3-13. https://doi.org/10.1080/10030548.2012.11076910

Bartel, K. A., Gradisar, M., & Williamson, P. (2015). Protective and risk factors for adolescent sleep: A meta-analytic review. Sleep Medicine Reviews, 21, 72-85. https://doi.org/10.1016/j.smrv.2014.08.002

Bastien, C. H., Vallières, A., & Morin, C. M. (2001). Validation of the insomnia severity index as an outcome measure for insomnia research. Sleep Medicine, 2, 297-307. https://doi.org/10.1016/S1389-9457(00)00065-4

Berglund, M. (1986). Suicide in male alcoholics with peptic ulcers. Alcoholism: Clinical and Experimental Research, 10, 631-634. https://doi.org/10.1111/j.1530-2726.1986.tb05158.x

Besser, A., Flett, G. L., Hewitt, P. L., & Guez, J. (2008). Perfectionism, and cognitions, affect, self-esteem, and physiological reactions in a performance situation. Journal of Rational-Emotive & Cognitive-Behavior Therapy, 26, 206-228. https://doi.org/10.1007/s10942-007-0067-0

Bieling, P. J., Israel, A. L., & Antony, M. M. (2004). Is perfectionism good, bad, or both? Examining models of the perfectionism construct. Personality and Individual Differences, 36, 1373-1385. https://doi.org/10.1016/S0191-8869(03)00235-6

Blasberg, J. S., Hewitt, P. L., Flett, G. L., Sherry, S. B., & Chen, C. (2016). The importance of item wording: The distinction between measuring high standards versus measuring perfectionism and why it matters. Journal of Psychoeducational Assessment, 34, 702-717. https://doi.org/10.1177/0734282916653701

Bos, S. C., & Macedo, A. F. (2019). Literature review on insomnia (2010–2016). Biological Rhythm Research, 50, 94-163. https://doi.org/10.1080/09292101.2017.1413766

*Brand, S., Kirov, R., Kalak, N., Gerber, M., Pühse, U., Lemola, S., Correll, C., Cortese, S., Meyer, T., & Holsboer-Trachsler, E. (2015). Perfectionism related to self-reported insomnia severity, but not when controlled for stress and emotion regulation. Neuropsychiatric Disease and Treatment, 11, 263-271. https://doi.org/10.2147/NDT.S74905

Brenner, J. S., LaBotz, M., Sugimoto, D., & Stracciolini, A. (2019). The psychosocial implications of sport specialization in pediatric athletes. Journal of Athletic Training, 54, 1021-1029. https://doi.org/10.4085/1062-6050-394-18

Burcaș, S., & Crețu, R. Z. (2020). Multidimensional perfectionism and test anxiety: A meta-analytic review of two decades of research. Educational Psychology Review, 33, 249-273. https://doi.org/10.1007/s10648-020-09531-3

Buyse, D. J. (2014). Sleep health: Can we define it? Does it matter? Sleep, 37, 9-17. https://doi.org/10.5665/sleep.3298

Buyse, D. J., Ancoli-Israel, S., Edinger, J. D., Lichstein, K. L., & Morin, C. M. (2006). Recommendations for a standard research assessment of insomnia. Sleep, 29, 1155-1173. https://doi.org/10.1093/sleep/29.9.1155

Buyse, D. J., Reynolds, C. F. III, Monk, T. H., Berman, S. R., & Kupfer, D. J. (1989). The Pittsburgh Sleep Quality Index: A new instrument for psychiatric practice and research. Psychiatry Research, 28, 193-213. https://doi.org/10.1016/0165-1781(89)90407-4

Chang, E. C., Sanna, L. J., Chang, R., & Bodem, M. R. (2008). A preliminary look at loneliness as a moderator of the link between perfectionism and depressive and anxious symptoms in college students: Does being lonely make perfectionistic strivings more distressing? Behaviour Research and Therapy, 46, 877-886. https://doi.org/10.1016/j.brat.2008.03.012

Curran, T., & Hill, A. P. (2019). Perfectionism is increasing over time: A meta-analysis of birth cohort differences from 1989 to 2016.
Journal of Social and Clinical Psychology, 24, 580–605. https://doi.org/10.1521/jscp.2005.24.4.580

*Richardson, C., & Gradisar, M. (2020). Perfectionism and insomnia in adolescents: The role of vulnerability to stress and gender. Journal of Adolescence, 85, 70–79. https://doi.org/10.1016/j.jadolescence.2020.10.003

Robinson, K., & Wade, T. D. (2021). Perfectionism interventions targeting disordered eating: A systematic review and meta-analysis. International Journal of Eating Disorders, 54, 473–487. https://doi.org/10.1002/eat.23483

*Schmidt, R. E., Courvoisier, D. S., Cullati, S., Kraehenmann, R., & Linden, M. V. D. (2018). Too imperfect to fall asleep: perfectionism, pre-sleep counterfactual processing, and insomnia. Frontiers in Psychology, 9, 1288. https://doi.org/10.3389/fpsyg.2018.01288

Sivertsen, B., Harvey, A. G., Pallesen, S., & Hysing, M. (2015). Mental health problems in adolescents with delayed sleep phase: Results from a large population-based study in Norway. Journal of Sleep Research, 24, 11–18. https://doi.org/10.1111/jsr.12254

Sivertsen, B., Petrie, K. J., Wilhelmsen-Langeland, A., & Hysing, M. (2014). Mental health in adolescents with Type 1 diabetes: Results from a large population-based study. BMC Endocrine Disorders, 14, 1–8. https://doi.org/10.1186/1472-6823-14-83

Slaney, R. B., Rice, K. G., Mobley, M., Trippi, J., & Ashby, J. S. (2001). The revised almost perfect scale. Measurement and Evaluation in Counseling and Development, 34, 130–145. https://doi.org/10.1080/07481756.2002.12069030

Smith, M. M., Sherry, S. B., Chen, S., Saklofske, D. H., Mushquash, C., Flett, G. L., & Hewitt, P. L. (2018). The perniciousness of perfectionism: A meta-analytic review of the perfectionism–suicide relationship. Journal of Personality, 86, 522–542. https://doi.org/10.1111/jopy.12333

Smith, M. M., Sherry, S. B., Ray, C., Hewitt, P. L., & Flett, G. L. (2021). Is perfectionism a vulnerability factor for depressive symptoms, a complication of depressive symptoms, or both? A meta-analytic test of 67 longitudinal studies. Clinical Psychology Review, 101982, https://doi.org/10.1016/j.cpr.2021.101982

Smith, M. M., Sherry, S. B., Vidovic, V., Saklofske, D. H., Stoebber, J., & Benoit, A. (2019). Perfectionism and the five-factor model of personality: A meta-analytic review. Personality and Social Psychology Review, 23, 367–390. https://doi.org/10.1177/1088886818814973

Smith, M. M., Vidovic, V., Sherry, S. B., Steward, S. H., & Saklofske, D. H. (2018). Are perfectionism dimensions risk factors for anxiety symptoms? A meta-analysis of 11 longitudinal studies. Anxiety, Stress, & Coping, 31, 4–20. https://doi.org/10.1080/10618061731384466

Stephan, Y., Sutin, A. R., Bayard, S., Krizan, Z., & Terracciano, A. (2018). Personality and sleep quality: Evidence from four prospective studies. Health Psychology, 37, 271–281. https://doi.org/10.1037/heap0000577

Stoeber, J. (Ed.) (2017). The psychology of perfectionism: Theory, research, applications. Routledge.

Stoeber, J. (2014). How other-oriented perfectionism differs from self-oriented and socially prescribed perfectionism. Journal of Psychopathology and Behavioral Assessment, 36, 329–338. https://doi.org/10.1007/s10862-013-9397-7

Stoeber, J., & Otto, K. (2006). Positive conceptions of perfectionism: Approaches, evidence, challenges. Personality and Social Psychology Review, 10, 295–319. https://doi.org/10.1207/s15327957pspr1004_2

Stoeber, J., Otto, K., & Dalbert, C. (2009). Perfectionism and the Big Five: Conscientiousness predicts longitudinal increases in self-oriented perfectionism. Personality and Individual Differences, 47, 363–368. https://doi.org/10.1016/j.paid.2009.04.004

Stoeber, J., Otto, K., & Stoll, O. (2006). MIPS: Multidimensional Inventory of Perfectionism in Sport (English version). School of Psychology, University of Kent.

Stoeber, J., Schneider, N., Hussain, R., & Matthews, K. (2014). Perfectionism and negative affect after repeated failure: Anxiety, depression, and anger. Journal of Individual Differences, 35, 87–94. https://doi.org/10.2176/1614-0001/a000130

Stricker, J., Buecker, S., Schneider, M., & Preckel, F. (2019). Multidimensional perfectionism and the Big Five personality traits: A meta-analysis. European Journal of Personality, 33, 176–196. https://doi.org/10.1002/per.2186

Taylor, J. J., Papay, K. A., Webb, J. B., & Reeve, C. L. (2016). The good, the bad, and the interactive: Evaluative concerns perfectionism moderates the effect of personal strivings perfectionism on self-esteem. Personality and Individual Differences, 95, 1–5. https://doi.org/10.1016/j.paid.2016.02.006

Totic-Poznanovic, S., Stu-Marojevic, B., & Zebic, M. (2012). Significance of perfectionism in understanding different forms of insomnia. Srpski arhiv za celokupno lekarstvo, 140, 204–210. https://doi.org/10.2298/SARH120420AT

Toy, R. E. (2009). Characteristics of individuals who are gifted: An analysis of self-report scores [doctoral dissertation, University of Northern Colorado]. ProQuest.

*Trudel-Fitzgerald, C., Savard, J., Slim, L. M., Roy, R. C., Flett, G. L., Hewitt, P. L., & Ivers, H. (2017). The relationship of perfectionism with psychological symptoms in cancer patients and the contributing role of hyperarousability and coping. Psychology & Health, 32, 381–401. https://doi.org/10.1080/08870446.2016.1273354

Vacca, M., Ballesio, A., & Lombardo, C. (2021). The relationship between perfectionism and eating-related symptoms in adolescents: A systematic review. European Eating Disorders Review, 29, 32–51. https://doi.org/10.1002/erv.2793

van de Laar, M., Verbeek, I., Pevernage, D., Aldenkamp, A., & Overeem, S. (2010). The role of personality traits in insomnia. Sleep Medicine Reviews, 14, 61–68. https://doi.org/10.1016/j.smrv.2009.07.007

van der Kaap-Deeder, J., Soenens, B., Boone, L., Vandenkerckhove, B., Stemée, E., & Vansteenkiste, M. (2016). Evaluative concerns perfectionism and coping with failure: Effects on rumination, avoidance, and acceptance. Personality and Individual Differences, 101, 114–119. https://doi.org/10.1016/j.paid.2016.05.063

Vincent, N., Sande, G., Read, C., & Giannuzzi, T. (2004). Sleep locus of control: Report on a new scale. Behavioral Sleep Medicine, 2, 79–93. https://doi.org/10.1207/s15402101bsm0202_1

*Vincent, N. K., & Walker, J. R. (2000). Perfectionism and chronic insomnia. Journal of Psychosomatic Research, 49, 349–354. https://doi.org/10.1016/S0022-3999(00)00175-6

Wojtowicz, A. A., & Banez, G. A. (2015). Adolescents with chronic pain and associated functional disability: A descriptive analysis. Journal of Child Health Care, 19, 478–484. https://doi.org/10.1177/136793514523157

*Xie, S. S., Lian, K. Y., & Lin, R. M. (2020). Classroom environment and perceived sleep disturbance in adolescents: Test of the mediating and moderating roles of perfectionism. Current Psychology, 39, 1732–1739. https://doi.org/10.1007/s12144-018-9872-0

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