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ORIGINAL PAPER

Differences in Early Maladaptive Schemas between Young Adults Displaying Poor Versus Good Sleep Quality

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Abstract
Research on the connection between sleep-related problems and Early Maladaptive Schemas (EMS) is scarce. The aim of the current study was to investigate a potential link between EMSs and poor sleep quality. Participants ($n = 249$) were selected from a larger sample of 1253 European Portuguese college students who completed the BaSIQS and the YSQ-S3. The major inclusion criteria for the selected participants were high versus low scores on the BaSIQS (poor versus good sleep quality). Students with poor sleep quality had significantly higher levels of Abandonment/ Instability, Mistrust/Abuse, Social Isolation/Alienation, Vulnerability to Harm or Illness, Entitlement/Grandiosity, Self-Sacrifice, and Negativity/Pessimism. These data suggest that EMSs are associated with poor sleep quality. However, additional studies are necessary to better understand this relationship.

Keywords Sleep quality · Insomnia · Early maladaptive schemas · College students

Introduction

Sleep is crucial to numerous cognitive processes, such as learning, memory, problem solving, and decision making [1]. Effects of sleep deprivation include excessive daytime sleepiness, lower attention levels, impaired memory and decision making, reduced motivation, fatigue,

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increased reaction time, and irritability. Insufficient sleep has a strong negative impact on quality of life and may be linked to severe emotional, social, academic, professional, and health difficulties [2, 3].

Research has shown that sleep problems are frequent among college students [4–6]. Transition to college is generally associated with several adjustments, including leaving home and increased autonomy. These, in turn, can result in poor sleeping habits due to a different sleep location and more flexibility in the sleep-wake schedule [3, 7]. Common complaints of Portuguese college students include difficulties in initiating and maintaining sleep, frequent use of sleep medication, irregularity in the sleep-wake schedule, pulling "all-nighters", sleep deprivation, and poor sleep quality [8, 9]. The resulting sleep debt can lead to decreased academic performance [1, 9, 10]. These issues can have a considerable impact in the life of a college student. However, less is known about the factors that may contribute to sleep problems [4].

Mental health among college students is an increasing concern [11, 12]. These individuals belong to a vulnerable group due to several stressors, e.g., academic overload, pressure to succeed, competition with peers, concerns about the future, and financial troubles [13]. The most prevalent issues in this population include personality, anxiety, mood, substance abuse disorders and suicidal ideation [11]. Several studies have also shown that sleep difficulties are significantly associated with other problems, particularly major depression and anxiety disorders [14–16].

Schema theory was developed from traditional cognitive-behavioral models and has gained considerable relevance in psychopathology in the last few years [17–19]. This theory proposes that negative experiences with family and peers during childhood and adolescence may lead to the development of Early Maladaptive Schemas (EMSs). EMSs are broad patterns comprising memories, bodily sensations, emotions, and cognitions, regarding oneself and one's relationship with others. These themes are elaborated throughout an individual's lifetime and play a significant role in how one feels, thinks, acts, and relates to others. EMSs begin as accurate and adaptive representations of the environment, but become dysfunctional with time, due to changes in the surrounding conditions. A schema is activated when a situation is similar to the one that originated the EMS in the first place, producing intense negative affect. Despite their maladaptive nature, schemas "fight for survival" ([20], p. 61). In order to escape the intense emotions the EMSs trigger, individuals develop mechanisms called maladaptive coping styles (surrender, avoidance, and overcompensation). These maladaptive coping styles, however, continue to perpetuate the schemas because they prevent individuals from questioning their veracity and from behaving in ways that allow pattern-breaking [20].

Schema theory identifies 18 EMSs. These are grouped into five categories of unmet core emotional needs, called schema domains: (1) the *Disconnection and Rejection* domain indicates expectations that one's needs for safety, stability, nurturance, acceptance, and empathy will not be met in a predictable manner. The typical family of origin is cold, rejecting, unpredictable, or abusive. The schemas in this domain are *Abandonment/ Instability* (perceived unreliability of significant others), *Mistrust/ Abuse* (belief that others will cause intentional harm), *Emotional Deprivation* (expectation that emotional support is unavailable), *Defectiveness/ Shame* (feeling that one is inferior or unwanted), and *Social Isolation/ Alienation* (belief that one is different and isolated); (2) The *Impaired Autonomy and Performance* domain refers to expectations that interfere with one's perceived ability to survive, function independently, or succeed. The typical family of origin is enmeshed, overprotective, or undermining of the child's confidence. This domain includes the EMSs *Dependence/ Incompetence* (belief that one is unable to take care of oneself), *Vulnerability to Harm or Illness* (fear that catastrophe

will strike at any moment), *Enmeshment/ Undeveloped Self* (excessive closeness to a significant other), and *Failure* (belief that one is inadequate compared to peers); (3) The *Impaired Limits* domain indicates a deficiency in internal limits, responsibility to others, or long-term goal orientation. The typical family of origin is permissive, overindulgent, or characterized by a sense of superiority. The schemas in this domain are *Entitlement/ Grandiosity* (belief that one is superior to others) and *Insufficient Self-Control/ Self-Discipline* (difficulty to exercise self-control to achieve goals); (4) The *Other-Directedness* domain refers to an excessive focus on the feelings, desires, and responses of others, at the expense of one's own needs. Typical family origin is based on conditional acceptance in order to gain love, attention, and approval. This domain includes the EMSs *Subjugation* (perception that one's needs are not valid or important), *Self-Sacrifice* (focus on meeting the needs of others at the expense of one's own), and *Approval-Seeking/ Recognition-Seeking* (emphasis on gaining attention, approval, or recognition from others); (5) The *Overvigilance and Inhibition* domain indicates an excessive emphasis on suppressing one's feelings, impulses, and choices, in order to avoid making mistakes. The typical family of origin is demanding or punitive. The schemas in this domain are *Negativity/ Pessimism* (focus on the negative aspects of life), *Emotional Inhibition* (inhibition of emotional expression), *Unrelenting Standards/ Hypercriticalness* (belief that one must strive to meet high internalized standards), and *Punitiveness* (belief that people should be punished for making mistakes) [21].

Schema therapy, the treatment approach derived from schema theory, was originally developed for patients with personality disorders [20]. However, over the past few years, there has been a tendency to relate schemas to other psychological disorders, such as schizophrenia [22], depression [23], bipolar disorder [24], social phobia [25], substance dependence [26], sexual dysfunction [27], gender identity disorder [28], post-traumatic stress disorder [29], and eating disorders [30]. EMSs have also been linked to other conditions, e.g. obesity [31], chronic pain [32], and aggressive sexual behaviour [33]. Additionally, several studies connect sleep quality with personality traits, for instance, perfectionism [34] and neuroticism [35]. A few investigations have also revealed that adverse conditions in childhood are associated with poorer sleep in adulthood [36]. Nonetheless, it appears that no attempt has been made to relate sleep problems to EMSs in a more direct way. Therefore, it seems relevant to investigate a potential relationship between sleep and EMSs. However, it is premature - due to absence of literature on the topic to assume causal assumptions between sleep quality and EMSs. Even so, three explanations seem reasonable: First, it may be possible that individuals who score higher in the various EMSs may also present worse sleep quality due to common factors (e.g., child maltreatment leading to poor sleep quality and EMSs development). On the other hand, we hypothesize that worst sleep quality may decreased the threshold for the activation of EMSs. Specifically, a "state" of poor sleep quality may influence (through depressive mood, for example) the impact of activating events that usually trigger the dysfunctional schemas. Finally, it may also be conceivable that when the EMSs are activated they may influence the sleep quality.

Considering the scarce literature, the purposes of the present study were to observe whether EMSs are related to sleep quality and which of them present a stronger association to self-reported poor sleep quality in a sample comprising European college students. Due to the absence of published studies on the relationship between sleep and schemas, the following hypotheses were based on clinical practice and empirical evidence about the role of personality traits, such as perfectionism [34] and neuroticism [35], and adverse childhood conditions [36] in sleep problems. It was expected that individuals with poor sleep quality would present more EMSs and

higher values in schema scores. Additionally, it was expected that eight specific EMSs, in four of the five schema domains, would have a stronger association with poor sleep quality: Emotional Deprivation (Disconnection and Rejection domain), Vulnerability to Harm or Illness, Failure (Impaired Autonomy and Performance domain), Approval-Seeking/ Recognition-Seeking (Other-Directedness domain), Negativity/ Pessimism, Emotional Inhibition, Unrelenting Standards/ Hypercriticalness, and Punitiveness (Overvigilance and Inhibition domain).

Methods

Participants

From an initial pool of $n = 1253$ participants, the selected sample comprised 249 higher education students, that were exclusively good or poor sleepers according to their scores in a sleep quality scale as described below (cf. Measures´ section), young adults, studying in full-time, single, having no children, unmedicated, and reporting no health problems, corresponding to the typical Portuguese college student (sleep quality definition and inclusion criteria detailed in the procedure (subsection 2.3). These participants had an average age of 20.7 years ($SD = 2.0$). Eighty-one percent were females. The majority were undergraduate students (70%), were living away from home to study in higher education (54%), were not sharing a room (80%), and had no sleep problems (75%).

Measures

The Basic Scale on Insomnia complaints and Quality of Sleep (BaSIQS) – student version [37] – is a 7-item measure designed to evaluate difficulties with sleep onset and maintenance, as well as subjective overall quality and depth of sleep, in the past month. This tool was shown to be largely correlated to the Pittsburg Sleep Quality Index [37]. Each item is rated on a 5-point Likert scale (0 to 4), except for the last two items, whose scoring is reversed. The total score is obtained by summing the individual items and may theoretically range from 0 to 28, with higher values indicating poorer sleep quality. The instrument presented adequate internal consistency in this study (Cronbach's alpha = 0.79). Participants were assigned to one of the two sleep quality groups based on their responses to this questionnaire. Those who scored least (up to the 25th percentile) were included in the "good sleep quality" group and those who scored most (above the 75th percentile) were included in the "poor sleep quality" group. This procedure of using extreme groups should be performed considering all the limitations that have been highlighted n the literature [38]. One should note that the BaSIQS is an instrument that have shown large association ($r = 0.74$) with the Insomnia Severity Index (ISI) and showed an acuity value of 0.90 – Area Under the Curve – in differentiating insomnia patients from healthy individuals [39].

The Young Schema Questionnaire – Short Form 3 (YSQ-S3) ([40]; Port. version: [41]) is a 90-item measure intended to assess the 18 EMSs. Respondents rate themselves on how well each item describes them on a 6-point Likert scale (1 = "completely untrue of me" to 6 = "describes me perfectly"). The mean score for each of the EMSs is calculated by summing the corresponding items. Higher values reflect unhealthier core beliefs. In this study, Cronbach's alpha for each of the 18 EMSs ranged from $\alpha = 0.56$ for the Unrelenting Standards/ Hypercriticalness subscale to $\alpha = 0.90$ for the Failure subscale, suggesting moderate to good internal consistency. The YSQ-S3 have been adapted in several Languages (cf. [42–46].

Procedure

A request to participate in the investigation was sent by email to a total of 55 universities and higher education institutes in Portugal and was also shared on social media. Potential participants clicked on a web URL taking them to the internet survey tool (*GoogleDocs* platform), where they were informed about the purpose of the study. Those who wished to proceed gave their consent electronically and were redirected to the questions. Participants provided basic demographic and clinical data, answered a short list of questions regarding their sleeping habits, and completed two self-report questionnaires, the BaSIQS [37] and the YSQ-S3 [41], all in online format and in their official Portuguese-Language versions. Only completed questionnaires could be submitted. Data were collected between February and April 2014 and were automatically stored in an electronic database.

A total of 1253 participants completed the questionnaires. From this initial pool, $n = 249$ were selected for the present study that better illustrated the typical Portuguese college student and that represented good versus poor sleepers in terms of sleep quality. Inclusion criteria, based on self-reported data, were: being a full-time student, single, and unmedicated; having between 18 and 25 years-old, no children, and no health problems; and belonging to the "good sleep quality" group or to the "poor sleep quality" group according to the BaSIQS.

Statistical Analyses

Statistical analyses were conducted using SPSS version 20.0 for Windows. The relationship between sleep quality and the EMSs was investigated through Multivariate Analysis of Variance (MANOVA). Sleep quality groups served as independent variables, whereas schema domains were used as dependent variables.

Results

In order to assess the relationship between sleep quality and the schemas in the Disconnection and Rejection domain (Abandonment/Instability, Mistrust/Abuse, Emotional Deprivation, Defectiveness/Shame, and Social Isolation/Alienation), a MANOVA was conducted. Multivariate analyses showed a statistically significant main effect for sleep quality [Wilks' Lambda = 0.908, $F(5, 241) = 4.899$, $p < 0.01$, partial $\eta^2 = 0.092$]. Univariate tests (using Bonferroni corrected alpha level, $p = 0.010$) revealed that participants with poor sleep quality had significantly higher levels of Abandonment/ Instability, Mistrust/Abuse, and Social Isolation/ Alienation (see Table 1).

A MANOVA was performed to analyze the relationship of sleep quality and the EMSs related to the Impaired Autonomy and Performance domain (Dependence/Incompetence, Vulnerability to Harm or Illness, Enmeshment/Undeveloped Self, and Failure). There was a statistically significant main effect for sleep quality [Wilks' Lambda = 0.931, $F(4, 242) = 4.499$, $p = 0.002$, partial $\eta^2 = 0.069$]. Univariate analyses (using Bonferroni corrected alpha level, $p = 0.012$) showed that participants with poor sleep quality presented significantly higher levels of Vulnerability to Harm or Illness (see Table 2).

A MANOVA was executed to assess the relationship of sleep quality and the schemas in the Impaired Limits domain (Entitlement/Grandiosity and Insufficient Self-Control/Self-Discipline). Findings revealed a statistically significant main effect for sleep quality [Wilks'

Table 1 Schemas in the disconnection and rejection domain as a function of sleep quality (poor sleep quality vs. good sleep quality)

	Group (sleep quality)						
	Poor		Good				
	($n = 113$)		($n = 136$)				
YSQ-S3	*M*	*SD*	*M*	*SD*	*F*(1, 245)	*p*	$\eta 2$
Abandonment/ Instability	6.30	2.66	4.93	1.91	11.423*	0.001	0.045
Mistrust/ Abuse	7.22	2.89	5.22	1.85	22.272*	0.000	0.083
Emotional Deprivation	5.43	2.96	4.22	2.20	4.815	0.029	0.019
Defectiveness/ Shame	5.15	2.85	3.70	1.93	5.935	0.016	0.024
Social Isolation/ Alienation	6.69	2.91	5.17	2.42	8.711*	0.003	0.034

Statistical significance using Bonferroni corrected alpha level, $p = 0.010$

*$p < 0.010$

Lambda = 0.939, $F(2, 244) = 7.894$, $p < 0.01$, partial $\eta^2 = 0.061$]. Results from univariate tests (using Bonferroni corrected alpha level, $p = 0.025$) indicated that participants with poor sleep quality had significantly higher levels of Entitlement/Grandiosity (see Table 3).

In order to analyze the relationship of sleep quality and the EMSs related to the Other-Directedness domain (Subjugation, Self-Sacrifice, and Approval-Seeking/Recognition-Seeking), a MANOVA was performed. Multivariate tests indicated a statistically significant main effect for sleep quality [Wilks' Lambda = 0.957, $F(3, 243) = 3.628$, $p = 0.014$, partial $\eta^2 = 0.043$]. Findings from univariate analyses (using Bonferroni corrected alpha level, $p = 0.017$) showed that participants with poor sleep quality presented significantly higher levels of Self-Sacrifice (see Table 4).

A MANOVA was conducted to assess the relationship of sleep quality and the schemas in the Overvigilance and Inhibition domain (Negativity/Pessimism, Emotional Inhibition, Unrelenting Standards/Hypercriticalness, and Punitiveness). Results showed a statistically significant main effect for sleep quality [Wilks' Lambda = 0.925, $F(4, 242) = 4.889$, $p = 0.001$, partial $\eta^2 = 0.075$]. Univariate tests (using Bonferroni corrected

Table 2 EMSs related to the impaired autonomy and performance domain as a function of sleep quality (poor sleep quality vs. good sleep quality)

	Group (sleep quality)						
	Poor		Good				
	($n = 113$)		($n = 136$)				
YSQ-S3	*M*	*SD*	*M*	*SD*	*F*(1, 245)	*p*	$\eta 2$
Dependence/ Incompetence	4.93	1.86	4.17	1.42	2.564	0.111	0.010
Vulnerability to Harm or Illness	4.99	2.23	3.43	1.53	15.545*	0.000	0.060
Enmeshment/ Underdeveloped Self	4.99	1.98	4.53	1.77	0.462	0.497	0.002
Failure	5.71	2.94	4.36	2.00	4.691	0.031	0.019

Statistical significance using Bonferroni corrected alpha level, $p = 0.012$

*$p < 0.010$

Table 3 Schemas in the impaired limits domain as a function of sleep quality (poor sleep quality vs. good sleep quality)

	Group (sleep quality)						
	Poor		Good				
	($n = 113$)		($n = 136$)				
YSQ-S3	*M*	*SD*	*M*	*SD*	*F*(1, 245)	*p*	$\eta 2$
Entitlement/ Grandiosity	6.65	2.17	6.01	1.68	15.525*	0.000	0.060
Insufficient Self-Control/ Self-Discipline	6.31	2.44	5.79	2.04	3.413	0.066	0.014

Statistical significance using Bonferroni corrected alpha level, $p = 0.025$

*$p < 0.010$

alpha level, $p = 0.012$) indicated that participants with poor sleep quality had significantly higher levels of Negativity/Pessimism (see Table 5).

Discussion

The aim of this study was to investigate a potential link between EMSs and sleep quality. Particularly, it was expected that college students with self-reported poor sleep quality would present more EMSs and higher values in schema scores. Furthermore, it was expected that eight specific EMSs, in four of the five schema domains, would have a stronger association with poor sleep quality. In general, results partially supported our hypotheses. Participants with poor sleep quality presented more EMSs and higher values in schema scores. A stronger relationship between poor sleep quality and seven EMSs, in all five schema domains, was also found. However, this was only observed for two of the eight hypothesized EMSs.

Regarding the *Disconnection and Rejection* domain, and contrary to what was expected, a relationship between *Emotional Deprivation* and poor sleep quality was not observed. Nevertheless, *Abandonment/Instability*, *Mistrust/Abuse*, and *Social Isolation/Alienation* were significantly associated with poor sleep quality. Individuals with an *Abandonment/Instability* schema expect significant others to suddenly disappear, abandon them, or leave them for somebody

Table 4 EMSs related to the other-directedness domain as a function of sleep quality (poor sleep quality vs. good sleep quality)

	Group (sleep quality)						
	Poor		Good				
	($n = 113$)		($n = 136$)				
YSQ-S3	*M*	*SD*	*M*	*SD*	*F*(1, 245)	*p*	$\eta 2$
Subjugation	5.09	2.26	4.33	1.56	3.133	0.078	0.013
Self-Sacrifice	7.43	2.38	6.35	2.30	8.685*	0.004	0.034
Approval-Seeking/ Recognition-Seeking	5.79	2.15	5.71	1.89	4.031	0.046	0.016

Statistical significance using Bonferroni corrected alpha level, $p = 0.017$

*$p < 0.010$

Table 5 Schemas in the overvigilance and inhibition domain as a function of sleep quality (poor sleep quality vs. good sleep quality)

	Group (sleep quality)						
	Poor		Good				
	($n = 113$)		($n = 136$)				
YSQ-S3	*M*	*SD*	*M*	*SD*	*F*(1, 245)	*p*	$\eta 2$
Negativity/ Pessimism	7.89	3.01	5.72	2.19	18.467*	0.000	0.070
Emotional Inhibition	6.92	2.95	6.05	2.79	2.030	0.156	0.008
Unrelenting Standards/ Hypercriticalness	4.97	1.60	4.39	1.62	5.703	0.018	0.023
Punitiveness	6.22	2.24	5.52	2.05	4.540	0.034	0.018

Statistical significance using Bonferroni corrected alpha level, $p = 0.012$

*$p < 0.010$

better. They live in fear and are constantly vigilant for signs of abandonment. Common emotions include anxiety about losing people, sadness and depression when there is a perceived or actual loss, and anger when people leave them. In accordance with the schema perpetuation process of surrender, these individuals usually choose partners who are unable to make a commitment [20]. Findings concerning this EMS corroborate previous research on the relationship between anxiety [47, 48], sadness [49], depression [50], anger [51], and sleep disturbances. Referring to *Mistrust/Abuse*, individuals with this schema do not trust other people and are suspicious and guarded. They expect lies, humiliation, or abuse, and frequently believe that all injuries caused are intentional [20]. Data referring to this EMS support previous investigations associating paranoia [52] and hostility [53] with insomnia. Research has also shown that an activation state similar to the one that occurs in dangerous situations makes the individual more focused on possible threatening cues or stimuli, which prevents relaxation [54]. As for the *Social Isolation/Alienation* schema, individuals believe that they are different from other people and feel isolated and left out from most groups. Consistent with the schema perpetuation process of avoidance, solitary activities are preferred and intimate relationships are limited or altogether non-existent [20]. Results regarding this schema are consistent with previous studies relating loneliness [55] and introversion [56] with sleep quality.

In the *Impaired Autonomy and Performance* domain, as expected, a significant association between poor sleep quality and *Vulnerability to Harm or Illness* was observed. This relationship, however, was not present in the *Failure* schema. Individuals with a *Vulnerability to Harm or Illness* EMS believe that something terrible is about happen at any moment and that they are unable to prevent it. Anxiety is the predominant emotion [20]. Findings concerning this schema are congruent with previous research on the relationship between anxiety [47] and catastrophizing [57], and insomnia.

Contrary to initial expectations, the *Impaired Limits* domain, specifically the *Entitlement/ Grandiosity* EMS, was significantly more prevalent in the poor sleep quality group. Individuals with this schema believe they are special and better than others and feel entitled to special rights and privileges. Attempts to force one's point of view or to control the behaviour of other people, without empathy or concern for their needs, are common. This EMS is frequently an overcompensation for the *Emotional Deprivation* and *Defectiveness/ Shame* schemas [20]. The unexpected association between *Entitlement/Grandiosity* and poor sleep quality cannot be

explained by an overcompensation for these two schemas because, as previously mentioned, no significant link between them and poor sleep quality was found. Nonetheless, data referring to the *Entitlement/Grandiosity* EMS corroborate previous investigations associating aggressiveness [58] and low conscientiousness [35, 59, 60] with sleep variables (namely sleep problems, insomnia, healthy sleep, and sleep quality).

Concerning the *Other-Directedness* domain, and in discrepancy with the original hypotheses, a relationship between *Approval-Seeking/Recognition-Seeking* and poor sleep quality was not found. Nevertheless, *Self-Sacrifice* was significantly associated with poor sleep quality. Individuals with this EMS focus excessively on meeting the needs of others, while their own needs remain unfulfilled. They do this voluntarily, because they do not want to distress others. However, they sometimes feel angry at the same people they sacrificed for [20]. Results regarding this schema support previous studies relating anger [51] and internalization [50] with insomnia and sleep disturbances.

In the *Overvigilance and Inhibition* domain, as expected, a significant relationship between poor sleep quality and *Negativity/ Pessimism* was found. This association, however, was not present in the *Emotional Inhibition*, *Unrelenting Standards/ Hypercriticalness*, and *Punitiveness* schemas. Individuals with a *Negativity/Pessimism* EMS focus excessively on the negative aspects of life and have an exaggerated expectation that things will go seriously wrong. They spend a great deal of time worrying, ruminating, and trying to avoid making mistakes that could have disastrous consequences [20]. Findings concerning this EMS are consistent with previous research on the relationship between rumination [61], worry [62], and harm avoidance [50], and sleep disturbances and insomnia.

Without considering the Bonferroni corrections, which are very conservative, it would also have been possible to observe a relationship between poor sleep quality and the following EMSs: *Emotional Deprivation*, *Defectiveness/Shame* (*Disconnection and Rejection* domain), *Failure* (*Impaired Autonomy and Performance* domain), *Approval-Seeking/Recognition-Seeking* (*Other-Directedness* domain), *Unrelenting Standards/Hypercriticalness*, and *Punitiveness* (*Overvigilance and Inhibition* domain). Schemas that survived the aforementioned corrections had small effect sizes [63]. Large effect sizes, however, were not expected considering that several other variables, which were not explored in this study, have already demonstrated playing a role in sleep quality e.g., stress reactivity [64], neuropsychophysiologic activation [54], and genetic factors [65]. Notwithstanding, findings from the present study may have clinical interest due to the consistency of the results. Statistical significance does not necessarily mean practical significance, especially with large samples ($n > 1000$). This, however, should not be an issue in the present study, given the number of cases considered in the analyses. Additionally, the robustness of these results could not have been explained through the use of a large sample because statistical significance does not influence effect sizes [66]. Individuals frequently possess more than one schema [20], which may greatly influence sleep quality. Another factor is the data collection period. The questionnaires were made available online in the beginning of the second semester. This time of the school year, due to fewer academic demands, can be associated with lower stress levels. Stress is a mediating variable between some personality characteristics, such as perfectionism, and sleep quality [67, 68]. Furthermore, EMSs interact with stress-induced life events, leading to anxiety and depression [69]. These conditions can, in turn, cause sleep difficulties and/ or activate EMSs. As such, it is possible that during exams, for example, effect sizes would have been larger. The data collection period could also explain, hypothetically, the absence of a significant relationship

between poor sleep quality and the remaining six expected EMSs (*Emotional Deprivation*, *Failure*, *Approval-Seeking/Recognition-Seeking*, *Emotional Inhibition*, *Unrelenting Standards/ Hypercriticalness*, and *Punitiveness*).

This study has some limitations that should be considered when interpreting its results. First, due to the cross-sectional nature of the investigation it is not possible to determine the causal relationship between EMSs and sleep quality. Although schemas can be conceptualized as vulnerability factors for poor sleep quality, only a longitudinal design can resolve the question of directionality. Second, despite the fact that the internet is being increasingly used in psychological research to collect data [70], this method presents a few risks, such as multiple submissions and self-selection biases. However, given the extent of the questionnaire, the idea of multiple submissions seems unlikely. Also, the majority of the participants reported not having sleep problems, which would exclude the hypothesis of a self-selection bias due to motivation. Third, the use of a non-probabilistic sample, composed mostly of females, may limit the generalizability of the findings. Nevertheless, an effort was made to obtain a wide sample, through the contact of a large number of higher education institutes. Furthermore, the predominance of females in higher education is, in fact, a reality in Portugal. Fourth, self-report measures can be responsible for social desirability biases. However, the questionnaires were submitted online and anonymously, which could have helped to minimize this factor. Finally, the YSQ-S3 may have been an insufficient measure for the EMSs, especially in individuals who use avoidance as a maladaptive coping style [20]. Although this instrument has been successfully used in research [20], the application of a complementary questionnaire, e.g., the Young Parenting Inventory (YPI), would be recommended. The YPI was developed to identify parental origins of maladaptive schemas for father and mother (or substitutes), separately. This measure enables to validate the EMS from the perspective of the parents´ influence [71].

Conclusions

Data from the present study suggest that EMSs are associated with poor sleep quality. However, as this was the first attempt to provide a link between schemas and sleep, additional research is necessary to better understand this relationship and its implications for clinical practice. Future studies could favor objective sleep measures (e.g., actigraphy and polysomnography), longitudinal designs, and clinical samples. If, in fact, further investigation shows that EMSs play a significant role in the development and maintenance of sleep difficulties, some elements of schema therapy may also be included in the treatment of sleep disorders.

Compliance with Ethical Standards

Ethical Approval All procedures performed in studies involving human participants were in accordance with the ethical standards of the institutional and/or national research committee (include name of committee + reference number) and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards.

Statement on the welfare of animals This article does not contain any studies with animals performed by any of the authors.

Informed Consent Informed consent was obtained from all individual participants included in the study.

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