Sleep Medicine 122 (2024) 106–112

Contents lists available at ScienceDirect

Sleep Medicine

journal homepage: www.elsevier.com/locate/sleep

Lifetime prevalence and characteristics of sleep paralysis in Italian university students population

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ARTICLE INFO

Keywords:
Sleep paralysis
Chronotype
Sleep quality
Anxiety

ABSTRACT

Sleep paralysis (SP) is a REM-related parasomnia, characterized by the inability to perform voluntary movements. It is a relatively widespread phenomenon in the general population and, although usually not dangerous, it is experienced with intense fear. The current study aims to evaluate the lifetime prevalence and characteristics of SP in the Italian student population. The study was conducted online, through an online battery of questionnaires. We used the Unusual Sleep Experience Questionnaire to investigate the prevalence of the disorder and the typical characteristics, metacognitive beliefs on the episodes, and previous distress factors. We also collected information about anxiety and depression symptomatology, sleep quality, and circadian preferences. Four hundred and thirty-two participants (333 F, 22.8 ± 2.57 y) took part in the study and 37.5 % of them reported having experienced at least one SP episode in their lifetime. On a physiological level, the most common features were the inability to speak followed by a tingling sensation and the inability to open the eyes, consistent with REM muscle atonia. Cognitive features during episodes include the perception of a presence in the room, followed by the fear of dying. Participants who reported SP had higher anxiety and worse sleep quality, and were more associated with evening chronotypes compared to non-SP responders. Our results show that SP is generally widespread in Italian students, in line with the prevalence reported in previous studies. Further studies could investigate the effects of suggested therapies to decrease the number of episodes of the disorder, especially in those who experience it recurrently.

1. Introduction

Sleep paralysis is a parasomnia of REM sleep characterized by the inability to perform voluntary movements, which can occur during the onset of sleep or upon awakening [1]. Although it may be a symptom of narcolepsy, in healthy individuals it is generally a non-dangerous phenomenon. Sleep paralysis is experienced with intense fear because of the aforementioned inability to move and the vivid sensory hallucinations that often occur during the episode [2]. Hallucinations are usually organized into three categories: incubus hallucinations, involving feelings of oppression and suffocation attributed to the effects of motoneuron hyperpolarization on respiratory perception; intruder hallucinations, involving the perception that someone is present in the room; and unusual bodily experiences, referring to sensations of bodily rotation and movement 3,4.

Sleep paralysis is distinguished from other parasomnias because the subject reports being awake during the episode [1]. However, supporting evidence for this assumption is still scarce since studying sleep paralysis in controlled contexts with objective measures is challenging. A recent study seems to suggest that given its alpha and theta rhythm characterization, it appears that sleep paralysis may be a transitional state between REM sleep and wakefulness [5]. The majority of evidence in the literature has relied on self-reported measures, both for characterizing the phenomenon and determining lifetime prevalence. Defining the prevalence of this disorder in the general population remains an ongoing challenge. Currently, the estimated prevalence varies widely, likely due to the terminology used to refer to the phenomenon or the description provided [6,7]. Furthermore, there is currently no validated and globally accepted tool for diagnosing this disorder. However, several questionnaires in the literature thoroughly characterize this experience and self-made questionnaires were used to detect sleep paralysis experience [7]. The risk factors that contribute to determining the occurrence of sleep paralysis include anxiety disorders [8–10], exposition to traumatic events [8], poor sleep quality [11], sleep disorder [7]. Moreover, psychiatric patients and university students seem to be more likely to have sleep paralysis. In particular, a systematic

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https://doi.org/10.1016/j.sleep.2024.08.013
Received 18 April 2024; Received in revised form 11 August 2024; Accepted 13 August 2024
Available online 13 August 2024

review reported that the prevalence of experiencing at least one episode of sleep paralysis in the course of life is 28.3 % in students [12]. This can be due to a constellation of factors like unhealthy lifestyles, sleep duration, and mental disorders [13]. The prevalence and characterization of sleep paralysis in university students have been described in different States (e.g. Ref. [10,13–16]) with similar results for the prevalence and characteristics of the disorder. There are currently no studies in Italy that have investigated sleep paralysis in college students, with only two studies investigating the characteristics of the phenomenon in a sample selected from the general population [17,18]. On this basis, in this study, we aimed to describe the prevalence lifetime of sleep paralysis in Italian students and describe the main characteristics of disorders using the Unusual Sleep Experience Questionnaire, developed by Paradis et al. [10]. Furthermore, we investigated whether participants with sleep paralysis differed in terms of sleep quality, levels of anxiety, and severity of depressive symptoms compared to those who had never experienced this phenomenon. Additionally, we explored whether specific chronotypes and nap habits were variables associated with sleep paralysis.

2. Methods and materials

The study was a cross-sectional research conducted entirely online through the Google Forms platform.

2.1. Participants

A total of 532 students participated in the study, recruited online through a snowball procedure with a link distributed online on various social media and Facebook groups of various Italian universities. The only requirement for participation was to be between 18 and 35 years old and currently enrolled as a university student. Individuals who did not fulfill these requirements were excluded. The final sample consisted of 432 university students, 333 identified as female, 94 as male, and 5 participants who indicated "other" gender. The average age of the sample was 22.8 years (SD = 2.57 y. o.). Data collection took place from the beginning of February 2020 to the end of March 2020, and all participants were Italian.

The present study was approved by the local ethical committee of the School of Psychology at the University of Padua and complies with global ethical standards.

2.2. Demographic

In the initial section, participants were presented with informed consent and were asked to provide basic demographic information such as gender, age, place of birth, employment status, and university affiliation. Participants who indicated employment were excluded from the sample. Additionally, participant's nap habits were investigated, including weekly frequency and average duration.

2.3. Unusual Sleep Experience Questionnaire

The Unusual Sleep Experience Questionnaire (USEQ), developed by Paradis et al. [10], was used to describe the phenomenon of sleep paralysis both quantitatively and qualitatively, through direct participant reporting. The presence or absence of sleep paralysis was determined by presenting each participant with a description of sleep paralysis. Participants who reported experiencing a similar event in their lifetime proceeded to complete the questionnaire, otherwise, they moved on to subsequent questionnaires.

To verify that participants had indeed experienced sleep paralysis, they were asked to describe their most vivid sleep paralysis experience. Participants who provided ambiguous or insufficient accounts were excluded from the sleep paralysis group. The questionnaire was translated into Italian by the authors (CC and NC).

2.4. Morningness-Eveningness Questionnaire - r

The Italian version of the Morningness-Eveningness Questionnaire - Reduced form (MEQ-r, [19,20]) was included to identify participant's chronotypes. The final score, obtained by summing individual item scores, ranged from 0 to 21. Scores between 4 and 10 classified the individual as a "night owl," with predominantly evening activity patterns; scores between 11 and 18 classified participants as "intermediate"; finally, scores between 19 and 25 classified the participant as a "morning lark," with predominantly morning activity patterns.

2.5. The Beck Depression Inventory-II

The Italian version of the Beck Depression Inventory-II (BDI-II; [21,22]) estimates the severity of key depression symptoms. The questionnaire comprises a total of 21 items, each scored from 0 to 3 based on their content severity. The final score, obtained by summing each item's score, ranges from 0 to 63. Scores equal to or above 20 are classified as moderate to severe depression (see Ref. [23]).

2.6. Pittsburgh Sleep quality index

The Italian version of the Pittsburgh Sleep Quality Index (PSQI; [24,25]) examines sleep quality over the past month through 19 items, each yielding a raw score. The final score is obtained by calculating and summing 7 components reflecting subjective sleep quality (1), sleep onset latency (2), duration (3), efficiency (4), disturbances (5), sleep medication use (6), and daytime dysfunction (7).

2.7. State-Trait Anxiety Inventory

The Italian version of the State-Trait Anxiety Inventory, version Y2 (STAI-Y2, [26,27]), composed of 20 Likert scale items, examined the severity of trait anxiety symptoms. Each item could be scored from 1 to 4 depending on the severity content. The final score, between 20 and 80, was obtained by summing the points of each single item. Following Franzoi and colleagues (2020), a cut-off of 40 has been used to identify the presence of anxiety traits.

3. Statistical analysis

Analyses were conducted using the statistical software RStudio [28]. To compare the demographic characteristics between participants with and without sleep paralysis we performed Welch's t-tests and χ^2. For the description of sleep paralysis, we calculated absolute frequencies and relative percentage frequencies for each item of USEQ. The open-ended questions were read and categorized according to content similarity.

Because half of our data were collected during the quarantine period due to SARS-CoV-2, which was mandatory in Italy as of March 13, 2020, we tested whether this variable affected our participants' responses. Therefore, we adjusted the exploratory intentions of our study by assessing whether there were differences in sleep quality (PSQI score), anxiety (STAI-Y2 score), and depressive symptoms (BDI-II score) between participants with and without sleep paralysis and between those exposed or not to the quarantine period. This was done through a 2×2 ANOVA by including the Quarantine factor (Yes - No) and Sleep Paralysis (Yes - No) between subjects. The evaluation of the normality of distribution and homogeneity of residuals, required for performing ANOVA, has shown that STAI-Y2, BDI-II, and PSQI violated the assumption of normality. We therefore normalized the data, using the z-score normalization, subtracting the mean from each value and then dividing by the standard deviation, to perform ANOVA.

4. Results

4.1. Frequencies and descriptions of sleep paralysis

In our sample of 432 students, 162 (37.5 %) reported having at least one episode of sleep paralysis in the course of life. No difference was found in age ($t_{286.93}$, p = .168) or gender distribution ($\chi2(1) = 0.095$, p = .757) between groups as shown in Table 1.

The occurrence of sleep paralysis can be found in Table 2. The majority of subjects reported having from 1 to 5 episodes during the last years (50.6 %) and in the last month (25.3 %).

The first sleep paralysis occurred during adolescence for the majority of participants (52.47 %), followed by early adulthood (14.20 %).

Concerning situational conditions concomitant to the first episode, 52.47 % of the participants reported experiencing remarkable circumstances. In particular, 45.88 % of them (n = 39) have experienced stressful moments (due to various causes, for example, family issues), 12.94 % (n = 11), personal problems, 12.94 % (n = 11) changes in life habits, and 11.76 % (n = 10) reported alteration in the sleep-wake cycle. The remaining (16.47 %) reported various kinds of events such as assumption of drugs, anxiety, taking of psychotropic drugs, isolation, and one participant did not specify the circumstances around the first events.

Regarding sleeping position, although half of the participants (45.06 %) reported that they saw no difference between sleeping supine and on their belly, 41 % reported experiencing paralysis more frequently while sleeping supine.

The perception of the duration of a sleep paralysis episode appears to be highly variable ranging from a few seconds (25.31 %) up to 15 min (7.41 %). Still, most of the participants reported knowing that the episode lasted between 1 and 5 min (47.53 %), although, at the time of the episode, they reported that the episode duration seemed to last much longer.

Sleep paralysis appears to be more frequent at waking (82.1 %) than at falling asleep and more recurrent during night sleep (58.02 %) compared to napping (28.4 %).

The different characterizations of sleep paralysis emerged both in their physiological component, typical of REM sleep, and in a more cognitive component as can be seen in Fig. 1. The most common physiological feature was the inability to ask for help and talk (83.95 %) followed by a feeling of numbness (75.31 %), while the cognitive features most frequently reported were feeling a presence in the room (64.2 %) and fear of dying (60.49 %).

Three extended open-ended questions were asked to describe more deeply the feeling of pressure, the kind of sound hearing, and what physical problem the participant thought to have.

Among those who felt a sense of pressure on their chest (n = 94), the majority of them described it as a weight pressing down (62.77 %) or as a person or creature sitting on their chest (31.91 %).

The majority of participants who heard a sound (n = 86) described it as human voices (45.35 %) and the sound of footsteps, but some of them declared that they were not able to describe the kind of sound they heard (13.58 %).

Regarding the description of the type of illness feared to be afflicted with (n = 62), the highest frequency is represented by diseases of the musculoskeletal system and the fear of paralysis (35.48 %).

Table 1
Sample characteristics.

		SP	NSP	Statistics	p
N		162 (37.5 %)	270 (62.5 %)		
Gender	*Male*	37	57		
	Female	123	210	$\chi2 = 0.095$*	p = .757
	Other	2	3		
Age		23.0 ± 2.7	22.5 ± 2.5	t(298,93) = 1.38†	p = .168
Nap	*Yes*	60	144	$\chi2 = 3.4467$	p = .063
	No	102	126		

Notes. SP = Sleep Paralysis; NSP= No-Sleep Paralysis. * The $\chi2$ on gender was performed only on females and males because the category "Other" did not have enough observations to perform the test. † This analysis was conducted on 420 participants since 12 participants (6 SP, 6 NSP) did not report correctly their birth date. Age is reported as mean ± standard deviation.

Table 2
Occurrence of sleep paralysis.

Lifetime Prevalence			
		Frequencies	%
1 - 5 episodes		66	40.74
6 - 10 episodes		36	22.22
10 - 20 episodes		18	11.11
More than 20		37	22.84
NS		5	3.09
Frequencies of episodes in the last year			
		Frequencies	%
Never		53	32.72
1 - 5 episodes		82	50.62
6 - 10 episodes		13	8.02
10 - 20 episodes		2	1.23
More than 20		8	4.94
NS		4	2.47
Frequencies of episodes in the last month			
		Frequencies	%
Never		118	72.84
1 - 5 episodes		41	25.31
6 - 10 episodes		1	0.62
10 - 20 episodes		1	0.62
NS		1	0.62
Last episodes experienced			
		Frequencies	%
Over the past week		18	11.11
Over the past year		65	40.12
Over the past month		28	17.28
More than 1 year ago	(2–6 years ago)	45	27.78
NS		6	3.70

Notes. NS = Not Specified.

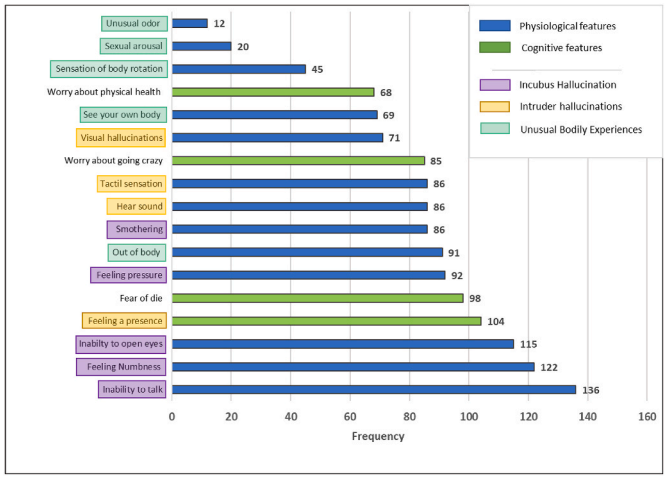

Fig. 1. Characteristics of sleep paralysis in our sample. In the x-axis the number of participants experiencing a particular characteristic. Labels in the y-axis categorize experiences according to the three-factor model proposed by Cheyne 29.

Forty-two percent of the participants additionally reported experiencing other emotions beyond what has already been described. Fear and its derivatives were the most common emotions (36 %). However, some participants (2 %) indicated experiencing positive emotions of calmness, relaxation, and happiness as well.

Visual hallucinations are one of the characteristic phenomena of sleep paralysis. Among our participants, 43.8 % reported having experienced a visual hallucination that had a human form (30.25 %) and that they felt fear towards the person, as they believed they intended to cause harm.

The explanations that participants gave themselves after the first episode of sleep paralysis are numerous: among these, 25.59 % believed it was a dream.

Preventive behaviours to other episodes have been adopted by 24.5 % of the participants. These include changing sleeping positions, adopting regular sleep-wake rhythms, and waking up as soon as they perceive that the episode is starting.

Those who consulted a professional (6.17 %) mostly turned to a general practitioner (30.77 %). The precautions suggested in these settings to limit the onset of the phenomenon are related to regularizing sleep-wake rhythms, meditation, and adopting a healthier lifestyle.

The majority of participants had already heard of sleep paralysis before participating in the research (77.78 %). However, some of them were familiar with the phenomenon under other names such as hypnagogic/hypnopompic paralysis, Out-of-body experience, Sleep Hypnosis, and others.

The last section investigated the belief that aliens could be the cause of the sleep paralysis phenomenon. The 4.32 % of the sample thought that the phenomenon could be caused by alien abduction. Only three participants reported thinking they had been victims of alien abduction after the first time they experienced the phenomenon, and among them, only one person reported having read on internet sites about abduction experiences similar to what they had experienced.

4.2. Explorative analysis

Since we collected part of our data at the beginning of the mandatory quarantine due to SARS-CoV-2, we explored whether there were differences in our data between participants tested before and after the beginning of the quarantine (Table 3).

First of all, considering the whole data collection period, we observed that 52.8 % of the students (n = 228) reported poor sleep quality (PSQI>5), 67.1 % of the students (n = 290) reported some anxiety traits (STAI-Y2> 40) whereas a moderate to severe depression symptomatology (BDI-II>19) was present in 19 % of the sample (n = 82). Overall, the prevalence of poor sleep, and anxiety and depression symptomatology we reported here is similar to what was reported in previous studies with samples of Italian university students [23,30,31].

Table 3
Descriptive statistics of participants tested before and after quarantine, with and without sleep paralysis.

	SP (n = 162)	NSP (n = 270)
Pre-Quarantine (n (%))	110 (67.9 %)	210 (77.8 %)
Quarantine (n (%))	52 (32.1 %)	60 (22.2 %)
BDI-II	13.9 ± 9.0	11.8 ± 9.4
Pre-Quarantine	13.1 ± 10.2	11.3 ± 9.6
Quarantine	15.5 ± 9.1	13.4 ± 8.8
STAI-Y2	49.0 ± 12.1	45.4 ± 11.8
Pre-Quarantine	48.4 ± 12.3	44.6 ± 11.9
Quarantine	50.2 ± 11.6	48.2 ± 10.9
PSQI	6.4 ± 3.0	5.81 ± 2.9
Pre-Quarantine	6.3 ± 3.2	5.8 ± 2.9
Quarantine	6.7 ± 3.0	5.9 ± 2.8

Notes. SP = Sleep Paralysis; NSP= No Sleep Paralysis. BDI-II= Beck Depression Inventory-II; PSQI= Pittsburgh Sleep Quality Index; STAI-Y2= State-Trait Anxiety Inventory-Y2. BDI-II, PSQI, and STAI-Y data are reported as mean ± standard deviation.

From the results of the two-way ANOVA on the PSQI, the Quarantine factor did not appear significant ($F(1,428) = 0.713$, $p = .414$, $\eta^2 < 0.01$), indicating that the perceived sleep quality of participants under quarantine was similar to that of participants recruited before quarantine. The Sleep Paralysis factor was significant ($F(1,428) = 4.055$, $p = .044$, $\eta^2 = 0.010$), indicating that sleep quality was worse in participants with sleep paralysis. The interaction between the Quarantine and Prevalence factors was not significant ($F(1,428) = 0.108$, $p = .773$, $\eta^2 < 0.001$).

From the results of the two-way ANOVA on the STAI-Y, the Quarantine factor is significant ($F(1,428) = 6.106$, $p = .013$, $\eta^2 = 0.010$), indicating that participants under quarantine experienced a sort of worsening of anxious symptoms compared to those recruited before quarantine. The Sleep Paralysis factor was significant ($F(1,428) = 7.718$, $p = .005$ $\eta^2 = 0.017$), indicating that anxious symptomatology was worse in participants with sleep paralysis. The interaction between the two factors was not significant ($F(1,428) = 0.467$, $p = .49$, $\eta^2 = 0.001$).

From the results of the two-way ANOVA conducted on the BDI-II, the Quarantine factor was significant ($F(1,428) = 5.389$, $p = .020$, $\eta^2 = 0.010$), indicating that participants under quarantine had more severe depressive symptoms compared to those not under quarantine. The Sleep Paralysis factor was not significant ($F(3,428) = 3.785$, $p = .052$, $\eta^2 = 0.009$) as the interaction between two factors ($F(3,428) = 0.015$, $p = .902$, $\eta^2 < 0.001$).

The analysis of the chronotype revealed that the evening chronotype was more associated with the sleep paralysis group, whereas the morning chronotype was more associated with the group without sleep paralysis ($\chi2(2) = 10.02$, $p = .006$). The habit of taking a nap was not associated with sleep paralysis ($\chi2(1) = 3.46$, $p = .065$).

5. Discussion

This research aimed to describe the frequency of sleep paralysis within the Italian university population, outlining its main characteristics from both a physiological and behavioral standpoint. Additionally, we aimed to explore the sleep quality, anxious and depressive symptomatology, chronotype, and nap habits of participants with sleep paralysis and compare them with those who have not experienced this disorder.

In 2011, a systematic review reported an average sleep paralysis lifetime prevalence of 28 % in university students [12]. Here, we reported a higher prevalence, i.e., 37.5 % of our sample have experienced at least one episode of sleep paralysis. It should be pointed out that in the recruitment phase, the study was advertised targeting both participants with and without sleep paralysis. Expressly mentioning sleep paralysis may have attracted more attention from students who experienced this phenomenon, leading to a slightly higher prevalence than what was reported by Sharpless & Barber [12], and in line with more recent studies (31.9 % in Ref. [32]; 34.8 % in Ref. [33]; 40.7 % in Ref. [34]).

In our sample, the first episode of sleep paralysis was most common during adolescence, followed by early adulthood. Changes in sleep quantity and quality occur during adolescence [35], which could be a factor involved in the onset of the phenomenon.

As observed in previous studies [10,36,37] sleep paralysis seems to occur more frequently when participants sleep supine rather than prone. However, about half of the sample did not perceive differences between the two positions.

Sleep paralysis is typically accompanied by significant anxiety and fear [38], as confirmed in our sample, where fear and its derivatives were widely experienced, suggesting that sleep paralysis is characterized by high emotional distress. Positive emotions constituted a minority in our sample (2 %) but we did not investigate whether these were connected to specific aspects of the sleep paralysis experience, as observed in other studies [39,40].

Regarding physiological and behavioral characteristics of sleep paralysis, the typical symptom is the inability to speak and ask for help,

followed by sensations of numbness and the inability to open the eyes. These manifestations are characteristic of sleep paralysis, as complete muscle atonia is present during REM sleep. However, it remains to be determined whether subjects are truly awake during an episode of sleep paralysis or if it is, in fact, a dream. Supporting the latter hypothesis, 25.59 % of our participants believed that what they had experienced was indeed a dream. Visual hallucinations were reported by about half of the sample, predominantly humanoid in form. The duration of the episode is typically a few minutes for most participants. However, it is worth noting that most participants reported the actual duration of an episode but not the perceived duration during the episode while experiencing it. Interestingly, none of our participants referred to elements of Italian folklore to describe their experience, as observed in other studies (e.g., Refs. [17,41]). This could be due to the widespread knowledge of sleep paralysis, making the more folkloristic aspect of the phenomenon less known. Similarly, only four participants reported thinking that the episode could be caused by an alien abduction, with only one participant extensively researching possible connections between what had happened to them and alien abductions. It should be emphasized that extraterrestrial phenomena are not characteristic elements of Italian culture, which may have influenced the lack of direct connection to the type of experience they had.

Our data are only partially consistent with previous studies. For instance, our sample reported a higher proportion of out-of-the-body experiences and the fear of dying compared to some UK and US-based studies (e.g., Ref. [42,43]). This may be due to our lower sample size compared to these studies, or some cultural differences and/or appraisals of the sleep paralysis. In this context, it is also important to acknowledge that the USEQ has not been validated in Italian, but here we used a version translated by the authors (CC and NC). Therefore, some questions may have been unambiguous due to an imperfect linguistic adaptation. For example, in the question asking what the participant thought the duration of the sleep paralysis episode was, some of the participants answered according to their perception of how long an episode lasted, while others reported how long they thought an episode truly lasted, beyond their perception. It should also be considered that we scored the open-ended questions using a content similarity approach, which may reduce the replicability of the study. Therefore, future studies may opt for using questionnaires with closed-ended items to increase the replicability of the results.

Among participants who have consulted a professional (6.17 %) have been diagnosed with sleep paralysis. Suggested treatments include psychotherapy, meditation, and regularization of sleep-wake rhythms. These suggestions are in line with the treatments proposed to contain the disorder [38]. However, it remains overlooked by this study whether the adoption of these measures has led to a significant improvement in the frequency of episodes. Also, we have no information on whether sleep paralysis occurs in an isolated or recurrent form. Therefore, it would be necessary to further investigate whether those who turned to a professional did so because the disorder appeared persistently or because they were worried about the experience they had during their first sleep paralysis episode. In this regard, it must be said that the majority of participants who thought they had health problems after the first episode, in particular related to the musculoskeletal system, and therefore this concern may have led them to consult a professional.

In our sample, we found an association between the evening chronotype and sleep paralysis. This may be due to the fact that people with an evening chronotype have worse sleep quality than participants with a morning or intermediate chronotype [44].

Regarding sleep quality, anxious symptomatology, and severity of depressive symptoms, it should be noted that although a significant difference was observed between participants with and without sleep paralysis, the effect size is considered small. The university population is known to report a generally poor sleep quality [30,31], which may contribute to the persistence of the disorder. The general poor sleep quality of university students may explain the small effect size found between the two groups. In addition, some sleep-related aspects remained neglected in this study, for example, if sleep paralysis occurs as a result of sleep deprivation. Moreover, the fact that no differences were observed in the sleep quality of quarantined versus pre-quarantined participants may be because the PSQI is a retrospective measure, referring to the sleep quality of the last month, and it only assesses self-perceived sleep quality. This could explain why we did not observe in our sample the widely reported detrimental effects of quarantine on self-perceived sleep quality (e.g., Ref. [31,45,46]). Also, the use of the PSQI, instead of other instruments such as the Insomnia Severity Index (ISI [47]), makes it difficult to compare our data with some of the previous studies reporting increased insomnia symptoms in participants with sleep paralysis compared to participants without sleep paralysis [42,43].

The current results should be interpreted also considering other limitations. For instance, it should be considered that we did not evaluate the presence of sleep disorders such as obstructive sleep apnea or narcolepsy. Furthermore, the PSQI assesses self-perceived sleep quality, so it may be necessary to include measures that can evaluate the participants' sleep quality from multiple perspectives. Lastly, although a previous study has reported that non-whites may experience higher rates of isolated sleep paralysis [12,42], we did not collect information about ethnicity. Overall, these limitations call for some caution when interpreting our results and suggest the need to identify additional variables that may also explain the link between sleep paralysis and factors that may trigger and maintain its onset.

6. Conclusion

The results obtained are consistent with current evidence in the literature [7,10,14,32], indicating that individuals with sleep paralysis report poorer sleep quality and more severe levels of anxiety compared to those without this disorder. The onset is concentrated during adolescence and often coincides with periods of distress, with no gender differences. Future studies could monitor both sleep quality and the presence of stressful events across childhood and adolescence, assessing the risk of developing sleep paralysis through longitudinal investigations. This approach may help in identifying the factors involved in the onset and maintenance of sleep paralysis, including the impact of lifestyle changes due to the transition from youth to adulthood. Additionally, an aspect overlooked by this study is how the number of hours slept influences the onset of the phenomenon, both from the perspective of sleep deprivation and occasional insomnia and in conditions related to hypersomnia not associated with narcolepsy. In fact, our survey did not include any questions asking participants if this phenomenon was more frequent at particular times in their lives. Finally, it would be interesting to evaluate the effects of recommended therapies on the occurrence of other sleep paralysis episodes, in particular in those subjects who experienced recurrent sleep paralysis.

Data availability statement

The data that support the findings of this study are available from the corresponding author upon reasonable request.

IRB statement

All participants provided informed consent. The study protocol was approved by the local Ethics Committee (Comitato Etico della Ricerca Psicologica, area 17). Code: BF8F43 AAFB0477EA78E733EB497A9A4C.

CRediT authorship contribution statement

Costanza Colombo: Writing – review & editing, Writing – original draft, Visualization, Methodology, Investigation, Formal analysis, Data curation, Conceptualization. **Nicola Cellini:** Writing – review & editing,

Validation, Supervision, Resources, Project administration, Methodology, Conceptualization.

Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Acknowledgments

The research was conducted within the research activity of the Department of General Psychology of the University of Padua without any funds. We thank Damiana Bergamo for her feedback on the manuscript preparation.

Appendix A. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.sleep.2024.08.013.

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