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Dreaming during the COVID-19 pandemic: A narrative review

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Abstract

According to several influential models, dreams can be affected by state- and trait-like factors, sleep features, and diurnal experiences. The COVID-19 pandemic globally affected daily habits, emotional experiences, and sleep. Previous studies suggested an influence of collective traumatic events on dreaming. Starting from these premises, several studies assessed the effect of the pandemic on dreams. This paper aims to review findings concerning the oneiric activity during the COVID-19 pandemic. We report pandemic-related changes in dreams and nightmares, and we consider the possible factors associated with dreaming. Moreover, we provide results about changes in the oneiric activity in different phases of the pandemic. The reviewed findings suggest a pandemic-related enhancement of dream and nightmare frequency, emotional intensity, and distressing contents, modulated by modifications in restrictive measures and associated with diurnal experiences, emotional status, and sleep pattern. We highlight several methodological issues and a large heterogeneity in the present literature, limiting results' generalizability. However, we provide possible interpretations of the most consistent findings in light of the main theoretical frameworks about dreaming.

Keywords: Dream, Nightmare, Pandemic, COVID-19, Continuity hypothesis

1. Introduction

Modern theoretical frameworks and experimental findings support different but non-mutually exclusive hypotheses about dreaming activity (for a review see Scarpelli et al., 2022a): (a) dream production and recall are affected by several state- and trait-like factors; (b) dream recall is influenced by the level of arousal/activation during sleep; (c) mental and neurobiological processes are characterized by continuity between waking and sleep; (d) the oneiric activity may have a role in emotional processes. Starting from these premises, it is easy to understand the strong scientific and mediatic interest in dreaming during the COVID-19 pandemic. Indeed, the pandemic strongly impacted daily habits, emotional experience, and sleep that, consistently with the above-mentioned theoretical frameworks, may be mirrored by modifications of the oneiric activity. Moreover, previous studies described changes in the oneiric activity after potentially traumatic collective experiences like earthquakes (Wood et al., 1992, Tempesta et al., 2013) and terroristic attacks (Hartmann and Basile, 2003). Therefore, a pandemic-related modification of the oneiric activity and a relationship between dream phenomenology and changes in sleep and waking experience can be postulated. The specific features of the pandemic (i.e., long duration, worldwide nature, local intermittent changes in the countermeasures used to prevent the virus spread) make it a unique context for the assessment of dream phenomenology in response to collective trauma and its relationship with daily habits, environmental changes, emotional facets, and sleep features.

The aim of this paper is to review the present studies focused on dreams during the COVID-19 pandemic, also providing a possible interpretation of the available results and a critical view on methodological issues. Specifically, we will provide an overview of dreams, nightmares, and lucid dreams in the general population and specific samples, taking into account different phenomenological facets (i.e., frequency, qualitative features, contents). First, we will consider the retrospective assessment of pandemic-related changes in the oneiric activity compared to pre-pandemic/non-pandemic conditions, also considering the factors associated with such changes. Then, we will report results about the descriptions of dreams and the predictor of several facets of the oneiric activity during the pandemic. Finally, we will explore longitudinal changes in dreaming during different phases of the pandemic. Several

methodological problems that affect the present literature will be highlighted and discussed, and the main findings will be interpreted in light of the main theoretical framework about dreaming.

2. Methods

2.1. Search strategy

We conducted a literature search using PubMed, Scopus, and Web of Science, considering available studies up to April 2022. Search terms included: “COVID”, “coronavirus”, “pandemic”, lockdown”, “Sars-Cov-2”, “dream”, “dreaming”, “oneiric”, “lucid dream”, “nightmare”. Search terms had to be included in the title, abstract, and/or keywords.

2.2. Inclusion/exclusion criteria

Titles, abstracts, and keywords were checked to meet the following criteria: (1) English language; (2) peer-reviewed article; (3) cross-sectional or longitudinal design; (4) main focus on at least one of the investigated phenomena (dreams, lucid dreams, nightmares); (5) quantitative examination of at least one aspect of the investigated phenomena: frequency, qualitative features, content. Books, abstracts, comments, reviews, meta-analyses, pre-prints, and letters to editor were excluded. Eligible articles were selected through a multi-step procedure (title reading, abstract, and full-text assessment) by 2 independent expert researchers. Any disagreement between the reviewers was resolved through a consensus session with a third reviewer. The reference lists of the selected papers were further reviewed for other potential studies: if a reference reported some of the search terms in the title, it was considered as a possible study of interest and checked considering the inclusion/exclusion criteria.

3. Results

A total of 32 papers met the inclusion criteria and were considered in our review (Table 1). Dreams were assessed in 27 papers, while nightmares and lucid dreams in 14 and 4 papers, respectively. Twenty-five studies had a cross-sectional design, 6 were longitudinal studies, and 1 paper adopted both a cross-sectional and longitudinal approach.

Table 1.

Main features and key findings of studies focused on the oneiric activity during the pandemic.

First Author	Year	Country	Design	Period of data collection	Sample	Dream, lucid dreams, and nightmare measures	Psychological and sleep measures
Barrett	2020	Multinational (86 nationalities)	Cross-sectional	Pandemic (Online survey, March 23 - July 15, 2020)	2888 adults (age range: 18–91 y) Mean age ± SD: 40.08 ± 16.89 Male: 890 (30.82%) Neutral or transgender: 68 (2.35%)	Report about any dreams related to COVID-19 → Assessment of emotions and body concerns from the LIWC	
Iorio	2020	Italy	Cross-sectional	Lockdown (Online survey, April - May, 2020)	796 adults (age range: 18–79 y) Mean age ± SD: 30.3 ± 12.8 y Male: 213 (26.76%)	Dream frequency and qualitative facets (Dream Questionnaire) Report about The Most Recent Dream → Assessment of qualitative aspects and analysis of the dream content (Grounded Theory Model)	

First Author	Year	Country	Design	Period of data collection	Sample	Dream, lucid dreams, and nightmare measures	Psychological and sleep measures
McKay	2020	Canada	Cross-sectional	Lockdown (Online survey, February 24 – March 9, 2020)	19 university students (≥ 18 y) at the beginning of the COVID-19 experience, compared to age- and sex-matched control group Male: 6 (32%)	- Dream recorded during 2 weeks using a dream journal → Analysis dream content (Hall/Van de Castle coding system)	
Mota	2020	Brazil	Cross-sectional and longitudinal	Pre-pandemic period (Smartphone application, September – November, 2019) and lockdown (online survey and audio file, March 12 – April 21, 2020)	a) Pandemic group: 31 adults Mean age ± SD: 34 ± 8.72 Males: 5 (16.13%) b) Control group: 31 adults Mean age ± SD: 28.5 ± 9.13 Males: 6 (19.35%) - Six participants had both pre-pandemic and pandemic dream reports	- Audio record of pre-pandemic and pandemic dreams → Assessment of the dream content using different computational language analyses: structural analysis using SpeechGraphs software; proportion of words using LIWC; semantic similarity using customized software to perform	Mental suffering during the pandemic period (PANSS)

First Author	Year	Country	Design	Period of data collection	Sample	Dream, lucid dreams, and nightmare measures	Psychological and sleep measures
						the Fast text method in Python	
Musse	2020	Brazil	Cross-sectional	Post-lockdown (Online survey, May 25 – June 1, 2020)	1057 adults (age range: 18–79 y) Mean age ± SD: 38.1 ± 13.7 y Males: 226 (21.4%) Not binary: 2 (0.2%)	- Questions about frequency and content of nightmare before and during the pandemic	- Personal and clinical antecedents
Pesonen	2020	Finland	Cross-sectional	Lockdown (Online survey, April 27 – May 5, 2020)	4275 participants (age range:10–99 y) Mean age ± SD: 42.6 ± 13.7 y Male: 812 (19%) 811 participants reported their dream content	- Lockdown-related changes in nightmare frequency - Dreams collected during the lockdown	Lockdown-related changes in stress and sleep pattern

First Author	Year	Country	Design	Period of data collection	Sample	Dream, lucid dreams, and nightmare measures	Psychological and sleep measures
						→Assessment of dream content using network and cluster analysis	
Schredl	2020	U.S.A.	Cross-sectional	Lockdown (Online survey, April – May, 2020)	3031 adults (≥ 18 y) Mean age ± SD: 49.54 ± 17.69 y Male: 1351 (44.57%)	- Questions on dream frequency, qualitative facets, and content during the pandemic	- Questions on the impact of COVID-19

First Author	Year	Country	Design	Period of data collection	Sample	Dream, lucid dreams, and nightmare measures	Psychological and sleep measures
Gorgoni	2021	Italy	Cross-sectional	Lockdown (Online survey, April 23 – May 4, 2020)	1091 adults (≥ 18 y) Mean age ± SE: 31.3 ± 0.33 y Male: 306 (28.05%)	Questions about dream frequency and qualitative aspects during the lockdown period	- Sleep variables (PSQI) - PTSD-related nocturnal disruptive behaviors (PSQI-A) - Depression (BDI-II) - Anxiety (STAI)

First Author	Year	Country	Design	Period of data collection	Sample	Dream, lucid dreams, and nightmare measures	Psychological and sleep measures
Borghi	2021	Italy	Cross-sectional	Lockdown (Online survey, March 8 – May 4, 2020)	761 adults (≥ 18 y) Mean age ± SD: 33 ± 12.4 y Male: 131 (17.2%)	Dream collected during the lockdown period selected by the participant → Application of a thematic analysis	- Anxiety, depression, and stress: DASS-21 - Resilience: Wagnild and Young Resilience Scale

First Author	Year	Country	Design	Period of data collection	Sample	Dream, lucid dreams, and nightmare measures	Psychological and sleep measures
Frankl	2021	Multinational (14 countries)	Cross-sectional	Pandemic (Online survey, May-July, 2020)	19.355 adults (≥ 18 y) Male: 6516 (33.73% of those who reported information about gender)	- Dream and nightmare frequency (BNSQ)	- Sleep measures (BNSQ) - Insomnia (ISI) - Sleep apnea (STOP Questionnaire) - RBD (single question) - Anxiety (GAD-2) - Depression (PHQ-2) - Well-Being (Well-Being Index) - Post-Traumatic Stress Disorder (two-item from the PTSD checklist) - Stress (single item) - Quality of life and health (two items)

First Author	Year	Country	Design	Period of data collection	Sample	Dream, lucid dreams, and nightmare measures	Psychological and sleep measures
Guerrero-Gomez	2021	Multinational (Italy, Romania, and Croatia)	Cross-sectional	During and after the lockdown (Online survey, Italy: April 27 – June 15, 2020; Romania: June 3 – July 2, 2020; Croatia: June 18 – July 1, 2020) Outcome referred to the lockdown period	2105 secondary school students (age range: 11–20 y) Mean age ± SD: 15.4 ± 2.1 y Male: 659 (31.3%)	- Questions about dream and nightmare frequency during the pandemic - Report of an extraordinary dream → identification of pandemic-related content	- Questions about pandemic-related distress, lockdown management, and emotional condition
Guo	2021	China	Cross-sectional	After the lockdown (Online survey, April 28 – May 28, 2020)	328 participants (age range: 14–56 y) Mean age ± SD: 28.71 ± 9.77 y Male: 113 (34.4%)	- threatening dream frequency (Dream Threat Questionnaire)	- media exposure - coping efficacy (Coping Efficacy Questionnaire) - Anxiety (GAD-7)
Kilius	2021	Canada	Cross-sectional	After the lockdown	71 university students (age range: 18–49 y)	- Report about a dream had during	

First Author	Year	Country	Design	Period of data collection	Sample	Dream, lucid dreams, and nightmare measures	Psychological and sleep measures
				(Online survey, July 17 – August 10, 2020) Outcome referred to the lockdown period	Male: 19 (26.76%) Non-binary: 1 (1.41%)	the isolation period → Analysis of dream content using the Hall-Van de Castle Dream Coding System - Questions about dream frequency and qualitative aspects during the pandemic	
Lin	2021	China	Cross-sectional	After the lockdown (Online survey, March, 19 – April 215, 2020)	528 health-care workers (Frequent nightmares= 144; Non-frequent nightmares= 384) Mean age ± SD: frequent nightmares= 32.29 ± 5.77 y; non-frequent nightmares= 34.13 ± 6.52 y; Male: frequent nightmares= 30 (20.8%); non-frequent nightmares= 103 (26.8%);	- Nightmare frequency (item “nightmare” in component 5 of the PSQI)	- Sleep quality (PSQI) - Daytime sleepiness (Epworth Sleepiness Scale) - Chronotype (reduced version of Morningness–Eveningness Questionnaire) - Questions concerning worries about the pandemic - General mental health (General Health Questionnaire)
Margherita	2021	Italy	Cross-sectional	Lockdown	1095 adults (≥ 18 y) Males: 208 (19%)	- Report of a dream had during the lockdown	

First Author	Year	Country	Design	Period of data collection	Sample	Dream, lucid dreams, and nightmare measures	Psychological and sleep measures
						→ Analysis of dream themes using the Most Recent Dream technique - Dream recall frequency, meaningfulness, and problem-solving dreams (MADRE)	
Mariani	2021a	Italy	Cross-sectional	Lockdown (Online blog, April – May, 2020)	68 adults Mean age ± SD: 26.16 ± 7.68 y Males: 22 (32.35%)	- Dreams collected from a blog → Analyses of dream themes using computerized referential process linguistic measures	
Mariani	2021b	Italy	Cross-sectional	Lockdown (Online survey, first week of the first Italian lockdown)	a) Dream group: 49 adults Mean age ± SD: 33.45 ± 10.12 y Males: 23 (46.94%) b) Experience of the lockdown group: 48 adults Mean age ± SD: 34.54 ± 12.8 Males: 25 (52.08%)	- Report of a night dream had during the lockdown → Analysis of dream themes using computerized referential process linguistic measures and Affect Salience Index	Application of computerized referential process linguistic measures and Affect Salience Index on written report of waking thoughts during the lockdown
Scarpelli	2021a	Italy	Cross-sectional	Lockdown (Online	5988 adults (≥ 18 y) Mean age ± SD:	- Dream and nightmare	- Psychosocial symptoms (DASS-

First Author	Year	Country	Design	Period of data collection	Sample	Dream, lucid dreams, and nightmare measures	Psychological and sleep measures
				survey, March 10 – May 4, 2020)	33.54 ± 13.53 y Male: 1596 (26.7%)	frequency (MADRE)	21) - Sleep measures (MOS-SS)

First Author	Year	Country	Design	Period of data collection	Sample	Dream, lucid dreams, and nightmare measures	Psychological and sleep measures
Scarpelli	2021b	Italy	Cross-sectional	Lockdown (Online survey, March 10, - May 4, 2020)	43 narcoleptic patients (age range: 18–60 y) Male: 18 (41.9%) 86 healthy controls (age range: 18–60 y) Male: 36 (41.9%)	- Dream, lucid dream, and nightmare frequency, emotional tone, emotional intensity, and nightmare distress (MADRE)	- Psychosocial symptoms (DASS-21) - Sleep measures (MOS-SS)
Scarpelli	2021c	Italy	Longitudinal	Lockdown periods	611 adults (≥ 18 y) Male: 128 (20.9%)	- Dream, lucid dream, and	- Psychological changes in the

First Author	Year	Country	Design	Period of data collection	Sample	Dream, lucid dreams, and nightmare measures	Psychological and sleep measures
				associated to the first and second pandemic waves (Online survey, Lockdown during the first wave: spring 2020; Lockdown during the second wave: December 18, 2020 – January 18, 2021)		nightmare frequency, emotional tone, emotional intensity, and nightmare distress (MADRE)	aftermath of a trauma (Post-traumatic Growth Inventory) - PTSD-related nocturnal disruptive symptoms (PSQI-A) - Practices and behavior related to sleep hygiene (Sleep Hygiene Index) - Sleep measures (MOS-SS)
Solomonova	2021	The larger part of the sample (n = 940)was located in Canada, 21 participants in other 5 countries, and 7 did not	Cross-sectional	Lockdown (Online survey, April 3 – May 15, 2020)	968 participants (age range: 12–92 y) Mean age ± SD: 52.5 ± 17.2 y Male: 258 (26.65%)	- dream themes during the last week (Typical Dreams Questionnaire + 4 pandemic-related themes)	- pandemic-related concerns - Stress (Cohen's Perceived Stress Scale) - Anxiety (GAD-7) - Depressive symptoms (Quick Inventory of

First Author	Year	Country	Design	Period of data collection	Sample	Dream, lucid dreams, and nightmare measures	Psychological and sleep measures
		communicate their location				- Dreams, bad dreams, and nightmare frequency during the past year preceding the lockdown and the last week	Depressing Symptomatology) - Sleep duration (PSQI)
Sommantico	2021	Italy	Cross-sectional	Lockdown and post-	475 participants (age range: 12–70 y) divided in	- Dream frequency,	

First Author	Year	Country	Design	Period of data collection	Sample	Dream, lucid dreams, and nightmare measures	Psychological and sleep measures
				lockdown (Online survey, April 17 – May 18, 2020)	adolescents (n = 230) and adults (n = 245) Mean age ± SD: 25.10 ± 12.2 y Male: 124 (26.1%)	emotional intensity, and emotional tone (Dream Questionnaire) - Analysis of the Most Recent Dream	

First Author	Year	Country	Design	Period of data collection	Sample	Dream, lucid dreams, and nightmare measures	Psychological and sleep measures
Wang	2021	China	Cross-sectional	Pre-pandemic and pandemic (Online survey, Non-epidemic situation: June 2019 Epidemic situation: February 2020)	a) Epidemic-situation sample: 127 undergraduates and postgraduates (age range: 18–39 y; Mean age ± SD: 25.6 ± 3.98 y) who experienced the spread of COVID-19 pandemic. Of these, 91 reported dreams they had during the previous week. Males: 19 (20.88%) b) Non-epidemic situation sample: 140 undergraduates and postgraduates (age range: 19–37 y; Mean age ± SD: 22.94 ± 3.14 y) who reported their dreams before the appearance of the pandemic in China Males: 18 (19.78%)	- Analysis of the Most Recent Dream →Application of different coding systems	
Alfonsi	2022	Italy	Longitudinal	Four assessments during the lockdown; one follow-up assessment during a period of eased restrictions (Online survey, T1: March 29 – April 5, 2020; T2: April 6 – April 12, 2020; T3: April 13 – April 19,	147 adults (age range: 18–81 y) Mean age ± SD: 34.07 ± 15.89 y Male: 42 (29%)	Number of dreams reported in a sleep diary	Sleep variables collected through a sleep diary

First Author	Year	Country	Design	Period of data collection	Sample	Dream, lucid dreams, and nightmare measures	Psychological and sleep measures
				2020; T4: April 27 – May 3, 2020; Follow-up: September 14 – October 12, 2020)			
Alghamdi	2022	Saudi Arabia	Cross-sectional	Lockdown (Online survey, two weeks at the end of May, 2020)	368 university students Mean age ± SD: 20.4 ± 1.6 Male: 132 (35.87%)	- Nightmare frequency assessed according to the ICSD-3	- Sleep disturbances: Generalized - Sleep Disturbance Scale - Depression: PHQ-2 - Anxiety: GAD-2 - Worries or concerns due to the restrictions - - Academic-related tension
Conte	2022	Italy	Longitudinal	Total lockdown (first wave) and partial lockdown (second wave) (Online survey, Total lockdown: April 1–20, 2020; Partial lockdown: Autumn, 2020)	- 1622 adults (≥ 18 y) at total lockdown, 214 adults at partial lockdown Mean age ± SD (total lockdown): 34.1 ± 13.6 y Mean age ± SD (partial lockdown): 36.78 ± 14.2 y Male (total lockdown): 451 (27.8%) Male (partial lockdown): 55 (25.7%)	- Questions about dream frequency and qualitative aspects	- sleep quality (PSQI and retrospective questions) - Questions about psychological variables

First Author	Year	Country	Design	Period of data collection	Sample	Dream, lucid dreams, and nightmare measures	Psychological and sleep measures

First Author	Year	Country	Design	Period of data collection	Sample	Dream, lucid dreams, and nightmare measures	Psychological and sleep measures
Goncalves	2022	Portugal	Longitudinal	Lockdown (Weekly online survey, March 26 – May 1, 2020)	5011 participants (≥ 16 y) Male: 1303 (26.6%)	- Single item concerning the presence of nightmares about the current situation	- Single item concerning insomnia symptoms
Kennedy	2022	U.S.A.	Cross-sectional	After the Lockdown (Online survey, June – November 2020)	419 adults (age range: 18–80 y) Mean age ± SD: 45.97 ± 16.07 y Male: 108 (25.95%)	- Question about themes of nightmares had during the quarantine - Nightmare frequency (MADRE)	- COVID-related stress - Sleep features - Depression (PHQ-2) 1. Anxiety (GAD-7)
Scarpelli	2022b	Multinational (14 countries)	Cross-sectional	Pandemic (Online survey, May – July, 2020)	a) 544 adults (≥ 18 y) with COVID-19 Male: 215 (39.5%)	- Questions about dream and nightmare frequency during	- Anxiety (GAD-2) - Depression (PHQ-2)

First Author	Year	Country	Design	Period of data collection	Sample	Dream, lucid dreams, and nightmare measures	Psychological and sleep measures
					b) 544 matched-controls Male 219 (40.3%)	and before the pandemic	- Stress (single item) - PTSD (two items) - Psychological wellbeing (Well-Being Index) - Quality of life and health (two items) - Sleep (BNSQ) 1. - Insomnia (ISI)
Scarpelli	2022c	Italy	Longitudinal	Lockdown and post-lockdown (Online survey, Last week of the Italian lockdown: April 28 – May 4, 2020; First week post-	90 adults (age range: 19–41 y) Mean age ± SD: 25.77 ± 3.85 y Male: 18 (20%)	-Dream frequency and qualitative aspects and lucid dream frequency using a daily dream diary during the last week of the lockdown and the first post-lockdown week - Audio-recorded dreams during the last week of the	- Sleep diary during the last week of the lockdown and the first post-lockdown week - Anxiety (STAI) - Depression (BDI-II)

First Author	Year	Country	Design	Period of data collection	Sample	Dream, lucid dreams, and nightmare measures	Psychological and sleep measures
				lockdown: Ma 5 – may 11, 2020)		lockdown and the first post-lockdown week →Analysis of qualitative features and contents of dreams collected	- Sleep variables (PSQI) 1. PTSD-related nocturnal disruptive symptoms (PSQI-A)
Gorgoni	2022	Italy	Longitudinal	Lockdown and post-lockdown (Online survey, Lockdown: April 23 – May 4, 2020) Post-lockdown: October 10–28, 2020)	108 adults (≥ 18 y) Mean age ± SE: 32.12 ± 1.29 Male: 25 (23.1%)	- Questions about dream frequency, qualitative aspects, contents, and lucid dream frequency	- Sleep variables (PSQI) - PTSD-related nocturnal disruptive behaviors (PSQI-A) - Depression (BDI-II) - Anxiety (STAI) 1. Time using digital media
Scepanovic	2022	Multinational	Cross-sectional	Pre-pandemic baseline dataset (January 1 – February 24, 2014) Pandemic	2888 adults (age range: 18–91 y) Mean age ± SD: 40.08 ± 16.89 Male: 890 (30.82%) Neutral or transgender: 68 (2.35%) Pre-pandemic baseline dataset:	- Dream reports related to the COVID-19 coronavirus, analysed through a deep-learning algorithm for the extraction of	

First Author	Year	Country	Design	Period of data collection	Sample	Dream, lucid dreams, and nightmare measures	Psychological and sleep measures
				dataset (February 1 – April 30, 2020) Pandemic dream survey (March 23 – July 15, 2020	974482 English tweets posted by 240959 unique users Pandemic dataset: 57287490 English Tweets posted by 11318634 unique users	mentions of medical conditions	

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Abbreviations: BDI-II, Beck Depression Inventory II; BNSQ, Basic Nordic Sleep Questionnaire; DASS-21, Depression Anxiety Stress Scale-21; GAD, Generalized Anxiety Disorder; ICSD-3, Third Edition of the International Classification of Sleep Disorders; ISI, Insomnia Severity Index; LIWC, Linguistic Inquiry and Word Count; PANSS, Positive and Negative Syndrome Scale; MADRE, Mannheim Dreams questionnaire; MOS-SS, Medical Outocomes Study-Sleep Scale; PHQ, Patient Health Questionnaire; PSQI, Pittsburgh Sleep Quality Index; PSQI-A, Pittsburgh Sleep Quality Index – Addendum; PTSD, Post-traumatic Stress Disorder; RBD, REM Sleep Behavior Disorder; SD, standard deviation; SE, standard error; STAI, State-Trait Anxiety Index; STOP, Snoring, Tiredness, Observed apnea, high blood Pressure; y, years.

The study sample size ranged from a minimum of 38 (two groups of 19 participants) to a maximum of 19355 participants. In all of the considered studies, females represented the larger part of the sample (males ranged from 16.13% to 44.57%), with the exception of a study that compared two groups with 46.94% and 52.08% of males, respectively (Mariani et al., 2021b). The widest age range considered is 10–99 y (Pesonen et al., 2020), which also represents the minimum and maximum age reached in the present literature. The minimum and maximum mean age were 15.4 y and 52.5 y respectively, but seven papers did not report the mean age. Six studies were multinational, while the others were performed in the following countries: Italy (14 studies), China (3 studies), Canada (2 studies), Brazil (2 studies), U.S.A. (2 studies), Finland (1 study), Saudi Arabia (1 study), Portugal (1 study). All the considered studies used an online strategy for data collection.

We found two main categories of dream and nightmare assessment in the reviewed literature: dream reports (15 studies), which allowed different methodologies of contents/themes analysis of specific dreams recorded (e.g., written, audio-recorded) by the participants, and dream items/questionnaires/diaries (24 studies), which allowed to score dream frequency, qualitative features, and contents. Also, 16 studies assessed sleep features, sleep disorders, or sleep-related variables, and 21 papers report on psychological/emotional/clinical variables. Twenty-three studies were performed on the general population, while other studies were focused on specific samples: university students (3 studies), undergraduates/postgraduates (1 study), secondary school students (1 study), adolescents (1 study), healthcare workers (1 study), narcoleptic patients (1 study), COVID-19 patients (1 study).

3.1. Pandemic-related changes in the oneiric activity compared to a non-pandemic condition

Changes in oneiric phenomenology during the pandemic compared to a non-pandemic condition were assessed with different methods: direct questions about the perception of pandemic-related changes in dreams (Schredl and Bulkeley, 2020, Guerrero-Gomez et al., 2021) and nightmares (Pesonen et al., 2020, Guerrero-Gomez et al., 2021), retrospective scoring of dream features (Conte et al., 2022, Gorgoni et al., 2021a, Fränkl et al., 2021, Solomonova et al., 2021, Scarpelli et al., 2022b) and nightmare features (Musse et al., 2020, Solomonova et al., 2021, Scarpelli et al., 2022b) before and during the pandemic, comparison with a population-based pre-pandemic sample (Scarpelli et al., 2021a, Kilius et al., 2021), and comparison with a non-pandemic control group (MacKay and DeCicco, 2020, Mota et al., 2020, Wang et al., 2021). Changes in dream frequency during the pandemic in the general population were reported by several studies (Schredl and Bulkeley, 2020, Conte et al., 2022, Gorgoni et al., 2021a, Fränkl et al., 2021, Scarpelli et al., 2021a, Scarpelli et al., 2022b, Solomonova et al., 2021). Conte and co-workers (2022) found that approximately half of the participants reported increased or decreased dream frequency during total and partial lockdown compared to pre-lockdown periods. The most frequently reported result is represented by increased dream frequency during total lockdown compared to the pre-pandemic period (Schredl and Bulkeley, 2020, Conte et al., 2022, Gorgoni et al., 2021a, Fränkl et al., 2021, Scarpelli et al., 2021a, Scarpelli et al., 2022b, Solomonova et al., 2021). This result was also confirmed in secondary school students (Guerrero-Gomez et al., 2021) and COVID-19 patients (Scarpelli et al., 2022b). Changes in nightmare frequency during the pandemic, mainly in the direction of a pandemic-related increase, were reported by 3 studies in the general population (Musse et al., 2020, Fränkl et al., 2021, Scarpelli et al., 2021a), one study in secondary school students (Guerrero-Gomez et al., 2021) and COVID-19 patients (Scarpelli et al., 2022b).

Pandemic-related modifications in contents and qualitative features of the oneiric activity have been observed by 5 studies in the general population (Mota et al., 2020, Schredl and Bulkeley, 2020, Conte et al., 2022, Gorgoni et al., 2021a, Wang et al., 2021) and two papers on small groups of university students (MacKay and DeCicco, 2020, Kilius et al., 2021). Specifically, several studies found changes in the emotional experience of dreams, in the direction of greater emotional intensity (Gorgoni et al., 2021a), more negative tone, or more frequent negative emotions in dreams (Schredl and Bulkeley, 2020, Conte et al., 2022, Gorgoni et al., 2021a) compared to pre-lockdown period. Conte and co-workers (2022) also observed that approximately half of the participants reported increased or decreased dream length and vividness during total and partial lockdown compared to pre-lockdown periods, and one study found a pandemic-related increase in dream vividness, bizarreness, and length compared to the pre-pandemic period (Gorgoni et al., 2021a).

The analysis of changes in contents of dreams collected during the pandemic points to (a) more animal imagery, location changes, virus-related content, food imagery, and head dream content in university students (MacKay and DeCicco (2020)); (b) a greater proportion of anger- and sadness-related words and higher average semantic similarities to the term “contamination” and “cleanness”, associated with mental suffering linked to social isolation (Mota et al., 2020); (c) aggressive interactions in female university student (Kilius et al., 2021); (d) increased frequency of threatening (non-aggressive) events (Wang et al., 2021).

Several variables were associated with specific pandemic-related changes in the oneiric activity. Female gender was related to a pandemic increase in dream frequency (Gorgoni et al., 2021a, Guerrero-Gomez et al., 2021), emotional load and bizarreness (Gorgoni et al., 2021a), negative dream tone, and pandemic-related dreams (Schredl and Bulkeley, 2020), nightmare frequency (Guerrero-Gomez et al., 2021, Kilius et al., 2021, Pesonen et al., 2020), and physical aggression in dream contents (Kilius et al., 2021). Increased stress was associated with boosted nightmare frequency (Pesonen et al., 2020). People most strongly affected by the pandemic exhibited heightened dream recall, more negative dream tone, and pandemic-related dreams (Schredl and Bulkeley, 2020). Younger age was associated with increased dream recall (Schredl and Bulkeley, 2020), but older participants had greater nightmare frequency in a small group of university students (Guerrero-Gomez et al., 2021). Higher education was associated with increased dream recall and COVID-19-related dreams in one paper (Schredl and Bulkeley, 2020). In a single study (Gorgoni et al., 2021) it was observed that (a) participants with poorer sleep quality had a greater increase in dream frequency and emotional load; (b) individuals with PTSD-related nocturnal sleep behaviors had a greater increase in dream frequency, emotional load, vividness, and bizarreness; (c) participants with depressive symptoms had a greater increase in dream frequency, emotional load, and vividness. Another study found that the proportion of participants reporting poor sleep quality, nightmares, and frequent sleep problems was higher during the pandemic in both low and high dream recall frequency groups, but such increase was greater for participants with high dream recall frequency (Fränkl et al. (2021)). Finally, in secondary school students, one study found that different indexes of pandemic-related subjective distress and emotional reactions were positively associated with nightmare increase, Italian participants more likely reported more nightmares compared to Croatian and Romanian, and experiencing discomfort/sadness was related to dream increase (Guerrero-Gomez et al., 2021).

One study assessed the predictors of bidirectional changes (i.e., increase and decrease) in dream variables during total and partial lockdown compared to pre-lockdown periods (Conte et al., 2022). During the total lockdown, (a) younger age predicted decreased and increased dream frequency, length, and vividness; (b) female gender predicted decreased and increased dream frequency and vividness; (c) worsened sleep quality predicted decreased dream frequency, length, and vividness; (d) increased dream negative emotionality predicted increased dream frequency, length, and both increased and decreased vividness; (e) delayed sleep midpoint, negative mood, and moderate stress respectively predicted increased dream length, decreased and increased dream vividness. During the partial lockdown, (a) younger age predicted decreased dream frequency and length, (b) positive mood predicted

decreased dream frequency and was negatively associated with increased dream vividness, (c) increased negative dream emotionality predicted decreased and increased dream frequency and length. The increase in negative emotionality was predicted by female gender, higher stress, more negative mood and worsened sleep quality in total lockdown, and worsened sleep quality during the partial lockdown. The presence of COVID-19 related dreams was predicted by female gender, higher general fear, increased dream vividness, and increased dream negative affect during total lockdown, and higher general fear during partial lockdown (Conte et al., 2022).

3.2. Characterization of the oneiric activity and associated variables during the pandemic

3.2.1. Dream frequency

Several studies found higher dream frequency (Iorio et al., 2020, Gorgoni et al., 2021a, Fränkl et al., 2021, Scarpelli et al., 2021a) or a greater percentage of high dream recallers (Sommantico et al., 2021) in women than men during the pandemic. Younger age was related to greater dream frequency (Gorgoni et al., 2021a, Fränkl et al., 2021, Scarpelli et al., 2021a) and a greater percentage of high dream recallers (Sommantico et al., 2021).

Considering the emotional status, one study found an association between PTSD symptoms and higher dream recall frequency (Fränkl et al., 2021), and participants with moderate-to-severe stress levels showed greater dream frequency in another study (Solomonova et al., 2021). The presence of depressive symptoms was associated with higher dream frequency in one paper (Gorgoni et al., 2021a). Frankl and co-workers (2021) also found a positive relationship between high dream recall frequency and depression, but when PTSD symptoms were included in the regression model, the direction of the relationship between dream recall frequency and depression turned negative, and the same phenomenon was found for anxiety. Two studies found that several environmental factors were associated with high dream frequency: territorial area (i.e., north of Italy), living alone during the lockdown (Gorgoni et al., 2021a), and not having children (Scarpelli et al., 2021a). Media exposure was found positively associated with threatening dream frequency, with anxiety as a partial mediator (Guo and Shen, 2021). Finally, three studies found an association between great dream frequency and sleep variables: higher sleep duration (Gorgoni et al., 2021a, Scarpelli et al., 2021a), higher sleep disturbance (Gorgoni et al., 2021a), nightmares, sleep talking, sleep maintenance problems, and RBD (Fränkl et al., 2021). Greater dream recall was also associated with sleepiness in a group of narcoleptic patients (Scarpelli et al., 2021b).

3.2.2. Dream qualitative aspects

The emotional intensity of dreams during the pandemic was greater in females (Iorio et al., 2020, Gorgoni et al., 2021a, Sommantico et al., 2021), which also reported more negative emotional tone or more frequent negative emotions in dreams (Barrett, 2020, Gorgoni et al., 2021a, Iorio et al., 2020). Dream emotional intensity was also associated with younger age, depressive symptoms, territorial area (i.e., north of Italy), living alone during the lockdown, poorer sleep quality, greater sleep duration, sleep disturbance, and daytime dysfunctions (Gorgoni et al., 2021a), job change and asking for help from mental health professional (Scarpelli et al., 2021c). Moreover, in one study greater emotional intensity was observed in people who stopped working, reported modification of the sleep onset, and changed habits at morning awakening (Scarpelli et al., 2021a). One paper reported more frequent dream negative emotions in younger adults, and participants with poor sleep quality, nocturnal disruptive behaviors, anxiety, and depressive symptoms (Gorgoni et al., 2021a), and a more negative emotional tone was observed in people who had stopped working, reported modification of the sleep onset and changed habits at morning awakening (Scarpelli et al., 2021a), and in adults compared with adolescents (Sommantico et al., 2021). The negative emotional tone was also associated with forced quarantine, having relatives/friends infected by COVID-19, and asking for help from mental health professional (Scarpelli et al., 2021c).

Beyond emotional valence, one study assessed the predictors of other dream features showing that (a) younger age, female gender, depressive symptoms, geographical area (i.e., north of Italy), and living alone during the lockdown predicted dream vividness, (b) younger age and geographical area (i.e., north of Italy) predicted dream bizarreness, (c) younger age, female gender, and living alone during the lockdown predicted dream length (Gorgoni et al., 2021a). Moreover, considering sleep features, (a) longer sleep duration, greater sleep disturbances, and daytime dysfunctions predicted dream vividness, (b) greater sleep disturbance predicted dream bizarreness, and (c) longer sleep duration and greater sleep disturbance predicted sleep length (Gorgoni et al., 2021a).

Finally, one study provided the characterization of lucid dreams during the pandemic in narcoleptic patients, showing greater lucid dream frequency in these patients compared with controls (Scarpelli et al., 2021b). Moreover, narcoleptic patients with greater lucid dream frequency showed a larger influence of dreams during wakefulness, specifically concerning problem-solving and creativity. Finally, lucid dream frequency was associated with sleepiness (Scarpelli et al., 2021b).

3.2.3. Qualitative and quantitative analyses of dream content, themes, and narrative styles

Several studies used different techniques to qualitative or quantitative analyse dream contents, themes, and narrative styles during the pandemic. Barrett (2020) collected any dreams related to COVID-19, assessing sex differences in emotions and body concerns from the Linguistic Inquiry and Word Count (LIWC). The author found that women showed lower positive emotions in dreams and greater rates of negative emotions, anxiety, sadness, anger, body content, references to biological processes, health, and death. Men exhibited a higher score for the LIWC variable, while positive emotions, negative emotions, anxiety, and death had a similar trend to the one observed in women, but with lower significant levels (Barrett, 2020). Dream related to COVID-19 has been also compared to a large number of tweets (considered an expression of waking experiences) mentioning the pandemic, using a deep-learning algorithm for the extraction of mentions of medical conditions (Šćepanović et al., 2022). Results suggest that (a) health expression common to dream dataset and tweets referred to typical COVID-19 symptoms, while those that distinguished dreams and tweets reflected differences in thought processes: tweets reflected linear and logical thoughts, describing realistic symptoms and related disorders; dreams reflected conditions unrelated to the virus and conditions of surreal nature.

Iorio and co-workers (2020) collected the most recent dream, assessing the common presence of qualitative dream aspects and analysing their content using the Grounded Theory Model (Glaser and Strauss, 1967), a method that allows the development of a theoretical account concerning the general features of a topic while grounding the account in empirically observation or data (Martin and Turner, 1986). The main findings show that (a) women exhibited greater dream emotional intensity, predominantly negative dream emotional tone, greater negative emotions and sensory impressions than men, (b) 20% of the reported dreams had explicit COVID-19 references, (c) participants knowing people affected by or died for COVID-19 exhibited greater emotional intensity and sensory impressions in dreams, (d) the most recent dreams were more likely set in external locations and showed negative emotions (mainly for dangerous, violent, and frustrating situations). The same research group collected the most recent dream around the end of the lockdown in adults and adolescents, also performing a stemming process and a Thematic Analysis of Elementary Contexts (Sommantico et al., 2021). The authors found that females reported longer dreams, lower positive emotions, higher negative emotions, and greater presence of sensory impressions than males. Adult participants reported longer dreams, higher negative emotions, and higher presence of sensory impressions than adolescents. Clusters of adolescents' more recent dream included home confinement, school, friends and boyfriends, and death of family members. Clusters of adults' more recent dream included home confinement, nostalgia for happiness, bodily sensations, dream evaluation, and compliance with health and safety norms.

Pesonen and collaborators (2020) assessed the content of dream collected during the lockdown using network and cluster analysis. Results revealed 33 dream clusters, including 20 bad dream clusters of which 55% were pandemic-specific. The dream-association networks were more accentuated for those who reported an increase in perceived stress.

Guerrero-Gomez and collaborators (2021) asked secondary school students to report "an extraordinary dream", in which the authors identified pandemic contents. A direct reference to COVID-19 related topics was found in 14.2% of reported dreams. Younger age, female gender, and worries about another lockdown were associated with the report of a pandemic-related dream.

In the study of Borghi and co-workers (2021), the authors performed a thematic analysis, a qualitative coding process that allows the identification, analysis, and aggregation of themes (Braun and Clarke, 2006), on lockdown dreams selected by the participants. They identified 8 categories in dreams (places, characters, relationships, actions, danger, death, processes, emotions) with specific sub-categories, which composed the narrative structure of dreams. Positive dream emotions were predicted by the presence in dreams of open places or places of escape, relationality that unites, and positive processes, while working in health care predicted a higher frequency of unborn person in dreams. The same research group (Margherita et al., 2021) analysed the narratives of the most recent dream during the lockdown period using T-Lab (Lancia, 2008), a quali-quantitative software for text analysis that identifies meaning dimensions and themes on the basis of the comparison of different lexical profiles. The authors found 4 thematic clusters: escape from the threat, the work of mourning, unrecalled dreams, COVID-19 as manifest content. A factorial mapping organized 3 vectors of meaning representative of the function of dreaming: remembering, repeating, and working through; from traumatic content to problem-solving strategy; from the safe-guardian of sleep to the safe-guardian of dream waking continuity.

Two studies from Mariani and co-workers (2021a; 2021b) also focused on dream themes. In the first study (Mariani et al., 2021a), the authors collected dreams from an online blog during the lockdown and analysed dream themes using different computerized referential processes linguistic measures, revealing three dream clusters: symbolizing process, arousal of emotional activation, reflection/reorganizing elaboration. In the second study (Mariani et al., 2021b), they applied computerized referential process linguistic measures and Affect Salience Index, a measure of arousal in written texts (Fornari, 1976, Salvatore and Freda, 2011, Valsiner, 2021), on dreams and waking thoughts collected during the lockdown. The authors found that (a) Affect Salience was present in dreams and waking thoughts, (b) Referential Activity was higher in dreams, while Reflection and Affect words were higher in waking thoughts, and (c) a greater symbolization process was observed during dreams and higher emotional distance in waking thoughts.

Solomonova and co-workers (2021) assessed dream topics and themes during the lockdown using a modified version of the Typical Dream Questionnaire (Nielsen et al., 2003) that also includes 4 pandemic-related concerns. The results showed that the most common dream themes during the pandemic were

centered around the topics of inefficacy, human threat, death, and pandemic imagery. Higher stress, anxiety, and depression levels were associated with the frequency of dreams contents about the pandemic, inefficacy, and death.

3.2.4. Nightmares

Nightmare frequency during the pandemic was associated with (and was more frequent in) the female gender in the general population (Musse et al., 2020, Scarpelli et al., 2021a), and in university students (Alghamdi et al., 2022). Younger age was also related to nightmare frequency (Musse et al., 2020, Scarpelli et al., 2021a). Concerning the emotional status during the pandemic, nightmare frequency was associated with anxiety and depressive symptoms (Scarpelli et al., 2021a), perceiving a high risk of contracting COVID-19, increased alcohol consumption during the pandemic, and suicidal ideation (Musse et al., 2020). A relationship has been also observed between nightmare frequency and sleep variables, specifically, modification of daytime napping and high intra-sleep wakefulness (Scarpelli et al., 2021a) and greater sleep disturbance (Scarpelli et al., 2021a, Alghamdi et al., 2022), while results about the association with sleep duration were contrasting (Scarpelli et al., 2021a, Solomonova et al., 2021).

Nightmare frequency was also assessed in specific populations. One study on healthcare workers found that individuals with frequent nightmares during the pandemic reported higher worry about being infected and family's infection of COVID-19, lower confidence in being cured if infected and sense of competence, a greater percentage of poor mental health, higher General Health Questionnaire score, reduced sleep duration, higher diurnal sleepiness, and poorer sleep quality (Lin et al., 2021). Moreover, reduced sleep duration and reduced habitual sleep efficiency were associated with frequent nightmares (Lin et al., 2021). In a small group of narcoleptic patients, nightmare frequency was related to the female gender, longer sleep duration, higher intra-sleep wakefulness, and sleepiness (Scarpelli et al., 2021b). In another study, individuals with COVID-19, compared to a control group, exhibited higher nightmare frequency, anxiety, depression, PTSD scores, and lower quality of life, quality of health, and wellbeing (Scarpelli et al., 2022b). In the COVID-19 group, greater nightmare frequency was predicted by higher dream recall frequency, higher anxiety, insomnia symptoms, high PTSD risk, lower sleep duration, and younger age (Scarpelli et al., 2022b).

Concerning qualitative aspects, in one study nightmare distress was greater in individuals who stopped working during the pandemic, having relatives or friends infected by or died for COVID-19, and exhibiting modification of sleep onset, morning awakening habits, and napping habits (Scarpelli et al., 2021a).

Nightmare contents have been also assessed. Previous psychiatric conditions, use of sleep medication, and younger age were found associated with nightmares characterized by pandemic contents (Musse et al., 2020). Kennedy and co-workers (2022) found that different nightmare contents were selectively associated with greater general COVID-related stress, worsened sleep, and worsened middle-of-the-night insomnia, while depression and anxiety were positively associated with all of the investigated nightmare themes. Finally, Alghamdi and co-workers (2022) observed in university students that the most common nightmare theme was not related to COVID-19.

3.3. Longitudinal changes during the pandemic

Several periods of the pandemic have been considered for longitudinal evaluations: different time points during the total lockdown (Alfonsi et al., 2022, Goncalves et al., 2022), total lockdown vs. periods characterized by reduced restrictive measures (Alfonsi et al., 2022, Scarpelli et al., 2022c, Gorgoni et al., 2022), total lockdown (first COVID-19 wave) vs. partial lockdown (second COVID-19 wave) (Conte et al., 2022, Scarpelli et al., 2021c). With the exception of one study conducted in Portugal (Goncalves et al., 2022), all longitudinal studies were performed in Italy. Goncalves and collaborators (2022) during the first six weeks of lockdown found three nightmare profiles (Stable-mild, Stable-moderate, and Stable-severe) and five insomnia profiles (No insomnia, Stable-mild, decreasing-moderate, stable-severe, increasing-severe). Being female, younger, perceiving the income as insufficient, and feelings of fear towards COVID-19 were associated with greater odds of insomnia and nightmares, and having a diagnosis of SARS-CoV-2 virus infection was related to worse patterns of nightmares about the pandemic (Goncalves et al., 2022). Using sleep and dream diaries during the total lockdown, Alfonsi and co-workers (2022) found an initial increase in the number of dreams, followed by a stabilization during the remaining lockdown weeks, and a reduction in a follow-up evaluation around four months after the end of the confinement. The follow-up evaluation was also characterized by greater ease of falling asleep, reduced sleep onset latency, and total bed time compared to the lockdown assessments (Alfonsi et al., 2022). During a similar post-lockdown period (around 5 months after the lockdown), compared with the period of home confinement, we recently observed (a) a reduction of dream frequency, emotional load, vividness, bizarreness, length, and lucid dream frequency, (b) a reduction of specific dream contents: being frozen with fright, being isolated/locked up/shut down, being half awake and paralyzed in bed, loved ones, being in crowded places, war, traveling, (d) absence of changes in dream emotions frequency, with fear as the most frequent emotion in dreams during and after the lockdown, (c) a reduction of sleep latency, disruptive nocturnal behaviors, and time spent with digital media (Gorgoni et al., 2022).

Only one study focused on the immediate effect of the end of the lockdown period on the oneiric activity using sleep and dream diary, and coding of audio-reported dreams (Scarpelli et al., 2022c). Compared to the last lockdown week, the first post-lockdown week was characterized by greater ease of falling asleep, lower number of awakenings, reduced dream recall and lucid dream frequency, and more dream about crowded places (Scarpelli et a, 2022c).

Two studies assessed the oneiric activity during the total and partial lockdown associated with the first and second waves of the pandemic. Conte and co-workers (2022) showed that the partial lockdown was characterized by a reduced proportion of participants reporting increased or decreased dream frequency, increased dream length and vividness, without a difference in the proportion of participants reporting COVID-19 related dreams, compared with the total lockdown period. Scarpelli and co-workers (2021c) observed that, compared to the first pandemic wave, participants had reduced dream recall frequency, nightmare frequency, lucid dream frequency, emotional intensity, nightmare distress, and greater negativity of the dream emotional valence in the second wave. Specific differences in post-traumatic growth, nocturnal disruptive behaviors, sleep, and sleep-related measures were observed as a function of changes in the oneiric activity in the second wave (Scarpelli et al., 2021c). Subjects with increased nightmare frequency in the second wave showed greater sleep disturbance, sleepiness, lower sleep hygiene, post-traumatic growth concerning relations with others, and greater PTSD-related nocturnal disruptive behaviors. Different post-traumatic growth dimensions and PTSD-related nocturnal disruptive behaviors were greater in participants with increased lucid dream frequency (Scarpelli et al., 2021c).

4. Discussion

4.1. Summary of findings and methodological issues

Considering the relatively small period of interest, a large number of studies focused on the oneiric activity during the pandemic, denoting the strong interest in this topic. The larger part of the considered studies were cross-sectional designs aimed at the characterization of dreams and their association with diurnal habits, emotional and clinical conditions, and sleep during the pandemic, or the retrospective assessment of changes in the oneiric activity compared to pre-pandemic/non-pandemic conditions. Only a few studies assessed longitudinal modifications in dreaming during the pandemic. Dream items/questionnaires/diaries were more frequently used than dream reports. Many studies were performed in the general population, while the assessment of dreams and nightmares in specific samples (i.e., healthcare workers, narcoleptic patients, and COVID-19 patients) was rarer.

Nightmares were widely assessed, but it should be considered that the reviewed literature is characterized by a lack of clarity and uniformity about the operational definitions of “nightmare”, making it difficult to understand if studies on pandemic nightmares actually assessed the same research object. Only one study (Alghamdi et al., 2022) used a clinical definition of nightmares according to Third Edition of the International Classification of Sleep Disorders (ICSD-3) diagnostic criteria. The definition of “nightmare” was mainly left to the participants, and only a few studies distinguished “nightmares” and “bad dreams”. In this view, many results about pandemic nightmares likely encompass both nightmares and bad dreams. Concerning lucid dreams, only 4 studies assess them during the pandemic using different experimental designs, and one of them was focused on narcoleptic patients. Therefore, it is difficult to determine the effect of the pandemic on lucid dreaming at present.

From a methodological standpoint, the reviewed studies are characterized by several issues, which lead us to recommend great caution in the interpretation of these findings. Overall, the present literature is characterized by a large heterogeneity concerning (a) the methods and instruments used to collect and analyse the oneiric activity, (b) the oneiric features considered, particularly concerning dream contents and themes, (c) the clinical, sociodemographic, environmental, and sleep measures collected as possible predictors of dream features, (d) the periods of the pandemic considered for data collection, (e) the objectives of the study, (f) the epistemological framework for the assessment of dream contents, themes, and narrative styles, (g) the composition of the sample, (h) the statistical models. As a consequence, studies are hardly comparable, and many findings have been not replicated (or they have been partially replicated using different methodologies).

The reported studies have been conducted during the pandemic, mainly in periods of forced isolation, leading to wide use of online recruitment and data collection strategies. This method can introduce a self-selection issue, attracting a large number of individuals with mental health problems, sleep alterations, or greater interest in dreams. Moreover, many studies were characterized by an unbalanced sample concerning several variables. The sample size of the reported studies is extremely variable (min: two groups of 19 participants; max: 19355 participants), and it is worth noting that several studies were conducted on very small samples. These issues limit the generalizability of the results.

4.1.1. Has the pandemic affected our dreams?

The available cross-sectional retrospective data mainly support the notion of an increased dream and nightmare frequency during the pandemic compared to pre-pandemic/non-pandemic conditions (Musse et al., 2020, Schredl and Bulkeley, 2020, Gorgoni et al., 2021a, Guerrero-Gomez et al., 2021, Fränkl et

al., 2021, Scarpelli et al., 2021a, Scarpelli et al., 2022b, Solomonova et al., 2021). Only a few studies assessed changes in the emotional features of dreams, mainly showing greater emotional intensity and more negative emotions during the pandemic (Schredl and Bulkeley, 2020, Conte et al., 2022, Gorgoni et al., 2021a). This view is also supported by findings on pandemic-related changes in dream contents, showing increased anger and sadness-related words (Mota et al., 2020), aggressive interaction in female university students (Kilius et al., 2021), and a higher frequency of threatening events (Wang et al., 2021). An influence of the pandemic on different qualitative facets of the oneiric activity, in the direction of increased dream vividness, bizarreness, and length has been also observed by one study (Gorgoni et al., 2021a, but see Conte et al., 2022).

It is worth noting that the retrospective evaluation of pre-pandemic and pandemic dream features may be affected by the intrinsic limitation due to a memory bias, possibly leading to the underestimation of dream frequency (Zadra, 2008). Therefore, pandemic-related changes in dreams compared to pre-pandemic periods may represent (a) greater accessibility to the memory of more recent (pandemic) dreams, or (b) the effect of time on dream elaboration/interpretation. Also, a memory bias associated with dream emotional valence may have led to an overestimation of bad dreams during the pandemic. An increased pandemic-related negative affect in dreaming activity may have impacted on the perception of bad dreams and overall dream recall frequency. Additionally, assumptions about the impact of the pandemic and restrictive measures may have affected the results, in the direction of an overestimation of pandemic- or lockdown-related changes (i.e., confirmational bias).

The heterogeneity in the variables assessed by different studies makes it difficult to determine which factors are associated with the observed pandemic-related dream changes. Overall, the female gender appears to be consistently related to quantitative and qualitative modifications in the oneiric activity during the pandemic (Conte et al., 2022, Gorgoni et al., 2021a, Guerrero-Gomez et al., 2021, Kilius et al., 2021, Pesonen et al., 2020, Schredl and Bulkeley, 2020). A worse emotional status (mainly in terms of greater stress and, secondarily, depression and anxiety) and a worse sleep pattern appear associated with the observed pandemic-related changes in dream and nightmare frequency, emotional load and negativity, and qualitative features (Conte et al., 2022, Fränkl et al., 2021, Gorgoni et al., 2021a, Guerrero-Gomez et al., 2021, Pesonen et al., 2020). Results about the effect of age are not consistent (Conte et al., 2022, Gorgoni et al., 2021a, Guerrero-Gomez et al., 2021, Schredl and Bulkeley, 2020), while other variables like education (Schredl and Bulkeley, 2020) and nationality (Guerrero-Gomez et al., 2021) or the reciprocal influence between different dream variables (Conte et al., 2022), have been only sporadically assessed, making difficult to draw conclusions.

4.1.2. Analysis of dream contents: do pandemic times induce pandemic dreams?

Several studies assessed the characteristics of contents, themes, and narrative styles of dreams collected during the pandemic. At present, the number of studies in this field is low and their methods, objectives, and epistemological frameworks are very heterogeneous. Therefore, it is difficult to provide a reliable characterization of dream contents during the pandemic. Despite such heterogeneity, a common observation obtained through the analysis of dream contents/themes is the pandemic-related increase or the frequent presence during the pandemic of distressing, emotionally negative contents in the oneiric activity (Mota et al., 2020, Musse et al., 2020, Iorio et al., 2020, Kennedy et al., 2022; Kilius net al, 2021; Sommantico et al., 2021; Pesonen et al., 2020; Solomonova et al., 2021; Wang et al., 2021; Alghamdi et al., 2022). The presence of explicit pandemic-related contents and themes has been revealed by several studies but results about their prevalence are not consistent (MacKay and DeCicco, 2020, Musse et al., 2020, Mota et al., 2020, Iorio et al., 2020, Sommantico et al., 2021, Pesonen et al., 2020, Borghi et al., 2021, Kennedy et al., 2022, Solomonova et al., 2021, Guerrero-Gomez et al., 2021, Alghamdi et al., 2022).

4.1.3. What variables were associated with facets of the oneiric activity during the pandemic?

The influence of sociodemographic and pandemic-related variables has been observed in several studies. The effect of gender on the oneiric activity has been frequently reported using different methods, mainly in the direction of greater dream frequency, emotional (negative) intensity, length, vividness, and pandemic-related contents (Barrett, 2020, Fränkl et al., 2021, Gorgoni et al., 2021a, Guerrero-Gomez et al., 2021, Iorio et al., 2020, Scarpelli et al., 2021a, Sommantico et al., 2021), and nightmare frequency (Musse et al., 2020, Scarpelli et al., 2021a, Alghamdi et al., 2022). The association between nightmare frequency and female gender has been also observed in narcoleptic patients (Scarpelli et al., 2021b). The effect of age has been frequently reported. Specifically, younger age has been associated with greater dream frequency, qualitative dream features, and pandemic-related contents (Gorgoni et al., 2021a, Fränkl et al., 2021, Scarpelli et al., 2021a, Sommantico et al., 2021, Guerrero-Gomez et al., 2021), while the relationship with dream length and negative emotional tone showed conflicting results (Gorgoni et al., 2021a, Sommantico et al., 2021). Younger age was also associated with nightmare frequency in the general population (Musse et al., 2020, Scarpelli et al., 2021a) and in COVID-19 patients (Scarpelli et al., 2022b).

Among pandemic-related variables, a relationship has been observed between having relatives or friends infected by or died for COVID-19 and nightmare distress (Scarpelli et al., 2021a), negative dream emotional tone (Scarpelli et al., 2021c), greater emotional intensity and sensory impressions in dreams (Iorio et al., 2020). Single studies also found a relationship between different oneiric facets and job stop/changes (Scarpelli et al., 2021c, Scarpelli et al.,

2021a), forced quarantine (Scarpelli et al., 2021c), geographical area, living alone during the lockdown (Gorgoni et al., 2021a), and COVID-19 infection (Scarpelli et al., 2022b).

Clearly, the above-mentioned unbalance in the sample of many studies, with an over-representation of several sociodemographic categories and a possible self-selection bias, represents e relevant methodological problem while assessing the relationships between these variables and dreaming. Crucially, in the vast majority of the studies, the sample included a large prevalence of females. In this view, it could be argued that the strong influence of gender on pandemic dreams and nightmares may represent a by-product of the large prevalence of females in the reviewed studies. Nevertheless, the existence of sex differences in dreaming activity has been widely observed also in pre-pandemic studies (Schredl and Reinhard, 2008b, Schredl, 2010). In particular, Schredl and Reinhard (2008b) found in their meta-analysis a robust gender difference in dream recall only when collected outside of the sleep laboratories (i.e., without any control of the preceding sleep stage).

The relationship of dream features with psychiatric symptoms and psychological well-being during the pandemic has been assessed by different studies. The most consistent results point to a relationship between different stress/post-traumatic stress measures and dream recall frequency in the general population (Fränkl et al., 2021, Solomonova et al., 2021) and COVID-19 patients (Scarpelli et al., 2022b), more accentuated dream-association networks (Pesonen et al., 2020), and specific dream and nightmare contents (Solomonova et al., 2021, Kennedy et al., 2022). Depressive symptoms have been associated with dream frequency (Gorgoni et al., 2021b, but see Fränkl et al., 2021 for the effect of PTSD), emotional intensity, negative emotions, vividness (Gorgoni et al., 2021b), frequency of specific dream contents (Solomonova et al., 2021), nightmare frequency (Scarpelli et al., 2021a) and themes (Kennedy et al., 2022). Anxiety was related to the frequency of negative emotions in dreams (Gorgoni et al., 2021b), specific dream themes (Solomonova et al., 2021), nightmare frequency (Scarpelli et al., 2021a) also in COVID-19 patients (Scarpelli et al., 2022b), nightmare themes (Kennedy et al., 2022), and represented a partial mediator in the positive relationship between media exposure and threatening dream frequency (Guo and Shen, 2021). Associations with oneiric phenomenology have been also observed for other variables like asking for help from mental health professional (Scarpelli et al., 2021c), worries about another lockdown (Guerrero-Gomez et al., 2021), increased alcohol consumption, and suicidal ideation (Musse et al., 2020). Moreover, in a population of healthcare workers, individuals with frequent nightmares during the pandemic were characterized by higher worry about being infected and family's infection of COVID-19, lower confidence in being cured if infected and a sense of competence, a greater percentage of poor mental health, higher General Health Questionnaire score (Lin et al., 2021).

The possible role of sleep and sleep-related variables in the oneiric activity during the pandemic has been also investigated. Overall, the main findings suggested that: (a) different indexes of poorer sleep quality and more disturbed/fragmented sleep (including the presence of sleep disorders) are associated with greater dream frequency (Gorgoni et al., 2021a, Fränkl et al., 2021), emotional intensity, negative emotional tone, vividness, bizarreness, length (Gorgoni et al., 2021a), nightmare contents (Kennedy et al., 2022), nightmare frequency in the general population (Scarpelli et al., 2021a, Alghamdi et al., 2022), healthcare workers (Lin et al., 2021), narcoleptic (Scarpelli et al., 2021b) and COVID-19 patients (Scarpelli et al., 2022b), and lucid dreams in narcoleptic patients (Scarpelli et al., 2021b); (b) sleepiness and daytime disfunctions are associated with greater dream emotional intensity and vividness (Gorgoni et al., 2021), dream recall in narcoleptic patients (Scarpelli et al., 2021b), nightmare frequency in healthcare workers (Lin et al., 2021) and narcoleptic patients (Scarpelli et al., 2021b), and lucid dream frequency in narcoleptic patients (Scarpelli et al., 2021b). Moreover, single studies suggest that changes in sleep habits (e.g., sleep onset, awakening, daytime naps) are associated with greater dream emotional intensity, more negative dream emotions, nightmare frequency and distress (Scarpelli et al., 2021a), and use of sleep medication appear related to pandemic-related nightmares (Musse et al., 2020). On the other hand, results about the relationship between sleep duration and oneiric activity appear conflicting (Gorgoni et al., 2021a, Scarpelli et al., 2021a, Scarpelli et al., 2021b, Scarpelli et al., 2022, Solomonova et al., 2021, Lin et al., 2021).

The absence of information on pre-pandemic sleep and mental health features in the larger part of the studies should be highlighted since it strongly limits the possibility to control for the influence of pre-existing sleep and psychopathological problems on dreaming during the pandemic and reliably assess the relationship between these variables and the oneiric activity. Specifically concerning sleep measures, it should be considered that the reviewed studies lack of objective sleep assessment (i.e., polysomnographic, actigraphic), limiting an accurate evaluation of the relationship between sleep and dreaming during the pandemic. Furthermore, the possible relationship between different dream features has been scarcely considered in studies conducted during the pandemic. According to the salience hypothesis (Cohen and MacNeilage (1974)), the subjective impact of dreams may strongly affect dream recall frequency. However, from an opposite standpoint, it could be hypothesized that a larger number of recalled dreams may lead to a subjective perception of increased emotional intensity and qualitative properties. Therefore, results on parallel quantitative and qualitative dream changes during the pandemic (e.g., Gorgoni et al., 2021a, Gorgoni et al., 2022) may be at least in part influenced by the relationship between dream features and may be interpreted in two ways: (a) the greater emotional intensity of dreams, likely related to modifications in diurnal emotional experiences, led to a higher dream recall frequency; (b) a greater dream production and/or recall, associated with diurnal experiences and/or alterations of the sleep pattern, led to a subjective perception of greater dream emotional intensity. Further studies are needed to disentangle this point.

4.1.4. Are different phases of the pandemic characterized by modifications of the oneiric activity?

The most consistent longitudinal finding is represented by reduced dream and lucid dream frequency during post-lockdown periods characterized by eased restrictive measures compare to lockdown periods (Alfonsi et al., 2022, Scarpelli et al., 2022c, Gorgoni et al., 2022). Changes in pandemic-related dream contents have been also observed by two studies immediately (Scarpelli et al., 2022c) and 5 months after the end of the total lockdown (Gorgoni et al., 2022). The direction of such content changes was not univocal between these studies, finding interpreted in light of the different time points considered (Gorgoni et al., 2022). Moreover, a single study found a reduction of dream emotional load, vividness, bizarreness, and length five months after the lockdown, while fear represented the most frequent emotion in both lockdown and post-lockdown (Gorgoni et al., 2022).

Only two studies assessed the difference between the total (first COVID-19 wave) and partial (second COVID-19 wave) Italian lockdowns (Scarpelli et al., 2021c, Conte et al., 2022). Results are hardly comparable starting from the different measures assessed (dream variables per se and lockdown-related dream variable changes, respectively). Overall, according to these studies, the partial lockdown period compared to the total lockdown was characterized by (a) a reduced proportion of participants reporting lockdown-related changes in dream frequency and qualitative features (Conte et al., 2022), and (b) reduced frequency of dreams, lucid dreams, and nightmares, emotional intensity, nightmare distress and greater negativity of the dream emotional valence, associated with differences in diurnal and nocturnal post-traumatic measures and sleep variables (Scarpelli et al., 2021c).

Considering the time passed during a lockdown period, Alfonsi and co-workers (2022) found an initial increase followed by a stabilization of dream recall frequency during the first Italian lockdown, and Goncalves and collaborators (2022) described different profiles of nightmare progression during the lockdown in Portugal, associated with gender, age, pandemic-related fears and perceptions, and COVID-19 diagnosis.

Summarizing, longitudinal studies on dream changes during the pandemic are scarce, often focused on different dream variables and time periods, and almost exclusively conducted in Italy, but the present findings consistently point out that dream phenomenology changes in different phases of the pandemic, mainly according to the time spent in a specific condition (e.g., lockdown) and the progressive modification in the restrictive measures.

4.2. Theoretical considerations

Overall, beyond the reported methodological issues characterizing the reviewed studies, the main results in the present literature suggest (a) a strong and complex influence of the pandemic on the oneiric activity, in the direction of a more frequent increase of dream and nightmare recall and (negative) emotional intensity, (b) a modulatory effect of the time spent in lockdown and changes in restrictive measures on quantitative and qualitative dream features (c) an influence of sociodemographic, environmental, emotional, clinical and sleep variables on dream and nightmare features and pandemic-related changes in the oneiric activity. These findings support the notion that collective potentially traumatic events strongly affect dreaming activity (Wood et al., 1992, Hartmann and Basile, 2003). Moreover, the most consistent results observed in this field can be considered in light of the main contemporary theoretical frameworks about the oneiric activity.

The observed dream changes compared to pre-pandemic periods, the relationship with several facets of the diurnal experience, and the modification of the oneiric activity in different phases of the pandemic can be interpreted in the framework of the “continuity hypothesis”, which claims that dreams reflect waking experiences, mental activity, and emotions (Schredl, 2006, Domhoff, 1996), pointing to the existence of a continuum between waking and sleeping mental/emotional/neurobiological processes (Scarpelli et al., 2019a, Scarpelli et al., 2021d). Several findings support the notion that dream contents may mirror different facets of the waking experience (Eichenlaub et al., 2017; Nielsen and Stenstrom, 2005), representing a response to diurnal worries and events characterized by great emotional valence and personal meaning (Malinowski and Horton, 2015, Van Rijn et al., 2015). Moreover, dreams may be actively involved in emotional regulation processes (Scarpelli et al., 2019a). Specifically, the oneiric activity may represent an offline simulation of threatening experiences, operating as emotional coping strategies based on problem-solving (Revonsuo, 2000, Revonsuo et al., 2015). Also, an involvement of dreams in fear extinction (Sterpenich et al., 2020, Nielsen and Levin, 2007), resolution of emotional conflicts, and reduction of negative mood (Cartwright et al., 2006) have been proposed.

In this view, the increased frequency, emotional load, and negative tone of dreams and nightmares compared to pre-pandemic periods and their modifications as a consequence of changes in restrictive measures may mirror progressive variations in daily habits and experiences during different phases of the pandemic, mainly reflecting the emotional response to pandemic-related events and environmental changes. The observed relationship of dream and nightmare phenomenology and pandemic-related changes in the oneiric activity with several facets of the emotional status (mainly stress-related measures, anxiety, and depression) is consistent with this hypothesis.

As previously observed, while several studies revealed explicit pandemic-related contents/themes, the assessment of their prevalence led to conflicting findings (MacKay and DeCicco, 2020, Musse et al., 2020, Mota et al., 2020, Iorio et al., 2020, Sommantico et al., 2021, Pesonen et al., 2020, Borghi et al., 2021, Kennedy et al., 2022, Solomonova et al., 2021, Guerrero-Gomez et al., 2021, Alghamdi et al., 2022). Beyond methodological differences between these studies, it is worth noting that dreams do not necessarily incorporate the explicit episodic memories, more likely extracting the gist of the salient

experiences (Eichenlaub et al., 2017, Malinowski and Horton, 2014, Wamsley and Stickgold, 2010) in an associative way. The common observation of pandemic-related increase or high frequency during the pandemic of distressing, emotionally negative contents in the oneiric activity, not necessarily containing an explicit pandemic reference, is in line with this view (Mota et al., 2020, Musse et al., 2020, Iorio et al., 2020, Kennedy et al., 2022; Kilius net al, 2021; Sommantico et al., 2021; Pesonen et al., 2020; Solomonova et al., 2021; Wang et al., 2021; Alghamdi et al., 2022).

The reviewed literature also points to a role of sleep features on dream and nightmare recall during the pandemic. As observed, several indexes of worse sleep quality appear associated with greater dream/nightmare frequency and emotional intensity, specific dream qualitative features and contents and greater pandemic-related changes in the oneiric production (Gorgoni et al., 2021; Fränkl et al., 2021; Kennedy et al., 2022; Scarpelli et al., 2021a, Scarpelli et al., 2021b, Scarpelli et al., 2022b; Lin et al., 2021; Alghamdi et al., 2022). These findings are consistent with the hypothesis that a greater level of arousal during sleep and intra-sleep wakefulness facilitate the encoding of the oneiric experience, more likely leading to a successful dream recall (De Gennaro et al., 2010, Koulack and Goodenough, 1976). Indeed, both healthy and clinical samples exhibit an association between greater dream recall and more fragmented sleep (Polini et al., 2017, Schredl, 2009, van Wyk et al., 2019). Furthermore, several findings suggest that a greater electrophysiological desynchronization promotes dream recall (Scarpelli et al., 2017, Scarpelli et al., 2020, Siclari et al., 2018, Siclari et al., 2017). The pandemic had a strong and complex impact on sleep (Partinen et al., 2021, Cellini et al., 2020, Franceschini et al., 2020, Alfonsi et al., 2021, Morin et al., 2021, Gorgoni et al., 2021b, Gorgoni et al., 2021c, Salfi et al., 2021), more frequently in the direction of a worse sleep quality (Jahrami et al., 2021, Jahrami et al., 2022). Therefore, it is possible that the increased frequency and intensity of the oneiric activity during the pandemic may be at least in part a consequence of greater arousal during sleep associated with the frequent reduction of sleep quality, which would facilitate the process of dream encoding and recall. It should be also considered that many studies point to changes in the sleep timing during the pandemic, mainly represented by delayed bed time and rise time (Cellini et al., 2020, Gao and Scullin, 2020, Marelli et al., 2021, Leone et al., 2020). Since we get more REM sleep in the morning, it could be speculated that the pandemic-related rise time delay may have increased the number of REM sleep morning awakenings, in turn enhancing the likelihood to remember vivid and intense dreams upon awakening. Indeed, albeit the view of an exclusive relationship between REM sleep and dreaming has been overcome (Scarpelli et al., 2022), many studies point to more frequent vivid and emotional dream contents upon REM awakenings (Foulkes et al., 1988, Nielsen et al., 1991, Merritt et al., 1994, Hobson et al., 2000, Oudiette et al., 2012). At present, only one study found that changes in sleep habits during the pandemic, including morning awakening, were associated with greater dream emotional intensity, more negative dream emotions, nightmare frequency and distress (Scarpelli et al., 2021a). Therefore, the general hypothesis of a relationship between delayed rise time and changes in dream phenomenology during the pandemic needs of a further and direct assessment.

Finally, the present literature confirms during the pandemic the classical observation of a relationship between dream recall and demographic variables like gender and age. The existence of greater dream and nightmare frequency in females has been previously found (Nielsen et al., 2000, Nielsen, 2012, Schredl, 2010, Schredl and Reinhard, 2008b). The nature of this phenomenon is not clear, but the greater predisposition for depression, anxiety, insomnia, and larger emotional reaction to negative stimuli in women may play a role (Suh et al., 2018, Özdin and Bayrak Özdin, 2020, Bradley et al., 2001, Lithari et al., 2010, Stevens and Hamann, 2012). Concerning age, beyond some conflicting results in specific dream variables, a greater dream/nightmare frequency and intensity in younger individuals has been observed (Gorgoni et al., 2021; Fränkl et al., 2021; Sommantico et al., 2021; Guerrero-Gomez et al., 2021; Musse et al., 2020; Scarpelli et al., 2021a; Scarpelli et al., 2022b). This result is consistent with the drop in dream and nightmare recall frequency observed in previous studies (Scarpelli et al., 2019b), likely explained by changes in sleep physiology (Nielsen, 2012) or reduced dream salience associated with lower interest in dreaming and impact of dream contents (Cohen, 1979, Giambra et al., 1996).

5. Conclusions

The oneiric activity has been strongly affected by the pandemic. The present literature mainly points to a pandemic-related enhancement of dream and nightmare frequency, emotional intensity, and distressing contents, modulated by changes in the restrictive measures and associated with diurnal experiences, emotional status, and sleep pattern. We have highlighted several methodological problems of the reviewed studies that strongly limit the generalizability of the results. Nevertheless, the main findings can be interpreted in light of several contemporary theoretical frameworks about dreams suggesting (a) the existence of a continuity between wake and sleep mentation, (b) an influence of the arousal/activation level during sleep on dream recall, (c) a role of dreams in emotional processes, (d) the influence of state- and trait-like factors on dreaming.

Further studies are needed to support the present conclusions on the oneiric activity during the pandemic. Starting from the strong methodological heterogeneity observed, future efforts should be focused on the replication of the present findings. It is even more true for findings on lucid dreams and for the assessment of dreaming in specific populations. In particular, no conclusion can be drawn for results on the oneiric activity in healthcare workers, narcoleptic patients, and COVID-19 patients since they have been directly assessed only in single studies. Similarly, albeit lucid dreams have been investigated in 7 studies, their methods, objectives, and population of interest were heterogeneous, making it difficult to support specific hypotheses about this research topic. Clearly, the unique condition represented by the lockdown during the first COVID-19 pandemic wave can't be replicated. Therefore, the replication of the available findings should be conducted through re-analysis of previously collected data. Moreover, a greater number of longitudinal studies on large samples in different phases of the pandemic is needed, with the aim to control the effect of environmental changes on dreams and

nightmares. Finally, it is worth noting that the assessment of a possible publication bias concerning the reviewed literature is still missing. Therefore, in order to increase our understanding of pandemic-related changes in the oneiric activity, we strongly encourage the direct evaluation of the file drawer problem and reports of negative findings in this research field.

Starting from the hypothesis of a role of dreams in emotional regulation and the observation of a continuity between dreaming and diurnal emotional functioning (Scarpelli et al., 2019a), a deeper scientific discussion about the possible role of the oneiric activity as a useful tool in a clinical context appear of great relevance (Pesant and Zadra, 2004, Leonard and Dawson, 2018, Scarpelli et al., 2022a). In particular, during periods like the pandemic when the entire world undergoes a threatening experience, the intense changes in dreaming may offer a privileged path to explore the individual emotional experience.

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