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# DREAMS, SLEEP QUALITY, AND COLLECTIVE TRAUMA: AN INVESTIGATION OF THE IMPACT OF THE COVID-19 PANDEMIC

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## Introduction

The phenomenon of dreaming is the consequence of the brain's ability to generate a whole new world of experience based on previous knowledge, regardless of the surroundings.<sup>1</sup> Studies on brain injuries, functional imaging, and neurophysiology have provided evidence regarding the neural correlates of sleep and dreams. Sleep is the moment when the normal physiological condition of awareness disappears. In a recent study,<sup>2</sup> almost 30% of the subjects who were mostly awakened early at night, report not to have realised anything. Although dreams have always fascinated human beings, their strictly scientific study has only recently begun.<sup>3</sup>

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<sup>1</sup> Stefano Bolognini, ed., *Il sogno cento anni dopo* (Milano: Mimesis Edizioni, 2016).

<sup>2</sup> Francesca Siclari, et al., "The neural correlates of dreaming," *Nature neuroscience* 20, no. 6 (2017): 872–878, <https://doi.org/10.1038/nrn.4545>.

<sup>3</sup> Allan J. Hobson, "REM sleep and dreaming: towards a theory of protoconsciousness," *Nature Reviews Neuroscience* 10, no. 11 (2009): 803–813, <http://dx.doi.org/10.1038/nrn2716>.

In *The Interpretation of Dreams*,<sup>4</sup> Freud predicted the research for an explanation of the organic basis for the mental event. Robust scientific investigations of dreams are complex endeavours since dreams are solely accessible through self-reports rather than direct observations, so it is difficult, if not impossible, to experimentally manipulate and observe dream content through exposure to stimuli before and during sleep.<sup>5</sup> Dreams represent brain organisation and functions and can, in some ways, be conceptualised as a brain-mind interaction. The evolutionary success of the human species has largely depended on our extraordinary cognitive capacities, and these abilities are based on a brain-mind system that functions non-stop, during both sleep and wakefulness.<sup>6</sup> Dreams are highly visual, colourful, rich in shapes, and full of movement. They incorporate categories that are common in the moments we are awake, such as people, faces, objects, and animals.<sup>7</sup> Dreams also contain sounds (including words and conversations) and, most rarely, tactile perceptions, smells, and tastes, as well as feelings of pleasure and pain. While dreaming, there is a considerable reduction in the voluntary control of actions and thoughts. Dreams can reflect one's own interests and personality, like one's mental activity when awake. Similar to people's personalities, dreams are generally rather stable over time during adulthood and share many similar characteristics among cultures and ages, i.e. the adolescent<sup>8</sup> population. Some dreams are characterised by a high level of emotional involvement, among which are joy, surprise,

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<sup>4</sup> Sigmund Freud and James Strachey, *The complete psychological works of Sigmund Freud*, Vol. 22 (London: Hogarth Press and the Institute of Psycho-analysis, 1953).

<sup>5</sup> David Foulkes and Allan Rechtschaffen, "Presleep determinants of dream content: Effects of two films," *Perceptual and Motor Skills* 19, no. 3 (1964): 983–1005, <https://doi.org/10.2466/pms.1964.19.3.983>; David Foulkes, *Dreaming: A cognitive-psychological perspective* (Hillsdale, NJ: Lawrence Erlbaum 1985); Morton F Reiser, *Memory in mind and brain: What dream imagery reveals* (Yale University Press, 1994).

<sup>6</sup> Kelly Bulkeley, *Big Dreams: the science of dreaming and the origins of religion* (Oxford University Press, 2016).

<sup>7</sup> Yuval Nir and Giulio Tononi, "Dreaming and the brain: from phenomenology to neurophysiology," *Trends in cognitive sciences* 14, no. 2 (2010): 88–100, <https://doi.org/10.1016%2Fj.tics.2009.12.001>.

<sup>8</sup> Calvin Hall and Robert Van de Castle, *The content analysis of dreams* (University of Michigan: Appleton-Century-Crofts, 1966); Ana Guerrero-Gomez et al., "Dreaming in adolescents during the COVID-19 health crisis: survey among a sample of European school students," *Frontiers in psychology* 12 (2021): 652627, <https://psycnet.apa.org/doi/10.3389/fpsyg.2021.652627>.

anger, fear, and anxiety. Interestingly, sadness, guilt, and depression are rare in dreams. This is in line with Freud's suggestion that dreams have their origin in perceived threats or conflicts. According to Foulkes,<sup>9</sup> dreams are an attempt of the sleeping mind to organise information, starting with the unconscious activation of memory units that takes place when sleeping. Dream awareness consists of a single fact: we are not contextually aware of where we are (in bed) or what we are doing (sleeping and dreaming). However, there is a strong<sup>10</sup> coherence in thoughts and images that are experienced while dreaming (uniformity).

Since the quarantine period due to COVID-19, the quality of sleep has changed. Lockdowns have had a strong impact on our daily routines, emotional experiences, and sleep. A variety of studies have shown a high prevalence of sleep problems among teenagers and young adults, as well as difficulties in remembering dreams. Zhou and colleagues<sup>11</sup> have studied symptoms of insomnia among Chinese teenagers and young adults and found that the prevalence of symptoms of insomnia was 23.2%. In this context, an interesting phenomenon has been observed—a strong change in dream activity, such as a decrease in dream recall frequency and increased dream vividness, oddity, and emotional intensity. This condition<sup>12</sup> suggests an impact of potentially traumatic collective experiences on dreams. An Italian<sup>13</sup> study surveyed 796 participants about their dream content using a questionnaire and reports of their most recent dream. The author found that women, compared to men, tend to recall dreams more frequently and that at least 20% of dreams containing aspects such as emotionality, intensity, and negative

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<sup>9</sup> Foulkes, *Dreaming*.

<sup>10</sup> Allan Rechtschaffen, "The single-mindedness and isolation of dreams," in *The mythomaniacs: The nature of deception and self-deception*, ed. Michael S. Myslobodsky (Mahwah: Lawrence Erlbaum Associates, 1997) 203.

<sup>11</sup> Shuo Zhou et al., "DREAM-in-CDM approach and identification of a new generation of anti-inflammatory drugs targeting mPGES-1," *Scientific reports* 10, no. 1 (2020): 10187, <https://doi.org/10.1038/s41598-020-67283-0>.

<sup>12</sup> Maurizio Gorgoni et al., "Pandemic dreams: quantitative and qualitative features of the oneiric activity during the lockdown due to COVID-19 in Italy," *Sleep medicine* 81 (2021): 20–32, <https://doi.org/10.1016/j.sleep.2021.02.006>.

<sup>13</sup> Ilaria Iorio, Massimiliano Sommantico, and Santa Parrello, "Dreaming in the time of COVID-19: A quali-quantitative Italian study," *Dreaming* 30, no. 3 (2020): 199, <https://doi.org/10.1037/drm0000142>.

emotions were related to COVID-19. The aim of this work is to investigate the quality of sleep and the content of dreams reported during the COVID-19 pandemic by means of an interview and textual analysis of the contents of dreams.

### Procedure

The data was collected via the Google Forms platform between July 2020 and December 2020 and included the informed consent form. The survey, which took around 15 minutes, was conducted with full respect for anonymity and privacy in accordance with the standards of ethical conduct. The data was analysed to test the hypotheses in question.

### Research Instruments

1) The TKYDQ questionnaire (Dreaming and the COVID-19 Pandemic): This questionnaire, originally designed by Bulkeley,<sup>14</sup> was translated into Italian by a native English speaker after obtaining the authors' permission. Subsequently, the questionnaire was back-translated to check correspondence with the original items and, where necessary, culturally adapted. The final Italian version included seven questions addressing dreaming and the COVID-19 pandemic. The list of items in this questionnaire can be found in the appendix.

2) The Pittsburgh Sleep Quality Index (PSQI): The Pittsburgh Sleep Quality Index (PSQI)<sup>15</sup> is a self-report questionnaire that takes 5–10 minutes to complete. This tool, which assesses the quality of sleep, consists of 19 items based on which a total score and 7 sub-scores are calculated. The PSQI is intended to be an easy-to-use standardised sleep questionnaire for clinicians and researchers and it can be used for a range of clinical and healthy populations, including the diagnosis of sleep disorders. Clinical studies have found the PSQI to be reli-

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<sup>14</sup> Bulkeley, *Big Dreams*.

<sup>15</sup> Carole Smyth, "The Pittsburgh sleep quality index (PSQI)," *Journal of gerontological nursing* 25, no. 12 (1999): 10–1, <https://doi.org/10.3928/0098-9134-19991201-10>.

able and valid in the assessment of sleep problems to some degree, but in particular with self-reported sleep problems and depression-related symptoms. This questionnaire yields seven components formed by combining specific items: subjective sleep quality (Component 1); the combination of the amount of time that each respondent needed to fall asleep during the past month and how often—on a weekly basis—they could not fall asleep within 30 minutes (Component 2); sleep duration (Component 3); the habitual effectiveness of sleep representing a quality index of night rest, which is the proportion between the hours slept versus the hours in bed (Component 4); sleep disturbances characterised by problems while sleeping such as nightmares, breathing issues, etc. (Component 5); the use of sleep medication (Component 6); and a combination of the frequency and severity of daily functions, such as problems staying motivated when performing daily activities or the ability to stay awake while driving, eating, or engaging in social activities (Component 7).

### Sample

Participants were recruited online using the convenience sampling method and online advertisements. The inclusion criteria were: a) acquisition of informed consent; b) being older than 18 years of age; c) adequate understanding of Italian; d) filling in all the sections of the questionnaire; e) enough knowledge of basic computer functions to complete the form on a PC, tablet, or smartphone. In total, 402 people aged between 18 and 71 (mean age=33.08; Standard Deviation=11.47) participated in the survey, out of which 301 were females (mean age=32.6, Standard Deviation=11.03) and the rest were males (mean age=34.51, Standard Deviation=12.65). Among all the participants, 68.8% had a university education, 34.4% declared themselves single and 4% divorced at the time of completing the survey. Moreover, 38.9% of the participants reported that they were unemployed and 5% reported being in retirement.

## Results

The following variables were used in a logistic regression analysis to investigate their predictive value regarding having bad dreams, dream recall, and dream content: sex; age; Covid-related dream; problems with insomnia; being personally affected by Covid; the time needed to go to sleep; duration of sleep; number of times without falling asleep in less than 30 minutes; getting up in the middle of the night or early in the morning; not being able to breathe satisfactorily; global judgement of sleep quality; use of medicine to help falling asleep; problems staying awake while driving, eating, or while engaging in social activities; being enthusiastic enough to do things properly; and having a partner (i.e., not being single at the time of answering the questionnaire). The pattern of responses is presented in Table 1.

The occurrence of bad dreams could be predicted by how participants judged their sleep quality ( $p < 0.0001$ ; odds ratio [aOR], 0.183; 95% confidence interval [CI], 0.096 – 0.347), how enthusiastic they were when performing their routine activities properly ( $p = 0.006$ ; aOR, 0.319; CI, 0.142 – 0.716), and the number of times they experienced breathing issues during sleep ( $p = 0.008$ ; aOR, 0.472; CI, 0.271 – 0.721). The way participants judged their sleep quality ( $p < 0.0001$ ; aOR, 0.199; CI, 0.108 – 0.365) and the level of enthusiasm they expressed during their routine activities ( $p = 0.004$ ; aOR, 0.345; CI, 0.166 – 0.714) could predict the positivity/negativity of their dreams. No predictors were found after applying the FDR correction for dream recall.

In addition to the questions in the PSQI, the survey included the following items: 1) how frequently the respondents recalled their dreams' content within the last month; 2) whether they had a dream related to the COVID-19 epidemic or not; 3) whether they have noticed any differences in the quality of emotions in their dreams; 4) the extent to which they have experienced insomnia/sleep disturbances; 5) how they have been personally affected by the pandemic; and 6) whether they agreed with the government's policies regarding the management of the pandemic. The results of the survey can be seen in Table 1.

Comparisons between men and women yielded significant differences considering a Bonferroni corrected p-value (0.0166), in C4,

TABLE 1: Specifics of the responses of participants (n=403).

	<i>Degree and direction of change</i>	Percentage
Remembering dreams	The same	54.09
	Slight increase	22.58
	Significant increase	5.21
	Slight decrease	12.9
	Yes/No	
COVID-related dream	Yes	10.92
Differences in quality of emotions	<i>Degree and direction of change</i>	
	No difference	64.02
	A little more negative	29.28
	Much more negative	3.23
	A little more positive	2.48
	Much more positive	0.99
Difficulties in sleeping/insomnia	<i>Number of days</i>	
	0	22.33
	1	21.34
	2	17.12
	3	16.13
	4	7.69
	5	7.44
	6	3.72
	7	4.22
In what way have they been personally affected by the pandemic	<i>Aspects of problems faced</i>	
	Holidays and meeting	34.99
	New mental health problems	25.31
	No impact	18.36
	Work related problems	13.9
	Financial difficulties	4.71
	Physical health problems	2.73
If they agree with the policies of the government regarding covid	<i>Agree/Disagree</i>	
	Agree	50.12
	Disagree	25.81
Judgement of sleep quality	<i>Degree and direction</i>	
	Very good	10.4
	Fairly good	54.6
	Fairly bad	30.5
	Very bad	4.5
Sleep duration	<i>Number of hours</i>	
	> 7 hours	33.7
	6/7 hours	31.3
	5/6 hours	27.8
	<5 hours	7.2
Use of sleep medication	<i>Frequency of use</i>	
	Not during the past month	86.4
	Less than once a week	6.5
	Once or twice a week	3.2
	Three or more times a week	4

$t(400)=3.271$ ,  $p=0.001$  and the global index  $t(399)=2.902$ ,  $p=0.004$  of the PSQI, with women having higher scores in both components, meaning that women on average reported more relaxed night sleep. Subjects who were personally affected by Covid differed significantly from non-affected individuals in C1,  $t(400)=3.776$ ,  $p<0.001$ , C2,  $t(399)=3.055$ ,  $p=0.002$ , C5,  $t(400)=2.787$ ,  $p=0.006$ , C7,  $t(400)=4.321$ ,  $p<0.001$  and the global index of PSQI,  $t(399)=3.575$ ,  $p<0.001$  in such a way that all the affected people had a higher score in all of these components. This highlights the fact that those who were directly affected by COVID-19 exhibit sleep disturbances in different indexes of sleep quality. Finally, subjects with partners had higher scores in C5  $t(400)=3.111$ ,  $p=0.002$ , which represents a higher range of bad dreams and breathing problems compared to those without a partner.

### Qualitative Analysis of the COVID-19 Related Dreams

Respondents were asked to share a recent COVID-19-related dream with as many details as possible, including the scenario, characters, thoughts, actions, and emotions. In total, 41 dreams have been collected and analysed. The reported dreams can be subdivided into different macro-categories. The most representative ones are those with a phobic content of contamination, fear of suffocating, fear of dying, feelings of panic, and negative emotionality. Phobia, moreover, was extended to the facemask but also to situations when the mask was absent, generating anxiety. Text analysis shows the fear of being positive with COVID-19, based on the repetition of words and phrases such as “infect”, “having been infected”, “having contracted it”, and experiencing respiratory symptoms and needing to be resuscitated. Other times, the person was asymptomatic and became the source of infection for the family. All this can be traced back to anxious and distressing feelings connected to the aggressiveness of the virus that “exterminates billions of lives” and where the only possibility to fight against it is a vaccine, even though it “has exorbitant prices”. Another category is represented by the fear of being infected, with persecutory content, or of being infected on purpose.





Table 2: Example Contents of some of the reported dreams

<p>I dreamt everything was back to normal and epidemic was a nightmare. When it was not possible to go out, I dreamt of being able to meet friends.</p>	<p>Confused and fragmentary memory of me and people whose identity I don't remember having approaches opposed to prevention, as nothing had ever happened.</p>	<p>Being in a very narrow space with many people without their face mask on.</p>
<p>I dreamt prices to buy vaccine were exorbitant and that every family could buy up to 3, therefore my parents renounced having it to the benefit of my two sisters and me.</p>	<p>A landscape of hills, you can see the beach, my house on the hills with my family, it's sunny. A tsunami, the sea floods everything, and leaves my husband and my sons submerged in front of the house. I find myself with a lot of people I don't know among debris, everything is grey and we look for shelter in a house, holding our hands, we try to get out again and I hear a dirge, like a voice music but produced by many people crying.</p>	<p>Seeing my family and not being able to give them a hug and a kiss.</p>
<p>I was walking along the seaside. There were many people without facemask not respecting social distance. My first thought was they were all reckless and this made me afraid.</p>	<p>My grandmother had a shop and we risked getting infected, I was crying in floods, we couldn't say goodbye.</p>	<p>I was visiting my American grandfather, who was still working in his company, which actually had become a shop, I found him in his office producing facemasks against covid, with the Italian flag drawn on them.</p>

<p>I dreamt several times of meeting my parents outdoors in a green area and of being worried. My concern came from the possibility of infecting them, as they are part of the risk category and I am “asymptomatic”.</p>	<p>I dreamt for up to 2 nights of getting infected... I was alone in the hospital and I cried because nobody came to look after me.</p>	<p>Everybody was wearing facemask in the middle of lava.</p>
<p>I look out of a window and I see that in the neighbours’ courtyard there is a party; I go there aware and therefore worried of not having face-mask. Several unicorns arrive flying and they land on the neighbours’ courtyard... I wonder how this is possible as unicorns are fantastic animals.</p>	<p>I find myself climbing the stairs of a building to reach the terrace because there was something in the street (like a demonstration) and from the top I was able to see better; but there were too many people in the terrace and I decide not to get close to them because of Coronavirus, I come back, I go down the stairs and I find myself in a shabby room, as an ancient abandoned chapel, with the statue of Our Lady of Medjugorie who was also dirty and ruined.</p>	<p>My father who told me he would stay until covid had disappeared. He died five years ago.</p>
<p>I dreamt of meeting a person I knew and I said hello with a kiss, and I remembered I made a mistake about doing it because there was covid.</p>	<p>A friend of mine at the bar affected by Corona got close to me to get me infected on purpose.</p>	<p>I was wandering in my neighbourhood and everybody was free and I didn’t understand why they were free to do everything without their masks on.</p>

## Discussion

This research is in line with a variety of studies<sup>16</sup> conducted over the last year and a half, which have demonstrated the central role of nightmares in people's dream experiences. An analysis of dreams can be considered from the Jungian theory of compensation. According to Jung, most dreams obey the law of compensation, through which the unconscious compensates the unilateral attitude of consciousness by integrating opposites.<sup>17</sup> According to the literature,<sup>18</sup> this condition is similar to trauma because people perceived the COVID-19 outbreak as potentially dangerous to their own lives. During this period, people's dreams changed, and there was a massive presence of dream content concerning fear of COVID-19. In particular, this study highlighted that during the COVID-19 pandemic, the sleep quality of individuals in society has been negatively affected at various levels. In this study, it was observed that the sleep quality of the individuals was poor. For example, during the COVID-19 pandemic, insomnia was rampant, causing a negative change in individuals' sleep quality. These results support our study. In our research, we evaluated sleep quality during the COVID-19 pandemic, as well as the impact of the Coronavirus on dream content.

Moreover, dreams can be analysed as an attempt of the unconscious to induce the dreamer to take note of real danger rather than putting up mechanisms of repression or denial.<sup>19</sup> Therefore, it functions as an invitation for dreamers to give the right value to the emotions experienced during a pandemic outbreak. In fact, the results have shown – as in previous studies – that most dreams had a pandemic topic, such as phobic content, including fear of contamination, fear of suffocation, fear of

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<sup>16</sup> Serena Scarpelli et al., "Pandemic nightmares: Effects on dream activity of the COVID-19 lockdown in Italy," *Journal of Sleep Research* 30, no. 5 (2021): e13300, <https://doi.org/10.1111/jsr.13300>.

<sup>17</sup> Marie-Louise Von Franz, *Sguardo sul Sogno* (Torino: Raffaele Cortina Editore, 1989).

<sup>18</sup> Yeliz Akkuş et al., "Determination of the factors affecting sleep quality in the general population during the early phase of the COVID-19 Pandemic," *Journal of Turkish Sleep Medicine* 8, no. 2 (2021): 142–150, <http://dx.doi.org/10.4274/jtstm.galenos.2021.93063>.

<sup>19</sup> Carl Gustav Jung, "Il significato della psicologia per i tempi moderni," in *Opere vol. 10/1: Civiltà in transizione: il periodo fra le due guerre* (Torino: Bollati Boringhieri, 1998): 201–224.

dying, panic sensations, and negative emotionality. Another category, conversely, was represented by the fear of being purposefully contaminated, which suggests a paranoid thought process. The results showed that a considerable portion of the subjects experienced an increased capacity to remember dreams and therefore a greater access to their unconscious, which is in line with similar studies on dreams during the pandemic. Barrett<sup>20</sup> asked more than 2800 participants to describe their dreams (those that were still clear) before and during the pandemic. After collecting information from a total of 9,000 dreams and analysing them with text analysis software, the author classified them into positive and negative emotions, such as anger, anxiety, sadness, health, or death. The study highlighted changes in dream content before and during the pandemic. As during the pandemic, the dream content was concentrated on Covid-19. All over the world,<sup>21</sup> researchers studying dreams have reported an increase in the frequency of vivid dreams and, in certain cases, nightmares during the COVID-19 pandemic.

For example, in a survey<sup>22</sup> comparing COVID-19-related dreams to those before the pandemic, the results suggest that the frequency of vivid dreams during self-isolation and quarantine has increased significantly. As far as the quantitative aspect of sleep is concerned, the seven main components of Pittsburgh's scale have been explored in the present study. In the sample of more than 400 healthy subjects, a significant portion reported difficulty falling asleep. Moreover, some reported not being able to totally enjoy the hours they spent in bed and not having really restful sleep. Some participants scored in the moderate

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<sup>20</sup> Deirdre Barrett, "Dreams about COVID-19 versus normative dreams: Trends by gender," *Dreaming* 30, no. 3 (2020): 216, <http://dx.doi.org/10.1037/drm0000149>.

<sup>21</sup> Michael Schredl and Kelly Bulkeley, "Dreaming and the COVID-19 pandemic: A survey in a US sample," *Dreaming* 30, no. 3 (2020): 189–198, <http://dx.doi.org/10.1037/drm0000146>; Natália Bezerra Mota et al., "Dreaming during the Covid-19 pandemic: Computational assessment of dream reports reveals mental suffering related to fear of contagion," *PLoS One* 15, no. 11 (2020): e0242903, <https://doi.org/10.1371/journal.pone.0242903>; Jiayi Wang et al., "Does COVID-19 impact the frequency of threatening events in dreams? An exploration of pandemic dreaming in light of contemporary dream theories," *Consciousness and Cognition* 87 (2021): 103051, <https://doi.org/10.1016/j.concog.2020.103051>.

<sup>22</sup> Elizaveta Solomonova et al., "Stuck in a lockdown: Dreams, bad dreams, nightmares, and their relationship to stress, depression and anxiety during the COVID-19 pandemic," *PLoS One* 16, no. 11 (2021), <https://doi.org/10.1371/journal.pone.0259040>.

clinical range of sleep disorders and a smaller percentage in the severe range, in which case they resorted to the use of drugs to sleep. They also reported at least one or two daily inconveniences per week due to difficulties getting restful sleep. Many people reported being more restless and, therefore, sleeping less than usual. Our routine has undoubtedly suffered from extensive alterations, which has had consequences for our sleep patterns.<sup>23</sup> According to some investigators, such as Barrett (2020), having more vivid dreams can be a result of a change in sleep times. During<sup>21</sup> the lockdown period, people seem to have slept more than usual. Dreams occur during the REM stage, where a transition from lighter to deeper sleep takes place. During this phase of sleep, our brain shows a higher level of activity, resulting in more vivid dreams. As the longest REM phase takes place only during the last hours of sleep, for most people, the REM phase can be disrupted if they do not get enough sleep. This result is similar to our research findings.

Moreover, we showed, in line with the findings of McNamara and colleagues,<sup>24</sup> that our dream patterns have been influenced by the fear and anxiety related to the pandemic. This study highlights how the REM dream system appears to be specialised in managing a wide range of types of imagery, memory, and cognitive elements. According to many researchers, dream vividness can be attributed to the emotional and physical chaos in which many people are living. The theory of dream continuity suggests that our dreams are influenced by our thoughts and actions during wakefulness. As a consequence, if we feel a certain level of stress as a result of the pandemic, work, or family, then the same patterns will also probably emerge in our dreams. It has been shown that the limbic system, which is involved in behavioural and emotional regulation, is activated during the most bizarre or sensitive dreams.<sup>25</sup>

It is for this reason that some researchers believe that dreams have a functional aim: to help dreamers prepare for the difficult and chal-

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<sup>23</sup> Solomonova et al., "Stuck in a lockdown."

<sup>24</sup> Patrick McNamara et al., "A neurocomputational theory of nightmares: the role of formal properties of nightmare images," *Sleep Advances* 2, no. 1 (2021), zpabo09, <https://doi.org/10.1093/sleepadvances/zpabo09>.

<sup>25</sup> McNamara et al., "A neurocomputational theory of nightmares."

lenging situations that they will have to deal with when they are awake. When something extraordinary happens, such as a pandemic, the brain can process it through dreams. What is transposed into dreams<sup>26</sup> are our recent experiences, oftentimes emotional and negative. Therefore, dreaming modulates emotional disorders, regulating the most problematic ones. Dreams can be considered a way to regulate the emotional components of our experiences, which does not always happen over just one night, but may need a longer period.<sup>27</sup> Dreams are also connected to memory. The results of a study by Marzano et al.<sup>28</sup> on the relationship between dreams and memories suggest that the neurophysiological mechanisms we use while we sleep and when we remember dreams are the same that are activated when we create and recover memories. In another study,<sup>29</sup> it was found out that vivid, bizarre, and emotionally intense dreams—dreams that we are usually able to remember—are connected to specific parts of the brain, i.e., the amygdala and the hippocampus. While the amygdala plays a fundamental role in elaborating emotional reactions, the hippocampus is involved in important functions of memory, such as consolidating information through short- and long-term memory. Another hypothesis is that dreaming more vividly is a traumatic reaction to stress or isolation. Stress factors related to long quarantines, contagion-related fears, frustration, feelings of boredom, lack of information, and fake news have been identified. It has been suggested that self-isolation and pandemic-related stress can increase the risk of developing PTSD.<sup>30</sup> This could partly explain the parallel phenomenon of alteration in dreams' content, as nightmares and disrupted sleep are important characteristics of PTSD. People suffering

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<sup>26</sup> Akkuş et al., "Determination of the factors affecting sleep quality."

<sup>27</sup> Anu-Katriina Pesonen, et al., "Pandemic dreams: network analysis of dream content during the COVID-19 lockdown," *Frontiers in psychology* 11 (2020): 573961, <https://doi.org/10.3389%2Ffpsyg.2020.573961>.

<sup>28</sup> Cristina Marzano, et al., "Recalling and forgetting dreams: theta and alpha oscillations during sleep predict subsequent dream recall," *Journal of Neuroscience* 31, no. 18 (2011): 6674–6683, <https://doi.org/10.1523/JNEUROSCI.0412-11.2011>.

<sup>29</sup> Samantha K. Brooks et al., "The psychological impact of quarantine and how to reduce it: rapid review of the evidence," *The Lancet* 395, no. 10227 (2020): 912–920, [https://doi.org/10.1016/S0140-6736\(20\)30460-8](https://doi.org/10.1016/S0140-6736(20)30460-8).

<sup>30</sup> Akkuş et al., "Determination of the factors affecting sleep quality."

from this pathology often have frequent and recurrent nightmares and intense flashbacks connected to intrusive traumatic memories.<sup>31</sup> In the Jungian vision of dreams, the presence of dreams with nightmares and traumas can be read as indications that the collective unconscious sends to the dreamer's consciousness, anticipating traumatic events that may arise later.<sup>32</sup> Several people have had anticipatory dreams related to pandemic events, coming from the collective unconscious. These dreams invite dreamers to prepare for unpredictable events by providing them with tools to acquire greater awareness.

### Conclusions

In conclusion, the pandemic seems to have fully entered our collective subconscious, not only through symbols but also by processing direct images and scenes from common experience and the rapid change in daily social interactions.

Dreams reflect the predominant thoughts we have when we are awake; they are necessary to build memories, allow an outlet for anguish and preoccupations, and help to process and emotionally face difficult situations in real life. Dreams can lead us to new insights and solutions to problems and can be powerful therapeutic tools. The analysis of problems connected to sleep and dreams can be considered an early predictor of other pathologies, as it often represents a risk factor for the development of anxious and depressive syndromes that, over the last year—aside from PTSD—have exponentially increased. This evaluation, therefore, requires clinical attention, early and timely interventions in the general population, and adequate early and wide-ranging psychological intervention. Hence, it is necessary to pay attention to the need for strengthening psychological support services and encouraging the narration and collection of dreams. Although the subjectivity

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<sup>31</sup> Madhulika A. Gupta, "Spontaneous reporting of onset of disturbing dreams and nightmares related to early life traumatic experiences during the COVID-19 pandemic by patients with posttraumatic stress disorder in remission," *Journal of Clinical Sleep Medicine* 16, no. 8 (2020): 1419–1420, <https://doi.org/10.5664/jcsm.8562>.

<sup>32</sup> Ferdinando Testa, *La clinica delle immagini Sogno e psicopatologia* (Bergamo: Moretti e Vitali, 2019).



and self-reporting nature of dreams are hard to capture in a quantitative manner, for all the purposes mentioned above, the use of statistical inference, where possible, can help provide a more reliable and valid interpretation of this human experience. Understanding and interpreting this phenomenon can hugely benefit from both quantitative and qualitative analyses and thus more investigations taking advantage of both methodologies are essential and recommended. Last but not least, the findings of this study can be useful for mental health professionals and emphasises the importance of psychological assessments of traumatic events.

### Limitations

Although our study highlighted an important theme aligned with previous studies on dream content—which is the association between dream content and the fear of COVID-19—it also comes with limitations such as the small sample size, which was not demographically representative. Considering this and other potential limitations of the study, cautious interpretation of the results is recommended.

### Contributor Statements

M.C. and T.F. conceptualised and designed the study; M.C., M.C.S., and B.K. designed the data collection instruments; A.R., C.L., and A.H.L. carried out the observations and statistical analyses and drafted the initial manuscript; C.M., T.F., and T.K. coordinated, supervised, and revised the manuscript. All the authors approved the final manuscript as submitted.

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## Declaration of Interest

The authors report no conflicts of interest.

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## Appendix

Italian translation of the TKYDQ questionnaire (Dreaming and the COVID-19 Pandemic)

WSC\_Q1- required: In che misura la frequenza con cui ti svegli ricordandoti un sogno è aumentata o diminuita nell'ultimo mese (ad esempio, dagli inizi di Aprile 2020)?

WSC\_Q2- required: Hai mai avuto un sogno collegato all'epidemia di Coronavirus (COVID-19), o i problemi sociali/economici causati dall'epidemia?

WSC\_Q3- required: Quante notti in media alla settimana soffri di insonnia o hai difficoltà a dormire? Se non sei sicuro, per favore dai la tua stima migliore.

WSC\_Q4- required: Dall'inizio dell'epidemia di Coronavirus (COVID-19), le emozioni nei tuoi sogni sono diventate più positive, negative, o le stesse di prima?

WSC\_Q5- required: Sei stato personalmente influenzato dall'epidemia Coronavirus (COVID-19) in uno qualsiasi di questi modi? Per favore seleziona tutto ciò che può essere applicato.

WSC\_Q6- required: Su un diverso argomento, approvi o disapprovi il modo in cui Donald Trump sta svolgendo il suo ruolo come presidente?