

Review

A Systematic Review of the Definition, Measurement, and Associated Factors of Pandemic Fatigue

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ABSTRACT

The rapid emergence and widespread transmission of severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) have prompted governments worldwide to enact policies and measures to manage the virus's spread. These interventions have substantially contributed to controlling disease transmission. However, they have also significantly disrupted daily life, leading to increased public fatigue and resistance to sustained control measures, a phenomenon known as pandemic fatigue. To develop a comprehensive understanding of pandemic fatigue, this review systematically explores the concept and identifies quantitative indicators for measuring it. We reviewed studies on pandemic fatigue across various countries, summarized the contributing factors, and analyzed its impact on personal protective behaviors. Our findings indicate that the enforcement of health measures significantly influences the onset of pandemic fatigue, while individual perceptions of risk can negatively affect personal protective behaviors, creating a feedback loop with increasing fatigue. These results underscore the importance of considering the current severity of the pandemic and individual decision-making processes in the implementation of interventions. Enhancing our understanding of pandemic fatigue is essential for developing effective policy responses in preparation for future potential epidemics.

The coronavirus disease 2019 (COVID-19) pandemic has posed unprecedented challenges to governments and societies worldwide (1). As of December 24, 2023, there have been more than 773 million confirmed cases and approximately 6.9 million reported fatalities (2). In response to the outbreak, governments have implemented extraordinary measures designed to mitigate the spread of the novel

coronavirus (3). These interventions have significantly curtailed the transmission of COVID-19 (4).

However, a global observation indicates a decreasing adherence to preventive measures against COVID-19 over time (5), a phenomenon referred to as pandemic fatigue. This condition is characterized by widespread feelings of fatigue and diminished motivation to comply with expert recommendations concerning COVID-19. Within the public sphere, pandemic fatigue can significantly undermine the effectiveness of health intervention strategies.

Governments have acknowledged their duty to tackle the root causes of pandemic fatigue in order to sustain public support for COVID-19 prevention measures (6). Numerous studies have endeavored to define and quantify pandemic fatigue from various angles. This systematic review seeks to attain a more holistic understanding of pandemic fatigue by identifying how it is conceptualized across different studies and exploring the factors that influence its intensity.

METHODS

Search Strategy and Selection Criteria

We conducted our literature searches using PubMed (7) and Web of Science (8), focusing on articles published between January 1, 2020 and June 1, 2023. Our inclusion criteria encompassed articles from peer-reviewed journals relevant to our study. The search strategy employed the following terms: 1) "COVID-19" OR "SARS-COV-2" OR "2019-nCoV" in conjunction with 2) "pandemic fatigue" OR "behavior fatigue" OR "measure fatigue." The comprehensive search query combined these groups as 1) AND 2). Our selection was limited to studies that quantitatively assessed pandemic fatigue among the general population. We excluded systematic reviews and meta-analyses that focused on clinical rather than pandemic-related fatigue. In total, 30 studies met our inclusion criteria and were analyzed in this review.

Data Extraction

The data extracted from each of the included studies comprised the following fields: 1) study methodology, 2) study area, 3) total sample size, 4) definition of pandemic fatigue, 5) measure of pandemic fatigue, 6) study time range, 7) value/level of pandemic fatigue, and 8) variables associated with pandemic fatigue. For data collection in our research, we employed Microsoft Excel (Version 2312, Build 16.0.17126.20132; Microsoft Corporation, Washington, USA) spreadsheets.

Rescaling Values of the Pandemic Fatigue Scale (PFS) in the Studies

To facilitate an intuitive comparison of pandemic fatigue levels across various countries, we reorganized the results from studies employing the PFS as a measure. Although each study utilized the PFS consistently, variations in their scoring scales may influence comparative analyses. Consequently, we rescaled the scores to a uniform range from 1 to 7. Specifically, we hypothesized that the original scores from the PFS adhere to a normal distribution. For each study under consideration, we generated a dataset of random integer samples drawn from a normal distribution matching the study's mean and standard deviation (SD). These samples were then standardized to a 1 to 7 scale, thus recalibrating both the mean and SD. This rescaling procedure was iterated 10,000 times to ensure robustness, and the average of these iterations was taken as the final estimate. The revised means and SDs are detailed in Supplementary Table S1 (available at <https://weekly.chinacdc.cn/>). All analyses were performed using R software, version 4.2.1. (R Foundation for Statistical Computing, Vienna, Austria).

RESULTS

Search Result

We identified 264 studies through searches of PubMed and Web of Science databases. Ultimately, 30 of these studies were included in our analysis. The detailed selection process is illustrated in Figure 1.

Characteristics of the Included Studies

Table 1 provides a summary of the characteristics of the studies included in this analysis. Zhang N's research, initiated in January 2019, represents the

earliest investigation into pandemic fatigue (17). In contrast, Torales J's study started the latest, spanning one month and concluding in December 2022 (12). The geographic scope of the studies is extensive, with five incorporating data from multiple countries across Europe, North America, South America, and Oceania. There are six studies conducted in Hong Kong Special Administrative Region (SAR), China and three in the Chinese mainland; and there are three studies in Spain. Regarding the methodologies employed, 24 of the studies used a cross-sectional approach to examine pandemic fatigue, while the remainder conducted longitudinal studies or did not specify their methods. Across the 30 studies analyzed, 12 different scales or methods were utilized to assess pandemic fatigue, with the PFS being the predominant measure.

The Concept of Pandemic Fatigue

Various definitions have been proposed to characterize the fatigue associated with the pandemic. These definitions broadly fall into two categories, as illustrated in Figure 2. The first category, as defined by the World Health Organization (WHO) (6), emphasizes information and behavioral fatigue. The second category aligns with traditional health psychology perspectives, focusing on physical and mental fatigue (38–39).

To assess the presence of pandemic-related fatigue, researchers employ two principal methods: subjective evaluations or performance decrements (22,40). The subjective method includes the development of feelings of exhaustion, typically measured using self-report questionnaires such as the PFS or the Fatigue Assessment Scale. The performance-based method, on the other hand, gauges fatigue by observing declines in compliance over time, such as changes in social distancing or adherence to individual-level protective behaviors.

The two main definitions of pandemic fatigue (information & behavioral fatigue and physical & mental fatigue) are summarized from 30 included studies. Two types of measures are used to determine pandemic fatigue, and three types of indicators assess the level of pandemic fatigue.

Factors Associated with Pandemic Fatigue

Figure 3 depicts the relationship between pandemic fatigue and its associated variables. The onset of pandemic fatigue is influenced by the severity of the

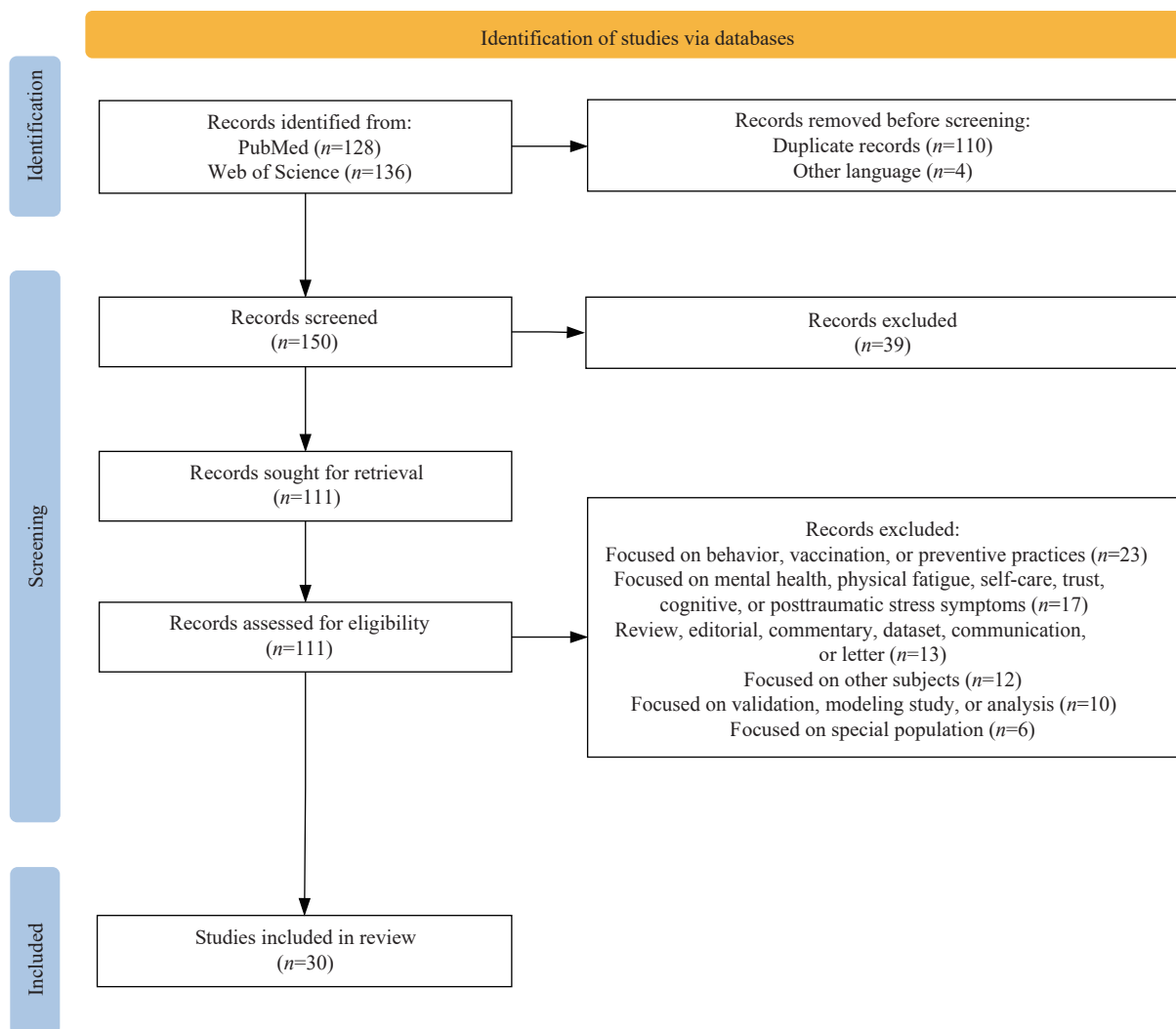


FIGURE 1. PRISMA flow diagram for the studies used to obtain studies measuring pandemic fatigue. Note: Data from PubMed were used for the primary search. Abbreviation: PRISMA=Preferred Reporting Items for Systematic Reviews and Meta-Analyses.

TABLE 1. Summary of the included studies.

Study	Definition of pandemic fatigue	Methodology	Area	Sample size	Measurement of fatigue	Time range
1 (9)	More specifically, drawing on the notion of pandemic fatigue put forward by the WHO, we define pandemic fatigue as a gradually emerging subjective state of weariness and exhaustion from, and as a general demotivation towards, following recommended health-protective behaviors, including keeping oneself informed about the pandemic.	Repeated cross-sectional & panel survey	Denmark; Germany	34,582	PFS [†]	19/10/2020–20/09/2021
2 (10)	World Health Organization (WHO)'s definition [‡] ; "The decrease in physical and/or mental performance that results from changes in central, psychological, and/or peripheral factors due to the COVID-19 disease," influenced mainly by psychophysical factors (stress, anxiety, depression, and pain), inflammations and pre-existing medical conditions.	Cross-sectional	Spain	596	PFS	22/12/2020

Continued

Study	Definition of pandemic fatigue	Methodology	Area	Sample size	Measurement of fatigue	Time range
3 (11)	WHO's definition	Cross-sectional	Poland	1,060	PFS	20/11/2021–15/12/2021
4 (12)	Pandemic fatigue has been defined as a cluster of demotivation, tiredness, and psychological effects that emerge gradually over time after the infection or through the adoption of the recommended measures to combat it.	Cross-sectional	Argentina, Bolivia, Uruguay, Peru, Paraguay	1,448	PFS	11/11/2022–20/12/2022
5 (13)	–	Cross-sectional	China [§]	4,317; 1,096; 2,172	PFS	03/02/2020–11/02/2020, 07/03/2020–16/03/2020, 01/04/2022–08/04/2022
6 (14)	–	Cross-sectional	China [¶]	803	Fatigue Assessment Scale**	12/2020–01/2021, 06/2021–07/2021, 12/2021–01/2022
7 (15)	WHO's definition	Cross-sectional	Malaysia	775	Fatigue Assessment Scale	01/04/2022–30/04/2022
8 (16)	Pandemic fatigue, the decreased motivation to adhere to social distancing measures and adopt health-protective behaviors	–	Italia	–	Social Distance ^{††}	11/2020–06/2021
9 (17)	WHO's definition	–	China [§]	–	Pandemic Fatigue Score (changes in local travel behaviors) ^{††}	01/2019–01/2021
10 (18)	WHO's definition	Longitudinal	USA	–	Social Distance ^{††}	03/2020–10/2021
11 (19)	Pandemic fatigue can also be considered a specific, severe form of cognitive load as defined under cognitive load theory.	Cross-sectional	Australian	600	PFS	09/2021
12 (5)	WHO's definition	Cross-sectional	China [§]	1,255	Questionnaire (Adherence to disease prevention measures) ^{††}	12/2020–01/2021
13 (20)	–	Cross-sectional	Spain	3,005	PFS	01/2021–06/2021
14 (21)	Pandemic fatigue usually refers to psychological fatigue as involving feelings of tiredness and physical and mental exhaustion.	Cross-sectional	China [§]	31,000	Risk Perceptions and Self-reported Behaviors ^{††}	05/2020–02/2021
15 (22)	Pandemic fatigue is best conceptualized as feelings of exhaustion or tiredness caused by the costs of compliance such as the mental costs of social isolation.	Longitudinal	Denmark, Sweden, the UK, USA, Italy, France, Germany, Hungary	49,116	Response ^{††}	13/09/2020–20/07/2021
16 (23)	The cardinal feature of pandemic fatigue is a progressive decline in adherence to government guidelines for social distancing (SDIS), arising in the weeks or months in which SDIS and other pandemic-mitigation measures are in place.	Cross-sectional	USA, Canada	5,812	Social Distancing Scales ^{††}	24/03/2021–04/05/2021
17 (24)	WHO's definition	Cross-sectional	Austrian (Carinthia, Vorarlberg)	1,003	PFS	04/2021–06/2021

Continued

Study	Definition of pandemic fatigue	Methodology	Area	Sample size	Measurement of fatigue	Time range
18 (25)	Pandemic fatigue is defined as physical and mental exhaustion and a lack of motivation to follow the recommended protective measures resulting from the application of several restrictions over a long period.	Cross-sectional	Saudi Arabia	650	PFS	04/2021–06/2022
19 (26)	–	Cross-sectional	China [¶] (Xi'an)	1,500	PFS	01/2022–02/2022
20 (27)	–	Cross-sectional	China [§]	4,726	Questionnaire ^{††}	02/2021–03/2021
21 (28)	Pandemic fatigue has been used to describe different phenomena related to psychological distress and demotivation to follow preventive measures, as well as decreased trust in the government and frequency of information-seeking behaviors.	Cross-sectional	Spain	1,018	PFS	11/2020
22 (29)	WHO's definition	Cross-sectional	Israeli Arabs	810	Questionnaire Examining Pandemic Fatigue (WHO) ^{††}	10/2020
23 (30)	WHO's definition; Moreover, it is associated with sleep problems, fear, sadness, and worrying.	Cross-sectional	Germany	4,462	SF-36-Health Survey ^{††}	18/01/2021–16/09/2021
24 (31)	Pandemic fatigue is defined as the tendency for individuals to become wearied of rules and advisory, which should be followed to prevent the spread of COVID-19.	Cross-sectional	Turkey	500	The COVID-19 Burnout Scale (COVID-19-BS) ^{††}	01/11/2020–12/11/2020
25 (32)	–	Cross-sectional	Australia, the UK, USA	2,343	changes in masks and other preventive behaviors ^{††}	03/2020–07/2020
26 (33)	Pandemic fatigue refers to the lack of motivation to stay aware of the pandemic and adhere to suggested protective health behaviors evolving gradually through time.	Cross-sectional	Philippines	1,467	PFS	24/06/2021–30/06/2021 (last week of June 2021)
27 (34)	–	Panel survey	Japan	2,046; 1,990	Changes in Preventive Measures ^{††}	2021; 2022
28 (35)	–	Longitudinal	China [§]	430	Behavioral fatigue ^{††}	22/03/2020–01/04/2020; 15/12/2020–29/12/2020
29 (36)	By definition, pandemic fatigue refers to one's tendency to become tired of rules and advisories, which should be followed to prevent the spread of COVID-19.	Cross-sectional	China [¶]	849	PFS	04/2022
30 (37)	WHO's definition	Cross-sectional	Israeli Arabs	2,486	Questionnaire Examining Pandemic Fatigue (WHO) ^{††}	11/2021

Note: "–" means the literature did not clearly state, or we did not find the information.

Abbreviation: WHO=world health organization; PFS=Pandemic Fatigue Scale; COVID-19=coronavirus disease 2019; FAS=Fatigue Assessment Scale.

* The WHO defines pandemic fatigue as a gradual decrease in motivation to adhere to recommended protective behaviors, influenced by an array of emotions, experiences, and perceptions (6).

† The PFS was originally developed by Lilleholt et al. (9) or Cuadrado et al. (10) to assess fatigue levels in individuals resulting from COVID-19.

§ Hong Kong Special Administrative Region, China

¶ Chinese mainland

** The FAS is a ten-item instrument designed to evaluate symptoms associated with chronic fatigue.

†† The measurement of pandemic fatigue was developed by the author, drawing on various sources.

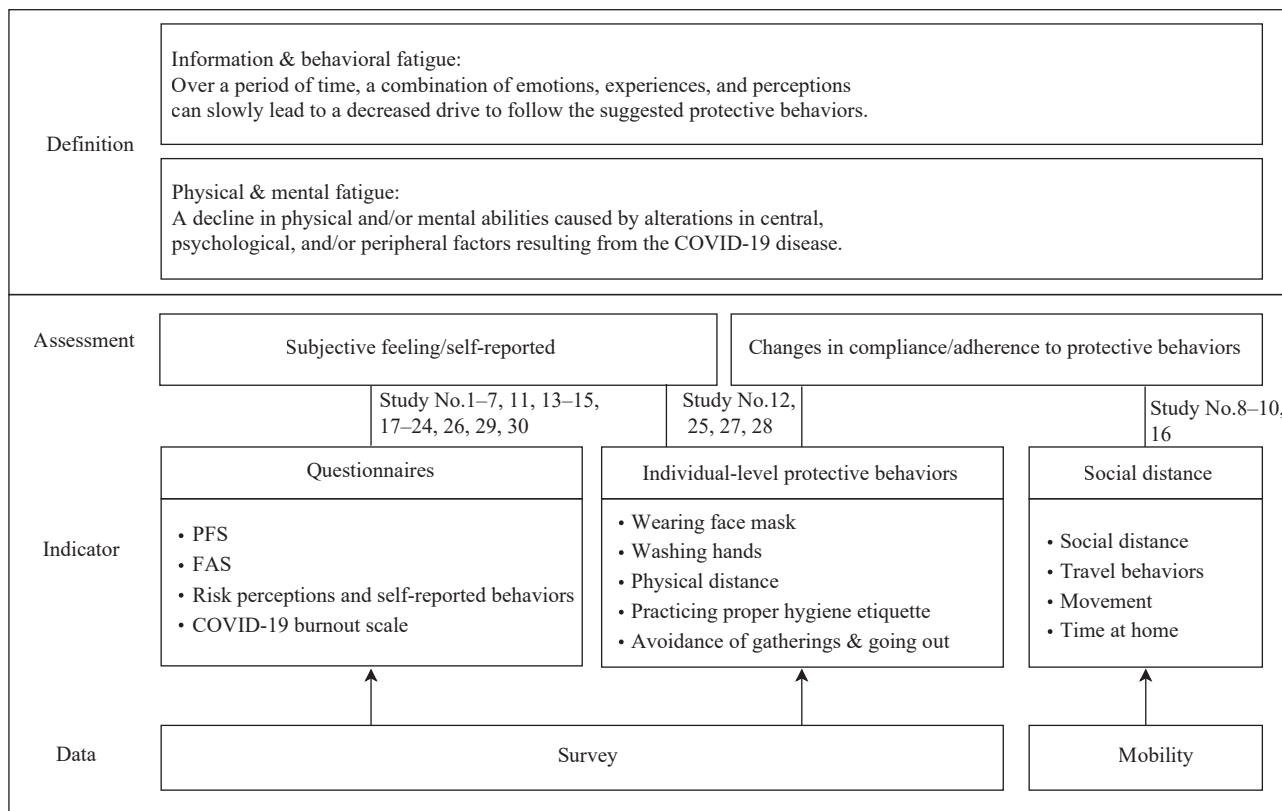


FIGURE 2. The concept of pandemic fatigue. Abbreviation: COVID-19=coronavirus disease 2019; PFS=Pandemic Fatigue Scale; FAS=Fatigue Assessment Scale.

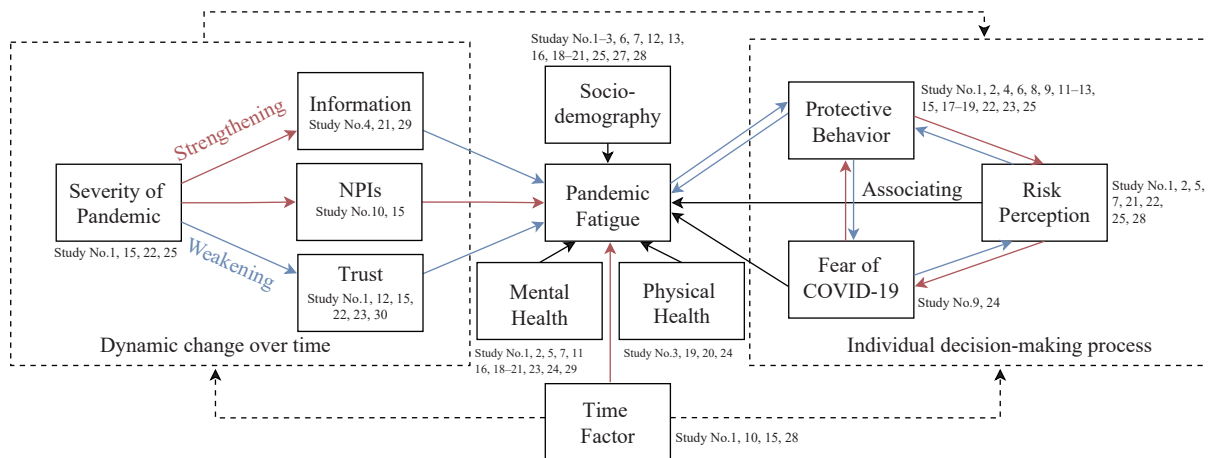


FIGURE 3. Illustration about the variables associated with pandemic fatigue. Abbreviation: NPI=non-pharmaceutical intervention.

pandemic, individual decision-making processes, and fundamental personal characteristics.

Should the severity of the outbreak intensify, governments might enforce stricter non-pharmaceutical interventions (NPIs) to limit human activities (41), potentially heightening the likelihood of pandemic fatigue among the public. Conversely, increased exposure to COVID-19-related information

could mitigate the onset of fatigue (28). Moreover, more severe pandemics may erode public confidence and trust in governmental responses, further contributing to pandemic fatigue.

In the process of individual decision-making, three crucial variables influence pandemic fatigue: protective behavior, risk perception, and the emotional response to COVID-19 (42). The feedback loop, illustrated

with three red arrows, represents the enhancement of protective behaviors through an elevated perception of disease risk and an increased fear of infection. Conversely, another feedback loop depicted with three blue arrows, demonstrates the weakening of protective behaviors driven by a reduction in emotional response to COVID-19 and perceived danger. Importantly, most studies have shown that an increased level of pandemic fatigue is associated with decreased adherence to preventive measures. Consistently adhering to these protective measures is positively correlated with a reduction in pandemic fatigue symptoms.

Pandemic fatigue is notably influenced by individual characteristics, with varying degrees observed across different socio-demographic groups. Research indicates that certain populations including adults, women, and individuals more severely affected by economic and employment disruptions are more susceptible to pandemic fatigue (5,11,23,25–28,32). In terms of mental health, there is a positive correlation between high levels of loneliness, depression, anxiety, pessimism, and other negative belief systems and the prevalence of pandemic fatigue (13,15,23,26,28,30,31). Physically, those with unhealthy lifestyles or poor physical health are also more likely to experience pandemic fatigue (11,26,27,31). A summary of the literature detailing the effects of individual characteristics can be found at <https://github.com/RuohanCHEN01/Pandemic-Fatigue-Review>.

The decision-making processes at both personal and national levels has had mental, physical, and social implications for individuals over time. Additionally, the course of the pandemic and the longevity of related measures significantly affect various behavioral dimensions of the individual pandemic experience. Generally, pandemic fatigue intensifies as the pandemic endures and its associated measures are prolonged.

A combination of factors conducted within two dynamic processes and basic individual characteristics directly or indirectly affects pandemic fatigue. The arrows denote the influence from one factor to another, with red and blue indicating strengthening and weakening, respectively. Pandemic fatigue and protective behaviors are mutually influenced, resulting in a negative cycle.

DISCUSSION

Our study conducted a review of the definitions of

pandemic fatigue as discussed in the existing literature. The definition provided by the WHO is widely accepted, and the PFS is the most frequently utilized metric for assessment. Additionally, we investigated the interactions between pandemic fatigue and its associated variables.

The diagram elucidates the dynamic relationship between the ongoing severity of the pandemic and individual decision-making processes, both of which are critical factors. The severity of the pandemic influences the dissemination of information, the enforcement of control measures, and the public's trust in governmental bodies, thereby affecting the levels of pandemic fatigue. To effectively address these issues, public health professionals and authorities must disseminate clear, culturally resonant information, avoid unnecessary scientific jargon, counteract misinformation, and develop communication strategies designed to either establish or restore public trust and confidence. Additionally, any preventative measures against COVID-19 that are no longer supported by current science should be promptly removed from official guidance, and control measures should be revised swiftly to reflect the latest data (43).

Individual decision-making processes may lead to diminished protective behaviors due to a decreased sense of fear and perceived threat. By modifying risk perceptions related to the likelihood of contracting severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) and the severity of the disease, individuals can enhance their self-protective behaviors (44). A recent systematic review indicates a global prevalence of 45.2% for chronic post-COVID-19 syndrome. Pandemic fatigue correlates with both unchangeable factors such as culture and sex, and modifiable factors including behavior and mental health. Commonly cited factors associated with a higher incidence of fatigue symptoms include female sex and adult age (45–46), aligning with our findings (available at <https://github.com/RuohanCHEN01/Pandemic-Fatigue-Review>). However, disparate results concerning certain factors have emerged across various studies, suggesting the need for future research to explore pandemic fatigue in more diverse population groups.

Systematic reviews suggest that the pooled prevalence of mental health issues during the COVID-19 pandemic exceeds prior levels; notably, the most substantial increase in mental health problems occurred during the early peak months of the pandemic, followed by a modest decline (47–49).

Moreover, the pandemic has precipitated widespread social consequences that are now apparent globally (50). These include profound alterations in lifestyle, work dynamics, and social interactions. Observations at the 9-month follow-up indicate that adherence to social distancing in public spaces was less stringent compared to personal and household hygiene measures (35). Pandemic-induced fatigue has exacerbated noncompliance with social distancing guidelines, particularly among special populations experiencing heightened fatigue. Further investigation into the potential long-term impacts of pandemic fatigue on mental health and social behavior is crucial to deciphering their interrelationship.

Pandemic fatigue appears to progressively increase over time. Studies conducted in Denmark and Germany (9) reveal that fatigue levels experienced a significant upsurge, as determined through ordinary least squares regression analysis. Specifically, the studies show an approximate increase of 5.8 percentage points in pandemic fatigue every six months, even when adjustments were made for the severity of the pandemic and the stringency of policy measures (22). This trend suggests that as the pandemic decelerates, fatigue levels correspondingly decrease, indicating that each pandemic wave potentially contributes to an accumulation of fatigue from which recovery is possible during inter-wave periods.

However, the dynamics of pandemic fatigue are complex and fluctuate over time, influenced by factors such as the duration of the pandemic, the strictness of interventions, and the severity of the pandemic itself. Effective monitoring of these contextual factors is essential for both understanding and mitigating the impacts of pandemic fatigue. Furthermore, this underscores the importance of longitudinal studies in exploring these temporal dynamics, providing critical insights that enhance our response strategies.

This study recognizes several limitations that warrant consideration in future research. First, pandemic fatigue is a complex and multifaceted concept that includes a wide range of terms describing its various dimensions. As such, our search strategy may not have captured all relevant studies. Second, our review was limited to studies published in English and Chinese, possibly excluding pertinent research published in other languages. Third, in terms of the remeasurement of PFS, we assumed that the distribution of raw PFS scores is normally distributed, which might introduce bias. Readers should approach the results stemming from this assumption with

caution.

In conclusion, pandemic fatigue represents a global phenomenon that adversely affects individuals' physical and mental health, as well as their social interactions. Considering the challenges and detrimental outcomes linked to this condition, it is imperative that further research be undertaken to thoroughly investigate its origins and consequences. It is also crucial for health policymakers to allocate increased funding aimed at alleviating the adverse effects of this fatigue and to formulate effective strategies for its management.

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SUPPLEMENTARY MATERIAL

SUPPLEMENTARY TABLE S1. Summary of PFS for each study.

Study	Area	Sample	Mean (SD) of original PFS	Scale of original PFS	Mean (SD) of rescaled PFS
2	Spain	596	2.98 (1.47)	1–7	2.98 (1.47)
3	Poland	1,060	4.42 (1.54)	1–7	4.42 (1.54)
4	Argentina, Bolivia, Uruguay, Peru, and Paraguay	1,448	21.7 (7.95)	6–42	3.67 (1.23)
11	Australian	600	3.87 (1.43)	1–7	3.87 (1.43)
13	Spain	3,005	17.80 (5.18)	6–30	3.96 (1.22)
18	Saudi Arabia	650	17.80 (7.00)	6–30	3.98 (1.44)
19	China (Xi'an)	1,500	2.97 (1.75)	1–7	2.97 (1.75)
21	Spain	4,726	17.06 (5.04)	6–30	3.79 (1.20)
26	Philippines	1,467	3.74 (0.75)	1–7	3.74 (0.75)

Abbreviation: PFS=Pandemic Fatigue Scale; SD=standard deviation.