BMC Psychology

RESEARCH

Open Access

A repeated cross-sectional pilot study of the relationship between perceived a community with shared future for doctor-patient and benefit finding: the mediating role of health self-consciousness and moderating role of anxiety

Fenwick Feng Jing[1†], Jing Zhou[2†], Jiaying Ge[2†], Xiaoyu Wang[2], Mengjiao Tang[3], Shenyu Zhao[3], Yanqiu Cui[3], Lijing Bai[2], Xiyang Xia[2], Yang Chen[2], Dan Shen[2], Haiying Chen[3], Juan Wen[4*], Lingmin Hu[2*] and Renjie Lu[3,5*]

Abstract

Objective Since January 8, 2023, China has managed COVID-19 as a Class-B infectious disease, marking the epidemic's transition to a low-level stage. This study analyzes the relationship between the public's perceived a community with shared future for doctor-patient (PCSF), health self-consciousness, benefit finding, and anxiety in this stage. Additionally, it compares changes in these variables across different stages of COVID-19.

Methods Using a repeated cross-sectional design, three surveys were conducted respectively in three different stages of COVID-19 in China. Specifically, the first survey was conducted in Beijing, Dalian, Zhengzhou, Heihe, and Shangrao from November 13 to 20, 2021 in the outbreak stage of COVID-19, yielding 1,252 valid responses out of 1,534 collected questionnaires. The second survey was conducted in Dalian, Zhengzhou, Heihe, Shangrao, and Lanzhou from December 1 to 19, 2021 in the stable stage of COVID-19, with 872 valid responses obtained from 1,075 collected questionnaires. The third survey was conducted in Beijing, Dalian, Zhengzhou, Heihe, Shangrao, Lanzhou, and Chengdu from January 29 to February 4, 2023 in the low epidemic level stage of COVID-19, achieving 2,113 valid responses from the 2,461 questionnaires collected.

Results Unlike in the outbreak stage but similar to the stable stage, the public's anxiety, health self-consciousness and benefit finding decreased while PCSF was improved in the low epidemic level stage. Consistent with both the

†Fenwick Feng Jing, Jing Zhou and Jiaying Ge contributed to the work equally and should be regarded as co-first authors.

*Correspondence:
Juan Wen
wenj2010@139.com
Lingmin Hu
hulingmin1986@126.com
Renjie Lu
renjie_lu@126.com
Full list of author information is available at the end of the article

outbreak and stable stage, PCSF, health self-consciousness, benefit finding, and anxiety showed positive correlations in the low epidemic level stage, with health self-consciousness partially mediating the positive impact of PCSF on benefit finding. Unlike in the stable stage but similar to the outbreak stage, anxiety did not moderate the relationship between PCSF and health self-consciousness in the low epidemic level stage.

Conclusions The public's health self-consciousness, benefit finding, and anxiety decreased, while PCSF increased in the low epidemic level stage. Furthermore, PCSF had a greater impact on benefit finding, and anxiety's impact on health self-consciousness was significantly reduced. Across different stages of COVID-19, PCSF directly increased benefit finding and also enhanced benefit finding by improving health self-consciousness. Thus, comprehensive intervention measures are beneficial in the low epidemic level stage.

Keywords Perceived a community with shared future for doctor-patient, Benefit Finding, Health self-consciousness, Anxiety

Introduction

Background

Corona Virus Disease 2019 (COVID-19) is a global public health issue [1]. Ensuring life safety and physical health has become the primary goal for both doctors and patients [2]. This epidemic has made the public deeply feel the vulnerability of life and the importance of health [3]. High-frequency health communication during the epidemic significantly enhanced the public's awareness of epidemic prevention and control as well as their medical knowledge reserve [4].

Typically, health-conscious individuals are more aware of and concerned about their own health, taking steps to ensure it and taking responsibility for both their own and others' health [5, 6]. One study has shown that COVID-19-related prevention awareness is linked to a healthy lifestyle [7]. While the epidemic has heightened public health self-consciousness, it has also brought many negative psychological issues, such as anxiety, depression, and fear [8]. Anxiety is a common psychological stressor during the epidemic [9–12]. Coronavirus anxiety is positively correlated with depression, generalized anxiety, and stress [13]. However, negative experiences can prompt the public to reflect on the meaning of life [14]. Meaning in life involves understanding the significance of one's existence and realizing one's goals and missions [15]. Although participants experienced anxiety, panic, and limitations during the epidemic, they sought new perspectives and creating meaning from these negative events [16]. Even after achieving meaning, they continue searching for it [17]. Studies indicate that disease prevention measures like social distancing and wearing masks do not reduce subjective well-being but may instead enhance it [18]. The meaning of life mitigates the negative impact of painful events experienced [19]. Consequently, the epidemic has had positive effects on increasing appreciation of life, promoting interpersonal relationships, and improving health, which is known as benefit finding [20]. In this study, benefit finding is defined as the perception of benefit from a particular adversity experience.

Furthermore, negative emotions brought by COVID-19 also inspired social support and solidarity [21]. To effectively respond to the epidemic, the concept of a community with a shared future for mankind has been advocated [22]. Since the fight against COVID-19 began, the Chinese government has implemented integrated management of public health, medical care, economy, transportation, education, and other areas [23], fully demonstrating the values of this concept [24]. China's epidemic prevention and control policies have protected populations from five global COVID-19 waves, avoiding widespread infection with the original strain and delta variant [25]. This concept has proved to be a powerful strategy in dealing with COVID-19, a common enemy of both doctors and patients [22]. Chinese medical staff have shown great professional dedication, volunteering to work under dangerous and overloaded conditions to treat COVID-19 patients [26]. Public sympathy for doctors has increased due to positive media coverage and public opinion on the hard work [27]. The doctor-patient relationship has been rapidly evolved into a community with a shared future for doctor-patient [9], where both doctors and patients understand the disease consistently, share efforts in dealing with the disease, and jointly bear the responsibility for treatment outcome [9]. In coping with COVID-19, the public has developed a deeper respect for the dedication and professional ability of medical staff, gradually realizing the significance of their joint efforts.

The first survey conducted by our research took place in the outbreak stage of COVID-19. The second survey followed immediately after 21 consecutive days (3 weeks) without new confirmed cases in the city, which is defined as the stable stage of COVID-19 [9]. As the virus continues to evolve, the Omicron variant has demonstrated reduced pathogenicity and toxicity along with enhanced immune escape ability [28, 29], leading to a higher

likelihood of asymptomatic or mild upper respiratory tract infection symptoms after human infection [30, 31]. Starting from mid-November 2022, the Chinese government adjusted COVID-19 response measures. A survey showed that anxiety prevalence among college students was 12.7% within one month of China's release of the new ten measures to optimize the implementation of outbreak prevention and control (December 31, 2022-January 7, 2023), consistent with or lower than finding from previous studies [32–35]. During this period, self-reported COVID-19 infection rates exceeded 80.2%, with 80.8% of students having recovered [35]. Subsequently, starting January 8, 2023, China classified COVID-19 as a Class-B infectious disease, and the risk of reinfection shortly after recovery was reduced due to antibodies protection [36–38]. The epidemic in China transitioned to a low-level stage [39]. The third survey was conducted from January 29, 2023, to February 4, 2023, known as the low epidemic level stage of COVID-19 [39], which was conducted immediately after COVID-19 was classified as a Class-B infectious disease with a steady decline in epidemic across the country. Many people had recovered from the infection and developed neutralizing antibodies in this stage. Consequently, the public's psychological state during this period may differ from that observed before the policy adjustment.

Our previous research has established that the common goal of doctors and patients is health, which is the premise for meaning in life [9]. Additionally, it has found that there is a positive correlation between PCSF, benefit finding, health self-consciousness, and anxiety in the outbreak stage and the stable stage of COVID-19 [9]. However, the long-term sustainability of the positive effects of COVID-19 remains uncertain, [40]. necessitating more longitudinal studies to explore emotional and behavioral responses during the epidemic [41]. A longitudinal study focusing on European healthcare workers in the outbreak stage revealed that higher levels of benefit finding reduced the bivariate correlation with post-traumatic stress syndrome over the study period [42]. Similarly, research involving Chinese students showed an increasing trend in deriving meaning from negative experiences in the outbreak stage of COVID-19 compared to the preceding three months [43]. Additionally, during and three months after the outbreak, initial and increased meaning creation from negative experiences predicted less psychological distress, including depression, anxiety, and stress [43]. However, there has been limited research focusing on the new model of doctor-patient solidarity in the context of COVID-19, examining longitudinal changes in its relationship with anxiety, benefit finding, and health self-consciousness. The relationship and changes between PCSF, benefit finding, health self-consciousness, and anxiety are not clear yet at present after China's classification of COVID-19 as a Class-B infectious disease. Given the potential prolonged low epidemic level stage of COVID-19, investigating these factors during this period will offer valuable insights into enhancing doctor-patient relationships, improving health literacy, and promoting positive psychology. Therefore, our study aims to analyze the relationship between PCSF, health self-consciousness, benefit finding, and anxiety in the low epidemic level stage of COVID-19 and comparing the changes of these factors in different periods.

Theory

Self-Determination Theory (SDT) explores human motivation and personality within the social context based on experience. It distinguishes motivation by levels of autonomy and control. SDT originated from experiments examining the effects of external rewards on intrinsic motivation [44]. The core of SDT is the idea of three basic psychological needs: competence, autonomy, and relatedness. Social environmental factors and individual causal orientation work together to enhance intrinsic motivation and facilitate the internalization of extrinsic motivation by satisfying these needs. The SDT model, proposed by Gagne and Deci [45], suggests that autonomous motivation at work is influenced by independent variables such as social environmental factors (work content, work situation, and work atmosphere) and individual differences (causality orientation). This autonomous motivation in turn, directly affects outcomes such as job performance (complexity, creativity, and organizational citizenship behaviors), subjective well-being, organizational trust, commitment, and job satisfaction.

When individuals prioritize extrinsic goals, they often feel controlled by their pursuits, whereas prioritizing intrinsic goals tends to foster greater autonomy. Managerial support for autonomy enhances employees' satisfaction with their needs for competence, autonomy, and relatedness, resulting in higher job satisfaction, improved performance, and greater well-being [46, 47]. In this study, the dynamic changes of the epidemic are considered social environmental factors that influence the internalization of the public's extrinsic motivation. The competency needs for both doctors and patients can be met through their cooperation and interaction. Patients may perceive their contribution to the treatment process, while doctors can recognize the value of their professional competence and skills. This interaction enhances patients' identification with the treatment plan and recovery outcome.

Good communication and shared decision-making between doctors and patients satisfy patients' autonomy needs, stimulating their enthusiasm and initiative in

health behaviors. This enhances individual health awareness and health management concepts. Furthermore, a community with shared future for doctor-patient represents a new concept of interpersonal relationship. Essentially, meaning is relational and represents the psychological understanding of the various connections between things [48, 49]. Studies have shown that interpersonal relationships are a crucial source of meaning in an individual's life, regardless of cultural background, gender, or age [50–52]. Doctors can fulfill patients' relatedness needs by providing care, listening, and support, making patients feel respected and values, thereby promoting the establishment of emotional ties and mutual trust. Patients are more likely to accept physicians' suggestions for promoting health and improving quality of life based on the trust they have built with them. Compared to the needs for autonomy and competence, the need for relatedness may play a more critical role in the internalization of extrinsic motivation. Consequently, patients' appreciation and recognition of life's meaning and health's importance may be heightened by improvements in PCSF and health self-consciousness, thus enhancing benefit finding.

SDT comprises four interrelated sub-theories: cognitive evaluation, organic integration, psychological needs, and causality orientations. Organismic integration theory (OIT) posits that an individual's self-integration is influenced by the environment and spans a continuum from low to high self-determination [53–56]. Depending on the level of self-integration, individual motivation manifests in three types: intrinsic motivation, extrinsic motivation, and amotivation. Extrinsic motivation can further be categorized into four forms: external regulation, introjected regulation, identified regulation, and integrated regulation based on the degree of self-integration. Amid the dynamically changing environment of the epidemic, individual's PCSF, health self-consciousness, and benefit finding may undergo a process of internalizing extrinsic motivation. However, these motivations are susceptible to change alongside environmental factors.

Nevertheless, there is a limited number of empirical studies on the internalization of extrinsic motivation in the workplace, primarily due to its dynamic nature, which necessitates longitudinal research for thorough. Therefore, this study employed a repeated cross-sectional design to investigate changes in the internalization of extrinsic motivation over time. Moreover, traditional work motivation theory posits that individual differences are determined by the type and intensity of psychological needs. Previous studies have primarily focused on investigating psychological needs expectations or the interplay between psychological needs and job characteristics concerning work motivation, job satisfaction, and job outcomes [57, 58]. The interactive effects of environmental factors and individual differences are crucial aspects of understanding individual behavior. Consequently, this study explicitly included anxiety related to the epidemic to examine the interaction between variables. Furthermore, applying SDT to social psychology research represents an innovative exploration in this field.

Research hypotheses

The prevalence of anxiety varies across geographical region, gender, epidemic stage, region, education levels, financial situation, living arrangements, and assessment tool [34, 59]. In the outbreak stage of COVID-19, the public may experience heightened anxiety due to the uncertainties associated with emergencies [60, 61]. Various demographic groups exhibit differing levels of anxiety [62–65]. They may become more attentive to individual health and enhance their own health self-consciousness [65]. However, anxiety may decrease as the epidemic gradually stabilizes and individuals adapt more socially. Disease-centered health awareness typically focuses on responding to and managing disease in the short term, rather than being sustained over time [66]. Additionally, our previous research has demonstrated that in the outbreak stage of COVID-19, negative experiences of COVID-19 may contribute to increased public benefit finding [9]. Research indicates that adverse or traumatic life events play a pivotal role in fostering "positive psychological change" [67]. Such experiences serve as catalysts for individuals' long-term personal growth [68]. The evaluation of life's meaning is a crucial metric in assessing positive psychological function [69]. Confronted with the challenges posed by the epidemic, some individuals have discovered meaning amidst their suffering [70]. In the low epidemic level stage of COVID-19, the public gradually adapts to the new lifestyle and becomes more conscious of their health risks, potentially leading to a decrease in reflections on the meaning of life. Besides, the epidemic's impact correlates positively with improved public attitudes towards doctors in general [27]. Research indicates a positive relationship between the quality of the doctor-patient relationship and functional health outcomes [71]. The epidemic has heightened public awareness regarding the importance of collaborative doctor-patient in facing health risks together. In the early days of China's adjustment to epidemic prevention and control policies, medical staff faced similar infection risks but continue to shoulder heavy medical responsibilities under significant pressure [72]. They were acutely aware of their responsibility and mission to safeguard people's health and lives, earning them public praise. Therefore, the public's PSCF may increase in the low epidemic level stage of COVID-19. This study proposes the following

hypothesis1 (H1): In contrast to the outbreak stage of COVID-19 and similar to the stable stage of COVID-19, anxiety, health self-consciousness, and benefit finding may decrease in the low epidemic level stage of COVID-19, but PCSF may increase.

Our previous studies have consistently shown correlations between health self-consciousness, PCSF, benefit finding, and anxiety by this group in the outbreak stage or the stable stage of COVID-19 [9]. Although the public's recognition of a community with shared future for doctor-patient begins with the epidemic, its significance extends beyond immediate response to the epidemic [9]. Therefore, the correlation among the public's PCSF, health self-consciousness, benefit finding, and anxiety may be maintained in the low epidemic level stage of COVID-19. Moreover, the doctor-patient relationship has notably improved through the epidemic, characterized by patients' enhanced appreciation of medical staff, adherence to medical advice, and solidarity [73–75]. Under the influence of the concept of a community with shared future for doctor-patient, the public has shifted from passive recipients of healthcare services to active managers of health. They enhance risk awareness and improve self-management behaviors through active participation in decision-making [76]. Therefore, PCSF may promote health self-consciousness. In responding to the epidemic, there is a requirement for interdependence among frontline staff and key stakeholder groups (e.g., colleagues, organizations, governments, and the public), and the solidarity of social groups may imbue life with meaningful [77]. Thus, a community with shared future for doctor-patient may contribute to enhancing benefit finding. A review study has shown a significant yet modest association between the meaning of life and objective health indicators [78]. Another study has also established a direct link between the meaning of life, health, and recovery [79]. When individuals believe they can enhance their health through positive behaviors, they establish clear goals and diligently pursue them. This sustained effort and the sense of accomplishment derived from achieving health goals can also motivate individuals to recognize the purpose and meaning of life. Thus, enhancing health self-consciousness may serve as the intrinsic motivator to enhance benefit finding. The common goal of doctors and patients is health, which forms the foundation of life's meaning [9]. Therefore, this study proposes the hypothesis 2 (H2): Similar to the findings from the outbreak stage and stable stage of COVID-19, there exists a positive correlation between PCSF, health self-consciousness, benefit finding, and anxiety in the low epidemic level stage of COVID-19, with health self-consciousness playing a partial mediating role in the positive impact of PCSF on benefit finding.

Compared with the outbreak stage of COVID-19, anxiety prevalence increased in the stable stage of COVID-19 (remission stage) [32]. A review study indicates that anxiety remains prevalent among adults for up to three months or more after the onset of acute COVID-19 [80]. Our previous research has confirmed that some individuals may experience delayed mental health recovery during the transition from the outbreak stage to the stable stage of COVID-19. In the case of high anxiety levels, individuals may overlook the positive role of PCSF. Anxiety may become a predominant factor affecting health self-consciousness, potentially displacing other influences including PCSF [9]. However, as the epidemic transitions to a low epidemic level, many individuals have recovered from infection [35]. Travel and cross-regional cooperation have become more convenient [81], and the public has gained a clearer understanding of COVID-19 [72]. These factors may help to reduce the public's anxiety. Therefore, despite the continued associations between PCSF, health self-consciousness, and benefit finding in the low epidemic level stage of COVID-19 due to their stability and long-term nature, the overall low level of anxiety in the population may neither amplify nor diminish the relationship between PCSF and health self-consciousness. Therefore, this study proposes the hypothesis 3 (H3): Similar to the regression model observed in the outbreak stage of COVID-19 and different from the model in the stable stage of COVID-19, the moderating effect of anxiety in the relationship between PCSF and health self-consciousness may be minimal in the low epidemic level stage of COVID-19.

Methods

Study design and setting

This longitudinal study aimed to minimize virus exposure risk by utilizing an electronic questionnaire distributed via the Questionnaire Star platform (https://www.wjx.cn) in selected cities. Informed consent was obtained through preliminary questions, ensuring respondents should be 18 years old or above and non-medical staff. Those who objected to the informed consent clause would be excluded from completing the questionnaire.

The questionnaires were distributed through a convenient sampling survey in the outbreak stage of COVID-19, in the stable stage of COVID-19, and in the low epidemic level stage of COVID-19 of the city. The cities surveyed were distributed in all directions of China and were geographically representative. The first survey was conducted in Beijing, Dalian, Zhengzhou, Heihe, and Shangrao from November 13 to 20, 2021 in the outbreak stage of COVID-19, yielding 1,252 valid responses out of 1,534 collected questionnaires. The second survey was conducted in Dalian, Zhengzhou, Heihe, Shangrao, and

Lanzhou from December 1 to 19, 2021 in the stable stage of COVID-19, with 872 valid responses obtained from 1,075 collected questionnaires. The third survey was conducted in Beijing, Dalian, Zhengzhou, Heihe, Shangrao, Lanzhou, and Chengdu from January 29 to February 4, 2023 in the low epidemic level stage of COVID-19, achieving 2,113 valid responses from the 2,461 questionnaires collected. Totally, 320 questionnaires were directly judged as invalid by the VIP function of the online questionnaire platform and automatically eliminate. The effective rate was 85.86%. Quality control standards were strictly followed in the screening of valid questionnaires.

This study extends the previous research [9]. Patients' answer scenarios were limited to the low epidemic level stage of COVID-19. A scenario description was added to the items of scales, that is, the new stage of policy optimization (Class B management) for the epidemic prevention and control in 2023. The results of the first and second surveys were officially published in September 2023 [9]. This study focuses on analyzing the third survey results and comparing them with the first and second survey results.

Sample size calculation

The sample size required for this study was calculated by G*Power 3.1.9.7 software [82]. Considering that the Kruskal-Wallis H-test is a nonparametric test similar to one-way analysis of variance [83], the software used the ANOVA test method to set the number of groups to 3, the effect size f was selected as medium and set to 0.25 [84], and the significance level (α) was set to 0.05. After calculation, the total sample size is required to reach at least 252. The sample size collected from all three surveys was greater than which required for the theory in this study.

Quality control

Quality control standards refer to the previous study published by our research group. About 40 items were included in each questionnaire of the first and second surveys, and questionnaires with a response time of less than 200 s were excluded. About 30 items were included in each questionnaire of the third survey, and questionnaires with a response time of less than 150 s were excluded. The network IP addresses of the questionnaires were limited to the cities that were surveyed, and only respondents located in these cities had access to the questionnaires. Questionnaires whose network IP address did not match the self-addressed address were excluded. For example, if the IP address is Beijing, the questionnaire title "Which city am I in now (city name)" should be "Beijing". Common sense questions were set as screening items, such as ambulance emergency calls, and questionnaires with incorrect answers to the screening questions were excluded. Reverse scoring questions were also included. A unique PIN was created for statistical analysis, which consists of the first letter of the respondent's written name and the last four digits of the mobile phone number. It was determined whether the questionnaire was repeated by the same person based on the basic personal information (personal identification number, IP address, gender, age, and education level), and the repeated questionnaires will only recognize the result of the first filling. A "trap" question was set up to check whether the respondent filled in carefully or not.

Questionnaire composition

The scales adopted in this study were derived from the Health Self-Consciousness Scale (HSCS), Perceived a Community with Shared Future for Doctor-Patient Scale (PCSFS), 7-Item generalized anxiety disorder scale (GAD-7) and the Benefit finding scale (BFS), which have been previously designed or revised [9]. In the outbreak stage and stable stage of COVID-19, the Cronbach's α of GAD-7 was 0.912 and 0.868, the Cronbach's α of HSCS was 0.782 and 0.835, the Cronbach's α for PCSFS was 0.868 and 0.891, and the Cronbach's α of BFS was 0.833 and 0.801. In the outbreak stage and stable stage of COVID-19, the Kaiser-Meyer-Olkin (KMO) values of GAD-7 were 0.925 and 0.901. The KMO values of HSCS were 0.680 and 0.722. The KMO values of PCSFS were 0.736 and 0. 747. The KMO values for BFS were 0.726 and 0.702. Each scale was measured with good reliability and validity in the outbreak stage and stable stage of COVID-19.

The first time for questionnaire distribution was when the respondents' city was in the outbreak stage of COVID-19. The second time of questionnaire distribution was when the epidemic in the respondents' city was under control. The third time of questionnaire distribution was in the low epidemic level stage of COVID-19 after the optimization and adjustment of the epidemic prevention and control policy. The language expressions of the three questionnaires were slightly different due to the different epidemic situations when they were distributed. The questions of the scales all added situations related to the epidemic. For example, in the first survey, the item was revised as "In the outbreak stage of COVID-19 the current round of the epidemic in my city makes me feel tense, anxious, or eager". In the second survey, the item was revised as "The epidemic in my city some time ago still makes me feel tense, anxious, or eager". In the third survey, the item was revised as "The current epidemic situation makes me feel tense, anxious or eager in the low epidemic level stage of COVID-19".

When the first and second questionnaires were distributed, the expressions of BFS and PCSFS were that the recurrence of the epidemic made me more aware of the significance of learning or working to society; the epidemic prevention and control made me realize more deeply that coping with the disease requires the joint efforts of doctors and patients, respectively. When the third questionnaire was issued, the expressions of BFS and PCSFS were that experiencing of the epidemic made me more aware of the significance of learning or working to society; experiencing of the epidemic has made me realize more deeply that coping with the disease requires the joint efforts of doctors and patients. In addition to the traditional demographic characteristic variables, the three questionnaires shared the following self-designed questions: whether I am vaccinated or not; how often I am concerned about the current epidemic.

7-item Generalized Anxiety Disorder scale (GAD-7)

GAD-7 is widely used in scientific research and clinical practice [85], as well as for measuring anxiety in the general population, medical staff, or COVID-19 patients during the epidemic [86]. The third survey scale added situational limits to the GAD-7 items, which helped to remind respondents about the main purpose of this survey. For example, experiencing the epidemic has made me more aware of the significance of my work or studies to society. The response options were completely no, a few days, more than a week, almost every day, with corresponding scores of 0, 1, 2, and 3. GAD-7 for the first and second surveys have been published in previous research [9].

Benefit Finding Scale (BFS)

The BFS in the third survey was a revised scale after each item of the scale that was previously verified by our research adjusted the limit of the epidemic restrictions [9]. There are three items on the scale: experiencing the epidemic has made me more aware of the significance of my learning or working to society; experiencing the epidemic has made me realize that things are changeable, and I have to do something more valuable in the future; experiencing the epidemic has made me have a clearer plan for the rest of my life, work and study. Reverse scoring questions were adopted in this scale. The answer options are sorted in sequence: Fully agree, Moderately agree, Uncertain, Moderately disagree, Fully disagree with corresponding scores of 5, 4, 3, 2, and 1. The BFS for the first and second surveys have been published in previous research [9].

Health Self-Consciousness Scale (HSCS)

The HSCS of the third survey was a revised scale after each item of the scale that was previously verified by our research adjusted the limit of the epidemic restrictions [9]. There are three items on the scale: affected by the epidemic, now I pay more attention to personal hygiene habits; affected by the epidemic, now I pay more attention to a healthy lifestyle; affected by the epidemic, now I'm more concerned about my health status. Reverse scoring questions were adopted for all items of the scale in this paper. The answer options are sorted in sequence: Fully agree Moderately agree, Uncertain, Moderately disagree, Fully disagree, with corresponding scores of 5, 4, 3, 2, and 1. The HSCS for the first and second surveys have been published in a previous study [9].

Perceived a Community with Shared Future for Doctor-Patient Scale (PCSFS)

The PCSFS of the third survey was a revised scale after each item of the scale that was previously verified by our research adjusted the limit of the epidemic restrictions [9]. There are three items on the scale: experiencing the epidemic has made me realize more deeply that coping with the disease requires the joint efforts of doctors and patients; experiencing the epidemic has made me realize more deeply that the common enemy between doctors and patients is disease; experiencing the epidemic has made me more aware of the limitations of modern medical technology. Reverse scoring questions were adopted for all items of the scale in this paper. The answer options are sorted in sequence: Fully agree Moderately agree, Uncertain, Moderately disagree, Fully disagree, with corresponding scores of 5, 4, 3, 2, and 1. The PCSFS for the first and second surveys has been published in a previous study [9].

Statistical analysis

It requires a segmented test for multiple models to establish a moderating model and mediating model through SPSS. The plug-in of SPSS can directly analyze the model of mediation, moderation, or both [87]. PROCESS is a percentile Bootstrap method based on bias correction. Simple slopes were tested in the M ± 1SD case. In this study, the results of the third survey data were analyzed using model No. 7 of the PROCESS 4.0 version.

All the scales have been validated and applied in previous research [9]. However, considering that the expression of all scales has been adjusted due to supplementary scenarios, the present study uses exploratory factor analysis to explore the dimension division of the

scales first through SPSS and then uses confirmatory factor analysis to verify whether the model is consistent with the hypothesis through SPSSAU.

The results of confirmatory factor analysis by SPSSAU are more abundant [88]. Reliability analysis is used to test the consistency or reliability of the results obtained from the scales. The Cronbach's α more than 0.7 indicates that the reliability of the scales is good. The higher the value of the corrected item-total correlation, the more consistent the indicator is with the content to be investigated. If the indicator is less than 0.3, it is considered that the item is not strongly correlated with other items and can be eliminated. The principal component analysis was used for exploratory factor analysis, and the maximum variance method was used for factor rotation. The KMO value greater than 0.6 indicates that the data is suitable for factor analysis. In confirmatory factor analysis, the absolute value of standardized loading coefficients for each measurement of the scale is greater than 0.6 and shows significance, indicating that the correlation between variables is good. The value of average variance extracted (AVE) greater than 0.5 and the value of construct reliability (CR) greater than 0.7 means that the data for this analysis has good aggregation (convergent) validity.

Tested by histogram and P-P diagram test, except that the total score of GAD-7 in the outbreak stage of COVID-19 was approximately normal distribution, the total scores of other scales in the outbreak stage of COVID-19, in the stable stage of COVID-19, and the low epidemic level stage of COVID-19 were skewed distribution. When comparing two sets of data, when one of the data does not meet the normality, the rank sum test is preferred. Count data are expressed as number and percentage. Continuous variables are expressed as median (interquartile range).

For data with normal distribution, the efficacy of the t-test and rank sum test is basically the same. However, However, for data with skewed distribution, the rank sum test is used. When the normal distribution and homogeneity of variance did not meet the requirements of the t-test, the Mann-Whitney U test was used to compare the two groups. the Kruskal-Wallis H test is an extension of the Mann-Whitney U test, which applies to the assumption that multiple sets of samples do not satisfy the normal distribution and homogeneity of variance. Jonckheere trend test is also a nonparametric test to test whether the distributions of multiple independent samples from multiple aggregates are significantly different and is used to test whether the analysis variables and each treatment group have order effects [89]. This study considers that there is an order in time between the outbreak stage of COVID-19, the stable stage of COVID-19, and the low epidemic level stage of COVID-19, and there may be a trend in the degree of impact on society. In this case, the Jonckheere trend test may be more effective than the Kruskal-Wallis H test. The Bonferroni method is used to correct the post hoc pairwise comparison of the significance level. Spearman rank correlation test is used to analyze the correlation between two variables that do not meet the normal distribution.

Results

Reliability and validity analysis

To verify the relationship between variables and factors in the new situation, this study used exploratory factor analysis and confirmatory factor analysis for the newly revised scales. The results of exploratory factor analysis showed that in the outbreak stage of COVID-19, the KMO value for GAD-7 was 0.928, the KMO value for HSCS was 0.682, the KMO value for CSFS was 0.735, and the KMO value for BFS was 0.727. In the stable stage of COVID-19, the KMO value for GAD-7 was 0.897, the KMO value for HSCS was 0.721, the KMO value for PCSFS was 0.746, and the KMO value for BFS was 0.700. In the low epidemic level stage of COVID-19, the KMO value for GAD-7 was 0.895, the KMO value for HSCS was 0.724, the KMO value for PCSFS was 0.710, and the KMO value for BFS was 0.707. All scales could be effectively explained by a valid factor. The total variance explained was over 50%. (Table 1)

The results of the confirmatory factor analysis showed that the absolute value of the standardized loading coefficients of each measurement item was greater than 0.6 for all scales in the outbreak stage of COVID-19. The AVE of GAD-7 was 0.605, and the CR of GAD-7 was 0.914. The AVE of HSCS was 0.562, and the CR of HSCS was 0.791. The AVE of PCSFS was 0.679, and the CR of PCSFS was 0.864. The AVE of BFS was 0.638, and the CR of BFS was 0.841. In the stable stage of COVID-19, the absolute value of the standardized factor loading coefficients of the second item in GAD-7 was 0.582, and the absolute value of the standardized factor loading coefficients of the other measurement items was greater than 0.6. The CR of GAD-7 was 0.873, and the AVE of GAD-7 was 0.496. The AVE of HSCS was 0.631, and the CR of HSCS was 0.837. The AVE of PCSFS was 0.731, and the CR of PCSFS was 0.891. The AVE of BFS was 0.574, and the CR of BFS was 0.801. In the low epidemic level stage of COVID-19, the AVE of GAD-7 was 0.598, and the CR of GAD-7 was 0.912. The AVE of HSCS was 0.623, and the CR of HSCS was 0.832. The AVE of PCSFS was 0.576, and the CR of PCSFS was 0.803. The AVE of BFS was 0.665, and the CR of BFS was 0.855. The model fitting index shows good. (Table 2)

In the outbreak stage of COVID-19, stable stage of COVID-19, and low epidemic level stage of COVID-19,

Table 1 Exploratory factor analysis of different scales

Different stages	Variables	KMO	Bartlett's test	Cumulative contribution rate of variance (%)
In the outbreak stage of COVID-19	GAD-7	0.928	< 0.001	66.116
	HSCS	0.682	< 0.001	70.084
	PCSFS	0.735	< 0.001	78.553
	BFS	0.727	< 0.001	75.808
In the stable stage of COVID-19	GAD-7	0.897	< 0.001	56.666
	HSCS	0.721	< 0.001	75.283
	PCSFS	0.746	< 0.001	82.019
	BFS	0.700	< 0.001	71.310
In the low epidemic level stage of COVID-19	GAD-7	0.895	< 0.001	65.564
	HSCS	0.724	< 0.001	74.850
	PCSFS	0.710	< 0.001	71.654
	BFS	0.707	< 0.001	77.033

GAD-7 7-item Generalized Anxiety Disorder Scale, *PCSF* Perceived a community with shared future for doctor-patient scale, *HSCS* Health self-consciousness scale, *BFS* Benefit finding scale

Table 2 Confirmatory factor analysis of different scales

Variable	In the outbreak stage of COVID-19			In the stable stage of COVID-19			In the low epidemic level stage of COVID-19		
	Standard factor loading coefficient	AVE	CR	Standard factor loading coefficient	AVE	CR	Standard factor loading coefficient	AVE	CR
GAD-7(item-1)	0.836	0.605	0.914	0.782	0.496	0.873	0.712	0.598	0.912
GAD-7(item-2)	0.834			0.582			0.831		
GAD-7(item-3)	0.695			0.699			0.770		
GAD-7(item-4)	0.756			0.668			0.846		
GAD-7(item-5)	0.736			0.707			0.762		
GAD-7(item-6)	0.837			0.737			0.736		
GAD-7(item-7)	0.738			0.737			0.749		
HSCS (item-1)	0.770	0.562	0.791	0.755	0.631	0.837	0.777	0.623	0.832
HSCS (item-2)	0.841			0.786			0.811		
HSCS (item-3)	0.622			0.840			0.779		
PCSFS (item-1)	0.842	0.679	0.864	0.822	0.731	0.891	0.740	0.576	0.803
PCSFS (item-2)	0.838			0.871			0.795		
PCSFS (item-3)	0.790			0.872			0.739		
BFS (item-1)	0.801	0.638	0.841	0.702	0.574	0.801	0.865	0.665	0.855
BFS (item-2)	0.772			0.729			0.874		
BFS (item-3)	0.823			0.836			0.694		

GAD-7 7-item Generalized Anxiety Disorder Scale, *PCSF* Perceived a community with shared future for doctor-patient scale, *HSCS* Health self-consciousness scale, *BFS* Benefit finding scale

the Cronbach's α of GAD-7 was 0.913, 0.867, and 0. 912. The Cronbach's α of HSCS was 0.783, 0.835 and 0.831. The Cronbach's α of PCSFS was 0.863, 0.890, and 0.802. The Cronbach's α of BFS was 0.836, 0.798, and 0.838 respectively. The corrected item-total correlation values of all scales were greater than 0.3. Therefore, there is a good consistency between the items within the scales. (Table 3)

Demographic characteristics of participants

The median age of all respondents in the three stages was 33 years. Therefore, the 33-year-old was classified

Table 3 Reliability analysis of different scales

Different stages	Variable	Corrected Item-Total Correlation	Cronbach's α if Item Deleted	Cronbach's α
In the outbreak stage of COVID-19	GAD-7	0.674 ~ 0.785	0.895 ~ 0.907	0.913
	HSCS	0.554 ~ 0.676	0.645 ~ 0.780	0.783
	PCSFS	0.719 ~ 0.751	0.796 ~ 0.828	0.863
	BFS	0.688 ~ 0.718	0.763 ~ 0.783	0.836
In the stable stage of COVID-19	GAD-7	0.542 ~ 0.711	0.839 ~ 0.867	0.867
	HSCS	0.674 ~ 0.725	0.744 ~ 0.795	0.835
	PCSFS	0.763 ~ 0.797	0.831 ~ 0.863	0.890
	BFS	0.614 ~ 0.688	0.675 ~ 0.756	0.798
In the low epidemic level stage of COVID-19	GAD-7	0.679 ~ 0.788	0.893 ~ 0.905	0.912
	HSCS	0.684 ~ 0.705	0.753 ~ 0.774	0.831
	PCSFS	0.638 ~ 0.669	0.707 ~ 0.740	0.802
	BFS	0.643 ~ 0.757	0.735 ~ 0.852	0.838

GAD-7 7-item Generalized Anxiety Disorder Scale, *PCSF* Perceived a community with shared future for doctor-patient scale, *HSCS* Health self-consciousness scale, *BFS* Benefit finding scale

and compared as the median age. In the outbreak stage of COVID-19, the median age of respondents was 30 years old, with more people under 33 years old. In the stable stage of COVID-19, the median age of respondents was 32 years old, with a relatively balanced distribution. In the low epidemic level stage of COVID-19, the median age of respondents was 36 years old, and more people were greater than or equal to 33 years old. The ratio between men and women was similar in all three stages, with more married respondents. Most of them had a junior college education or below. (Table 4)

The influencing factors of anxiety in the outbreak stage of COVID-19, stable stage of COVID-19 and low epidemic level stage of COVID-19

According to the evaluation and classification standard of GAD-7, the total score on the anxiety scale ranges from 0 to 21. 0 to 4 represents no anxiety, 5 to 9 indicates mild anxiety, 10 to 14 indicates moderate anxiety, and more than 15 represents severe anxiety [90]. There was a statistically significant difference in the percentage of respondents with moderate to severe anxiety across three stages ($\chi^2 = 835.782$, $p < 0.001$). In the stable stage of COVID-19 and low epidemic level stage of COVID-19, the incidence of no anxiety was higher, accounting for 62.50% and 55.09%, and the incidence of severe anxiety was low, accounting for 0.23% and 3.93% respectively. In the outbreak stage of COVID-19, the incidence of no anxiety was lower, accounting for 16.77%, and the incidence of severe anxiety was higher, accounting for 21.88%, compared with the stable stage of COVID-19 and low epidemic level stage of COVID-19.

Mann-Whitney U test showed that citizens who were worried about being infected had a higher probability

Table 4 Demographic characteristics of participants

	In the outbreak stage of COVID-19 *N*(%)	In the stable stage of COVID-19 *N*(%)	In the low epidemic level stage of COVID-19 *N*(%)
< 33 years	827(66.1)	449(51.5)	730(34.5)
≥ 33 years	425(33.9)	423(48.5)	1383(65.5)
Male	660(52.7)	428(49.1)	1025(48.5)
Female	592(47.3)	444(50.9)	1088(51.5)
Married	776(62.0)	613(70.3)	1183(56.0)
Unmarried	476(38.0)	259(29.7)	930(44.0)
High school (Technical secondary school) and below	523(41.8)	400(45.9)	455(21.5)
Junior college	494(39.5)	370(42.4)	770(36.4)
Bachelor's degree or above	235(18.8)	102(11.7)	888(42.0)

of anxiety than those who were not worried about being infected (Z = -9.170, -3.657, and −8.636, $p < 0.001$) in the outbreak stage of COVID-19, stable stage of COVID-19, and low epidemic level stage of COVID-19. Kruskal-Wallis H test showed that the distribution of anxiety among those with different levels of concern towards the epidemic was not all the same, and the difference was statistically significant (H = 65.166, 39.397, and 159.970, $p < 0.001$) in the outbreak stage of COVID-19, stable stage of COVID-19, and low epidemic level stage of COVID-19. After the pairwise comparison of the significance level corrected by the Bonferroni method, it was found that those who were actively concerned about the epidemic had the highest anxiety in the outbreak stage of COVID-19. Those who were actively concerned about the epidemic had the highest anxiety in the stable stage of COVID-19 and low epidemic level stage of COVID-19, followed by those who were passively concerned about the epidemic, and finally, those who were not concerned about the epidemic.

Changes in anxiety, health self-consciousness, PCSF, and benefit finding

The Jonckheere-Terpstra test showed that there were statistically significant differences in anxiety (J = 1,807,451.500, $p < 0.001$), health self-consciousness (J = 2,396,021.500, $p < 0.001$), benefit finding (J = 2,450,084.500, $p < 0.001$) and PCSF (J = 2,893,023.500, $p = 0.014$) in the outbreak stage of COVID-19, stable stage of COVID-19, and low epidemic level stage of COVID-19.

After the pairwise comparison of the significance level corrected by the Bonferroni method, it was found that the differences in anxiety between the outbreak stage of COVID-19 and stable stage of COVID-19, the outbreak stage of COVID-19 and low epidemic level stage of COVID-19, and stable stage of COVID-19 and low epidemic level stage of COVID-19 were statistically significant (adjusted $p < 0.001$). The highest anxiety was found in the outbreak stage of COVID-19, followed by the low epidemic level stage of COVID-19, and the lowest in the stable stage of COVID-19. There was no statistical difference in health self-consciousness between the stable stage of COVID-19 and low epidemic level stage of COVID-19 (adjusted $p = 1.000$), but there were statistical differences in health self-consciousness between the outbreak stage of COVID-19 and stable stage of COVID-19, the outbreak stage of COVID-19 and low epidemic level stage of COVID-19 (adjusted $p < 0.001$). The health self-consciousness was the highest in the outbreak stage of COVID-19 and decreased in the stable stage of COVID-19 and the low epidemic level stage of COVID-19. There was no statistical difference in benefit finding between the stable stage of COVID-19 and low epidemic level stage of COVID-19 (adjusted $p = 1.000$), but there were statistical differences in benefit finding between the outbreak stage of COVID-19 and stable stage of COVID-19, the outbreak stage of COVID-19 and low epidemic level stage of COVID-19(adjusted $p < 0.001$). The benefit finding was the highest in the outbreak stage of COVID-19 and decreased in the stable stage of COVID-19 and the low epidemic level stage of COVID-19. There were no statistical differences in PCSF between the outbreak stage of COVID-19 and stable stage of COVID-19, the stable stage of COVID-19 and low epidemic level stage of COVID-19 (adjusted $p = 1.000$ and $p = 0.072$), but there was a statistical difference in the outbreak stage of COVID-19 and low epidemic level stage of COVID-19 (adjusted $p = 0.036$). The PCSF was higher in the low epidemic level stage of COVID-19, compared with the outbreak stage of COVID-19. H1 is verified.

Correlation among anxiety, health self-consciousness, PCSF, and benefit finding

First of all, the total scores of health self-consciousness, anxiety, PCSF, and benefit finding were standardized in this study to eliminate the dimensional relationship between variables to make the data comparable. Then, the Spearman method was used for correlation analysis. There was a positive correlation between anxiety, health self-consciousness, PCSF, and benefit finding in the outbreak stage of COVID-19 ($p < 0.001$). There was a positive correlation between anxiety, health self-consciousness, and PCSF in the stable stage of COVID-19 ($p < 0.001$ and $p = 0.001$), and the correlation coefficient with benefit finding was not statistically significant ($p = 0.126$). There was a positive correlation between health self-consciousness, PCSF, and benefit finding in the stable stage of COVID-19 ($p < 0.001$). There was a positive correlation between anxiety, health self-consciousness, PCSF, and benefit finding in the low epidemic level stage of COVID-19 ($p < 0.001$).

With the development and control of the epidemic, the associations between the public's anxiety, health self-consciousness, PCSF, and benefit finding are also changing. From the outbreak stage of COVID-19, the stable stage of COVID-19 to the low epidemic level stage of COVID-19, the correlation coefficients between anxiety and health self-consciousness gradually decreased, the correlation coefficient between anxiety and PCSF did not change much, and the correlation coefficient between anxiety and benefit finding decreased first and then increased; the correlation coefficients between health self-consciousness and PCSF changed in a way that first decreased and then increased, and the correlation coefficient between health self-consciousness and benefit finding decreased first and then slightly increased; the

correlation coefficient between PCSF and benefit finding gradually decreased. These changes may be related to changes in public awareness of the epidemic, coping behavior, and living environment. H2 is verified. (Table 5)

Mediating effect of health self-consciousness between PCSF and benefit finding

The public's understanding and judgment of objective things and phenomena change with the increase of age. Social and cultural factors may shape the behavior and thinking patterns of individuals of different genders. Different learning stages may have different understandings of the world. Marital status is also one of the factors that influence the way the public view and deal with things. This paper continues to refer to the previous research methods of our research and takes age, gender, education level, and marriage as control variables [9]. The total scores of PCSF, anxiety, health self-consciousness, and benefit finding were standardized. Model 7 of the SPSS macro program PROCESS was used to test the mediating role of health self-consciousness between PCSF and benefit finding, and the moderating role of anxiety between PCSF and health self-consciousness. A total of 5000 repeated sampling tests were conducted and a hypothesis test was performed at a 95% confidence interval. PCSF was an independent variable, health self-consciousness was a mediating variable, anxiety was a moderating variable, and benefit finding was a dependent variable.

When benefit finding was a dependent variable, all three models were statistically significant in the outbreak stage of COVID-19, stable stage of COVID-19, and low epidemic level stage of COVID-19 ($R=0.545$, 0.427, 0.325; $R^2=0.297$, 0.183, 0.106; $p<0.001$). In the three stages, R^2 decreases in turn, and the fitting effect of the model on the data was gradually poor, indicating that the variables of the equation had a worse ability to explain benefit finding. The direct effect values of PCSF on benefit finding in the three stages were 0.434,0.329 and 0.281, and the confidence intervals were 0.384 to 0.484, 0.264 to 0.393, 0.236 to 0.326, respectively. The upper and lower limits of the confidence interval did not include 0, indicating that the partial mediating effect existed ($p<0.001$). Therefore, PCSF not only positively affected benefit finding directly, but also indirectly affected benefit finding through health self-consciousness in the outbreak stage of COVID-19, the stable stage of COVID-19, and the low epidemic level stage of COVID-19. Hypothesis two (H2) is verified. (Table 6)

Moderating effect of anxiety between PCSF and health self-consciousness

When health self-consciousness was the outcome variable, all three models were statistically significant in the outbreak stage of COVID-19, stable stage of COVID-19, and low epidemic level stage of COVID-19 ($R=0.375$, 0.382, 0.351; $R^2=0.140$, 0.146, 0.123; $p<0.001$). In the low epidemic level stage of COVID-19, R^2 decreased and the fitting effect of the model on the data was gradually poor, indicating that the variables of the equation had a worse ability to explain benefit finding. In the outbreak stage of COVID-19, the moderating effect (anxiety × PCSF) did not exist between PCSF and health self-consciousness ($p=0.344$), although anxiety had a positive impact on health self-consciousness. (Table 7)

The main effect was significant ($p<0.001$) before introducing the moderating effect (anxiety × PCSF) in the stable stage of COVID-19. After the introduction of the moderating effect, the coefficient of anxiety × PCSF was negative, while the coefficient of anxiety was positive,

Table 5 Correlation analysis of anxiety, HSC, PCSF, and BF

		Anxiety	HSC	PCSF	BF
In the outbreak stage of COVID-19	Anxiety	1.000	0.321**	0.152**	0.251**
	HSC	0.321**	1.000	0.222**	0.323**
	PCSF	0.152**	0.222**	1.000	0.481**
	BF	0.251**	0.323**	0.481**	1.000
In the stable stage of COVID-19	Anxiety	1.000	0.273**	0.111**	0.052
	HSC	0.273**	1.000	0.128**	0.174**
	PCSF	0.111**	0.128**	1.000	0.355**
	BF	0.052	0.174**	0.355**	1.000
In the low epidemic level stage of COVID-19	Anxiety	1.000	0.094**	0.116**	0.150**
	HSC	0.094**	1.000	0.341**	0.196**
	PCSF	0.116**	0.341**	1.000	0.293**
	BF	0.150**	0.196**	0.293**	1.000

HSC Health self-consciousness, *PCSF* Perceived a community with shared future for doctor-patient, *BF* Benefit finding

** : $p<0.01$

Table 6 A test of the mediating effect of HSC between PCSF and BF

		Unstandardized Coefficients		t	*p*	95% Confidence Interval	
		B	Std. Error			Lower level	Upper level
In the outbreak stage of COVID-19	Constant	-0.169	0.228	-0.741	0.459	-0.616	0.278
	PCSF	0.434	0.025	17.092	< 0.001	0.384	0.484
	HSC	0.209	0.025	8.461	< 0.001	0.160	0.257
	Gender	-0.062	0.048	-1.295	0.196	-0.156	0.032
	Marriage	-0.038	0.068	-0.550	0.583	-0.172	0.097
	High school and below[+]	-0.050	0.074	-0.676	0.499	-0.195	0.095
	Junior college	-0.002	0.067	-0.030	0.977	-0.133	0.129
	Age	0.008	0.007	1.186	0.236	-0.005	0.021
In the stable stage COVID-19	Constant	-0.327	0.330	-0.992	0.322	-0.975	0.320
	PSCF	0.329	0.033	10.027	< 0.001	0.264	0.393
	HSC	0.135	0.032	4.218	< 0.001	0.072	0.198
	Gender	-0.023	0.064	-0.362	0.718	-0.149	0.102
	Marriage	-0.344	0.083	-4.138	< 0.001	-0.507	-0.181
	High school and below[+]	0.269	0.116	2.317	0.021	0.041	0.497
	Junior college	0.048	0.104	0.456	0.649	-0.157	0.252
	Age	0.009	0.009	1.047	0.295	-0.008	0.027
In the low epidemic level stage COVID-19	Constant	-0.146	0.187	-0.780	0.435	-0.512	0.221
	PSCF	0.281	0.023	12.239	< 0.001	0.236	0.326
	HSC	0.095	0.022	4.323	< 0.001	0.052	0.138
	Gender	0.019	0.042	0.463	0.644	-0.062	0.101
	Marriage	-0.063	0.064	-0.993	0.321	-0.188	0.062
	High school and below[+]	0.069	0.056	1.223	0.222	-0.041	0.178
	Junior college	-0.122	0.048	-2.570	0.010	-0.215	-0.029
	Age	0.005	0.004	1.205	0.228	-0.003	0.014

HSC Health self-consciousness, *PCSF* Perceived a community with shared future for doctor-patient, *BF* Benefit finding

[+]: High school includes technical secondary school

thus the moderating effect played a negative moderating role ($p=0.028$). Anxiety has a negative moderating effect between PCSF and health self-consciousness, indicating that anxiety will weaken the effect of PCSF on health self-consciousness. Anxiety and PCSF have a relationship of substitution on health self-consciousness. When anxiety was at a low level (M-1SD), it had a positive effect on health self-consciousness ($p=0.040$; 95%CI= [0.005,0.183]). The simple slope was 0.094. When anxiety was at a medium and a high level, the moderating effect was not significant. Anxiety had different effects on health self-consciousness at different levels, and the moderating effect of anxiety between PCSF and health self-consciousness was established. (Table 7)

In the low epidemic level stage of COVID-19, the moderating effect (anxiety × PCSF) did not exist between PCSF and HSC ($p=0.849$), although anxiety had a positive effect on HSC ($p=0.001$).H3 is verified. (Fig. 1)

In the outbreak stage of COVID-19, for every one-point increase in PCSF, health self-consciousness increased by 0.158 points; for every one-point increase in anxiety, health self-consciousness increased by 0.268 points. In the stable stage of COVID-19, for every one-point increase in anxiety, health self-consciousness increased by 0.251 points; for every one-point increase in anxiety × PCSF, health self-consciousness decreased by 0.071 points. In the low epidemic level stage of COVID-19, for every one-point increase in PCSF, health self-consciousness increased by 0.340 points; for every one-point increase in anxiety, health self-consciousness increased by 0.074 points. Thus, compared with the outbreak stage of COVID-19 and the stable stage of COVID-19, the effect of PCSF on benefit finding increased and the effect of anxiety on health self-consciousness decreased in the low epidemic level stage of COVID-19. (Table 7)

Finally, the above coefficients are substituted into the regression equation to obtain:

Table 7 A test of the mediating effect of anxiety between PCSF and HSC

		Unstandardized Coefficients		t	*p*	95% Confidence Interval	
		B	Std. Error			Lower Bound	Upper Bound
In the outbreak stage of COVID-19	Constant	-0.748	0.251	-2.974	0.003	-1.241	-0.255
	PCSF	0.158	0.028	5.649	< 0.001	0.103	0.212
	Anxiety	0.268	0.027	9.919	< 0.001	0.215	0.321
	Anxiety × PCSF	-0.023	0.025	-0.946	0.344	-0.072	0.025
	Gender	0.140	0.053	2.645	0.008	0.036	0.244
	Marriage	0.036	0.076	0.476	0.634	-0.113	0.185
	High school and below[+]	0.033	0.082	0.403	0.687	-0.128	0.194
	Junior college	0.070	0.074	0.947	0.344	-0.075	0.216
	Age	0.021	0.007	2.891	0.004	0.007	0.035
In the stable stage of COVID-19	Constant	-0.842	0.337	-2.501	0.013	-1.503	-0.181
	PCSF	0.023	0.034	0.673	0.501	-0.043	0.089
	Anxiety	0.251	0.032	7.784	< 0.001	0.188	0.314
	Anxiety × PCSF	-0.071	0.032	-2.199	0.028	-0.135	-0.008
	Gender	0.352	0.065	5.439	< 0.001	0.225	0.479
	Marriage	-0.132	0.085	-1.541	0.124	-0.299	0.036
	High school and below[+]	-0.197	0.119	-1.660	0.097	-0.430	0.036
	Junior college	-0.181	0.107	-1.695	0.091	-0.390	0.029
	Age	0.027	0.009	3.024	0.003	0.010	0.045
In the low epidemic level stage of COVID-19	Constant	0.026	0.186	0.139	0.889	-0.338	0.390
	PCSF	0.340	0.022	15.776	< 0.001	0.298	0.383
	Anxiety	0.074	0.023	3.220	0.001	0.029	0.119
	Anxiety × PCSF	0.004	0.021	0.190	0.849	-0.036	0.044
	Gender	0.036	0.046	0.798	0.425	-0.053	0.126
	Marriage	-0.055	0.063	-0.872	0.384	-0.178	0.069
	High school and below[+]	0.071	0.056	1.261	0.207	-0.039	0.181
	Junior college	-0.021	0.047	-0.442	0.658	-0.113	0.072
	Age	-0.001	0.004	-0.179	0.858	-0.009	0.008

HSC Health self-consciousness, *PCSF* Perceived a community with shared future for doctor-patient

[+]: High school includes technical secondary school

In the outbreak stage of COVID-19: health self-consciousness = -0.748 + 0.158 * PCSF + 0.268 * anxiety + 0.140 * gender + 0.021 * age.

In the stable stage of COVID-19: health self-consciousness = -0.842 + 0.251 * anxiety − 0.071*(anxiety × PCSF) + 0.352 * gender + 0.027 * age.

In the low epidemic level stage of COVID-19: health self-consciousness = 0.026 + 0.340 * PCSF + 0.074 * anxiety.

Discussion

According to SDT, when individuals are in the social environment that supports internalization, they are more likely to actively absorb external values as part of themselves. However, if the internalization process is hindered to a certain extent, individuals may only partially absorb extrinsic values, so that the behavior may still be under extrinsic control or internalized values may be transformed back to a state of extrinsic control. This theory will be able to explain the changes in PCSF, health self-consciousness, and benefit finding in the dynamic changes of the epidemic. Besides, Individuals' PCSF, health self-consciousness, and benefit finding are all the results of internalization of extrinsic motivation under the same social environment factors. Therefore, there may be a correlation between these factors. Individuals' perceived support in the external environment may further strengthen the perception and recognition of the meaning of life and the importance of health, thus enhancing their benefit finding. In addition, anxiety may be affected by external stress (epidemic) and interact with individuals' PCSF, health self-consciousness, and benefit finding. The introduction of anxiety as a variable to study the interaction with environmental factors will help

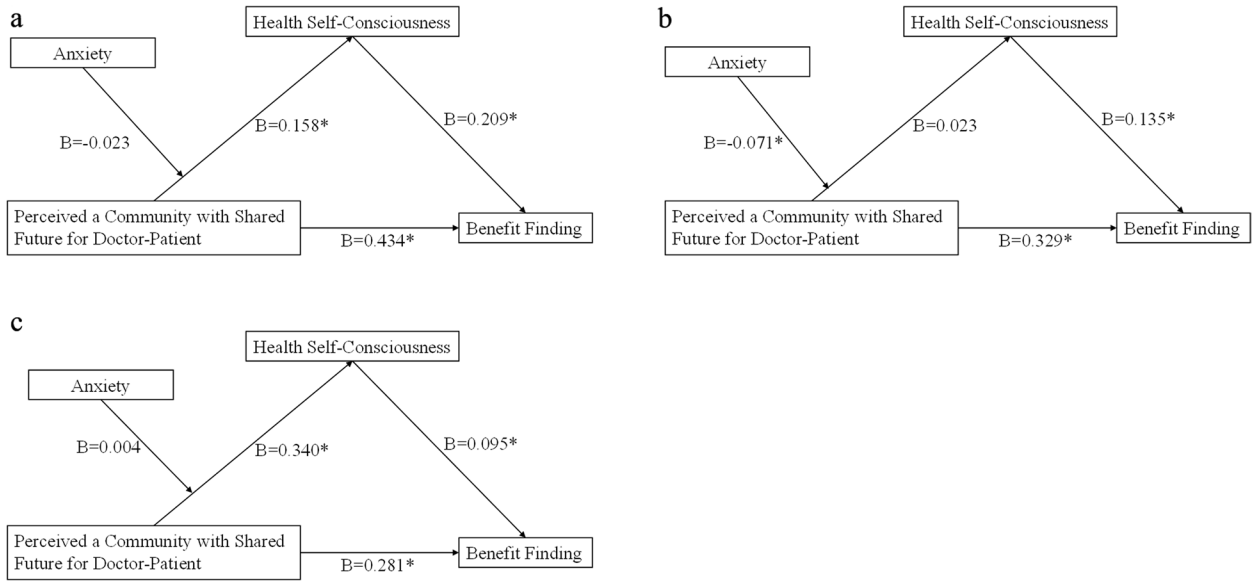

Fig. 1 Path model examining the moderated mediation effect among benefit finding, health self-consciousness, perceived a community with shared future for doctor-patient and anxiety in different stages of COVID-19. **a** In the outbreak stage. **b** In the stable stage. **c** In the low epidemic level stage. *$p < .05$

to better understand the individuals' psychological state, behavioral response, and motivation internalization process in different environments.

The influence factors of anxiety in different stages of COVID-19

When a major public health event occurs, the psychological state of individuals will change with the external environment [91]. In the stable stage of COVID-19 and in the low epidemic level stage of COVID-19, relatively few people experienced anxiety, while in the outbreak stage of COVID-19, more people experienced anxiety, with higher rates of severe anxiety. Therefore, a devastating and unpredictable epidemic may increase the suffering of many people, at least temporarily [92]. At the same time, citizens who feared being infected were more likely to experience anxiety during the epidemic. Fear of COVID-19 is an independent predictor of generalized anxiety symptoms [93]. In particular, preexisting anxiety on health may affect emotional and behavioral responses to the outbreak of epidemic [41]. In addition, those who were actively concerned about the epidemic showed higher levels of anxiety in the outbreak stage of COVID-19, stable stage of COVID-19, and low epidemic level stage of COVID-19. This is because people who are anxious about COVID-19 tend to experience a series of unpleasant symptoms, which are triggered by thoughts or information related to this infectious disease [94, 95]. People who spend too much time in the media tend to have higher levels of mental anxiety [96]. There is a direct link between the level of anxiety and depressive symptoms and the average number of COVID-19 cases per day [97]. Therefore, it is beneficial to reduce anxiety through comprehensive measures such as advocating a healthy lifestyle, establishing positive interventions, providing mental health support, promoting social support, and solving economic impacts in the low epidemic level stage of COVID-19 [98, 99]. Media reports should not overemphasize the negative impact on mental health, and individuals' mental health should be intervened as early as possible [92]. Special attention needs to be given to those who are worried about the risk of infection or actively concerned about the epidemic.

The change of anxiety, health self-consciousness, PCSF and benefit finding in different stages of COVID-19

Delta variant was the main strain of novel coronavirus circulating in China at the time of the first survey (November 2021). However, it was also in November 2021 that the Omicron variant was first discovered in South Africa [100]. The Omicron variant was first imported into Hong Kong, China on November 27, 2021, and was first imported into mainland China on December 9, 2021. The public's concerns about the pathogenicity of the Delta variant and the unknown Omicron variant were superimposed during the period of the first survey. The health self-consciousness of respondents was higher in the outbreak stage of COVID-19, while it was lower in the stable stage of COVID-19 and the low epidemic level stage of

COVID-19. Therefore, it should be an immediate initiative of the government to take this opportunity to promote healthy lifestyles and behaviors.

In addition, the epidemic not only brought negative stress but also had a positive change or a buffering effect on some people [92]. In this study, the benefit finding was also higher in the outbreak stage of COVID-19. The epidemic enhanced the public's appreciation and reverence for life [16]. Uncertainty events tend to arouse the public's attention and thinking, thus increasing their perception and reflection. Studies have shown that the epidemic has reawakened Chinese undergraduates to reflect on their lives and clarify their life goals and meanings [16]. The public's attention and thinking may accordingly decrease as these events no longer exist or their impact decreases (e.g., when the epidemic is under control or in the low epidemic level stage). Therefore, the meaning of life is an important psychological factor to resist trauma and cope with disaster [17, 101]. The public should construct and create meaning from negative situations and transcend the dilemma in real life in a life course where good times and bad times coexist [102]. Individuals should maintain this attitude of learning and thinking even if these events pass.

Moreover, after the adjustment of the epidemic prevention and control policy, Chinese medical staff have also suffered severe attrition due to infection in the treatment of infected patients. However, they showed strong psychological quality and emergency response ability at critical moments and insisted on protecting the lives and health of patients. The positive performance of medical staff enhanced the public's trust and promoted their understanding and respect for medical staff. As a result, the PCSF was higher in the low epidemic level stage. SDT suggests that autonomy support is the basis for individuals to transform and integrate external values into themselves. In a community with shared future for doctor-patient, patients can feel that they are not isolated individuals, but partners valued by their doctors. This kind of attention and concern makes patients feel that their lives are meaningful, then promotes them to face the disease and treatment process more actively, thereby enhancing the construction of their meaning of life. Therefore, this study suggests that the concept of PCSF should be promoted and applied in medical education, doctor-patient communication, and healthcare services as soon as possible.

The mediating role of health self-consciousness between PCSF and benefit finding

Existential anxiety is defined as anxiety caused by failure to exert the potential of life. The epidemic may activate and maintain existential anxiety or change the pleasure or psychological balance of human life, which may change our beliefs in the meaning of our existence [103]. The epidemic has inspired feelings of a community of shared future among the public and also strengthened values of collective interest and individual responsibility. Studies have confirmed that there is a positive correlation between the pursuit of meaning in life, happiness, life satisfaction, and subjective health in a collectivist society [104]. Negative life events are often accompanied by fundamental changes in the individual value system (view of reality) and the individual's self-experience [105]. In the outbreak stage of COVID-19, the public and medical staff's joint response to the epidemic made them pay more attention to their own health, which led to an increased benefit finding. In the stable stage of COVID-19, the public's attention to medical staff was correspondingly reduced, and their emphasis on health was also reduced, which led to a decreased benefit finding. The third survey was conducted after the policy adjustment in the low epidemic level stage of COVID-19. The public and medical staff have jointly dealt with the challenges and threats of the epidemic, and also experienced the process of infection and recovery together. This shared experience in turn enhanced the public's concern for self-health and re-understanding of the meaning of life. Compared with the outbreak stage of COVID-19 and the stable stage of COVID-19, the impact of PCSF on benefit finding increased in the low epidemic level stage of COVID-19. Thus, PCSF may directly increase benefit finding, or indirectly increase benefit finding by enhancing health self-consciousness, whether it is in the outbreak stage of COVID-19, the stable stage of COVID-19, or the low epidemic level stage of COVID-19. This result reconfirms the stability, longevity, and association between PCSF, health self-consciousness, and benefit finding [9]. SDT believes that to stimulate public motivation, we should transform from the environmental factors that meet the three psychological needs of competence, autonomy, and relatedness. Unity and mutual assistance are in the common interest of all mankind [4]. It requires the joint efforts of the government, medical institutions, media, social organizations, and the public to build a community with shared future for doctor-patient, including perfecting laws and systems, improving medical services, and promoting the doctor-patient relationship.

The moderating role of anxiety in the relationship between PCSF and health self-consciousness

In the outbreak stage of COVID-19, anxiety increased due to the public's concern about being infected and excessive attention to the epidemic, thereby increasing their attention to health self-consciousness. In the stable stage of COVID-19, the epidemic was effectively controlled, the public's sense of security increased, and concerns and unease about the epidemic gradually decreased. As previous studies

by this group have found, the removal of the epidemic as a risk factor is equivalent to distinguishing the high-level and low-level anxiety groups more obviously. That is, there is heterogeneity between the two [9]. In the stable stage of COVID-19, individuals with lower anxiety may better deal with emotions and cognition, and it is easier to realize the connection with a community with shared future for doctor-patient, so as to enhance their attention and action on their health. Individuals with higher anxiety may pay more attention to their own problems and ignore the attention and emotional response to PCSF, thus weakening the effect of PCSF on health self-consciousness. Therefore, anxiety is not always a bad thing [106]. Moderate anxiety can remind people to be vigilant and take the necessary precautions to protect their health. However, the impact of anxiety on health self-consciousness was significantly reduced in the low epidemic level stage of COVID-19. This is related to the public's recovery from infection and scientific understanding of the pathogenicity of Omicron. This is because Omicron-infected individuals have significantly lower rates of hospitalization and death from the disease compared with wild-type, Alpha, and Delta [107]. Therefore, the goals of supporting the public in coping with anxiety and enhancing PCSF are interrelated and mutually reinforcing. At the same time, providing psychological support and enhancing the doctor-patient relationship can better promote the development of individuals' intrinsic motivation.

Conclusion

SDT links social environmental factors with individual behavior, providing a basis for intervening environmental factors to facilitate the internalization of extrinsic motivation. In the low epidemic level stage of COVID-19, there was a positive correlation between PCSF, health self-consciousness, benefit finding, and anxiety. Compared with the stable stage of COVID-19 and the low epidemic level stage of COVID-19, the public's anxiety, benefit finding, and health self-consciousness were higher in the outbreak stage of COVID-19. In the low epidemic level stage of COVID-19, the public's PCSF had an increased effect on the benefit finding, and the effect of anxiety on health self-consciousness was significantly reduced. The PCSF was higher in the low epidemic level stage of COVID-19 than in the outbreak stage of COVID-19. The PCSF could directly increase benefit finding, or indirectly increase benefit finding by enhancing health self-consciousness, whether it is in the outbreak stage of COVID-19, the stable stage of COVID-19, or the low epidemic level stage of COVID-19. Anxiety is more likely to occur in populations who are worried about being infected and actively paying attention to the epidemic. In the stable stage of COVID-19, a high level of anxiety may weaken the effect of PCSF on health self-consciousness. Comprehensive interventions such as psychological support, gratitude education, and promotion of the doctor-patient relationship can better facilitate the internalization of individual extrinsic motivation.

Limitation

This group adopted a repeated cross-sectional design to conduct a questionnaire survey separately in the outbreak stage of COVID-19, stable stage of COVID-19, and low epidemic level stage of COVID-19, to understand changes in PCSF, anxiety, health self-consciousness, and benefit finding at each of the three time points. However, this research method remains weak in terms of its efficacy in exploring causal relationships. In contrast, longitudinal studies can better reveal causal relationships between variables. Moreover, despite of the stability and long-term nature of PCSF, health self-consciousness, and benefit finding, the explanatory power of PCSF and health self-consciousness on benefit finding decreased in the low epidemic level stage of COVID-19. This means that the public's benefit finding may be influenced by other factors. Therefore, it may be necessary to incorporate new variables or further improve the PCSFS, HSCS, and BFS to ensure the validity of the scale items and the comprehensiveness of the measurement, and to enhance the explanatory power of relevant models in the low epidemic level stage of COVID-19.

Currently, our research group is in the process of further optimizing these three scales by increasing the number of items and dimensions. Last but not the least, there were some differences in the demographic characteristics of the respondents who were administered the questionnaires in the three stages. Our group had intended to use propensity score matching to eliminate the influence of confounding factors. However, our research group found the results of the multivariate factor analyses without propensity score matching were similar to the previous research results published by our group, while the results of the multivariate factor analyses after propensity score matching with severe loss samples were different from the previous research results published by our group. Therefore, to avoid serious selective bias, our research group decided to use the original data after quality control to analyze it directly. In addition, the results of this study rely on self-reported data, which are influenced by recall and social expectation bias.

Acknowledgements

This research was supported by the Doctor of Management in Healthcare Program jointly held by ISCTE University Institute of Lisbon (Iscte), Portugal, and Southern Medical University (SMU), P. R. China. Thanks for the help with this program.

Authors' contributions

Mr. Fenwick Feng Jing was responsible for project design and project progress promotion; Ms. Jing Zhou is mainly responsible for literature review and project design; Ms. Jiaying Ge is responsible for literature review and data

analysis; Ms. Xiaoyu Wang is responsible for data review; Ms. Mengjiao Tang is responsible for English translation and polishing; Ms. Shenyu Zhao was responsible for literature review and questionnaire design; Ms. Yanqiu Cui is mainly responsible for conducting the investigation; Ms. Lijing Bai mainly assisted in carrying out investigations; Ms. Xiyang Xia is responsible for English polishing; Ms. Yang Chen is mainly responsible for data verification; Ms. Dan Shen is responsible for material preparation; Ms. Haiying Chen is responsible for the preparation of materials in the early stage; Ms. Juan Wen is responsible for content review; Ms. Lingmin Hu is mainly responsible for content review; Mr. Renjie Lu is mainly responsible for completing the first draft. All authors are responsible for the entire contents of this manuscript and agree to submit it.

Funding
This research was supported by National Key R&D Program "Fertility Health and Health Security for Women and Children": Clinical Cohort and Intervention Study on Genetic Problems in Assisted Reproduction Offspring [2021YFC2700602], and Open Research Fund Program of Changzhou Institute for Advanced Study of Public Health, Nanjing Medical University [CPHS202303], Jiangsu maternal and child health research project [F202052], and the open project of biological resources sample bank of major diseases in Jiangsu province in 2020 [SBK202007002], and Top Talent of Changzhou "The 14th Five-Year Plan" High-Level Health Talents Training Project [2022CZBJ084], Hospital Management innovation research project of Jiangsu Hospital Association in 2023 [JSYGY-3-2023-247].

Availability of data and materials
The data presented in this study are available on request from the corresponding author. The data are not publicly available due to privacy restrictions.

Declarations

Ethics approval and consent to participate
The study was approved by the ethics committee of Changzhou Maternity and Child Health Care Hospital (No.2022 [21]). All participants provided informed consent online before the survey, in accordance with the principles of the Helsinki Declaration.

Consent for publication
None.

Competing interests
The authors declare no competing interests.

Author details
[1]School of Management, Qufu Normal University, Rizhao, Shandong 276826, China. [2]Department of Reproduction, Changzhou Maternity and Child Health Care Hospital, Changzhou Medical Center, Nanjing Medical University, Changzhou, Jiangsu 213000, China. [3]Changzhou Third People's Hospital, Changzhou Medical Center, Nanjing Medical University, Changzhou, Jiangsu 213000, China. [4]Nanjing Maternity and Child Health Care Institute, Women's Hospital of Nanjing Medical University, Nanjing Maternity and Child Health Care Hospital, Nanjing, Jiangsu 210000, China. [5]Changzhou Institute for Advanced Study of Public Health, Nanjing Medical University, Changzhou, Jiangsu 213000, China.

Received: 22 March 2024 Accepted: 16 July 2024
Published online: 08 August 2024

References

1. Rehman SU, Rehman SU, Yoo HH. COVID-19 challenges and its therapeutics. Biomed Pharmacother. 2021;142:112015. https://doi.org/10.1016/j.biopha.2021.112015.
2. Kurotschka PK, Serafini A, Demontis M, Serafini A, Mereu A, Moro MF, et al. General practitioners' experiences during the first phase of the COVID-19 pandemic in Italy: a critical incident technique study. Front Public Health. 2021;9:623904. https://doi.org/10.3389/fpubh.2021.623904.
3. Pu B, Zhang L, Tang Z, Qiu Y. The Relationship between Health Consciousness and Home-Based Exercise in China during the COVID-19 Pandemic. Int J Environ Res Public Health. 2020;17(16):5693. https://www.mdpi.com/1660-4601/17/16/5693.
4. Liu W, Yue XG, Tchounwou PB. Response to the COVID-19 epidemic: the Chinese experience and implications for other Countries. Int J Environ Res Public Health. 2020;17(7). https://doi.org/10.3390/ijerph17072304.
5. Piko BF, Keresztes N. Physical activity, psychosocial health, and life goals among youth. J Community Health. 2006;31(2):136–45. https://doi.org/10.1007/s10900-005-9004-2.
6. Harris P, Salehi A, Kendall E, Whitty J, Wilson A, Scuffham P. She'll be right, mate! Do australians take their health for granted? J Prim Health Care. 2020;12(3):277–88. https://doi.org/10.1071/hc20025.
7. Bao X, Chen D, Shi L, Xia Y, Shi Z, Wang D. The relationship between COVID-19-related prevention cognition and healthy lifestyle behaviors among university students: mediated by e-health literacy and self-efficacy. J Affect Disord. 2022;309:236–41. https://doi.org/10.1016/j.jad.2022.04.044.
8. Sokouti M, Shafiee-Kandjani AR, Sokouti M, Sokouti B. A meta-analysis of systematic reviews and meta-analyses to evaluate the psychological consequences of COVID-19. BMC Psychol. 2023;11(1):279. https://doi.org/10.1186/s40359-023-01313-0.
9. Lu R, Zhao S, Zhou J, Ou W, Wen J, Hu L. Perceived a community with shared future for doctor-patient and benefit finding: a moderated mediation model. BMC Psychol. 2023;11(1):174. https://doi.org/10.1186/s40359-023-01175-6.
10. Orrù G, Bertelloni D, Diolaiuti F, Conversano C, Ciacchini R, Gemignani A. A psychometric examination of the coronavirus anxiety scale and the fear of coronavirus disease 2019 scale in the Italian population. Front Psychol. 2021;12:669384. https://doi.org/10.3389/fpsyg.2021.669384.
11. Cybulski M, Wojszel ZB, Wojszel A, Jahel S, Sliwinska P, Krajewska-Kulak E. Assessment of COVID-19 anxiety levels and attitudes to COVID-19 vaccine among older adults in Poland: a pilot study. Vaccines (Basel). 2022;10(11). https://doi.org/10.3390/vaccines10111918.
12. Zubayer AA, Rahman ME, Islam B, Zaman O, Jobe MC. COVID-19 anxiety and associated factors among university students in Bangladesh. Death Stud. 2023;1–6. https://doi.org/10.1080/07481187.2023.2180692.
13. Zhao S, Akhter S. Negative psychological and educational impacts of Corona Virus anxiety on Chinese university students: exploring university students' perceptions. Heliyon. 2023;9(10):e20373. https://doi.org/10.1016/j.heliyon.2023.e20373.
14. Vohs KD, Aaker JL, Catapano R. It's not going to be that fun: negative experiences can add meaning to life. Curr Opin Psychol. 2019;26:11–4. https://doi.org/10.1016/j.copsyc.2018.04.014.
15. Steger MF, Oishi S, Kashdan TB. Meaning in life across the life span: levels and correlates of meaning in life from emerging adulthood to older adulthood. J Posit Psychol. 2009;4(1):43–52. https://doi.org/10.1080/17439760802303127.
16. Ge Y, Lu CY, Shuai MQ, Wenger JL, Peng CH, Wang H. Meaning in life among Chinese undergraduate students in the post-epidemic period: a qualitative interview study. Front Psychiatry. 2022;13:1030148. https://doi.org/10.3389/fpsyt.2022.1030148.
17. Naghiyaee M, Bahmani B, Asgari A. The psychometric properties of the Meaning in Life Questionnaire (MLQ) in patients with life-threatening illnesses. Sci World J. 2020;2020:8361602. https://doi.org/10.1155/2020/8361602.
18. Tokson M, Rahrig H, Green JD. Disease-preventive behaviors and subjective well-being in the COVID-19 pandemic. BMC Psychol. 2023;11(1):288. https://doi.org/10.1186/s40359-023-01316-x.
19. Frankl E. İnsanın anlam arayışı [Man's search for meaning] (S. Budak, Trans.). İstanbul, Turkey: Okyanus Yayıncılık; 2014.
20. Tasso AF, Sahin HN, San Roman GJ. COVID-19 disruption on college students: academic and socioemotional implications. Psychol Trauma. 2021;13(1):9–15. https://doi.org/10.1037/tra0000996.
21. Zanjari N, Abootalebi M, Delbari A, Abolfathi Momtaz Y. Impact of COVID-19 on Lifestyle: a sample of Iranian older adults. J Appl Gerontol. 2023;42(10):2100–9. https://doi.org/10.1177/07334648231178670.
22. Qian X, Ren R, Wang Y, Guo Y, Fang J, Wu ZD, et al. Fighting against the common enemy of COVID-19: a practice of building a community with a shared future for mankind. Infect Dis Poverty. 2020;9(1):34. https://doi.org/10.1186/s40249-020-00650-1.

23. Liu WY, Chuang YC, Liu TJ, Chien CW, Tung TH. Insights from the comparisons of SARS-CoV and COVID-19 outbreaks: The evidence-based experience of epidemic prevention in China. Medicine (Baltimore). 2021;100(6):e24650. https://doi.org/10.1097/md.0000000000024650.
24. Hu L, Bai L, Zhao S, Lu R. Analysis of doctor-patient relationship in post-COVID-19 period: perspective differences between citizen and medical staff. Inquiry. 2021;58:469580211060300. https://doi.org/10.1177/00469580211060300.
25. The Lancet Regional Health, Western P. The end of zero-COVID-19 policy is not the end of COVID-19 for China. Lancet Reg Health West Pac. 2023;30:100702. https://doi.org/10.1016/j.lanwpc.2023.100702.
26. Liu Q, Luo D, Haase JE, Guo Q, Wang XQ, Liu S, et al. The experiences of health-care providers during the COVID-19 crisis in China: a qualitative study. Lancet Glob Health. 2020a;8(6):e790–8. https://doi.org/10.1016/s2214-109x(20)30204-7.
27. Li J, Pang PC, Xiao Y, Wong D. Changes in Doctor-Patient relationships in China during COVID-19: a text mining analysis. Int J Environ Res Public Health. 2022;19(20). https://doi.org/10.3390/ijerph192013446.
28. Brüssow H. COVID-19: Omicron - the latest, the least virulent, but probably not the last variant of concern of SARS-CoV-2. Microb Biotechnol. 2022;15(7):1927–39. https://doi.org/10.1111/1751-7915.14064.
29. Suzuki R, Yamasoba D, Kimura I, Wang L, Kishimoto M, Ito J, et al. Attenuated fusogenicity and pathogenicity of SARS-CoV-2 omicron variant. Nature. 2022;603(7902):700–5. https://doi.org/10.1038/s41586-022-04462-1.
30. He Y, Zhang F, Liu Y, Xiong Z, Zheng S, Liu W, et al. Clinical Characteristics of Mild Patients with Breakthrough Infection of Omicron Variant in China after Relaxing the Dynamic Zero COVID-19 Policy Vaccines. 2023;11(5):968. https://www.mdpi.com/2076-393X/11/5/968.
31. Liao CX, Wang B, Lyu J, Li LM. [Progress in research of etiology and epidemiology of 2019-nCoV omicron variant]. Zhonghua Liu Xing Bing Xue Za Zhi. 2022;43(11):1691–8. https://doi.org/10.3760/cma.j.cn112338-20220929-00829.
32. Li Y, Zhao J, Ma Z, McReynolds LS, Lin D, Chen Z, et al. Mental health among college students during the COVID-19 pandemic in China: a 2-wave longitudinal survey. J Affect Disord. 2021;281:597–604. https://doi.org/10.1016/j.jad.2020.11.109.
33. Chang JJ, Ji Y, Li YH, Pan HF, Su PY. Prevalence of anxiety symptom and depressive symptom among college students during COVID-19 pandemic: a meta-analysis. J Affect Disord. 2021;292:242–54. https://doi.org/10.1016/j.jad.2021.05.109.
34. Deng J, Zhou F, Hou W, Silver Z, Wong CY, Chang O, et al. The prevalence of depressive symptoms, anxiety symptoms and sleep disturbance in higher education students during the COVID-19 pandemic: a systematic review and meta-analysis. Psychiatry Res. 2021;301:113863. https://doi.org/10.1016/j.psychres.2021.113863.
35. Chen H, Feng H, Liu Y, Wu S, Li H, Zhang G, et al. Anxiety, depression, insomnia, and PTSD among college students after optimizing the COVID-19 response in China. J Affect Disord. 2023;337:50–6. https://doi.org/10.1016/j.jad.2023.05.076.
36. The State Council of the People's Republic of China. Notice on the issuance of the overall plan for the implementation of the "Class B and B tubes" for the novel coronavirus infection. In: commission H, ed. Beijing: The State Council of the People's Republic of China; 2022. https://www.gov.cn/xinwen/2022-12/27/content_5733739.htm.
37. Robbiani DF, Gaebler C, Muecksch F, Lorenzi JCC, Wang Z, Cho A, et al. Convergent antibody responses to SARS-CoV-2 in convalescent individuals. Nature. 2020;584(7821):437–42. https://doi.org/10.1038/s41586-020-2456-9.
38. DiGiulio MB, Arbab R, Driscoll KP, Balmer DJ. COVID-19 infection may not produce lasting immunity in non-vaccinated young adults: a retrospective review of COVID-19 antibody data. Cureus. 2022;14(3):e23698. https://doi.org/10.7759/cureus.23698.
39. The State Council of the People's Republic of China. Joint Prevention and Control Mechanism of the State Council: The overall epidemic situation in the country has now entered a low epidemic level.Beijing: The State Council of the People's Republic of China. 2023. Available from: https://www.gov.cn/xinwen/2023-01/30/content_5739281.htm.
40. Törnbom K, Larsson A, Sunnerhagen KS, Palstam A, Persson HC. Understanding concerns after severe COVID-19: A self-imposed lockdown guarded by anxiety?. PloS one. 2023;18(7):e0287981. https://doi.org/10.1371/journal.pone.0287981.
41. Sauer KS, Jungmann SM, Witthöft M. Emotional and Behavioral Consequences of the COVID-19 Pandemic: The Role of Health Anxiety, Intolerance of Uncertainty, and Distress (In) Tolerance. Int J Environ Res Public Health. 2020;17(19):7241. https://doi.org/10.3390/ijerph17197241.
42. Negri L, Bassi M, Accardi R, Delle Fave A. Post-traumatic stress symptoms and benefit finding: a longitudinal study among Italian health workers during the COVID-19 pandemic. Soc Psychiatr Psychiatry Epidemiol. 2023;58(10):1549–59. https://doi.org/10.1007/s00127-023-02475-3.
43. Yang Z, Ji L-J, Yang Y, Wang Y, Zhu L, Cai H. Meaning making helps cope with COVID-19: A longitudinal study. Pers Individ Dif. 2021;174:110670. https://doi.org/10.1016/j.paid.2021.110670.
44. Van Lange PAM, Higgins ET, Kruglanski AW. Handbook of Theories of Social Psychology. London: Sage; 2011. Available from: http://digital.casalini.it/9781446269008.
45. Gagné M, Deci EL. Self-determination theory and work motivation. J Org Behav. 2005;26(4):331–62. https://doi.org/10.1002/job.322.
46. Lynch MF Jr, Plant RW, Ryan RM. Psychological Needs and Threat to Safety: Implications for Staff and Patients in a Psychiatric Hospital for Youth. Prof Psychol Res Prac. 2005;36(4):415–25. https://doi.org/10.1037/0735-7028.36.4.415.
47. Baard P, Deci E, Ryan R. The relation of intrinsic need satisfaction to performance and well-being in work settings. J Appl Soc Psychol. 2004;34:2045–68.
48. Batthyany A, Russo-Netzer P. Psychologies of meaning. In Meaning in positive and existential psychology. New York: Springer New York; 2014; p. 3–22.
49. Baumeister RF. Meanings of life. Guilford press; 1991.
50. Lambert NM, Stillman TF, Hicks JA, Kamble S, Baumeister RF, Fincham FD. To Belong Is to Matter: Sense of Belonging Enhances Meaning in Life. 2013;39(11):1418–27. https://doi.org/10.1177/0146167213499186.
51. O'Donnell MB, Bentele CN, Grossman HB, Le Y, Jang H, Steger MF. You, me, and meaning: an integrative review of connections between relationships and meaning in life. J Psychol Afr. 2014;24(1):44–50. https://doi.org/10.1080/14330237.2014.904097.
52. Van Tongeren DR, Green JD, Davis DE, Hook JN, Hulsey TL. Prosociality enhances meaning in life. J Positive Psychol. 2016;11(3):225–36. https://doi.org/10.1080/17439760.2015.1048814.
53. Ryan RM, Deci EL. Self-determination theory and the facilitation of intrinsic motivation, social development, and well-being. Am Psychol. 2000;55(1):68–78. https://doi.org/10.1037/0003-066X.55.1.68.
54. Deci EL, Ryan RM. The "What" and "Why" of Goal Pursuits: Human Needs and the Self-Determination of Behavior. Psychol Inquiry. 2000;11(4):227–68. https://doi.org/10.1207/S15327965PLI1104_01.
55. Deci EL, Ryan RM. Handbook of self-determination research.University Rochester Press; 2004.
56. Ryan RM, Deci EL. On happiness and human potentials: a review of research on hedonic and eudaimonic well-being. Ann Rev Psychol. 2001;52:141–66. https://doi.org/10.1146/annurev.psych.52.1.141.
57. Hackman JR, Lawler EE. Employee reactions to job characteristics. J Appl Psychol. 1971;55(3):259–86. https://doi.org/10.1037/h0031152.
58. McClelland DC, Burnham DH. Power is the great motivator. 1976. Harv Bus Rev. 2003;81(1):117–26.
59. Fang Y, Ji B, Liu Y, Zhang J, Liu Q, Ge Y, et al. The prevalence of psychological stress in student populations during the COVID-19 epidemic: a systematic review and meta-analysis. Sci Rep. 2022;12(1):12118. https://doi.org/10.1038/s41598-022Z16328-7.
60. Deng J, Zhou F, Hou W, Silver Z, Wong CY, Chang O, et al. The prevalence of depression, anxiety, and sleep disturbances in COVID-19 patients: a meta-analysis. Ann New York Acad Sci. 2021;1486(1):90–111. https://doi.org/10.1111/nyas.14506.
61. COVID-19 Mental Disorders Collaborators. Global prevalence and burden of depressive and anxiety disorders in 204 countries and territories in 2020 due to the COVID-19 pandemic. Lancet (London, England). 2021;398(10312):1700–12. https://doi.org/10.1016/s0140-6736(21)02143-7.
62. Baldassini Rodriguez S, Bardacci Y, El Aoufy K, Bazzini M, Caruso C, Giusti GD, et al. Sleep Quality and Its Relationship to Anxiety and Hardiness in a Cohort of Frontline Italian Nurses during the First Wave of the

COVID-19 Pandemic. Nurs Rep (Pavia, Italy). 2023;13(3):1203–15. https://doi.org/10.3390/nursrep13030103.
63. Lucijanic D, Mihaljevic Peles A, Piskac Zivkovic N, Lucijanic M, Kranjcevic M, Muzinic Marinic L. Relationship of Anxiety, Depression, Stress, and Post-Traumatic Stress Disorder Symptoms with Disease Severity in Acutely Ill Hospitalized COVID-19 Patients. Behav Sci (Basel, Switzerland). 2023;13(9):734. https://doi.org/10.3390/bs13090734.
64. Gohari MR, Patte KA, Ferro MA, Haddad S, Wade TJ, Bélanger RE, et al. Adolescents' Depression and Anxiety Symptoms During the COVID-19 Pandemic: Longitudinal Evidence From COMPASS. J Adolesc Health: Official Publ Soc Adolesc Med. 2024;74(1):36–43. https://doi.org/10.1016/j.jadohealth.2023.07.024.
65. Cosco TD, Wister A, Best JR, Riadi I, Kervin L, Hopper S, et al. Worsened Ability to Engage in Social and Physical Activity During the COVID-19 Pandemic and Older Adults' Mental Health: Longitudinal Analysis From the Canadian Longitudinal Study on Aging. Innov Aging. 2023;7(7):igad086. https://doi.org/10.1093/geroni/igad086.
66. Ferreira J, Fricton J, Rhodus N. Orofacial disorders. Current Therapies in Orofacial Pain Oral Medicine. Heidelberg: Springer, Berlin; 2017 p. 1-354.
67. Jayawickreme E, Infurna FJ, Alajak K, Blackie LER, Chopik WJ, Chung JM, et al. Posttraumatic growth as positive personality change: Challenges, opportunities, and recommendations. J Person. 2021;89(1):145–65. https://doi.org/10.1111/jopy.12591.
68. Yan Z, Wenbin J, Bohan L, Qian W, Qianqian L, Ruting G, et al. Posttraumatic growth trajectories among frontline healthcare workers during the COVID-19 pandemic: A three-wave follow-up study in mainland China. Front Psychiat. 2022;13:945993. https://doi.org/10.3389/fpsyt.2022.945993.
69. Krok D. When is Meaning in Life Most Beneficial to Young People? Styles of Meaning in Life and Well-Being Among Late Adolescents. J Adult Dev. 2018;25(2):96–106. https://doi.org/10.1007/s10804-017-9280-y.
70. Wu D, Ye B, Tang C, Xue J, Yang Q, Xia F. Self-Compassion and Authentic-Durable Happiness During COVID-19 Pandemic: The Mediating Role of Meaning of Life and the Moderating Role of COVID-19Burnout. Psychol Res Behav Manag. 2022;15:3243–55. https://doi.org/10.2147/prbm.S380874.
71. Olaisen RH, Schluchter MD, Flocke SA, Smyth KA, Koroukian SM, Stange KC. Assessing the Longitudinal Impact of Physician-Patient Relationship on Functional Health. Ann Fam Med. 2020;18(5):422–9. https://doi.org/10.1370/afm.2554.
72. Cheng Z, Tao Y, Liu T, He S, Chen Y, Sun L, et al. Psychology, stress, insomnia, and resilience of medical staff in China during the COVID-19 policy opening: a cross-sectional survey. Front Public Health. 2023;11:1249255. https://doi.org/10.3389/fpubh.2023.1249255.
73. Aguirre S, Jogerst KM, Ginsberg Z, Voleti S, Bhullar P, Spegman J, et al. COVID-19 Impact on the Doctor-Patient Relationship: Patient Perspectives on Emergency Physician Empathy and Communication. Bullet Emerg Trauma. 2021;9(3):125–32. https://doi.org/10.30476/beat.2021.89058.1216.
74. Roubille C, Ribstein J, Hurpin G, Fesler P, Fiat E, Roubille F. Confidence vanished or impaired until distrust in the doctor-patient relationship because of COVID-19: Confidence vanished or impaired until distrust: "COVID" in relationship. La Revue de medecine interne. 2021;42(1):58–60. https://doi.org/10.1016/j.revmed.2020.10.007.
75. Zhou Y, Ma Y, Yang WFZ, Wu Q, Wang Q, Wang D, et al. Doctor-patient relationship improved during COVID-19 pandemic, but weakness remains. BMC Fam Prac. 2021;22(1):255. https://doi.org/10.1186/s12875-021-01600-y.
76. Boeder S, Matamoros D, Mansy C. Practical Guidance for Healthcare Providers on Collaborating with People with Type 2 Diabetes: Advancing Treatment and Initiating Injectable Therapy. Diabetes therapy: research, treatment and education of diabetes and related disorders. 2023;14(2):425–46. https://doi.org/10.1007/s13300-022-01330-z.
77. Sumner RC, Kinsella EL. Solidarity appraisal, meaning, and markers of welfare in frontline workers in the UK and Ireland during the Covid-19 pandemic. SSM Mental Health. 2022;2:100099. https://doi.org/10.1016/j.ssmmh.2022.100099.
78. Czekierda K, Banik A, Park CL, Luszczynska A. Meaning in life and physical health: systematic review and meta-analysis. Health Psychol Rev. 2017;11(4):387–418. https://doi.org/10.1080/17437199.2017.1327325.
79. Mulahalilović A, Hasanović M, Pajević I, Jakovljević M. Meaning and the Sense of Meaning in Life from a Health Perspective. Psychiatria Danubina. 2021;33(Suppl 4):1025–31.
80. Premraj L, Kannapadi NV, Briggs J, Seal SM, Battaglini D, Fanning J, et al. Mid and long-term neurological and neuropsychiatric manifestations of post-COVID-19 syndrome: A meta-analysis. J Neurol Sci. 2022;434:120162. https://doi.org/10.1016/j.jns.2022.120162.
81. Mallapaty S. China is opening up after 3 years - what does it mean for research? Nature. 2023;613(7945):622. https://doi.org/10.1038/d41586-023-00091-4.
82. Kang H. Sample size determination and power analysis using the G*Power software. J Educ Eval Health Prof. 2021;18:17. https://doi.org/10.1146/annurev.psych.52.1.141.
83. Veblen T. The One-Way ANOVA and the Kruskal-Wallis H-Test: Comparing the Means of Three or More Unrelated Groups. Nurs Allied Health; 2009. p. 171. Retrieved form https://bpb-usw2.wpmucdn.com/sites.umassd.edu/dist/f/1316/files/2023/01/Statistics-for-Nursing-and-Allied-Health-PDFDrive-.pdf#page=185.
84. Cohen J. A power primer. Psychol Bullet. 1992;112(1):155–9. https://doi.org/10.1037//0033-2909.112.1.155.
85. Spitzer RL, Kroenke K, Williams JBW, Löwe B. A brief measure for assessing generalized anxiety disorder: the GAD-7. Arch Intern Med. 2006;166(10):1092–7. https://doi.org/10.1001/archinte.166.10.1092.
86. Kunzler AM, Röthke N, Günthner L, Stoffers-Winterling J, Tüscher O, Coenen M, et al. Mental burden and its risk and protective factors during the early phase of the SARS-CoV-2 pandemic: systematic review and meta-analyses. Glob Health. 2021;17(1):34. https://doi.org/10.1080/17439760802303127.
87. Hayes AF. Introduction to mediation, moderation, and conditional process analysis: A regression-based approach. Guilford publications; 2017.
88. The SPSSAU project. SPSSAU. (Version 23.0) [Online Application Software]. The SPSSAU project. 2023. Available from: Retrieved from https://www.spssau.com.
89. Jonckheere AR. A Distribution-Free k-Sample Test Against Ordered Alternatives. Biometrika. 1954;41(1/2):133–45. https://doi.org/10.2307/2333011.
90. Patel G, Fancher TL. In the clinic. Generalized anxiety disorder. Annals of internal medicine. 2013;159(11):ITC6-1, ITC6-2, ITC6-3, ITC6-4, ITC6-5, ITC6-, ITC-7, ITC6-8, ITC6-9, ITC6-10, ITC6-1; quiz ITC6-2. https://doi.org/10.7326/0003-4819-159-11-201312030-01006.
91. Jiang Y, Chengyu Y, Yaoyao M, Yinghui L, Shan L, Tao C, et al. Analysis on knowledge, attitude and practice to avian influenza A(H7N9)of urban residents of Wusheng, Sichuan. Disease Surveillance. 2018;33(6):493. https://doi.org/10.3784/j.issn.1003-9961.2018.06.012.
92. Penninx B, Benros ME, Klein RS, Vinkers CH. How COVID-19 shaped mental health: from infection to pandemic effects. Nature Med. 2022;28(10):2027–37. https://doi.org/10.1038/s41591-022-02028-2.
93. Lee SA, Jobe MC, Mathis AA, Gibbons JA. Incremental validity of coronaphobia: Coronavirus anxiety explains depression, generalized anxiety, and death anxiety. J Anxiety Dis. 2020;74:102268. https://doi.org/10.1016/j.janxdis.2020.102268.
94. Evren C, Evren B, Dalbudak E, Topcu M, Kutlu N. Measuring anxiety related to COVID-19: A Turkish validation study of the Coronavirus Anxiety Scale. Death Stud. 2022;46(5):1052–8. https://doi.org/10.1080/07481187.2020.1774969.
95. Lee SA. Coronavirus Anxiety Scale: A brief mental health screener for COVID-19 related anxiety. Death Stud. 2020;44(7):393–401. https://doi.org/10.1080/07481187.2020.1748481.
96. Pitol MNS, Patwary MM, Aurnob S, Ahmed S, Islam MA, Dash HK, et al. Exploring media consumption and mental health among young adults during the second wave of COVID-19 in Bangladesh. Heliyon. 2023;9(10):e20371. https://doi.org/10.1016/j.heliyon.2023.e20371.
97. Jia H, Guerin RJ, Barile JP, Okun AH, McKnight-Eily L, Blumberg SJ, et al. National and State Trends in Anxiety and Depression Severity Scores Among Adults During the COVID-19 Pandemic - United States, 2020-2021. MMWR Morb Mortal Week Rep. 2021;70(40):1427–32. https://doi.org/10.15585/mmwr.mm7040e3.
98. Zhong Y, Huang J, Zhang W, Li S, Gao Y. Addressing psychosomatic issues after lifting the COVID-19 policy in China: A wake-up call. Asian J Psych. 2023;82:103517. https://doi.org/10.1016/j.ajp.2023.103517.

99. Hu L, Zhao S, Zhou J, Ou W, Wen J, Lu R. The influence of benefit finding on academic engagement among Chinese college students: A moderating effect model. Heliyon. 2023;9(9):e20245. https://doi.org/10.1016/j.heliyon.2023.e20245.
100. Vaughan A. Omicron emerges. New scientist (1971). 2021;252(3363):7. https://doi.org/10.1016/s0262-4079(21)02140-0.
101. Davis CG, Wortman CB, Lehman DR, Silver RC. Searching for meaning in loss: are clinical assumptions correct. Death Stud. 2000;24(6):497–540. https://doi.org/10.1080/07481180050121471.
102. PTP W. Courage, Faith, Meaning, and Mature Happiness in Dangerous Times. Positive Living Newsletter. 2017. Available from: http://www.drpaulwong.com/inpm-presidents-report-may-2017/.
103. Tomaszek K, Muchacka-Cymerman A. Thinking about My Existence during COVID-19, I Feel Anxiety and Awe-The Mediating Role of Existential Anxiety and Life Satisfaction on the Relationship between PTSD Symptoms and Post-Traumatic Growth. Int J Environ Res Public Health. 2020;17(19):7062. https://doi.org/10.3390/ijerph17197062.
104. Lin L, Chan HW. When is search for meaning in life beneficial for well-being? A cross-national study. Int J Psychol: J Int de psychologie. 2021;56(1):75–84. https://doi.org/10.1002/ijop.12696.
105. Yang W, Staps T, Hijmans E. Going through a dark night: existential crisis in cancer patients-effective coping as a psycho-spiritual process embedded in the vulnerability of the body. Stud Spiritual. 2012;22:311–39.
106. Nicomedes CJC, Avila RMA. An analysis on the panic during COVID-19 pandemic through an online form. J Affect Dis. 2020;276:14–22. https://doi.org/10.1016/j.jad.2020.06.046.
107. Papagoras C, Zioga N, Papadopoulos V, Gerolymatou N, Kalavri E, Bounos C, et al. Omicron variant dominance and anti-SARS-CoV-2 vaccination are key determinants for a milder course of COVID-19 in patients with systemic autoimmune rheumatic diseases. Clin Rheumatol. 2023;42(12):3375–85. https://doi.org/10.1007/s10067-023-06769-4.

Publisher's Note