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COVID-19 Burnout Subject to the Dynamic Zero-COVID Policy in Hong Kong: Development and Psychometric Evaluation of the COVID-19 Burnout Frequency Scale

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Abstract: We sought to develop and validate a self-assessment burnout scale of the Chinese general population during the COVID-19 pandemic in the context of a dynamic zero-COVID policy. Factors relevant to individuals' burnout during the prolonged COVID-19 pandemic were identified in the literature and through the reviews of an expert panel. A convenience sample of 1087 was randomly divided into two subsamples and the scale's psychometric properties were assessed. Findings suggested that the COVID-19 BFS has adequate reliability ($\alpha = 0.90$) along with factorial, concurrent, and convergent validity. Results of confirmatory factor analysis (CFA) supported the one-factor structure of the scale. Concurrent validity results indicate a significant positive correlation between COVID-19 BFS and the Fear of COVID-19 Scale ($r = 0.131, p < 0.001$), suggesting that individuals with higher levels of burnout may also have higher levels of fear of COVID, or vice versa. The scale was also correlated positively with being against the dynamic zero-COVID strategy ($r = 0.340, p < 0.001$), indicating that a higher level of burnout may be associated with individuals who are against the dynamic zero-COVID strategy. The results suggest the five-item COVID-19 BFS is a valid and reliable scale for the measurement of burnout frequency of the Chinese general population in relation to the prolonged COVID-19 pandemic in a dynamic zero-COVID policy context.

Keywords: prolonged COVID-19; pandemic burnout; fatigue; Chinese general population; CFA; public health; dynamic zero-COVID policy; Hong Kong

1. Introduction

1.1. Dynamic Zero-COVID Strategy

In contrast to most Western countries, China adopted a zero-COVID policy to contain the transmission of COVID-19 to keep COVID-19 cases as close to zero as possible [1]. Similarly, Hong Kong, a densely populated city in China with a 7.4 million population in 1104 square kilometers, adopts a dynamic zero-COVID policy which comes with the

test–trace–isolate–quarantine (TTIQ) strategy that confirmed cases are isolated from the community and their close contacts are traced and identified and pre-emptively quarantined during a disease outbreak. The infection rates in Hong Kong have been significantly lower than many Western countries, proving the dynamic zero-COVID policy effective. However, extensive contact tracing, mandatory testing, and strict social distancing measures of the zero-COVID policy have disrupted almost every individual, directly or indirectly, in every aspect of their lives, including, work, study, social life, and even normal daily routine. Together with the unpredictable end of the pandemic, with repeated waves of different variants, many people have felt socially restricted, frustrated, and hopeless, and have been subject to increased levels of stress, anxiety, depression, fears, post-traumatic stress and burnout [2–7]. Some have reported being physically and emotionally drained as they did not know when they could resume normal activities and felt desperate even though they had strictly adhered to the anti-epidemic measures [8].

Despite the continuous adherence to the dynamic zero-COVID strategy, the highly transmissible Omicron variant discontinued Hong Kong's track record of very low or zero COVID-19 cases, with the first local case reported on 31 December 2021. As Hong Kong failed to contain the Omicron variant during the fifth wave of the pandemic, Hong Kong hit a record daily high of 56,827 COVID confirmed cases on 3 March 2022, which is 2.66% up from the day before, 40,019% up from a month before, and 5090 more than the U.S.'s case count for the same day [9]. There have been over 1.193 million confirmed cases and over 9100 deaths during the fifth wave of the pandemic. The number of COVID-19 deaths once reached one of the highest per one million population among developed countries to 37.69 on 14 March 2022, partly because of the low vaccination rate in the territory. The quarantine centers, community isolation facilities, hospitals, and morgues across the city were overwhelmed. Together with anticipation of a potential citywide lockdown as hinted by the Hong Kong Government in early March 2022 for the purpose of universal mandatory COVID testing, and the associated panic-hoarding of supplies, the pandemic and the dynamic zero-COVID policy have together driven a heightened level of stress, anxiety, and burnout of the people in Hong Kong.

1.2. "Pandemic Fatigue"

With the emerging literature on the mental and physical exhaustion in relation to COVID-19-related restrictions and adherence and the constant state of alert and uncertainty, a number of pandemic-related burnout/fatigue terms have been coined by scholars, such as "pandemic burnout" [10,11], "pandemic fatigue" [2,12–15], "quarantine fatigue" [16], and "behavioral fatigue" [17]. The World Health Organization (WHO) [18] describes "pandemic fatigue" as the feelings of burnout and chronic stress experienced by people during a prolonged public health crisis. A Google search for "pandemic fatigue" yielded over 50 million results as of 23 June 2022. Fatigue is defined as "the awareness of a decreased capacity for physical and/or mental activity due to an imbalance in the availability, utilization, and restoration of resources needed to perform activity" [19]. "Pandemic fatigue" is defined as the tendency for individuals to become weary of rules and advice which should be followed to prevent the spread of COVID-19 [13,14]. Ford et al. (2022) regarded "pandemic fatigue" as a negative affective response to COVID-19 [20]. It refers to the notion of behavioral fatigue associated with adherence to COVID restrictions [21] and brought about by the pandemic's restrictions on daily life [22,23]. "Burnout" refers to a state of emotional, physical, and mental exhaustion due to prolonged exposure to excessive stress [10] and traditionally depicts a work-oriented situation [24,25]. In the face of the COVID-19 pandemic, however, burnout is no longer solely work-oriented.

Burnout caused by the pandemic can result in emotionally and physically drained [18], affecting people's ability to work and function efficiently. It has been found that people with higher levels of burnout frequency were more likely to experience lack of motivation, decreased work efficiency, and increased anxiety and stress [2]. The Hong Kong Government has acknowledged people's fading tolerance towards anti-pandemic measures, with

more and more people subject to exhaustion and burnout [26]. Intolerance of uncertainty would affect individuals' perceptions and behavioral and emotional reactions towards these uncertain situations [27], which may result in negative impacts for individuals and the society. Research has found that people experiencing pandemic burnout can lead to refusal of adherence to anti-pandemic measures because they often feel uncertain about the end of the pandemic and the continuing changing policy and anti-epidemic measures, being restricted and lack of freedom, misunderstand that COVID-19 is not dangerous as before, and feel desperate about not being able to socialize with others [17]. As a result, people may become adapted to the COVID existence, and ignore the anti-epidemic measures to prevent the spread of COVID. Some may even feel that their freedom is of higher priority than being infected with COVID as they perceive that COVID is not that threatening [17,18].

1.3. Pandemic Burnout Assessment

Despite the increasing interest and attention from researchers on burnout globally [5,28,29], research on the pandemic-related burnout among the general public is limited [2,30]. In particular, nothing is known about the pandemic-related burnout of the Chinese general population in the context of dynamic zero-COVID policy. In addition, most of the studies examining burnout during COVID-19 pandemic have focused on healthcare professionals and teachers [5,28–30]. Occupation-related construct, instrument length, and scoring complexity are some factors that often limit the application of multidimensional occupation-based burnout measures in the general population. Further, only limited studies have focused on examining the level of and factors related to burnout among the general public. There is a scarcity of scales that directly measure pandemic-related burnout [30], not to mention burnout scales specific to the dynamic zero-COVID policy. Burnout scales that have been validated were used in previous studies but not in the relevant context. For instance, the Copenhagen Burnout Inventory [31] which was developed in the context of hospital nurses, was adapted by Talaee et al. (2020) to assess pandemic-specific burnout [32]. Adapted from the Burnout Measure-Short Version (BMS) [33], Yıldırım and Solmaz (2020) developed a measure of burnout related to COVID-19 exhaustion, the COVID-19 Burnout Scale [30]; however, the scale is not relevant to the measurement of the pandemic burnout of individuals subject to the dynamic zero-COVID policy. The measures for burnout assessment used in Hong Kong were work-related (e.g., Maslach Burnout Inventory (MBI), Copenhagen Burnout Inventory (CBI), the Oldenburg Burnout Inventory (OLBI)), targeting medical professionals and students, caregivers, teachers, and corporate employees (e.g., [34–37]).

Given that the COVID-19 pandemic and the dynamic zero-COVID policy are continuing in China with the risk of future outbreaks, and the classic conception of burnout and the measures are all work-oriented (e.g., [24,25]), the development of a measure for assessing COVID-specific burnout of the general population in the context of the dynamic zero-COVID policy is essential to increase awareness of COVID-related burnout and provide a platform for advocacy and policy change. Against this background, the aims of the present study were to develop a brief scale for measuring COVID-related burnout and to initially assess its reliability and validity. In view of the recent increasing attention on COVID-19-related burnout, the development of a validated burnout measure would provide an important contribution to early identification efforts and ongoing monitoring.

2. Materials and Methods

2.1. Study Design and Study Participants

The study adopted a cross-sectional research design with a convenience and snowball sampling technique, where participants were invited to pass the study invitations to their contacts in order to reach a wider population in the community. The online survey was administered using the Qualtrics platform. The participants were Hong Kong residents aged 18 years or above and able to read and understand Chinese, and were recruited via email and social media apps, including WhatsApp, Signal, WeChat, Instagram, and Facebook. Data were collected during a 3-week period in March 2022 during the fifth wave

of the pandemic in Hong Kong. Prior to completing the survey, participants were provided with a consent form acknowledging consent for their participation in the study. The survey reported information about the purpose of the study, and a general description of the questionnaire, including information about risks and benefits of participation, the time necessary to complete the survey, and privacy policy information. The study was approved by the research ethics committee at the University where the first author of this paper is employed. Participation was voluntary, and no incentives were given to the participants. This work was conducted as part of a psychological health study during the COVID-19 pandemic. The data were password-protected and handled confidentially. In total, a sample of 1404 adults from the general population in Hong Kong participated in this study. Due to missing data, 317 participants were excluded, resulting in an eligible sample of 1087 for this study (with a completion rate of 77.42%). Multiple entries by a single user were minimized with the use of cookies such that each respondent's device was assigned a unique user identifier. The average age of the participants was 34.29 years ($SD = 12.31$). Among the respondents, 785 were female (72.22%) and 96 reported having a chronic disease (8.83%). Almost all of the participants (96.04%, $n = 1044$) reported being vaccinated.

2.2. Procedure

2.2.1. Phase 1: Development of the Scale

The conceptual foundation for the items in the development of the scale was based upon the definition of pandemic fatigue by the WHO [18]. As defined by the WHO, "pandemic fatigue" refers to people feeling exhausted and demotivated by adhering to the pandemic policies and measures and following recommended behaviors to protect themselves and others from the virus. Multiple steps were taken to develop the scale items. First, we reviewed burnout measurement literature to help us to identify existing questionnaires for healthcare professionals prior to the onset of COVID-19 [38,39] pandemic and during the COVID-19 pandemic [40]. Second, based on the literature review (e.g., the Maslach Burnout Inventory (MBI) [24]), 11 relevant categories were identified: Exhaustion, Burnout, Physical tiredness, Confusion, Stress, Frustration, Irritability, Hopelessness, Trap, Boredom, and Out of control, and 11 relevant questions were developed accordingly to fit into the COVID-19 pandemic and the dynamic zero-COVID policy context, and were applied to the general population. Items were modified from occupation-oriented to COVID-oriented (e.g., "I feel emotionally exhausted because of my work" was modified to "I feel emotionally exhausted because of the COVID-19 pandemic and the preventive measures.", and "I feel frustrated by my work" was modified to "I feel frustrated by the COVID-19 pandemic and preventive measures"). Third, the initial set of 11 items was reviewed and edited by a panel of experts who represented multiple fields and backgrounds, including mental health professionals, physicians, psychologists, and sociologists. One item of "I feel burnout because of the COVID 19 pandemic and safety measures" was found not appropriate and therefore removed. Fourth, a pilot study with 30 participants from the general public was conducted to seek their views and thoughts about each question of the 10-item scale. Fifth, all items were translated and back-translated to/from Chinese and English repeatedly by the bilingual authors [41]. Forward translation from English to Chinese and backward translation from Chinese to English procedures were adopted. Each question of the translated scale was independently reviewed by the first, second, and third authors of the study compared with the original version. The Chinese and English versions were compared to determine whether they were equivalent in meaning and appropriateness. Any discrepancies and disagreements between the original and the back-translation were then checked and considered by the first, second, and third authors together. Revisions were made until consensus was reached. Sixth, to provide preliminary feedback on the initial set of items of the scale, we invited 27 health and related professionals including doctors, nurses, medical science professionals, sports professionals, and other healthcare professionals to examine the acceptability, clarity, understandability, and applicability of individual items, as well as the comprehensiveness of the scale [42].

The feedback was checked and considered by a panel consisting of the first, second, and third authors and the items were reworded and rephrased as appropriate until satisfactory agreement was obtained. The items were graded on a seven-point Likert scale (1 to 7): never (1), a few times a year (2), at least once a month (3), several times a month (4), once a week (5), several times a week (6), and once per day or more (7). The questions are related to frequency of burnout feelings in coping with COVID-19, covering the following areas: emotional exhaustion and physical tiredness, boredom because of travel restriction, out of control in life, as well as stress, confusion, hopelessness, and frustration with and adherence to the COVID-19 prevention measures.

2.2.2. Phase 2: Validation of the Scale

The validation involved the following steps. In the initial stage, by means of cross-validation, the sample with 1087 was randomly split in half, i.e., the first subsample ($n = 544$) as the developmental sample, and the second subsample ($n = 543$) as the validation sample. This procedure was crucial to avoid the potential issue of overfitting when running Exploratory Factor Analysis (EFA) and Confirmatory Factor Analysis (CFA) on the same dataset [43–47]. The structure of the scale was examined by using an EFA. To evaluate the factor structure that emerged from the developmental sample, CFA was used.

The first subsample ($n = 544$) was used to identify the items for the scale with reference to the stepwise confirmatory factor analytical (SCOFA) approach [48], i.e., involved the use of CFA that could iteratively remove the item with the lowest factor loading from the item pool, in addition to the classical testing theory (CTT) in psychometric analysis using EFA with principal component analysis (PCA) [49–51]. The cut-off values of Kaiser–Mayer–Olkin (KMO) > 0.70 and Bartlett’s tests $p < 0.01$ were adopted in EFA. In addition, the evaluated items needed to possess a factor loading of over 0.50 and factors with an eigenvalue greater than 1.0 [52–54].

To evaluate the factorial validity and explore whether the five items of the scale depicted a single dimension, CFA was then conducted to assess model fit for a one-factor solution based on the second subsample ($n = 543$) [55,56]. In view of the recent CFA literature and simulation studies results, the diagonally weighted least squares (DWLS) estimator was employed [45,57,58]. To obtain more accurate information regarding the goodness of model fit, the CFA results were evaluated using several indicators, i.e., standardized root mean square residual (SRMR), the robust root mean square error of approximation (RMSEA), the Tucker Lewis index (TLI), and the comparative fit index (CFI) and chi-square divided by the degrees of freedom (χ^2/df). SRMR values less than 0.08 indicate adequate fit, and RMSEA values less than 0.06 indicate a small error of approximation [59]. TLI values greater than 0.950 indicate good fit, CFI values of 0.950 or greater indicate good fit [60–62], and chi-square divided by the degrees of freedom (χ^2/df) values of 3 or less indicate a good model fit [63,64]. In addition, multiple tools were used to evaluate the internal consistency reliability of the scale, including the corrected item–total correlation between the items [54,65], the McDonald’s Omega (ω) coefficient [66,67], and Cronbach’s alpha (α) coefficient [61,68].

Consistent with the process of scale validation, we then moved to examine the convergent and concurrent validity of the scale by administering other measures that purport to assess other well-established scales and construal-related measures [69]. The measures included Fear of COVID-19 Scale, support for “living with COVID” policy, chronic illness conditions (i.e., Do you have any chronic illness e.g., diabetes, kidney problem, cancer? “yes” or “no”), family infection (i.e., Have your family members or close friends ever been infected with COVID-19? “yes” or “no”), age, attitude toward the dynamic zero-COVID strategy, and COVID-19 vaccination record (“yes” or “no”). The 7-item Fear of COVID-19 Scale was reported to be valid and reliable in assessing anxiety regarding COVID-19 and to correlate with other measures of health-related anxiety and depression [50]. Items are on a 5-item Likert scale from 1 (Strongly Disagree) to 5 (Strongly Agree). The dynamic zero-COVID strategy included 4 statements, including: “Dynamic Zero COVID-19 strategy”

is an effective measure to protect my city against COVID-19; I support the “Dynamic Zero COVID-19 strategy” continuing and remaining the ultimate goal in the long run; I support the government adopting the “living with COVID” policy instead of the “Dynamic Zero COVID-19 strategy”; The “Dynamic Zero COVID-19 strategy” is not sustainable in the long run. Participants were invited to respond on a scale from “Strongly Disagree” to “Strongly Agree” on a 5-point Likert scale. With reference to the recent literature on COVID-19, we anticipated that the COVID-19 BFS is positively associated with Fear of COVID-19 [70,71], and support for “living with COVID” policy by reducing the quarantine and social distancing rules [72]. We also expected the COVID-19 BFS to be positively correlated with chronic illness conditions [73]. On the contrary, we expected the COVID-19 BFS to have a negative relationship with age [71,73], attitude toward the dynamic zero-COVID strategy [74], and COVID-19 vaccination record [75].

Data were managed and analyzed using the lavaan package [76] in the R computing environment (3.6.1) and IBM SPSS version 26.0.

3. Results

3.1. Factorial Validity of the COVID-19 Burnout Frequency Scale

With reference to the approach of SCOFA [48], five items were selected for the construction of the COVID-19 Burnout Frequency Scale. The following five items were removed from the subsequent analysis due to the poor psychometric properties: “I feel physically tired because of the COVID-19 pandemic and the preventive measures”; “I feel confused with the COVID-19 preventive measures (e.g., frequent COVID-19 testing, tightening of social distance, dine-in ban)”; “I feel frustrated by the COVID-19 pandemic and the preventive measures”; “I feel bored with my work/study, daily living and COVID-19 preventive measures during the pandemic”; and “I feel out of control in multiple areas of my life during the COVID-19 pandemic”. The selected items were further verified using EFA with principal component analysis (PCA). The results from the first subsample ($n = 544$) illustrated that the five-item COVID-19 Burnout Frequency Scale had a KMO value of 0.886 ($\chi^2 = 1733.195$; $df = 10$, $p < 0.001$), signifying that the proposed scale had good factorial validity. We report in Table 1 the detailed results of EFA. The findings indicate that the COVID-19 Burnout Frequency Scale stands for a unidimensional construct with good model fit (eigenvalue = 3.660, explaining 73.200% variance) comprising five items.

Table 1. Exploratory Factor Analysis on first subsample data ($n = 544$).

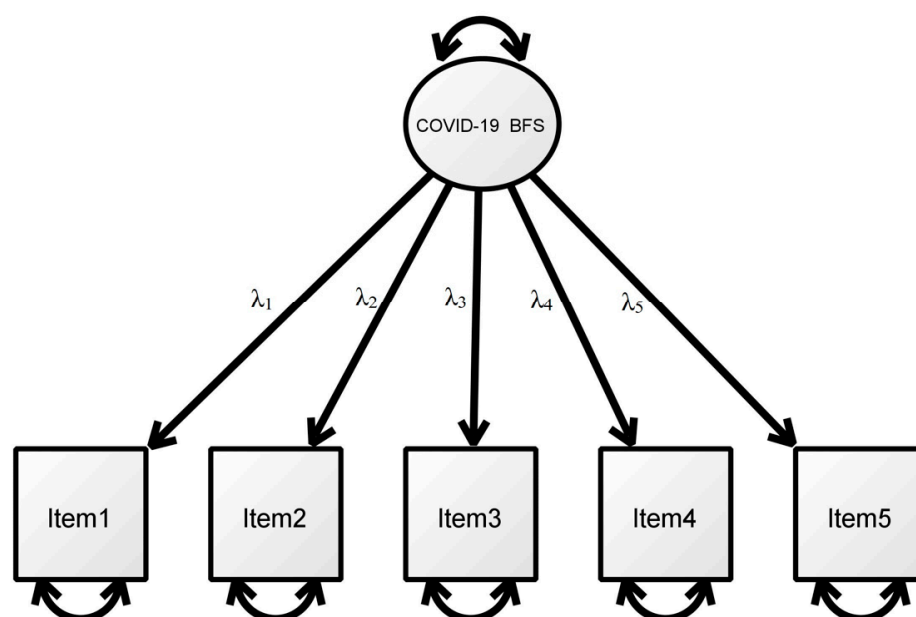
Item	First Subsample
1. I feel emotionally exhausted because of the COVID-19 pandemic and the preventive measures.	0.849
2. I feel stressed by adhering to the COVID-19 preventive measures.	0.887
3. I feel irritable and have a shortening fuse with the COVID-19 preventive measures.	0.890
4. I feel hopeless as the COVID-19 pandemic continues despite preventive measures.	0.840
5. I feel trapped in my city due to the travel ban and restrictions during the COVID-19 pandemic.	0.809

The factorial validity of the COVID-19 Burnout Frequency Scale was further evaluated with CFA using the DWLS estimator. In Model 1 (second subsample, $n = 543$), the CFA suggested that the five-item COVID-19 Frequency Scale fulfilled all the stringent criteria of good model fit, with $\chi^2 (1.628) / 5 = 0.325$, SRMR = 0.007, CFI = 0.999, TLI = 0.999, and RMSEA = < 0.001 [90% CI < 0.001–0.026]. Model 2 reports the CFA results of the entire dataset (Combo, $N = 1087$). The findings replicated the results from the second subsample, i.e., the scale still possessed good factorial validity, as $\chi^2 (6.678) / 5 = 1.335$, SRMR = 0.010, CFI = 0.999, TLI = 0.999, and RMSEA = 0.018 [90% CI < 0.001–0.048]. Neither Model 1 nor 2 involved any post hoc modifications. Table 2 reports the detailed results, including the standardized estimate of the items and the estimated model (Figure 1). In short, the findings suggested that the five-item COVID-19 Frequency Scale has one-factor structure and demonstrates good factorial validity.

Table 2. Factor loadings and fit indices in confirmatory factor analysis for the COVID-19 Burnout Frequency Scale (see Figure 1 for the estimated model).

Item		Second Subsample	
		Model 1	Model 2
Item 1	λ_1	0.798	0.813
Item 2	λ_2	0.902	0.900
Item 3	λ_3	0.907	0.908
Item 4	λ_4	0.811	0.820
Item 5	λ_5	0.746	0.759
Model fit			
N		543	1087
RMSEA		<0.001	0.018
RMSEA 90% CI		<0.001–0.026	<0.001–0.048
SRMR		0.007	0.010
χ^2		1.628	6.678
df		5	5
χ^2/df		0.325	1.335
CFI		0.999	0.999
TLI		0.999	0.999

Note: RMSEA = root mean square error of approximation, SRMR = standardized root mean residual, CFI = Comparative Fit Index, TLI = Tucker Lewis Index. Combo = Combined samples 1 and 2, λ = standardized factor loading.

**Figure 1.** Estimated model of the five-item COVID-19 Burnout Frequency Scale (CV-19 BFS).

The COVID-19 BFS was further tested by the measurement of invariance (configural, metric, scalar, and strict) between the male and female participants (Table 3). The results demonstrated that all the models fulfilled the requirements for good model fit.

Table 3. Measurement invariance of the COVID-19 Burnout Frequency Scale.

Model	CFI	TLI	SRMR	RMSEA	90%CI of RMSEA	Δ CFI
Configural Invariance	0.999	0.999	0.013	0.016	(0.000, 0.051)	
Metric Invariance	0.999	0.999	0.024	0.054	(0.032, 0.076)	0.004
Scalar Invariance	0.999	0.999	0.014	0.013	(0.000, 0.033)	0.002
Strict Invariance	0.999	0.999	0.014	0.013	(0.000, 0.033)	0.002

3.2. Internal Consistency

The findings suggest that the COVID-19 BFS had good internal consistency. Table 4 reports the item correlations for all five items of the COVID-19 BFS as well as its descriptive statistics, including the mean, standard deviation, skewness, kurtosis, corrected item–total correlations, and Cronbach’s alpha. We examined an index of internal consistency reliability by calculating coefficient alphas. We found acceptable levels of reliability, with Cronbach’s alpha coefficient = 0.90. We also found that the corrected item-to-total correlations for the proposed scale ranged from 0.694 to 0.811. In addition, the McDonald’s Omega coefficient for the proposed scale was above the acceptable range, with $\omega = 0.91$. The results also indicate no significant differences or relationships observed in the COVID-19 BFS scores with gender, based on the correlation and independent-sample *t*-test results.

Table 4. Descriptive statistics and item correlations for the COVID-19 BFS (N = 1087).

Item	1	2	3	4	5
1	-	0.696	0.672	0.608	0.572
2	0.699	-	0.768	0.657	0.614
3	0.674	0.774	-	0.659	0.634
4	0.618	0.671	0.673	-	0.590
5	0.574	0.616	0.631	0.603	-
Mean	4.08	3.89	4.59	3.50	3.96
SD	1.973	2.101	2.115	2.212	2.148
Skewness	−0.018	0.055	−0.326	0.298	0.122
Kurtosis	−1.289	−1.368	−1.343	0.074	0.074
r_{it}	0.742	0.811	0.809	0.743	0.694
α_{iid}	0.886	0.871	0.871	0.886	0.896

Note: All correlations are significant at the 0.001 level (two-tailed); Lower triangle for Spearman correlations; upper triangle for Pearson correlations; r_{it} = Corrected item–total correlations; α_{iid} = Cronbach’s alpha, if item deleted.

3.3. Convergent and Concurrent Validity

We examined the extent to which the COVID-19 BFS demonstrates convergent and concurrent validity with other measures that purport to assess the same or very similar constructs. The results in general replicated the relationships between the COVID-19 BFS and the other construct-related scales and measures reported in the existing literature related to COVID-19 (Table 5). As such, the five-item COVID-19 Burnout Frequency Scale had significant and weak positive relationships with the Fear of COVID-19 Scale ($r = 0.131$, $p < 0.001$) and chronic illness condition ($r = 0.090$, $p < 0.001$). The intention to adopt “living with COVID” ($r = 0.292$, $p < 0.001$) and being against the “dynamic Zero COVID-19 strategy” ($r = 0.340$, $p < 0.001$) also had a moderate positive relationship with the COVID-19 BFS.

Table 5. Correlations between the COVID-19 BFS in relation to other construal-related measures.

Scale/Measures	COVID-19 BFS
Fear of COVID-19 Scale	0.131
I support the government adopting the “living with COVID” policy instead of the “Dynamic Zero COVID-19 strategy”.	0.292
The “Dynamic Zero COVID-19 strategy” is not sustainable in the long run.	0.340
Do you have any chronic illness (e.g., diabetes, kidney problem, cancer)?	0.090
Age	−0.334
COVID-19 vaccination status	−0.149
Have your family members or close friends ever been infected with COVID-19?	−0.107
“Dynamic Zero COVID-19 strategy” is an effective measure to protect my city against COVID-19.	−0.345
I support the “Dynamic Zero COVID-19 strategy” continuing and remaining the ultimate goal in the long run.	−0.368

The COVID-19 BFS was expected to demonstrate a negative relationship with the following variables and measures. In particular, the COVID-19 BFS was negatively related

to the COVID-19 vaccination status ($r = -0.149, p < 0.001$), “Have your family members or close friends ever been infected with COVID-19?” ($r = -0.107, p < 0.001$), and age ($r = -0.334, p < 0.001$). The results also demonstrated that the COVID-19 BFS had a significant moderate negative relationship with the attitude toward “Dynamic Zero COVID-19 strategy” as an effective measure and to adopting this policy in the long run, as $r = -0.345$ ($p < 0.001$) and -0.368 ($p < 0.001$), respectively. To sum up, the newly proposed scale demonstrated good concurrent validity based on the above correlation coefficient results.

4. Discussion

COVID-19-related burnout is increasingly a prominent global public health issue. Yet, past research has not focused on the burnout in the context of individuals subject to a dynamic zero-COVID policy. Similar to mainland China, ever since the COVID-19 outbreak, Hong Kong has been adopting a dynamic zero-COVID policy with strict anti-epidemic social distancing and restriction measures. Whilst individuals may react differently to COVID-19 in face of the prolonged strict anti-epidemic measures in Hong Kong, pandemic-related burnout is a key concern among the general public, which would greatly worsen one’s quality of life and mental health. With this study, we sought to develop the COVID-19 BFS and evaluate the factorial validity, internal reliability, and convergent and concurrent validity with a large sample of the Chinese general population in Hong Kong.

The COVID-19 BFS was developed in multi-phases, including an initial phase of scale development based on literature review, review of an expert panel, translation, and back-translation, and followed by a validation process which provided initial evidence for the reliability and validity of the new measure. The results of psychometric analyses suggested preliminary evidence for the use of the COVID-19 BFS in assessing the construct of pandemic burnout in Hong Kong in a Chinese dynamic zero-COVID policy context. Results from CFA indicate that COVID-19 BFS is a structurally valid, unidimensional measure of burnout frequency with all items loaded significantly into a single factor. The scale was observed to be measuring a single construct, with all five items having corrected item–total correlations ranging from 0.694 to 0.811, which is above the normally accepted cut-off level of 0.3 [77,78]. The internal consistency was supported by Cronbach’s alpha ($\alpha = 0.90$), which was above the acceptable level of 0.70. The present study revealed that the COVID-19 BFS is a valid and reliable instrument for measuring burnout frequency in a Chinese context in response to sustaining COVID-19 pandemic.

Consistent with the literature on COVID-19, the results of the study show the positive association of the COVID-19 BFS with the Fear of COVID-19 Scale ($r = 0.131, p < 0.001$) [70,71], chronic illness condition ($r = 0.090, p < 0.001$) [73], the intention to adopt “living with COVID” policy ($r = 0.292, p < 0.001$) by reducing the quarantine and social distancing rules [72] and being against the “dynamic Zero COVID-19 strategy” ($r = 0.340, p < 0.001$). As reported in previous studies [71,73–75,79], the results showed a negative association of the scale with COVID-19 vaccination status ($r = -0.149, p < 0.001$), “Have your family members or close friends ever been infected with COVID-19?” ($r = -0.107, p < 0.001$), age ($r = -0.334, p < 0.001$), the attitude toward Dynamic Zero COVID-19 strategy as an effective measure ($r = -0.345, p < 0.001$), and attitude towards adopting this policy in the long run ($r = -0.368, p < 0.001$). To our knowledge, this is the first study to develop and test a self-reported measure on burnout of the Chinese general population during the COVID 19 pandemic in a dynamic zero-COVID policy context. A strength of this study is the confirmation of reliability and validity of the new measure with an independent, large population sample.

5. Limitations and Future Directions

The study has some limitations that should be taken into consideration. First, we acknowledge that the sample of the general population collected in the current study via convenience and snowball sampling may not be representative and thus might have introduced selection bias. There may be concerns on how the results would generalize

beyond this sample to all Chinese in Hong Kong or other cities of China. Second, our data were based on a single sampling process, and we assessed the psychometric features of the COVID-19 BFS without conducting a test–retest reliability check. Third, discriminant validity (i.e., the degree to which core aspects of burnout can be discriminated from each other) was not included in the validation procedure. Fourth, the COVID-19 BFS was tested in a Hong Kong Chinese cultural context; it remains to be investigated how it behaves in the mainland Chinese cultural and other cultural settings.

We invite future research to focus on more elaborate testing to evaluate the validity of the COVID-19 BFS, especially to evaluate the applicability of the scale to different populations in North America, Europe, and the Middle East that showed cultural differences in handling the COVID-19 pandemic as compared to Hong Kong and China [80–82]. More studies are needed to monitor how the burnout frequency changes over time in response to the development of the COVID-19 pandemic. Longitudinal studies in this field are warranted. In addition, prospective research should be undertaken to examine how the COVID-19 BFS correlates with other burnout scales. Examination of the association between the COVID-19 BFS and other constructs (such as job security and performance, academic performance, personality) is also warranted.

6. Conclusions

In the present study, we developed and validated an instrument of the COVID-19 BFS with good initial evidence for internal reliability and construct and concurrent validity among the general population of Hong Kong Chinese in a dynamic zero-COVID policy context. To the best of our knowledge, the COVID-19 BFS represents the first instrument developed for this purpose. The scale has potential applications for research in assessing individuals' burnout in the Chinese general population as the pandemic continues. The scale could also contribute to increase awareness and knowledge of pandemic burnout, for the benefit of general population health.

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