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Measurement and community antecedents of positive mental health among the survivors of typhoons Vamco and Goni during the COVID-19 crisis in the Philippines

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ABSTRACT

The present study examined the measurement and antecedents of positive mental health in people who concurrently experienced two disasters of different nature (i.e., typhoons and COVID-19 crisis), focusing on the survivors of typhoons Vamco and Goni that hit the Philippines in November 2020, during the COVID-19 pandemic. First, we investigated the psychometric properties of Mental Health Continuum-Short Form (MHC-SF), a well-validated measure of positive mental health dimensions (i.e., emotional, social, and psychological well-being) by: 1) comparing the structural validity of three measurement models including a single-factor, bifactor, and three-factor solutions of positive mental health; 2) looking into the criterion validity through correlating the MHC-SF subscales with relevant measures; and 3) calculating for item reliability. Second, we examined the mediating role of social responsibility in the positive influence of community resilience on the three dimensions of positive mental health. Using 447 participants, with ages ranging from 18 to 70 years old, confirmatory factor analysis showed that compared to the single-factor and the bifactor models, the intercorrelated three-factor model of MHC-SF has the best model fit and most stable factor loadings. MHC-SF subscales correlated with relevant measures indicating criterion validity and yielded excellent internal consistency for all subscales. Additionally, results showed that social responsibility mediated the positive impact of community resilience on emotional, social, and psychological well-being of Filipinos in times of great adversities. The findings were discussed within the context of extreme weather events and the COVID-19 crisis in the Philippines, highlighting implications on disaster preparedness and mental health policies at the community level.

1. Introduction

More than 20 typhoons enter the Philippines every year, five of which are often destructive. Given its geographical location, the country is highly susceptible to tsunamis, storm surges, landslides, and flooding, severely affecting peoples' livelihoods, properties, and health [1]. In November 2020, the Philippines was hit by two consecutive typhoons, typhoon Vamco and super typhoon Goni, which together caused massive destruction in many parts of the country. The impact of these typhoons has posed an even greater life

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risk and consequences to Filipinos' mental health as they were dealing concurrently with the COVID-19 crisis. One gap in the literature was the lack of attempt to examine the mental health of people who faced extreme typhoons at the time of a disease outbreak. The current study takes a look into the well-being of Filipinos who faced two disasters of different nature such as typhoons Goni and Vamco and the COVID-19 crisis. Specifically, the present study aims to examine the psychometric properties including factorial validity, criterion validity, and reliability of the Mental Health Continuum-Short Form (MHC-SF) [2], an established measure of positive mental health. Moreover, we aim to investigate the mediating role of social responsibility in the positive influence of community resilience on positive mental health.

1.1. Disasters and mental health

Previous studies showed that exposure to disasters has detrimental impacts on people's mental health. For example, previous research found a prevalence of mental health illnesses following a natural disaster in Vanuatu [3], traumatic effects among residents in flood-affected areas in the UK [4], and depression, anxiety, and post-traumatic stress disorder (PTSD) among adolescents after the 2011 Great East Japan earthquake and tsunami [5].

Natural disasters in the Philippines have posed threats to the mental health of many Filipinos. For example, past studies have documented that survivors of supertyphoon Haiyan, the strongest cyclone ever recorded, experienced psychological distress [6] and post-traumatic stress [6–8]. In 2020, the Philippines faced the brunt of a series of extreme typhoons in the middle of the COVID-19 pandemic, two of which particularly caused severe damages in many parts of the country. Super typhoon Goni and typhoon Vamco hit the country in November 2020, causing wide-scale damage to the livelihood and loss of lives in the country [9]. While previous research examined the mental health consequences of typhoons on Filipinos, examining mental health within the unique context of multiple adversities seems lacking in the literature. We aim to address this gap by investigating the positive mental health of Filipinos within the context of typhoons Goni and Vamco and the COVID-19 crisis.

1.2. Mental health during the COVID-19 crisis

As of February 2022, there were >404 million confirmed cases, including at least 5.78 million deaths [10]. In the Philippines, there were >3.6 million confirmed cases of COVID-19 with >54,700 deaths in the same period [11]. Consequently, the COVID-19 pandemic has posed significant mental health challenges. Compared with natural disasters, the challenges brought about by the pandemic (e.g., mobility restrictions, job loss, school closures, uncertainty, etc.) are unprecedented and have caused a wider inimical impact (i.e., physical and emotional health, economy, etc.) on people's lives [12–15]. Across the globe, the prevalence of depression, anxiety, distress, and insomnia was found during the pandemic [13,16–20]. Recent studies have documented varying levels of depression, anxiety, fatigue, and distress among Filipino adolescents and adults [21–25]. The bidimensional model of mental health [26] proposed the necessity to examine mental health not only by looking into psychopathology but also by examining the well-being aspect or its positive dimension. Despite the call for a more balanced perspective on mental health, the literature on Filipinos' mental health during the COVID-19 outbreak remains focused mostly on its psychopathological aspects including depression (e.g. Ref. [21], anxiety [22,27], and distress [21,25], among others. We seek to address this limitation by focusing on the positive aspect of the mental health of Filipinos during multiple adversities.

1.3. Measurement of positive mental health

The comprehensive Mental Health Continuum-Long Form (MHC-LF) [28], a multidimensional measure, was developed to assess people's positive mental health. A few years later [2], Keyes and colleagues developed a brief and efficient 14-item measure of positive mental health called the Mental Health Continuum-Short Form (MHC-SF), using samples from South Africa [2]. They proposed that MHC-SF consists of three intercorrelated subscales including emotional (EWB), social (SWB), and psychological well-being (PWB). Since then, studies that aimed to validate the MHC-SF in different contexts and populations gradually emerged. For example, a substantial number of studies confirmed the intercorrelated three-factor structure of MHC-SF in special populations including youth in primary mental health service in Ireland [29] and earthquake survivors in Iran [30]. The same structure has been confirmed among Chinese [31], Dutch [32], and Kiwi adolescents [33], Canadian adolescents and adults [34], French Canadian young adults [35], and Serbian adults [36]. On the other hand, a number of studies found a valid bifactor model of MHC-SF, which consists of three latent factors and an overall latent factor of positive mental health among adolescents and adults in Denmark [37], adult women in Portugal [38], and in-patients with affective disorders and non-clinical samples in Greece [39]. A critical limitation in the literature is the dearth of studies that examine the factor structure of positive mental health using MHC-SF within the context of extreme adversities. An exemption is a study among earthquake survivors in Iran (see Ref. [30]). The current research aims to address this gap by investigating the factorial validity, criterion validity, and reliability of the MHC-SF among the survivors of typhoons Vamco and Goni that hit the Philippines at the peak of the COVID-19 crisis.

1.4. Antecedents of positive mental health

The literature identified several factors that contribute to positive mental health in times of disasters including resilience [40], social support [41], and government response [42], among others. Community resilience, or people's perception of the capacity of their wider community to recover from adversities [43,44], is known to be an important resource in times of disasters [45]. For instance, evidence shows that community resilience is associated with higher levels of well-being among Israeli adults four months after Israel's war in the Gaza Strip [46], and predicted absence of anxiety among displaced survivors of supertyphoon Haiyan, which hit the Philippines in 2013 [47].

Another important factor that facilitates positive mental health is social responsibility [48], or the extent to which a person adheres

to social rules and expectations with concern for the common good [49]. Past studies demonstrated that people with greater social responsibility reported higher levels of well-being [50]. Evidence also established a link between community resilience and social responsibility. For example, past studies showed that providing support to fellow community members was positively associated with community resilience during natural disasters [51] and terror attacks [52]. One noticeable limitation in the literature is the lack of studies examining community resilience, social responsibility, and positive mental health in one coherent model. The current study advances the literature by examining the mediating role of social responsibility in the positive association between community resilience and positive mental health and its dimensions among Filipinos within the context of multiple catastrophic disasters such as typhoons Vamco and Goni that hit the Philippines during the peak of the COVID-19 crisis.

1.5. The present research

Guided by the above-mentioned arguments, the present study aimed to examine the psychometric properties and antecedents of positive mental health of Filipinos within the context of the disasters caused by typhoons Vamco and Goni that subsequently hit the Philippines in November 2020, at the peak of the COVID-19 crisis. We reasoned the importance of examining positive mental health within the context of the above-mentioned extreme weather events during the COVID-19 crisis as typhoon disaster response and relief operations have been exceptionally challenging in consideration of precautionary protocols for the COVID-19 outbreak. To address the objectives of the study, three phases were employed. Phase 1 initially investigated the factor structure of the Mental Health Continuum-Short Form [2] to establish a viable measure of positive mental health among Filipinos in times of adversities. We compared three models including a single-factor model representing a unidimensional model of well-being (Model 1), a bifactor model representing three intercorrelated factors including EWB, SWB, PWB, and an overall latent factor of well-being (Model 2), and a three-factor model representing three intercorrelated but distinct latent factors of EWB, SWB, and PWB (Model 3). In Phase 2, we examined the criterion validity of MHC-SF by assessing its correlations with relevant measures including individual resilience, community resilience, and social responsibility. We also investigated internal consistency by calculating item reliability. Phase 3 examined the antecedents of positive mental health among Filipinos during the above-mentioned disasters. We tested a mediation model demonstrating how perceived social responsibility serves as an underlying mechanism that facilitates the positive impact of

Table 1
Demographic characteristics of the participants.

Demographic variables	*f*	%
Gender		
Males	132	29.53
Females	304	68.01
Did not report	11	2.46
Total	447	100
Age		
18–25	323	72.26
26–35	77	17.23
36–45	22	4.92
46–55	14	3.13
55–70	11	2.46
Total	447	100
Education		
High school graduates	17	3.80
Reached college	223	49.89
College graduates	172	38.48
Postgraduate	35	7.83
Total	447	100
Family income		
Much higher than average	71	15.88
Higher than average	196	43.85
Average	146	32.66
Lower than average	26	5.82
Much lower than average	8	1.79
Total	447	100
Residence type		
Rural	100	22.37
Suburban	96	21.48
Urban	251	56.15
Total	447	100
Participants with family members infected by COVID-19		
With infected family member/s	69	15.44
No infected family member/s	378	84.56
Total	447	100
Awareness of COVID-19 infection in the local community		
Aware	149	33.33
Not aware	298	66.67
Total	447	100

Note: *f* refers to the number of participants.

community resilience on the dimensions of positive mental health. Simply put, we put forward the following hypotheses:

Hypothesis 1. MHC-SF comprising 14 items will demonstrate a valid and reliable multidimensional measure of positive mental health among Filipinos.

Hypothesis 2. Social responsibility will mediate the positive influence of community resilience on emotional well-being.

Hypothesis 3. Social responsibility will mediate the positive influence of community resilience on social well-being.

Hypothesis 4. Social responsibility will mediate the positive influence of community resilience on psychological well-being.

2. Methods

2.1. Participants

A total number of 447 individuals (Mean age = 24.84, SD age = 9.27), with ages ranging from 18 to 70 years old, participated in the web-based survey. All participants were residing in the Philippines. Table 1 summarizes the demographic profile of the respondents.

2.2. Instruments

2.2.1. Positive mental health

The 14-item Mental Health Continuum-Short Form [2] was employed to assess the positive mental health of Filipinos within the context of typhoons Vamco and Goni and the COVID-19 crisis. MHC-SF has three subscales including emotional (3 items), social (5 items), and psychological well-being (6 items) rated through a 6-point scale (1 = *never* to 6 = *everyday*), with higher scores indicating greater levels of well-being for each subscale. Previous studies showed Cronbach's alpha coefficients indicating high reliability for the EWB, SWB, and PWB subscales among Dutch ($\alpha = 0.80$ to $\alpha = 0.83$ [32]; and Chinese adolescents ($\alpha = 0.83$ to $\alpha = 0.92$; [31], and Iranian earthquake survivors ($\alpha = 0.83$ to $\alpha = 0.88$; [30]. The psychometric properties of MHC-SF in the present study were presented in the Results section of this paper.

2.2.2. Individual resilience

The 10-item Connor-Davidson Resilience Scale (CD-RISC 10) was utilized to evaluate the participants' capacity to recover from adversities [53,54]. Participants rated each item (e.g., "*Under pressure, I focus and think clearly*") on a 5-point scale (0 = *Not true at all times* to 4 = *True nearly all of the time*), with higher scores indicating greater levels of individual resilience. CD-RISC 10 has demonstrated a stable single-factor structure based on adult samples in China [55] and non-professional caregivers in Spain [56]. Previous research showed that CD-RISC 10 has a high internal consistency ($\alpha = 0.86$) among Spanish adults [56]. Past studies used the CD-RISC 10 as a valid measure of individual resilience among Filipino adults [21]. In the present study, confirmatory factor analysis (CFA) solution of the CD-RISC 10 showed an adequate data-model fit for a modified single-factor model ($\chi^2 = 114.01$, $df = 33$, $p < .001$, CFI = 0.94, TLI = 0.92, RMSEA [90% CI] = 0.07 [0.06, 0.08], SRMR = 0.04), with strong item factor loadings (λ) ranging from 0.41 to 0.60. We allowed error terms of items 1 and 2 as well as items 7 and 8 to correlate to improve model fit. Cronbach's alpha and McDonald's omega coefficients of CD-RISC 10 were $\alpha = 0.92$ and $\omega = 0.92$, respectively.

2.2.3. Community resilience

The Conjoint Community Resilience Assessment Measure (CCRAM-10) is a 10-item test utilized to assess Filipinos' perception of the capacity of their local community to recover from adversities [44]. Participants rated the items (e.g., "*I can count on people in my community to help me in a crisis, including the current typhoon.*") using a 5-point scale (1 = *strongly disagree* to 5 = *strongly agree*), with higher scores indicating greater levels of community resilience. Recent studies demonstrated Cronbach's alpha coefficients of CRAMM-10 among Chinese [57] and Filipinos [58] with $\alpha = 0.85$ and $\alpha = 0.90$, respectively. In the current study, CFA solution of the CRAMM-10 yielded an acceptable data-model fit for a modified single-factor model ($\chi^2 = 126.75$, $df = 33$, $p < .001$, CFI = 0.93, TLI = 0.91, RMSEA [90% CI] = 0.07 [0.06, 0.08], SRMR = 0.05), with strong item factor loadings ranging from 0.41 to 0.67. To improve the model fit, error terms of items 1 and 6 as well as items 9 and 10 were allowed to correlate. The overall reliability coefficients of CCRAM-10 were $\alpha = 0.87$ and $\omega = 0.88$.

2.2.4. Social responsibility

The 7-item Perceived Social Responsibility Scale (PSRS) [59] was used to measure the extent to which a person adheres to social rules and expectations with concern for the common good. A sample item is: *"I am able to demonstrate socially responsible characteristics."* Participants' responses were measured on a 5-point Likert scale, ranging from 1 = *not at all true* to 5 = *really true,* with higher scores reflecting greater levels of social responsibility. In the original study, the internal consistency of the scale was strong ($\alpha = 0.87$), suggesting high internal consistency of the PSRS items. Previous studies used the PSRS as a valid tool measuring social responsibility in Filipino adolescents and adults [60]. In the current study, CFA of the PSRS items demonstrated an adequate model fit for a modified single-factor model ($\chi^2 = 44.82$, $df = 11$, $p < .001$, CFI = 0.97, TLI = 0.94, RMSEA [90% CI] = 0.08 [0.06, 0.10], SRMR = 0.03), with strong item factor loadings ranging from 0.40 to 0.60. Error terms of items 2 and 3, items 3 and 7, and items 4 and 5 were allowed to correlate to improve model fit. The Cronbach's alpha and McDonald's omega coefficients of the scale were $\alpha = 0.84$ and $\omega = 0.84$, respectively.

2.3. Procedures

The data collection was implemented between November 1–15, 2020 when typhoons Goni and Vamco hit the Philippines. Informed

consent was obtained from the participants prior to data collection. Participants were informed about the anonymity and confidentiality of their data. All participants were also informed about their right to withdraw from the study at any point and were reminded that they can contact the researchers, who consist of medical and mental health professionals, in case they experience psychological distress due to their participation in the study. No participants reported any distress associated with their participation. After securing the informed consent, the participants completed an online questionnaire containing measures of positive mental health, individual and community resilience, social responsibility, and demographic questions. This study was approved by the administration of Cavite State University-General Trias Campus. All procedures complied with ethical principles for research with human participants consistent with the 1964 Helsinki Declaration and its later amendments and comparable ethical standards.

2.4. Controlled variables

Guided by previous studies, information on socio-demographic variables such as age, gender, income, religiosity, presence of COVID-19 infection in the family, and awareness of COVID-19 cases in one's local community were collected to control for their effects on well-being. Past research found that age was significantly associated with well-being in adults [61]. Using worldwide datasets, previous research found that women experience higher levels of well-being than men [62]. Moreover, income was found to be associated with well-being, happiness, and life satisfaction [63]. Additionally, those who perceived themselves to be internally religious experienced greater well-being [64]. Lastly, having family members with COVID-19 infection and awareness of COVID-19 cases in the community were found to be associated with people's psychological response to the pandemic [17,21,58].

2.5. Data analysis

To address the objectives of the study, we implemented three phases of data analysis using Mplus [65]. For each phase, we conducted a preliminary analysis to determine descriptive statistics and normality distribution of the variables (i.e., MHC-SF items in Phase 1, criterion variables in Phase 2, and path analysis variables in Phase 3).

In Phase 1, we examined the structural validity of the MHC-SF through confirmatory factor analysis. Initially, the single-factor solution (Model 1) representing a unidimensional model of well-being was tested by analyzing all the 14 items of MHC-SF as one factor. Next, we examined the factorability of MHC-SF through a bifactor model (Model 2) characterized by three intercorrelated latent factors (i.e., EWB, SWB, and PWB) and an overall well-being factor. Lastly, we examined the three-factor model of MHC-SF (Model 3) by structuring the items as indicators of three intercorrelated latent factors (i.e., EWB, SWB, and PWB). To assess the goodness of data-model fit, we utilized Tucker-Lewis index (TLI) and comparative fit index (CFI) values between 0.90 and 0.95. In addition, we utilized standardized root mean square residual (SRMR) and root mean square error approximation (RMSEA) values of < 0.08 as criteria for an adequate model fit. TLI and CFI values > 0.95, and SRMR and RMSEA values < 0.05 were criteria for a good model fit [66,67]. Moreover, factor loadings of $\lambda \geq 0.30$ for a large sample were considered as strong [68]. Following CFA, descriptive statistics, normality distribution, and reliability of the MHC-SF factors were computed. Reliability was estimated in terms of Cronbach's alpha (α) and McDonald's omega (ω). A coefficient of $\geq$. 70 was considered to indicate high reliability.

In Phase 2, we explored the correlations of MHC-SF subscales with existing measures of individual resilience, community resilience, and social responsibility to examine potential support for criterion validity. We employed bivariate correlations using *Pearson r* to assess the associations between MHC-SF's EWB, SWB, and PWB subscales and the above-mentioned relevant variables. The size of correlation coefficients (r) was interpreted using these criteria: 0.00–0.09 = negligible, 0.10–0.29 = small, 0.30–0.49 = moderate, $\geq$ 0.50 = large [68].

In Phase 3, path analysis through structural equation modeling (SEM) was used to examine the direct effect of community resilience on the three latent factors of MHC-SF (i.e., EWB, SWB, and PWB). SEM was utilized as it allows testing of causal relationships of latent and observed variables while taking into account the measurement errors in the analysis [69]. More importantly, we examined the indirect and total effects of community resilience on EWB, SWB, and PWB via perceived social responsibility using bootstrapping procedures with 5000 bootstrap samples [70].

3. Results

3.1. CFA of MHC-SF

CFA was conducted using maximum likelihood estimator [65]. We examined three competing models to determine data-model fit. Model 1 structured the MHC-SF items as a single-factor representing a unidimensional model of positive mental health. Model 2 structured a bifactor model of positive mental health with three correlated latent factors (i.e., EWB, SWB, and PWB) and an overall factor of positive mental health. Model 3 structured the MHC-SF items as indicators of the intercorrelated three factors (i.e., EWB, SWB, and PWB). Table 2 summarizes the model fit indices of the three competing models. CFA results of Model 1 indicated sub-optimal

Table 2
Goodness of fit of the models.

Models	X^2	*df*	CFI	TLI	RMSEA (90% CI [LL-UL])	SRMR
Model 1 (Single-factor)	485.73	77	.84	.81	.11 (.10, .11)	.07
Model 2 (Bifactor)	128.57	57	.97	.95	.05 (.04, .06)	.04
Model 3 (Three-factor)	208.57	74	.95	.93	.06 (.05, .07)	.04

Note: CFI = comparative fit index, TLI = Tucker-Lewis index, RMSEA = root mean square error approximation, SRMR = root mean square residual, CI = confidence interval, LL = lower limit, UL = upper limit.

model fit. Results of CFA of Model 2 indicated good model fit but showed several items with weak loadings (i.e., <0.40) and some items with factor loadings >1.05. Model 3 results indicated a good model fit, with strong factor loadings for all items, ranging from $\lambda = 0.58$ to $\lambda = 0.93$. We note that no modifications were done to improve the data-model fit of Model 3. Given that Model 3 has more acceptable results for both fit indices and factor loadings compared to Models 1 and 2, we concluded that Model 3 is the best model of MHC-SF in this study. Table 3 presents the psychometric properties of the three-factor model.

3.2. Descriptive statistics and reliability of MHC-SF

At the item level, Table 4 summarizes the normality estimates and inter-item correlations. Cronbach's alpha item reliability (if item deleted) was consistently between $\alpha = 0.74$ to $\alpha = 0.76$ for EWB, $\alpha = 0.70$ to $\alpha = 0.75$ for SWB, and $\alpha = 0.80$ to $\alpha = 0.83$ for PWB, suggesting that all the items of MHC-SF were equally good indicators of positive mental health in Filipinos. At the latent level, Table 5 presents the descriptive statistics of MHC-SF. Skewness and kurtosis values suggested an approximately normal distribution for the EWB, SWB, and PWB subscales of MHC-SF. Moreover, factor intercorrelations were in the hypothesized direction, ranging from $r = 0.50$ to $r = 0.67$, suggesting that the MHC-SF subscales are related but distinct well-being constructs. In terms of reliability, both Cronbach's alpha coefficient and McDonald's omega values were consistently high for EWB ($\alpha = 0.82$, $\omega = 0.82$), SWB ($\alpha = 0.78$, $\omega = 0.77$), and PWB ($\alpha = 0.84$, $\omega = 0.84$) subscales.

3.3. Bivariate correlation of MHC-SF with relevant measures

We examined the evidence for the criterion validity of MHC-SF through bivariate correlations of MHC-SF latent factors and relevant variables. As summarized in Table 6, MHC-SF subscales were significantly associated with relevant observed variables. Specifically, the MHC-SF EWB, SWB, and PWB subscales were significantly and positively correlated with individual resilience, community resilience, and social responsibility, with correlation coefficients ranging from $r = 0.15$ to $r = 0.48$, providing support for criterion validity. We note that we are only interested in investigating individual resilience as a criterion measure in Phase 2. Hence, it was not part of the mediation hypothesis in Phase 3.

3.4. Mediation analysis

As presented in Fig. 1, the results of path analysis found support for Hypothesis 2 and 4 as social responsibility fully mediated the positive influence of community resilience on both EWB and PWB. Moreover, the results found partial support for Hypothesis 3 as social responsibility partially mediated the positive influence of community resilience on SWB. In other words, community resilience positively predicted social responsibility, and in turn, social responsibility positively predicted EWB, SWB, and PWB. In addition, significant total effects were found for SWB (total effect = 0.38, $SE = 0.07$, $p < .001$, 95% CI [0.24, 0.52]) and PWB (total effect = 0.22, $SE = 0.06$, $p < .001$, 95% CI [0.09, 0.34]) but not for EWB (total effect = 0.11, $SE = 0.06$, $p =$ ns, 95% CI [-0.01, 0.24]). EWB, SWB, and PWB subscales were allowed to covary. Age, gender, income, religiosity, living with family members infected by COVID-19, and awareness of COVID-19 cases in one's community were set as covariates to control for their effects.

Taken together, the results provided support for all the four hypotheses proposed in this study.

4. Discussion

The objectives of the current research were to examine the psychometric properties of MHC-SF and to determine the community antecedents of its subscales (i.e. EWB, SWB, and PWB) among the survivors of typhoons Vamco and Goni that hit the Philippines during the COVID-19 crisis. Overall, we found support for the structural validity, criterion validity, and internal consistency of the MHC-SF

Table 3
CFA standardized factor loadings (λ) of the Mental Health Continuum-Short Form items.

Items (During the past month, how often did you feel …)	EWB Subscale (λ)	SWB subscale (λ)	**PWB subscale (λ)**	SE	z	95% CI LL- UL
1. happy.	.62			.04	17.57	.56–.69
2. interested in life.	.72			.04	17.85	.64–.80
3. satisfied with life.	.87			.05	19.37	.78–.96
4. that you had something important to contribute to society.		.72		.06	12.15	.61–.84
5. that you belonged to a community (like a social group, or your neighborhood).		.75		.06	11.69	.62–.87
6. that our society is a good place, or is becoming a better place, for all people.		.85		.05	16.90	.75–.85
7. that people are basically good.		.69		.05	12.51	.58–.80
8. that the way our society works makes sense to you.		.92		.05	17.59	.82–1.02
9. that you liked most parts of your personality.			.84	.05	18.02	.75–.94
10. good at managing the responsibilities of your daily life.			.75	.05	16.04	.66–.84
11. that you had warm and trusting relationships with others.			.60	.04	13.52	.52–.69
12. that you had experiences that challenged you to grow and become a better person.			.58	.05	11.93	.48–.67
13. confident to think or express your own ideas and opinions.			.79	.05	15.93	.69–.88
14. that your life has a sense of direction or meaning to it.			.93	.05	18.24	.83–1.03

Note: All items were significant at $p < .001$, EWB = emotional well-being, SWB = social well-being, PWB = psychological well-being, CI = confidence interval, LL = lower limit, UL = upper limit, SE = standard error.

Table 4
Normality estimates, reliability if deleted, and inter-item correlations of the Mental Health Continuum-Short Form items.

Items (During the past month, how often did you feel …)	Skewness	Kurtosis	Cronbach's alpha if deleted	1	2	3	4	5	6	7	8	9	10	11	12	13
1. happy.	-.75	1.07	.76	–												
2. interested in life.	-.48	-.11	.74	.60*	–											
3. satisfied with life.	-.65	.30	.74	.61*	.61*	–										
4. that you had something important to contribute to society.	-.04	-.88	.75	.31*	.38*	.39*	–									
5. that you belonged to a community (like a social group, or your neighborhood).	-.18	-.90	.75	.29*	.27*	.29*	.49*	–								
6. that our society is a good place, or is becoming a better place, for all people.	.10	−1.41	.71	.34*	.33*	.34*	.39*	.40*	–							
7. that people are basically good.	-.52	-.33	.76	.29*	.30*	.33*	.28*	.29*	.40*	–						
8. that the way our society works makes sense to you.	.08	−1.15	.70	.28*	.27*	.30*	.38*	.38*	.63*	.49*	–					
9. that you liked most parts of your personality.	-.65	.05	.80	.50*	.50*	.54*	.39*	.29*	.38*	.37*	.40*	–				
10. good at managing the responsibilities of your daily life.	-.76	.68	.81	.41*	.30*	.47*	.29*	.19*	.35*	.35*	.36*	.58*	–			
11. that you had warm and trusting relationships with others.	-.85	.51	.82	.40*	.35*	.47*	.30*	.32*	.28*	.36*	.27*	.44*	.44*	–		
12. that you had experiences that challenged you to grow and become a better person.	-.60	-.26	.83	.29*	.35*	.34*	.29*	.24*	.22*	.28*	.27*	.36*	.32*	.40*	–	
13. confident to think or express your own ideas and opinions.	-.39	-.45	.80	.36*	.36*	.42*	.33*	.28*	.33*	.34*	.36*	.52*	.48*	.46*	.45*	
14. that your life has a sense of direction or meaning to it.	-.32	-.78	.80	.45*	.51*	.52*	.35*	.28*	.44*	.35*	.46*	.55*	.53*	.40*	.47*	.55*

Note: *$p < .001$.

Table 5
Distribution and reliabilities of MHC-SF subscale scores.

MHC-SF Subscales	Mean	SD	Skewness	Kurtosis	ω	α
Emotional well-being	459	.82	-.47	-.08	.82	.82
Social well-being	3.67	.89	.01	-.84	.77	.78
Psychological well-being	4.40	.82	-.45	-.22	.84	.84

Note: SD = standard deviation, ω = McDonald's omega, α = Cronbach's alpha.

Table 6
Descriptive statistics, reliability, and Pearson's correlations of relevant measures with MHC-SF subscales.

Measures	MHC-SF EWB	MHC-SF SWB	MHC-SF PWB	Mean (SD)	Skewness	Kurtosis	ω	α
Individual Resilience	.38*** (CI = .30, .46)	.26*** (CI = .17, .34)	.48*** (CI = .40, .55)	3.87(.54)	-.25	.20	.85	.84
Community Resilience	.15*** (CI = .06, .24)	.32*** (CI = .23, .40)	.23*** (CI = .14, .32)	3.52(.59)	-.15	-.08	.86	.85
Perceived Social Responsibility	.20*** (CI = .11, .29)	.28*** (CI = .19, .36)	.33*** (CI = .24, .41)	3.97(.55)	-.36	.10	.83	.83

Note: EWB = emotional well-being, SWB = social well-being, PWB = psychological well-being, SD = standard deviation, ω = McDonald's omega, α = Cronbach's alpha, CI = 95% confidence interval. Coefficients in **bold** represent indirect effects. ***$p < .001$.

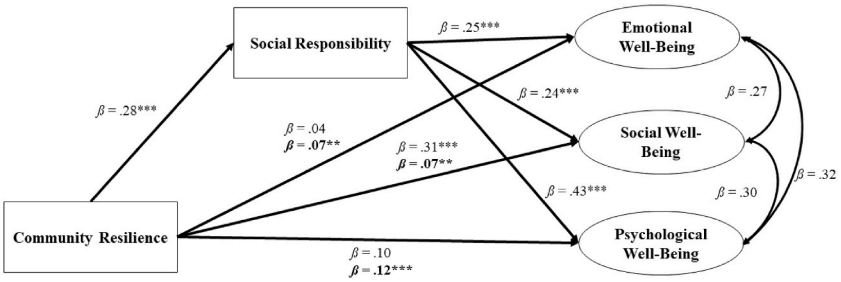

Fig. 1. Final model demonstrating the influence of community resilience on positive mental health via social responsibility.

items in assessing positive mental health in Filipinos. In addition, our findings confirmed that social responsibility mediates the positive influence of community resilience on the three subscales of positive mental health among Filipinos within the contexts of extreme weather events occurring during the COVID-19 pandemic.

4.1. Validity findings of MHC-SF

The first aim of this study was to examine the structural validity of the MHC-SF using Filipino participants. Initial CFA results provided support for a stable correlated three-factor model that replicated the original intercorrelated three-factor solution of MHC-SF based on data from South African samples [2]. All 14 items loaded substantially on their hypothesized latent factors of EWB, SWB, and PWB, indicating that the items are valid in capturing relevant information to describe the latent factors of positive mental health. In addition, our findings demonstrated that compared to the single-factor and bifactor models, the intercorrelated three-factor model of MHC-SF is the best model based on two criteria: 1) adequate data-model fit indices and 2) stable factor loadings. It is noteworthy that despite the bifactor model having a better overall data-model fit, we concluded that the three-factor model is a more robust model of MHC-SF as it has met both the two above-mentioned criteria. Taken together, the intercorrelated three-factor model verified in MHC-SF supports the conceptualization of positive mental health that consists of interrelated but distinct dimensions [2,33]. With a viable structural validity established in this study, the MHC-SF can be convincingly used in robust causal analyses such as mediation analysis [71]. Lastly, our findings provided support for the criterion validity of MHC-SF by establishing significant correlations with relevant measures of individual resilience, community resilience, and social responsibility.

Substantial previous research focused on examining the structural validity of MHC-SF in a general context using adolescent and adult samples (e.g., Refs. [31,34]. Our study makes a significant contribution in validating MHC-SF in the context of extreme weather events such as typhoons that occurred during the COVID-19 pandemic, which made disaster responses exponentially difficult. Thus, MHC-SF can be used as a brief and psychometrically sound instrument in assessing people's well-being within the contexts of multiple crises at the local and global levels.

4.2. Antecedents of positive mental health in times of adversities

We found support for Hypothesis 2 and 4 as social responsibility fully mediated the positive impact of community resilience on EWB and PWB among the survivors of typhoons Vamco and Goni during the peak of the COVID-19 crisis in the Philippines. This is noteworthy since community resilience and social responsibility are crucial elements in helping people cope with life-threatening

events [72–74] as collective actions can facilitate the survival of communities [75,76]. Our findings provided support to past research on the critical role of social responsibility and community resilience on people's well-being in times of disasters. For instance, community resilience was positively associated with the well-being of Israeli adults who have been threatened by missile attacks [46]. Research on local communities in Australia emphasized that the resilience of a community boosts people's psychological well-being [77]. Another line of evidence showed that social responsibility was found to help people cope during natural disasters [78]. Since the Philippines is a disaster-prone country where people constantly experience natural disasters like extreme typhoons [79], constant exposure to disastrous calamities over time may have provided Filipinos with opportunities to develop collective strategies in responding to extreme typhoons [40,80,81].

Confirming Hypothesis 3, our findings revealed that social responsibility partially mediated the positive link between community resilience and social well-being. In other words, individuals who perceive their local community as showing solidarity in times of disaster, and capable of withstanding great adversities, are more likely to develop a strong sense of responsibility to assist fellow community members, which in turn contributes to their sense of social connection with others and personal satisfaction. We explain that socially-oriented factors such as community resilience and social responsibility are strong factors that contribute to the mental health of individuals in a collectivistic country like the Philippines [82–86]. In addition, Filipinos engage in culturally collective practices that historically allowed them to withstand different adversities as a community. For instance, two of the culturally ingrained practices that use collective action in times of need and emergency are the Filipino concepts of *bayanihan* and *damayan. Bayanihan* is an ancient Filipino custom that involves collectively assisting one's family, friends, neighbors, and fellow members of the wider community in times of emergency or great need [87]. On the other hand, *damayan* is a community's sense of social responsibility and solidarity through compassion, which is demonstrated when showing support and providing help to another community member in need [88]. Filipinos' sense of *bayanihan* and *damayan* have been observed to manifest in calamity contexts including when facing typhoons [88,89] and when dealing with the COVID-19 pandemic [90,91].

In summary, the present study contributed to the literature in several important ways. First, this study established the structural validity, criterion validity, and reliability of MHC-SF, as a viable tool in assessing the positive mental health of Filipinos during extreme weather events and global health crises. Second, the current research filled the gap in the literature by demonstrating that social responsibility serves as a significant mechanism that mediates the positive impact of community resilience on the domains of well-being among the survivors of typhoons Vamco and Goni, which hit the Philippines at the peak of the COVID-19 crisis. Third, while most studies focused on the negative aspects of people's mental health (e.g., depression, anxiety, and stress) during the COVID-19 crisis (e.g. Refs. [21,25,92]), our findings extended the literature by examining the psychometric properties and predictors of positive mental health among individuals facing the challenges caused by COVID-19 pandemic and natural disasters. The bidimensional model of mental health [26] emphasized that mental health consists not only of psychopathological symptoms (negative mental health) but also of flourishing well-being [93]. Lastly, this study demonstrated the importance of assessing well-being among individuals who face multiple crises and disasters.

4.3. Implications

The current findings provide meaningful and relevant insights for community policies promoting positive mental health in times of great adversities. First, our findings indicate that MHC-SF is a valid and reliable tool in assessing EWB, SWB, and PWB of Filipinos in times of multiple disasters. Disaster responders may utilize MHC-SF as a screening tool in identifying survivors with diminished levels of positive mental health, and can be utilized as a basis for providing appropriate psychological interventions. Second, the current findings demonstrated that community resilience is an important promoting factor of positive mental health in times of calamities. National and local governments in the Philippines may give further attention to strengthening the citizens' solidarity and disaster preparedness of local communities during extreme typhoons especially in times of global health crises like the COVID-19 pandemic. Our findings indicate that people tend to have better mental health when they perceive their local community as capable of withstanding disasters. Third, our findings showed that people who have a strong perception of social responsibility develop greater levels of emotional, social, and psychological well-being. Community programs and interventions that aim to educate residents about the value of social responsibility may be implemented. Our findings highlight that having a greater sense of social responsibility in times of adversities facilitates positive mental health. Putting together, the present study provided relevant scientific insights that may be used as bases in designing and implementing policies and programs that promote mental health in times of great disasters.

4.4. Limitations and future directions

The limitations of the present study offer opportunities for future research.

First, the current research only focused on positive mental health during the typhoons and COVID-19 crisis. Future studies may concurrently examine both positive and negative aspects of mental health (e.g., distress) as suggested by the bidimensional model of mental health [26]. Second, the participants in the study were mostly early adults. Future studies may consider focusing on the mental health of children and older adults as they may have developmentally unique coping strategies in times of adversities [40,80,81]. Third, the present study employed a quantitative approach to examining the promoting factors of positive mental health. Studies in the future may utilize qualitative approaches to gain an in-depth understanding of the community-level factors that facilitate well-being during great adversities. Lastly, the data were collected through an online survey, limiting its scope only among Filipinos with access to stable internet. Thus, the current findings have limited generalizability. Future studies may use a combination of online and direct administration of surveys to a wider range of participants. Nonetheless, the present study offers valuable insights in assessing positive mental health and determining its antecedents within the context of typhoons occurring during a global health crisis.

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Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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