

Investigation into public anxiety symptoms and preventive measures during the COVID-19 outbreak in Taiwan

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Abstract

Background: The objective of this study was to investigate anxiety symptoms and preventive measures being taken against COVID-19. The study also aimed to compare the association between preventive measures and anxiety symptoms during the week immediately preceding the study and those symptoms and measures at the beginning of the outbreak.

Methods: A cross-sectional population survey using an online questionnaire commenced on 14 February 2020. The study participants were residents of Taiwan and were aged between 20 and 70 years. The 6-item state version of the State–Trait Anxiety Inventory (STAI-6) was used to assess anxiety symptoms. The questions about preventive measures asked participants about their personal protection, cough etiquette, contact precautions, voluntary quarantine, and prompt reporting.

Results: Of a total of 3,555 completed responses, a total of 52.1% (95% Confidence Interval [CI] 50.4–53.7) of the respondents reported having moderate to severe levels of anxiety symptoms in the past week, whereas 48.8% (95%CI 47.2–50.5) reported that they had had moderate to severe levels of anxiety symptoms at the beginning of the outbreak. The median scores for anxiety symptoms in the past week and at the beginning of the outbreak were 46.7 (IQR [Interquartile Range] 36.7–53.3) and 43.3 (IQR 36.7–53.3), respectively. The median scores for the preventive measures taken in the past week and at the beginning of the outbreak were 26.0 (IQR 21.0–30.0) and 24.0 (IQR 19.0–28.0), respectively, out of a maximum score of 36. In the multivariate analysis, having an increased anxiety symptom score from the beginning of the outbreak to the past week (adjusted OR = 7.38, 95%CI 6.28–8.66) was a strongly significant determinant of having an increased preventive measures score in the past week compared with score at the beginning of the outbreak.

Conclusions: The study reveals the need to reduce levels of public anxiety and to maintain appropriate levels of infection prevention against COVID-19. The psychological effects and psychobehavioural responses to the outbreak found in this study provide important information about developing and implementing effective preventive and emotional regulation control strategies.

Background

On 9 January 2020, a novel coronavirus was detected as the causative agent linked to cases of pneumonia reported in Wuhan, and the genome sequence was made public [1]. Subsequently, the rapid spread of the outbreak across Wuhan and, at a later date, outside mainland China prompted the Chinese government to take immediate action to carry out a lockdown of the epicentre and several nearby cities in the province of Hubei. *The rapid* spread of the novel coronavirus has caused much anxiety and stigma and, on 11 February 2020 the World Health Organization (WHO) declared that the official name for the new coronavirus disease was COVID-19 [2].

The severity and highly contagious nature of *COVID-19* has sparked concern worldwide and especially in the countries neighbouring China. The close proximity of Taiwan to China, coupled with the high frequency of cross-border travel, has placed Taiwan as one of the most highly threatened countries, among the other neighbouring countries in Asia, in relation to a *COVID-19* outbreak. The Taiwanese government has raised the levels of alert and worry about a potential *COVID-19* outbreak in the country. The country has also issued an advisory warning against travel to China. At a later date, various measures were undertaken by the Taiwan government to contain the spread of the *COVID-19* virus, including travel bans, and quarantine for those who have recently been to China and who have had close contact with confirmed cases of *COVID-19*. Despite these measures, the first case of *COVID-19* in Taiwan was reported on 21 January 2020. On 8 February, the number of confirmed cases in Taiwan had increased to 18. On 16 February, the first coronavirus death was reported in Taiwan, and the total number of confirmed cases was 20. The first death, from a locally transmitted case in Taiwan, also marked the fifth fatality outside mainland China [3]. Taiwan has been listed by the Centers for Disease Control and Prevention as one of the countries with an apparent community spread [4].

The *COVID-19* outbreak threatens not only the life of those infected but also the psychological health of the affected community [5]. The *lessons learned from previous outbreaks such as Ebola, severe acute respiratory syndrome (SARS) and the 2009 influenza A (H1N1)* have led to worldwide recognition of the importance of addressing morbidities related to mental health associated with the outbreak [6-9]. The impact of such morbidities during a disease outbreak is crucial, not only because it results in a significant weakening in social and other areas of functioning, including an impairment in preventive measures [10,11], but also because excessive mental distress may have a number of biological effects, including reduced cell-mediated immunity and increased inflammatory processes [12,13]. As the preliminary evidence suggests that older adults, and people with underlying health conditions or compromised immune systems, might be at higher risk of mortality with *COVID-19* [14], it is important for the general population to reduce the distress associated with the outbreak in order to maintain a strong immune system and thus reduce the risk of infection.

Considering the strong psychological effect of the *COVID-19* outbreak, it is tremendously important to assess the lay public's psychobehavioural response to the outbreak in order to develop and implement effective preventive and emotional regulation control strategies. An important element of outbreak management is the appropriate psychobehavioural response to preventive measures to minimize the spread of infection. Experiences from the previous **SARS epidemic** underline the importance of appropriate behavioural responses in controlling an epidemic [15,16].

Because of the importance of determining the level of psychological distress and understanding the psychobehavioural consequences of *COVID-19* among the general public while the epidemic is still ongoing, the objective of this study is to investigate the anxiety symptoms among the general public caused by *COVID-19*, and assess the measures they are taking against *COVID-19*. In particular, this study aims to compare the anxiety symptoms and preventive measures during the week immediately prior to

the study, while the outbreak was still on the rise, and at the time the COVID-19 outbreak as first reported in China.

Methods

Study design and participants

We commenced a cross-sectional, web-based anonymous survey using an online questionnaire on 14 February 2020. The inclusion criteria were that the respondents were Taiwan residents who were between 20 and 70 years old. Participants were informed that their participation was voluntary, and consent was implied on completion of the questionnaire. In this online survey, consent obtained from the participants was verbal and the Institutional Review Board has waived written (signed) consent. Our survey ended on 16 February 2020, immediately after the report of the first death from the COVID-19 virus in Taiwan.

If your IRB has waived **written** (signed) **consent**,

Procedures

The snowballing sampling technique was used to recruit the participants. The researchers used social networks, namely Facebook and LINE (the most popular messaging app in Taiwan) to circulate the survey link to all members of their contact lists. When participants anonymously completed the survey, they were encourage to disseminate the survey link to all their contacts with a thank note at the end. The participants were informed that their participation was voluntary, and consent was implied through their completion of the questionnaire. The questionnaire was developed in English and was then translated into Mandarin. Local experts validated the content of the questionnaire, after which it was pilot tested. The survey consisted of three sections, which assessed 1) demographic background, 2) anxiety symptoms, and 3) preventive measures.

Anxiety symptoms

The 6-item state version of the State–Trait Anxiety Inventory (STAI-6) assessing anxiety symptoms that was used in this study was adapted from previous studies [17,18]. The participants rated the frequency of experiencing six emotional states, namely being calm, tense, upset, relaxed, content, and worried, in relation to the current COVID-19 outbreak. A 4-point scale was used (1 = not at all, 2 = somewhat, 3 = moderately, 4 = very much). The scores on the three positively-worded items were reverse coded. The participants were asked to rate each of the anxiety symptoms during the *past week* (PW) and during the *beginning of the outbreak* (BO). The anxiety symptoms during the PW are defined as the anxiety level between 8 February and the time of the survey. The anxiety level during the BO is defined as the anxiety symptoms experienced from the date of the Wuhan lockdown (23 January 2020) until 8 February 2020. The total summed scores were prorated (multiplied by 20/6) in order to obtain scores that were comparable with those from the full 20-item STAI (giving a range from 20 to 80) [17]. A cut-off score of 44 was used to indicate moderate to severe symptoms [10,19,20].

Preventive measures

Questions assessing preventive measures was developed for this study (Appendix 1). Preventive measures were assessed using questions that asked the participants about their personal protection (four items), cough etiquette (four items), contact precautions (two items), voluntary quarantine (one item), and prompt reporting (one item). The response option was on a 4-point Likert scale, with the items scored as 0 (rarely), 1 (occasionally), 2 (often), or 3 (always). The participants were asked to answer each question about the preventive measures they had carried out during the PW and during the BO. As with the anxiety levels, the preventive measures during the PW are defined as preventive measures carried out between 8 February and the time of the survey, and preventive measures during the BO are the measures carried out from the date of the Wuhan lockdown (23 January 2020) until 8 February 2020. The total score for the preventive measures is obtained by summing across all the questions. The possible score ranges from 0 to 36, with higher scores indicating more preventive measures.

Ethical considerations

This study protocol was approved by the Research Ethics Committee of the National Taiwan Normal University (no. 202002HS007).

Statistical analyses

The reliability of the anxiety symptoms and preventive measure scores was evaluated by assessing the internal consistency of the items representing the scores. The 12 items for preventive measures had a reliability (Cronbach's α) of 0.891. Multivariable logistic regression was used to determine the factors influencing an increase in the preventive measures score from the beginning of the outbreak to the past week. Variables that were significant using a chi-square (χ^2) test were selected for multivariate logistic regression analysis and included in the model, using a simultaneous forced-entry method. Odds ratios (OR), 95% confidence intervals (95%CI), and p values were calculated for each independent variable. The model fit was assessed using the Hosmer–Lemeshow goodness-of-fit test [21]. All statistical analyses were performed using the Statistical Package for the Social Sciences, version 20.0 (IBM Corp., Armonk, NY, USA). A $p <$ value of less than 0.05 was considered statistically significant.

Results

Of a total of 3,555 complete responses, the majority were from the North district of Taiwan (66.3%), were from females (78.2%), and were from respondents aged 31-40 years (36.9%) or 41-50 years (28.4%). A summary of the characteristics of the respondents is provided in the first and second columns of Table 1.

Anxiety symptoms

Using a cut-off score of 44 for the STAI score, a total of 52.1% (95%CI 50.4–53.7) of the respondents reported moderate to severe levels of anxiety symptoms in the PW, whereas 48.8% (95%CI 47.2–50.5)

reported moderate to severe levels of anxiety symptoms in the (BO) (Table 1). The highest proportions of moderate to severe cases of anxiety in the PW were observed in the 31-40 years age group (57.1%; 95%CI 54.4–59.8), among women (55.2%; 95%CI 53.4–57.1), among those with an education level of high school and below (56.0%; 95%CI 49.6–62.2), and among respondents from the North district (53.1%; 95%CI 51.1–55.1). Respondents with an average household income of below NT\$20,000 (54.4%; 95%CI 50.1–58.6) and those with an average household income between NT\$20,000 and NT\$50,000 (54.4%; 95%CI 51.8–56.9) showed a similar proportion of moderate to severe cases of anxiety in the PW.

The highest proportion of moderate to severe cases of anxiety during the BO were observed in those aged 31-40 years (53.7%; 95%CI 51.0–56.4), females (51.9%; 95%CI 50.0–53.7), those with a college education level (51.2%; 95%CI 49.1–53.4), and respondents with a household income between NT\$20,000 and NT\$50,000 (51.6%; 95%CI 49.0–54.2). Among respondents from the North (49.4%; 95%CI 47.3–51.4) and Central (49.7%; 95%CI 45.8–53.7) districts there was a very similar proportion of moderate to severe cases of anxiety during the BO. On the whole, those in the older age group, males, those whose highest educational level was a degree and above, those in the higher income group and those in the South and East districts reported a lower level of anxiety symptoms during both the PW and the BO.

A comparison of the proportion of moderate to severe cases of anxiety during the PW and the BO revealed that significantly the highest increase in the proportion of moderate to severe cases of anxiety was among those in the 41-50 years age group (5.2%; 95%CI 4.0–6.7). In contrast, among the respondents in the 20-30 year age group there was a decrease in the proportion with moderate to severe anxiety (-2.8%; 95%CI -9.2–3.6). The group of female participants showed a significantly higher increase in the proportion of moderate to severe cases of anxiety (3.3%; 95%CI 2.7–4.1) than the group of male participants (2.7%; 95%CI 1.8–4.1). The respondents whose highest educational level was high school or below (6.0%; 95%CI 3.7–9.7) and those in the income group below NT\$20,000 (5.7%; 95%CI 4.0–8.0) showed the highest increase in the proportion of those with moderate to severe anxiety. Respondents from the North (3.7%; 95%CI 3.0–4.6) and Central (3.2%; 95%CI 2.0–4.9) districts reported a higher increase in the proportion of those with moderate to severe anxiety than those from other districts.

The *difference* in the mean STAI score for the PW (46.2, SD=11.68) and the BO (45.0, SD=12.13) was statistically significant (*Wilcoxon signed rank test* = 6.414, $p < 0.001$). The median scores for anxiety symptoms during the PW and the BO were 46.7 (IQR 36.7–53.3) and 43.3 (IQR 36.7–53.3), respectively. The scale for both scores ranges from 20 to 80. In total, 1,229 (34.6%; 95%CI 33.0–36.2) of the respondents recorded an increase in their anxiety score during the PW compared with the BO (PW score > BO score), and 2,326 (65.4%; 95%CI 63.9–67.0) recorded a similar or lower anxiety score (PW score ≤ BO score).

Preventive measures

The summary of responses in relation to preventive measures during the PW and BO is shown in Table 2. Among the personal protection measures carried out during the PW, the highest proportion was for respondents who frequently washed their hands with soap (49.0%; 95%CI 47.3–50.7), followed by those

who wore a mask (31.8%; 95%CI 30.3–33.4). Under cough etiquette, the most commonly practised preventive measure was disposing of tissues immediately after coughing or sneezing (80.1%; 95%CI 78.9–81.4), and covering one's mouth and nose when coughing or sneezing (65.2%; 95%CI 63.6 – 66.7). Performing hand hygiene was reported always practised by a considerable proportion of the participants (60.3%; 95%CI 58.6–61.9). Over a third of respondents reported that they always avoided proximity with others (34.4%; 95%CI 32.8–36.0) and avoided gathering in groups (41.2%; 95%CI 39.5–42.8). Near two thirds reported that they would always voluntarily quarantine themselves if they were feeling unwell (61.6%; 95%CI 60.0–63.2), but fewer than half said they would always report promptly to the health authorities if they were feeling unwell (45.4%; 95%CI 43.8–47.1).

Similar findings were reported for preventive measures at the BO, with the highest proportion reporting that they had always disposed of tissues immediately after coughing and sneezing (66.5%; 95%CI 64.9–68.0), followed by those who had covered their mouths and noses when coughing or sneezing (62.2%; 95%CI 60.6–63.8). The proportion who practised contact precautions was relatively low. A comparison of the proportions who always practised particular preventive measures during the PW and the BO shows that disposing of tissues immediately after coughing and sneezing recorded the highest increase (13.6%; 95%CI 12.6–14.8), followed by avoiding group gatherings (10.3%; 95%CI 9.4–11.4) and frequently washing hands (10.8%; 95%CI 9.8–11.8). A lower increment in the proportion can be seen for using eye protection (1.9%; 95%CI 1.5–2.4) and covering one's mouth and nose when coughing or sneezing (3.0%; 95%CI 2.4–3.6).

The *difference* in the mean total scores for preventive measures during the PW (25.4, SD=5.85) and the BO (23.4, SD=6.56) was statistically significant (*Wilcoxon signed rank test* = 23.917, $p < 0.001$). The median scores for preventive measures during the PW and the BO were 26.0 (IQR 21.0–30.0) and 24.0 (IQR 19.0–28.0), respectively. The total score for preventive measures during the PW ranges from 2 to 36, whereas the total score for preventive measures during the BO ranges from 0 to 36. For the respondents overall, a total of 1,696 (47.7%, 95%CI: 46.1–49.4) reported an increase in their total preventive measures score during the PW compared with their score during the BO and 1,859 (52.3%, 95%CI: 50.6–53.9) reported similar or lower total preventive measures scores.

Table 3 shows the univariate and multivariable analyses of the factors associated with a higher total preventive measures score when comparing the PW with the BO. Having an increased anxiety score during the PW compare with the score during the BO (adjusted OR = 7.38, 95%CI 6.28–8.66) was a strongly significant determinant of an increase in the preventive measure score from the BO to the PW. Respondents with a college level of education (adjusted OR = 1.58, 95% 1.17–2.13) or graduate level and above (adjusted OR = 1.74, 95% 1.28–2.38) were more likely to have an increased preventive measure score from the BO to the PW compared to those whose highest education level was high school and below.

Discussion

Approximately three weeks after the widespread news of the lockdown of the epicentre of COVID-19, this study found the alarming result that over half (52.1%) of Taiwanese lay members of the public who participated in the survey had moderate to severe levels of anxiety. Those in the younger age groups, females, and those with a lower educational background and in lower income groups were found to show more anxiety symptoms, and this provides valuable information to allow public health authorities and stakeholders to coordinate their targeted mental health interventions. Despite it being widely circulated in the news media that it is likely that older adults affected by *COVID-19* have a higher risk of complications and mortality, and the recent large report on epidemiological data from the Chinese Centre for Disease Control and Prevention that showed that those aged above 60 years accounted for 44.1% of confirmed cases in Wuhan [22], the study participants in the older age group appear to have a lower level of anxiety. Further studies are warranted to elucidate whether the low anxiety stems from a lack of knowledge or to their being out-of-touch with current media interventions. The exponential increase in confirmed COVID-19 cases in mainland China following the lockdown, as well as increasing numbers of cases outside China, including in Taiwan, has sparked global concern and likewise an increase in the anxiety levels among the participants in this study. Concurrent with the relatively low level of anxiety among those with higher education and higher income, the increase in anxiety levels was also lowest among the group with higher socio-economic status. The underlying reasons for the socio-economic disparities in anxiety also warrant further investigation in the future.

Our study participants were taking relatively good preventive measures, evidenced by the median scores of 25 and 23, out of a possible score of 36, for the past week and the beginning of the outbreak, respectively. Further, nearly half of them reported improved prevention practices in the past week compared to the beginning of the outbreak. The study also found a considerable increase in preventive measures related to hand washing, cough etiquette, and contact precaution, which perhaps explains why, to date, only 20 confirmed cases have been reported in Taiwan, despite it being in close geographical *proximity* to mainland China and having a high volume of travellers to and from mainland *China prior to the outbreak*. *Nonetheless, the findings highlight the need to improve contact precautions, since the proportion of respondents who were avoiding proximity and group gatherings remained low at both the beginning of outbreak and in the past week. Multivariable analyses revealed that participants with higher education levels reported a higher increase in their preventive measures. A higher increase in anxiety symptoms was also associated with a greater increase in preventive practices. This finding is in congruence with previous findings from the SARS outbreak in Hong Kong where a positive dose-response gradient between anxiety level and uptake of personal protective measures was found [15], which suggests that the right amount of anxiety, so long as it is not at the level that could result in a detrimental health impact, can perhaps help to stimulate practices that prevent an epidemic.*

The current study has several limitations. The first limitation is that the responses were based on self-reporting and may be subject to self-report and recall bias. Second, the snowballing method used in this study can lead to selection bias. It is notable that the study has an over-representation of female participants and an unequal distribution of respondents between the districts of Taiwan. Nevertheless, during the period of crisis for the outbreak, the snowballing method, which used LINE and Facebook, the

largest social media platform in Taiwan, was extremely effective in achieving a broad coverage of participants. Despite these limitations, the study contributes tremendously to the understanding of the psychological well-being and psychobehavioural responses of the general public in Taiwan associated with COVID-19 while the epidemic is still on-going.

Conclusion

The study revealed the need to reduce public anxiety levels and to maintain *appropriate* infection *prevention against COVID-19*. It is of the utmost urgency that public health interventions are carried out to reach the identified groups of people with poor adherence to preventive measures. Considering the extremely contagious nature of *COVID-19*, a slight lack of compliance by even a small portion of the population may have grave consequences and contribute to the continued spread of the outbreak. The prominent psychological effects and psychobehavioural responses to the outbreak found in this study provide important information for developing and implementing effective preventive and emotional regulation control strategies.

Abbreviations

BO: Beginning outbreak

CI: Confidence Interval

COVID-19: Coronavirus disease-2019

H1N1: influenza A

NT\$: New Taiwan Dollar

PW: Past week

SARS: Severe acute respiratory syndrome

STAI-6: State–Trait Anxiety Inventory

WHO: World Health Organization

Declarations

Ethics approval and consent to participate

This study protocol was approved by the Research Ethics Committee of the National Taiwan Normal University (no. 202002HS007).

Consent for publication

Not applicable

Availability of data and materials

The datasets used and analyzed during the current study are available from the corresponding author on reasonable request.

Competing interest

The authors declare that they have no competing interests

Author Contributions

LPW and TSHL conceived the study. CCH and TSHL conducted and collected data. LPW and HA analysed the data. LPW wrote the manuscript. All authors have approved the manuscript.

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Tables

Table 1 Participant characteristics and anxiety symptom score *past week* and *beginning of the outbreak* (N=3555)

Socio demographic characteristics	N	% (95% CI)	Past week (score ≥ 44) (n=1852)		Beginning of the outbreak (score ≥ 44) (n=1738)		Differences (Past week-beginning of the outbreak)			
			n	% (95% CI)	n	% (95% CI)	% (95% CI)			
Age group (yrs)										
20-30	468	13.2 (12.1-14.3)	228	48.7 (44.2-53.2)	241	51.5 (47.0-56.0)	-2.8 (1.6-4.7)			
31-40	1313	36.9 (35.3-38.5)	750	57.1 (54.4-59.8)	705	53.7 (51.0-56.4)	3.4 (2.6-4.6)			
41-50	1008	28.4 (26.9-29.9)	521	51.7 (48.6-54.8)	469	46.5 (43.5-49.6)	5.2 (4.0-6.7)			
50-70	766	21.5 (20.2-22.9)	353	46.1 (42.6-49.6)	323	42.2 (38.7-45.7)	3.9 (2.8-5.5)			
Gender										
Male	775	21.8 (20.5-23.2)	317	40.9 (37.5-44.4)	296	38.2 (34.8-41.7)	2.7 (1.8-4.1)			
Female	2780	78.2 (76.8-79.5)	1535	55.2 (53.4-57.1)	1442	51.9 (50.0-53.7)	3.3 (2.7-4.1)			
Highest educational level										
High school and below	250	7.0 (6.2-7.9)	140	56.0 (49.6-62.2)	125	50.0 (43.9-56.2)	6.0 (3.7-9.7)			
College	2069	58.2 (56.6-59.8)	1136	54.9 (52.8-57.0)	1060	51.2 (49.1-53.4)	3.7 (2.9-4.6)			
Graduate and above	1236	34.8 (33.2-36.4)	576	46.6 (43.8-49.4)	553	44.7 (42.0-47.5)	1.9 (1.2-2.8)			

Average monthly household

income (NT\$)										
<20,000	528	14.9	(13.7-	287	54.4	(50.1-	257	48.7	(44.4-	5.7 (4.0-8.0)
		16.1)			58.6)			52.9)		
20,000-50,000	1440	40.5	(38.9-	783	54.4	(51.8-	743	51.6	(49.0-	2.8 (2.1-3.8)
		42.1)			56.9)			54.2)		
50,000-100,000	1251	35.2	(33.6-	647	51.7	(49.0-	608	48.6	(45.8-	3.1 (2.3-4.2)
		36.8)			54.5)			51.4)		
>100,000	336	9.5	(8.5-	135	40.2	(35.1-	130	38.7	(33.6-	1.5 (0.6-3.4)
		10.5)			45.5)			44.0)		
Location										
North district	2358	66.3	(64.7-	1252	53.1	(51.1-	1164	49.4	(47.3-	3.7 (3.0-4.6)
		67.9)			55.1)			51.4)		
Central district	599	16.8	(15.6-	317	52.9	(48.9-	298	49.7	(45.8-	3.2 (2.0-4.9)
		18.1)			56.9)			53.7)		
South district	484	13.6	(12.5-	239	49.4	(45.0-	233	48.1	(43.7-	1.3 (0.6-2.7)
		14.8)			53.8)			52.6)		

Table 2 Differences in prevention measures the past week and beginning of the outbreak (N=3555)

Prevention measures	Past week		Beginning of the outbreak		Differences (Past week-beginning of the outbreak)
	Always practice		Always practice		
	n	% (95 CI%)	n	% (95 CI%)	% (95 CI%)
<i>Personal protection</i>					
Wear a mask	1132	31.8 (30.3-33.4)	802	22.6 (21.2-24.0)	9.2 (8.4-10.3)
Eye protection	447	12.6 (11.5-13.7)	381	10.7 (9.7-11.8)	1.9 (1.5-2.4)
Wash hand frequently with soap	1742	49.0 (47.3-50.7)	1359	38.2 (36.6-39.8)	10.8 (9.8-11.8)
Avoid touching your eyes, nose, and mouth	1059	29.8 (28.3-31.3)	777	21.9 (20.5-23.3)	7.9 (7.1-8.9)
<i>Respiratory Etiquette/Cough Etiquette</i>					
Cover mouth and nose with tissue when cough or sneeze.	2317	65.2 (63.6-66.7)	2212	62.2 (60.6-63.8)	3.0 (2.4-3.6)
Dispose tissue paper immediately after coughing or sneezing	2848	80.1 (78.9-81.4)	2363	66.5 (64.9-68.0)	13.6 (12.6-14.8)
Wash hand immediately after coughing or sneezing.	1115	31.4 (29.8-	968	27.2 (25.8-	4.2 (3.5-4.9)

		32.9)		28.7)	
Perform hand hygiene (e.g., hand washing with or antiseptic handwash) after	2142	60.3	1904	53.6	6.7 (5.9-7.6)
having contact with respiratory secretions or contaminated objects		(58.6-		(51.9-	
		61.9)		55.2)	
<i>Contact precautions</i>					
Avoid proximity (closeness) with other people	1222	34.4	961	27.0	7.3 (6.5-8.2)
		(32.8-		(25.6-	
		36.0)		28.5)	
Avoid group gathering	1463	41.2	1096	30.8	10.3 (9.4-11.4)
		(39.5-		(29.3-	
		42.8)		32.4)	
<i>Voluntary quarantine</i>					
If I am feeling unwell, I distance myself from others	2191	61.6	2016	56.7	4.9 (4.3-5.7)
		(60.0-		(55.1-	
		63.2)		58.3)	
<i>Prompt reporting</i>					
If I am feeling unwell, I will immediately declare my symptoms to the	1615	45.4	1410	39.7	5.8 (5.1-6.6)
authority/healthcare providers		(43.8-		(38.0-	
		47.1)		41.3)	

Table 3 Factors associated with differences in total preventive measure scores (N=3555)

Univariate analysis					Multivariable analysis ^a
Differences in total preventive measure scores					Differences in total preventive measure scores
					Score past week > score beginning of the outbreak vs Score past week ≤ score beginning of the outbreak
Covariates	Frequency (%)	Score past week > score beginning of the outbreak (n=1696)	Score past week ≤ score beginning of the outbreak (n=1859)	<i>P</i>	OR (95% CI)
Socio demographic characteristics					
Age group (yrs)					
20-30	468 (13.2)	227 (48.5)	241 (51.5)		
31-40	1313 (36.9)	638 (48.6)	675 (51.4)	0.735	
41-50	1008 (28.4)	477 (47.3)	531 (52.7)		
50-70	766 (21.5)	354 (46.2)	412 (53.8)		
Gender					
Male	775 (21.8)	372 (48.0)	403 (52.0)	0.871	

Female	2780 (78.2)	1324 (47.6)	1456 (52.4)		
Highest educational level					
High school and below	250 (7.0)	96 (38.4)	154 (61.6)		Ref
College	2069 (58.2)	994 (48.0)	1075 (52.0)	0.008	1.58 (1.17-2.13)**
Graduate and above	1236 (34.8)	606 (49.0)	630 (51.0)		1.74 (1.28-2.38)***
Average monthly household income (NT\$)					
<20,000	528 (14.9)	232 (43.9)	296 (56.1)		
20,000-50,000	1440 (40.5)	688 (47.8)	752 (52.2)	0.138	
50,000-100,000	1251 (35.2)	622 (49.7)	629 (50.3)		
>100,000	336 (9.5)	154 (45.8)	182 (54.2)		
Location					
North district	2358 (66.3)	1128 (47.8)	1230 (52.2)		
Central district	599 (16.8)	277 (46.2)	322 (53.8)	0.838	
South district	484 (13.6)	234 (48.3)	250 (51.7)		
East district	114 (3.2)	57 (50.0)	57 (50.0)		
Anxiety symptom score					
Differences in score between past one week and beginning the outbreak					
Score past one week \leq score beginning the outbreak	2326 (65.4)	744 (32.0)	1582 (68.0)	p<0.001	Ref

Score past one week > score	1229	952 (77.5)	277 (22.5)	7.38 (6.28-8.66)***
beginning the outbreak	(34.6)			

p<0.01, *p<0.001

^aHosmer-Lemeshow test, chi-square: 4.812, p-value: 0.307; Nagelkerke R² : 0.240

Supplementary Files

This is a list of supplementary files associated with this preprint. Click to download.

- [Appendix1.docx](#)