AGE DIFFERENCE AND PSYCHOLOGICAL FACTORS THAT ARE ASSOCIATED WITH ADOPTION RATE OF PROTECTIVE MEASURES AGAINST COVID-19 IN MALAYSIA

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Abstract

Purpose: The COVID-19 pandemic has threatened the livelihood of more than 140,000 individuals in Malaysia. The adoption of protective measures, such as social distancing, wearing face masks, and increasing hygiene levels, is crucial to contain the disease among the general public. This study answered two research questions: what psychological factors are associated with the adoption of protective measures; and, is there an age difference in the adoption of protective measures against COVID-19 in Malaysia.

Methodology: 310 individuals between 18 and 65 years old (*M*=31), who were staying in Malaysia during the 2020 Movement Control Order, were recruited to answer an online survey assessing perceived severity, perceived vulnerability, perceived self-efficacy in adopting protective measures and perceived anxiety and number of protective measures adopted against COVID-19. One-way ANOVA and standard multiple regression were conducted to analyse the data.

Results: Perceived self-efficacy in adopting protective measures and perceived anxiety were significant predictors of adoption of protective measures, while perceived severity and perceived vulnerability were not. The older adult group (≥37 years) was found to adopt significantly more protective measures compared to younger adult groups.

Conclusion: Perceived self-efficacy in adopting protective measures and perceived anxiety were significant predictors of adoption of protective measures, while adult's ≥37 years adopted significantly more protective measures compared to younger adults in Malaysia during COVID-19. The relevant authorities can utilize the results of this study to create more relevant interventions and target them towards the younger population, in order to promote the adoption of protective behaviors against COVID-19 in Malaysia.

Keywords: Age Difference, COVID-19 in Malaysia, Protection Motivation Theory, Psychological Predictors

Introduction

Coronavirus Disease 2019 (COVID-19), which was declared a pandemic by the World Health Organisation (WHO), has affected more than 103 million individuals, with more than 2 million deaths globally to date (1, 2). Pandemics such as this are also a threat to national security and the economy (3-5).

COVID-19 in Malaysia

Malaysia had its first confirmed case in January 2020, and was placed under a nationwide movement control order (MCO), beginning on the 18th of March 2020, in an attempt to contain the virus outbreak. The implementation of the MCO placed heavy restrictions on domestic and international travel, closed educational institutions and places of worship, and restricted the movement of individuals whose jobs were not listed under the essential services category (6). Individuals in Malaysia were ordered to stay at home and avoid unnecessary outings, causing unprecedented disruptions. The public were also asked to adopt protective measures recommended by WHO and the government such as hand washing with soap, social distancing, avoiding crowded places, and wearing masks, to avoid contracting COVID-19 (7, 8). Mass travelling, panic buying before the lockdown, refusal of COVID-19 tests, denial of symptoms, and non-adherence to protective measures were reported; which furthered the spread of COVID-19 in Malaysia (9). While the number of COVID-19 cases decreased after the MCO implemented in March,

it increased again in October 2020 (10), suggesting the disease can be easily spread if the public do not adopt sufficient protective measures. While vaccines are going to be available, it will require at least 60%-70% of Malaysians (approximately 20-23 million Malaysians) to be vaccinated, before collective immunity can be achieved (11). Additionally, there are currently no approved vaccines certified safe for vulnerable groups such as children and the elderly with chronic diseases these groups would need to rely on adopting non-pharmaceutical protective measures while waiting for the vaccine to be developed and distributed. Until all groups of society can be vaccinated, the pandemic is likely to be around. Thus, it is critical for the public to adopt protective measures to prevent the spread of the disease, and to minimize the mortality rate, the impact on the economy, personal well-being, education and mental health (12).

Research on past pandemics reveals that psychological factors are useful in predicting the adoption of protective measures among the public (13, 14). It is important to understand how the public view COVID-19 and their self-efficacy in carrying out protective measures, in order to develop effective intervention campaigns. Protection Motivation Theory (PMT) was developed to understand and predict protective measures based on cognitive processes that can be explained as the processes of threat and coping appraisal (15). PMT explains that threat appraisal is measured through the perceived severity of and one's vulnerability to the threat, which if perceived as being severe and that one is vulnerable, would increase the individual's motivation to perform protective measures. Coping appraisal is measured using perceived response efficacy and perceived self-efficacy which, if both are high, would also increase the individual's motivation to carry out protective measures. Together, the threat and the coping appraisal induce protection motivation (15).

Perceived severity, vulnerability and self-efficacy in the adoption of protective measures

Past research found that perceived severity was significantly associated with protective measures such as wearing a mask and regular hand washing during the H1N1 pandemic in the United Kingdom; and adoption of social distancing and self-isolation measures during the COVID-19 pandemic (14, 16, 17). Similarly, perceived vulnerability has also been a useful predictor of adoption of protective measures against past pandemics where perceived vulnerability was significantly associated with adopting more protective measures during the H1N1 and COVID-19 pandemics (7, 16, 18). However, no significant link was found between perceived vulnerability and intention to adopt protective measures during the H1N1 pandemic in the Netherlands after the alert level was raised to above level 6 and WHO declared the outbreak an epidemic (18). Past studies conducted during the H1N1 pandemic also suggested that perceived self-efficacy was a predictor of the adoption of protective measures as it was significantly associated with greater hand washing behavior (19), while a review on communication during the H1N1 pandemic found that self-efficacy successfully increased adoption of recommended behaviors (20).

Perceived anxiety and adoption of protective measures

Although perceived anxiety is not included as a factor in PMT, previous research on pandemics found that levels of anxiety significantly predicted adoption of protective measures. As seen in research conducted during the SARS pandemic in the Netherlands, United Kingdom and Hong Kong, participants with increased levels of anxiety and higher risk perception had a higher likelihood of adopting protective measures against the SARS pandemic (13, 15, 21). Similar findings were generated in Australia, where higher levels of anxiety were associated with readiness to avoid public events, social gatherings and wearing a mask to prevent the spread of the H1N1 pandemic (22).

Age group differences in adoption of protective measures

Apart from psychological factors, do demographic factors such as age play a role in prudent adherence to protective measures? Previous studies on pandemics and health-related behaviors reported that age had a significant association with the adoption of protective measures. A study in Saudi Arabia found that being below the age of 37 years was significantly associated with lower adoption of protective measures against COVID-19 (23); while another research found that Australian participants above 61 years old demonstrated higher compliance with local quarantine rules and remained in the town limits during the H1N1 pandemic (22). A study conducted on the H1N1 pandemic in Hong Kong also found that participants from the older age group were more likely to practice better hand hygiene compared to younger participants, but there were no age group differences in adopting social distancing (19). In Germany, younger participants were found to have lower acceptance and adoption of protective measures against COVID-19 (24). In contrast, younger Japanese were found to practice social distancing more than their older counterparts (25).

Importance of study

Past studies on the H1N1 and SARS pandemics have shown that knowledge of the disease, perceived risk, vulnerability, self-efficacy, confidence in protective measures and levels of anxiety caused by the disease promote the adoption of protective measures (12-14, 18). However, most research on past pandemics was conducted in Western countries and in monocultural societal contexts such as Taiwan and Hong Kong, hence there could be cultural differences if the research were to be repeated in the Malaysian multicultural context (26). As the effectiveness of these psychological predictors in terms of adoption of protective measures is still unknown, there is insufficient evidence to determine the effectiveness of one, a few or all of the psychological factors in predicting the adoption of protective measures

in Malaysia, as well as the extent to which these factors would affect the adoption of protective measures.

Additionally, the participants in this research, age between 18-65 years old, were chosen because there is a scarcity of literature comparing age group differences in the adoption of protective health behaviors during pandemics in Malaysia. It is important to take into account how individuals of different age groups responded to the pandemic, to further understand the pandemic's effects on the public. This cross-sectional study will provide further understanding on how to help the authorities provide more holistic solutions, targeted to specific populations, and potentially increase the effectiveness of their interventions for this and future pandemics.

Furthermore, Malaysia was not significantly affected by the above-mentioned past pandemics (i.e., H1N1 and SARS) to a point where Movement Control Orders were required to contain the outbreaks. Therefore, it is important to monitor and understand the psychological responses to the pandemic, in order to identify behavioral patterns and provide insights for time and cost-effective interventions and future preventions, in order to contain the outbreak locally (25).

This study aimed to answer two research questions: i) What are the psychological predictors of high adoption of protective measures among individuals in Malaysia? ii) Is there a difference in the rate of adoption of protective measures among different age groups? Specifically, the purpose of this study was to understand how perception of severity, vulnerability, self-efficacy and adoption of protective measures and anxiety, which predicted the adoption of protective measures utilized by Western and unicultural communities during this and other pandemics, would predict the rate of adoption of protective measures against COVID-19 among individuals in Malaysia. (Refer to Figure 1 for the Conceptual Framework).

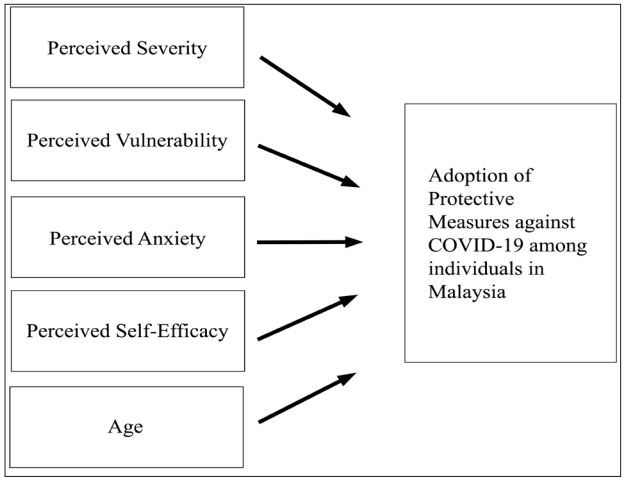

Figure 1: Conceptual framework of the study

Methods

Study design

This study was a quantitative, cross-sectional survey. The independent variables were perceived severity, perceived vulnerability, perceived anxiety, and perceived self-efficacy in adopting protective health behavior, in relation to COVID-19. The dependent variable was the number of protective health behaviors adopted.

Participants

A total of 369 participants, between the ages of 18-65 years old, and who were staying in Malaysia during the MCO (18th March 2020 – 12th May 2020), were recruited for this study using convenience sampling. Fifty nine entries were removed due to incomplete or invalid data, hence, only 310 individuals, with an average age of 31 years and between the ages of 18 to 65 years old (*SD*=11.9, *Md*=27), were included in the study. Sample selection excluded individuals who were suffering from or had recovered from COVID-19, or had stayed alone during the entire period of the MCO. Of the participants, 67.1% were females (*n*=208) and 32.9% males (*n*=102). (Refer to Table 1 for more demographic details).

Table 1: Demographics of participants (*n*=310)

Characteristics		n	(%)
Age (years)	≤ 22	123	39.7
	23 - 36	84	27.1
	≥ 37	103	33.2
Ethnicity	Malay	14	4.5
	Chinese	277	89.4
	Indian	8	2.6
	Others	11	3.5
Education Level	No Formal / Primary School Education	4	1.2
	Secondary School	27	8.7
	Pre-University/ Form 6	45	14.5
	Diploma	52	16.8
	Bachelor's Degree	160	51.6
	Postgraduate Degree	22	7.1
Occupation	Student	118	38.1
	Business Owner / Freelancer /Self-Employed	43	14.2
	Full-time Employee	103	33.2
	Part-time Employee	9	2.9
	No Income	26	8.4
	Retiree	10	3.2

Measurement instruments

An adapted version of the Survey of "Risk perception and behavioral responses of the general public during the Influenza A (H1N1) pandemic in the Netherlands" (13), which was adapted for COVID-19 in Malaysia, was used for this study. This survey has seven subscales with a total of 13 questions, measuring the individual's knowledge on COVID-19, perceived severity of COVID-19, perceived vulnerability to COVID-19, perceived anxiety, perceived self-efficacy behaviors, intention of adopting protective health behaviors, and adoption of protective health behaviors. The Cronbach alpha for perceived severity (α=.80), perceived vulnerability (α=.60), perceived anxiety (α=.80), and perceived self-efficacy (α=.90) in the previous study demonstrated high internal consistency and reliability (13). Based on the aims of this study, only perceived severity, perceived vulnerability, perceived anxiety, perceived self-efficacy and adoption of protective health behaviors subscales were used for analysis (Refer to Table 2).

Table 2: Summary table of measurement instruments

	Display Type
Perceived Severity (Cronbach alpha .82)	5-point Likert Scale
How severe do you think COVID-19 is?	Not Severe At All - Very Severe
COVID-19 is very harmful for my health	Totally Disagree - Totally Agree
Perceived severity of COVID-19 compared to other illness	Not Severe At All - Very Severe
Perceived Vulnerability (Cronbach alpha .90)	5-point Likert Scale
Do you think that you might get COVID-19 if you do not take any preventive measures?	Definitely Yes - Definitely Not
Perceived chance of getting infected compared to others	Extremely Likely - Extremely Unlikely
Perceived Anxiety (Cronbach alpha .79)	5-point Likert Scale
How often do you think of COVID-19?	Not at all - All the time
Are you worried about COVID-19?	Not at all worried - Very worried
Are you scared about COVID-19?	Not scared at all - Extremely scared
Perceived Self-Efficacy (Cronbach alpha .76)	5-point Likert Scale
If the governmental health authorities were to recommend these protective measures, please indicate if you think you can take these measures.	Certainly – Certainly not
Adoption of Protective Measures	Multiple Choice, Multiple Answers
Nothing	
I avoided crowded places	
I practiced better hygiene (Washing hands more frequently, using tissues when coughing or sneezing)	
I wear face masks when I go out	
I went to see a doctor	
I avoided people with COVID-19 like symptoms	
I bought antiviral medications	
I got a vaccine for seasonal flu	
Others	

Perceived severity and perceived vulnerability

The subscale of perceived severity and perceived vulnerability to COVID-19 aimed to measure the participants' risk perception. Perceived severity measures an individual's belief about the seriousness of contracting the illness, while perceived vulnerability measures an individual's perception of the likelihood of being infected with the illness (13). Both subscales were scored by totaling up the scores of the participants. Higher scores for both scales indicated that participants perceived COVID-19 to be very severe and that they were very vulnerable to COVID-19. The Cronbach alpha for perceived severity and for perceived vulnerability subscales in this study was .82 and .90 respectively, demonstrating high reliability when used with Malaysian participants.

Perceived anxiety

The subscale of perceived anxiety aimed to measure participants' feelings of anxiety in relation to COVID-19. The higher the total score of the participants, the more they felt anxious about COVID-19. The Cronbach alpha for this subscale was .79, displaying fairly high reliability.

Perceived self-efficacy

The subscale of perceived self-efficacy was used to measure participants' confidence in their abilities to execute protective health behaviors. The higher the participants' scores on the scale, the lower their confidence in their abilities to carry out the above-mentioned behaviors. The perceived self-efficacy scale had fairly high reliability in this study, with a Cronbach alpha of .76.

Adoption of protective health measures

The subscale of adoption of protective health measures quantified the amount of protective health measures taken by the participants. It involved a multiple-choice question with multiple answers. Participants could select as many protective health measures taken as they wanted. Each measure had the same value of 1; the values were then summed up. The higher the total scores of the participant, the greater the adoption of protective health measures.

Procedure

Ethics approval for conducting this study was obtained from the Department of Psychology Research Ethics Committee of Sunway University (Approval Code: 202006067) prior to data collection. Participants were recruited through convenience sampling via various social media platforms such as WhatsApp, Facebook and Instagram; they were then provided with a link which directed them to a Qualtrics survey. Measurement instruments were presented and data collection conducted using the English language. Participants first read through the information sheet detailing the purpose of the study, their rights, confidentiality, information about the investigators and the affiliated university, and then they gave their consent and answered the electronic questionnaire.

Results

Research question (i)

Pearson's correlation was conducted to examine the effects of perceived severity, vulnerability, anxiety, and self-efficacy, on the adoption of protective measures. The results indicated a significant association between adoption of protective measures and perceived anxiety $r(310)$=.23, p=.000, as well as perceived self-efficacy $r(310)$=.22, p=.000. On the other hand, perceived severity and vulnerability were not correlated with the adoption of protective measures. Prior to this, multicollinearity was checked between the independent variables; all variables had a bivariate correlation of <.7. Normality tests were also conducted to determine the normal distribution of the data. Four outliers with standard residues outside the normal range were identified, but the maximum value for Cook's Distance was >1. Hence, no transformation of data was needed.

A standard multiple regression analysis was then conducted to determine the strengths of perceived anxiety and self-efficacy in predicting the adoption of protective measures. Both perceived anxiety and perceived self-efficacy predicted adoption of protective measures, R=.308, R^2=.095, F(4, 302)=7.899, p<.001. Perceived anxiety had a beta value of .22, t=3.74, p<.001; thus, as perceived anxiety increased by 1 *SD*, adoption of protective measures increased by .22 *SD*. Perceived self-efficacy had a beta value of .21, t=3.58, p<.001; thus, as perceived self-efficacy increased by 1 *SD*, adoption of protective measures increased by .21 *SD*. Overall, perceived anxiety and perceived self-efficacy predicted 9.5% of the variability in adoption of protective measures. The results also showed that perceived severity and perceived vulnerability were not significant predictors of adoption of protective measures, with R=.308, R^2=.095, F(4, 302)=7.899, p=.217 and p=.210, indicating that perceived severity and perceived vulnerability contributed 9.5% of the variance in the adoption of protective measures. Out of the four predictors, perceived anxiety and perceived self-efficacy were significant predictors, with perceived anxiety being slightly stronger than perceived self-efficacy in influencing the adoption of protective measures. Thus, the answer to research question (i) is yes, perceived anxiety and self-efficacy are significant psychological predictors of adoption of protective measures against COVID-19 among the public in Malaysia, (Refer to Table 3*).*

Table 3: Regression analysis summary for psychological predictors and adoption of protective measures

Variables	*B*	Std. Error	*β*	*t*	*p*
Perceived Severity	-.02	.02	-.075	-1.24	.217
Perceived Vulnerability	.01	.01	.069	1.26	.210
Perceived Anxiety	.11	.03	.221	3.74	.000
Perceived Self-Efficacy	.06	.02	.205	3.58	.000

Note. R^2= .095.

Research question (ii)

The study analyzed the response of 310 participants, of which 38.1% were students, 14.2% were business owners, 36.1% were employees, and 11.6% were retirees or had no income; 9.9% of the participants had received a secondary school or lower level of education, 31.3% had a pre-university or diploma education, 51.6% had a Bachelor's degree and 7.1% had a Postgraduate degree. Participants were divided into three approximately equal age groups using Visual Binning. The youngest group (n=123, 39.7%*)* consisted of individuals below 22 years old (emerging adults), the middle group (n=84, 27.1%) consisted of individuals between 23 to 36 years old (young adults) and

the oldest group (*n*=103, 33.2%*)* consisted of individuals above 37 years old (mature adults).

To examine if age group had an effect on adopting protective measures, a One-Way ANOVA test was used. There was a significant difference between the three age groups on the number of protective health measures adopted, $F(2, 307)=9.017$, $p=.001$, $\eta^2=.055$, indicating a moderate effect size. Post Hoc comparison using TukeyHSD indicated that the mean score for individuals over 37 years old (*M*=4.13, *SD*=1.23*)* was significantly higher than individuals below 22 years old (*M*=3.52*, SD*=.94*)*. Individuals between 23 to 36 years old (*M*=3.69, *SD*=1.09) did not differ significantly from individuals over 37 years old (*mean difference*=.44, *p*=.018), and individuals below 22 years old (*mean difference*= -.17, *p*=.510). Planned contrast revealed that individuals in the older age group (over 37 years old) adopted more protective measures than those in the younger age group (below 22 years old and between 23 to 26 years old), $F(2, 307)=9.017$, $p=<.001$. Hence, the answer to research question (ii) is yes, there is an age difference in the adoption of protective measures among individuals in Malaysia.

Discussion

Psychological predictors of protective measures

The results of the multiple regression conducted found that perceived anxiety and self-efficacy were significant psychological predictors of adoption of preventive measures, while there was no significant difference in adoption for perceived vulnerability and severity.

The results are supportive of recent research on COVID-19 in Japan, South Korea, and Kuwait, which found that perceived self-efficacy, increased the adoption of protective measures. Individuals who reported higher self-efficacy were significantly predicted to stay at home in Japan (25); and to adopt significantly more protective measures in South Korea and Kuwait (8, 27). Similarly, high perceived anxiety among individuals in Hong Kong predicted higher motivation in adoption of protective measures against COVID-19 (28). The results are also in line with research done on H1N1 and SARS, clearly suggesting that these psychological factors are predictive of adoption of protective measures globally (13, 14, 19-21).

As COVID-19 is Malaysia's first experience with a major pandemic that has required a nationwide lockdown, it is understandable that the perceived anxiety of individuals in Malaysia has increased significantly. When not much was known about COVID-19, the anxiety of the public would have increased due to uncertainty (29, 30). Thus, turning to problem-focused coping strategies, like adhering to prescribed protective measures, would have helped to curb their anxiety (31). It is also noted that while individuals tend to gravitate towards finding active solutions to cope with their anxiety, they are more inclined to choose solutions that they can carry out confidently (i.e., perceived self-efficacy). Similarly, research on hospital staff highlighted the significance of self-efficacy when coping with COVID-19 associated anxiety (32). This indicates that perceived self-efficacy is important for managing anxiety as the frontliners during the pandemic, by adopting more and prudent protective. This is an interesting finding as it suggests that, as well as showing news that may induce slight fear or anxiety among the public on the severity of the COVID-19 pandemic, it is also important to provide sufficient education and information on easy and convenient protective measures, to ensure that the public believe they can protect themselves from the disease effectively.

On the other hand, the results are not in line with other past research that found that perceived vulnerability and severity were significant predictors of adoption of preventive behaviors (7, 8, 21, 25). Additionally, it was found that, while the components of PMT are useful for understanding an individual's intention to practice social distancing, it is not useful for predicting actual behavior in a simulated epidemic (33). Hence, this explains why perceived severity and vulnerability did not predict adoption of protective measures during COVID-19.

As the daily case count in Malaysia during the time the research was conducted was decreasing the participants might have been under the delusion that COVID-19 was not severe, and that they were less vulnerable to COVID-19, explaining why perceived severity and vulnerability were not predictive of adopting protective measures.

The results could also be extrapolated to the second MCO with careful consideration of its limitations, as even though the numbers of cases of COVID-19 are rising daily (increase in perceived severity and vulnerability); it seems that the public has lower perceived anxiety and adoption of protective measures. This is suggested by the increased cases, lenient lockdown measures and the Malaysian government's repeated dire warnings during the second MCO (34). From a different point of view, the lower adoption of protective measures which has led to the spike in COVID-19 cases since early December could be due to the announcement of the vaccine rollout at the end of November. Thus, the public feels that they would be able to avoid getting COVID-19 with the vaccine, hence, reducing their perceived anxiety and resulting in their lower adoption of protective measures. The results also suggest that individuals in Malaysia are more emotional than rational, as they adopt more protective measures when they have higher perceived anxiety and self-efficacy, while perceived severity and vulnerability does not increase their adoption of protective measures. However, further in-depth research is needed to understand and validate the findings of such an argument.

Age group

This study compared individuals from three different age groups and their adoption of protective measures, and was intended to determine if age had an effect on adoption of protective measures. The results of the one-way ANOVA found that participants from the oldest age group adopted

significantly more protective measures against COVID-19 compared to participants from the youngest age group.

This is consistent with past research which found that older individuals are more likely to adopt protective measures in relation to health-related issues such as pandemics, vaccines, communicable and non-communicable diseases (13, 19). This finding has also been seen in research done on COVID-19 across the globe, taking into account surveys that were conducted multiple times (23, 24, 35), as older individuals are more aware that they are more at risk of worse outcomes if infected with the COVID-19 virus, especially those with existing illnesses (35). This is supported by the COVID-19 mortality statistics in Malaysia, which showed that 64% of COVID-19 related deaths were patients who were above 60 years old, and only 3.9% of the COVID-19 related deaths were patients who were below 30 years old (36). Evidently, it is understandable that individuals from the younger age groups feel less anxious about COVID-19, and thus, adopt fewer protective measures.

Strengths and limitations

This study is one of the few studies conducted on the COVID-19 pandemic examining psychological predictors and the adoption of protective measures in Malaysia. The study utilized a combination of concepts from Protection Motivation Theory, as well as perceived anxiety, expanding the current literature on the psychological behavioral aspect in pandemic research. The sample size of the current study was also relatively large and inclusive of young to older individuals, aged 18 to 65 years old, signifying a fair representation of Malaysian adults. The study also utilized online questionnaires without collecting any identifying details, which reduced the magnitude of social desirability bias as compared to phone calls or virtual interviews (13).

This study has a few limitations. The participants' responses were collected throughout 17th July to 23rd September 2020, which could have resulted in different responses at different times. For instance, individuals might have lower perceived severity and vulnerability as the number of cases were decreasing, but higher anxiety levels because they were under strict movement control and conditional movement control orders during June 2020, compared to individuals who responded in September 2020, where the movement control orders were more lenient and the cases had decreased to double digits for some time. Additionally, as participants were recruited through convenience sampling, without controlling for an equal number of different ethnicities, the results might not be generalized to the wider Malaysian population. However, they would still be useful in helping to understand a part of the Malaysian community. This study did not examine the psychological predictors of adoption of protective measures for individuals who were staying alone during the lockdown, which could have provided different results, as long periods of social isolation alone could have had different effects on behavior in relation to the COVID-19 pandemic.

Implications

One of the practical implications of this study is that a clearer picture of age differences in relation to adoption of protective measures has been obtained. Thus, the relevant authorities could use these findings to tailor their approach to different segments of the populations in encouraging the adoption of protective measures. For instance, the authorities could utilize this knowledge to create and target effective COVID-19 protection campaigns to younger adults. This could also be useful in the near future when promoting the adoption of vaccines for COVID-19. Additionally, the findings of this study provide more insight into how individuals' perceived severity, vulnerability, self-efficacy and anxiety have affected their adoption of protective measures during the pandemic in Malaysia. Hence, the authorities should help to raise awareness and promote education in order to increase the public's self-efficacy in adopting protective measures. The current study also helps provide a better understanding of possible factors that can motivate individuals in Malaysia, so the relevant authorities can be better prepared should such pandemics happen in the future.

As perceived anxiety has been found to be associated with adopting protective measures, it is also important that mental health professionals prepare and develop coping methods to help the public cope with increasing anxiety in relation to COVID-19. The authorities should also take into account the public's anxiety levels when they are communicating COVID-19-related news, in order to prevent the over-inducing of fear. In order to reduce the spread of COVID-19, it is imperative that relevant authorities incorporate psychological factors in their strategies to control the pandemic based on the evidence of past research, to effectively promote the adoption of non-medical protective measures which are safe for individuals of all ages.

Recommendations

A longitudinal study should be carried out to provide a more accurate representation of whether perceived severity, vulnerability, anxiety and self-efficacy predict adoption behaviors. Longitudinal studies would also be useful in determining if there has been any prolonged exposure to increased anxiety levels in relation to COVID-19, and if individuals have been desensitized to their anxiety so that it no longer predicts the adoption of protective measures (18). A longitudinal study would also offer the opportunity to compare the results of the study across periods (i.e., MCO in 2020 and MCO in 2021). Future studies conducted in the national language should also be considered to reach more Malaysians. As the pandemic is still present, it will take a while before it is completely eradicated in Malaysia. Therefore, it is important to continue to investigate how psychological factors and age predict the adoption of protective measures during different levels of seriousness of the COVID-19 pandemic.

The public's behaviors and perceptions are unstable and can change in a short time (37). Thus, it would be useful to acquire a more equal sample of participants of different ethnicities for future studies, as it would be meaningful to determine if there are any differences between different ethnic groups, as well as to provide a more representative picture of the multicultural Malaysian population.

Conclusion

The COVID-19 pandemic in Malaysia does not show any signs of slowing down in 2021, as Malaysia undergoes another Movement Control Order. While there is no vaccine that is safe for the entire population, the public will still have to rely on non-medical protective measures to avoid contracting COVID-19. Thus, it is crucial that the Malaysian health authorities include psychological factors in their interventions and take into account age differences in order to promote the adoption of protective measures and contain the spread of COVID-19.

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Competing interests

The authors declare that they have no competing interests.

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