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Determining Factors Influencing Filipinos' Behavioral Protection against COVID: Integrating Extended Protection Motivation Theory, Theory of Planned Behavior, and Ergonomic Appraisal

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Abstract: This study examined the perceived protective behavior of Filipinos towards COVID-19. It utilized the extended protection motivation theory (PMT) and theory of planned behavior (TPB) models with the integration of ergonomic appraisal, applying partial least square structural equation modeling (PLS-SEM) to determine the factors affecting the protective behavior of Filipinos against COVID-19. A questionnaire was developed and distributed to 3000 Filipino citizens to measure the factors and their relationships. Results showed that understanding COVID-19 significantly influences the Filipinos' perceived virus severity and vulnerability. In turn, perceived severity, self-efficacy, attitude, and subjective norms were the significant factors that affected the behavioral intention, impacting protective behavior. In addition, cognitive and macro ergonomics have been found to be the factors that influence the protective behavior of Filipinos against COVID-19. Thus, the study's findings can be used as a framework for developing pandemic response initiatives that aim to inform and educate Filipinos, especially those who do not have the privilege of accessing information. Lastly, the outcome of this study can be used as a theoretical framework for future researchers who aim to conduct a study in a similar discipline.

Keywords: COVID-19; partial least square structural equation modeling (PLS-SEM); PMT; TPB; ergonomic appraisal

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1. Introduction

Coronavirus disease 19 (COVID-19) has developed into a significant public health emergency that has been a source of concern on a global scale since its initial outbreak in late December 2019. Because of the rapid worldwide spread of the virus, the World Health Organization (WHO) declared on 11 March 2020, that COVID-19 is a global pandemic. It is urgently necessary for governments, health authorities, researchers, and public members to actively participate in preventing and controlling the pandemic [1]. As a preventive measure, governments worldwide have instituted social restrictions, and at the forefront of these restrictions is the implementation of lockdown and quarantine protocols. As a result of the lockdown implementation, people are not allowed to go outside of their homes, which has resulted in the closure of businesses, schools, colleges, and universities [2]. This negatively affects every country in the world's economic status, including the Philippines'.

On 16 March 2020, President Rodrigo Duterte placed Metro Manila under enhanced community quarantine (ECQ) and the other parts of the country shortly after. At the beginning of June 2020, lockdown restrictions, except in highly populated areas, began to ease. The movement from ECQ to general community quarantine (GCQ) was a necessary

decision the government made to address more health concerns of the people and help the country's struggling economic status. Since then, the implementation of various community quarantines has constantly changed, but the restrictions have become more lenient due to the availability of the COVID-19 vaccine in March 2021 [3]. As of 4 April 2022, the statistical count of total COVID-19 cases in the Philippines was recorded to be 3,679,629, while the number of deaths was recorded to be a total of 59,343, and 61.04% of the total population of the country was vaccinated [4]. However, based on the study conducted by Chen et al. [5], there is a lack of motivation and information regarding the vaccine against COVID-19, which is why people are not motivated enough to get the vaccine and adopt the recommended preventive measures. Thus, it is essential to develop programs that enhance the threat appraisal of people towards the virus, their coping appraisal towards the vaccine, and the confidence and attitude of the people towards this global health crisis.

1.1. COVID-19 in the Philippines

The Philippines experienced significant challenges in managing the COVID-19 pandemic. According to data from various health agencies, the country reported a substantial number of COVID-19 cases, with infection rates fluctuating due to multiple waves of the virus [6]. The proportion of individuals infected was considerable, putting immense pressure on the healthcare system [7]. Comparing the Philippines to other Southeast Asian countries, the infection rate was relatively high, influenced by population density and urbanization, particularly in Metro Manila [8].

The Philippine government implemented several measures to curb the spread of COVID-19. These included imposing enhanced community quarantine (ECQ) in high-risk areas, which restricted movement and closed non-essential businesses, expanding testing capacity and improving contact tracing despite logistical challenges, and launching a vaccination campaign in early 2021 that prioritized healthcare workers, the elderly, and those with comorbidities [9]. Although the vaccination rollout was initially slow, rates improved over time. Public health campaigns were also widespread, promoting mask wearing, social distancing, and hygiene practices through various media platforms [10]. Several cultural and historical aspects influenced the compliance and effectiveness of these measures. The Philippines has a strong sense of community and family, which facilitated information dissemination but made social distancing challenging [11]. The predominantly Catholic population faced disruptions in religious practices, requiring careful management to prevent gatherings that could spread the virus. Additionally, the archipelagic nature of the Philippines presented unique challenges in implementing uniform measures across different islands and regions, with remote and rural areas often having limited access to healthcare and information [12].

Existing literature highlights several key points regarding the Philippines' response to COVID-19. Studies indicate that the pandemic exposed vulnerabilities in the Philippine healthcare system, including shortages of medical supplies and healthcare workers. Research has revealed severe economic impact, with lockdowns leading to job losses and exacerbating poverty levels [13]. Studies also showed varying levels of public trust in government measures, influenced by political dynamics and historical skepticism towards authority [14]. Studies have consistently highlighted the significant strain placed on the Philippine healthcare system by the pandemic. According to Anastacio [15], the pandemic exposed critical gaps in the healthcare infrastructure, including inadequate hospital beds, shortages of personal protective equipment (PPE), and a deficit of healthcare professionals. The rapid surge in COVID-19 cases often overwhelmed hospitals, particularly in urban centers like Metro Manila. Efforts to expand healthcare capacity included the establishment of temporary quarantine and treatment facilities, yet these measures struggled to keep pace with the demand. The economic fallout from the COVID-19 pandemic has been profound in the Philippines [16]. According to a report by the Asian Development Bank [17], the country experienced a significant economic contraction, with the GDP shrinking by 9.6% in 2020. The lockdown measures, while necessary for public health, led to widespread

business closures and job losses. The informal sector, which constitutes a large portion of the Philippine economy, was hit particularly hard. Studies by Lavado et al. [18] underscore that poverty rates increased, and income inequality was exacerbated during the pandemic period. The effectiveness of public health interventions has been a focal point of several studies. A study by Cocal [19] examined the impact of community quarantines and found that while these measures were effective in slowing the spread of the virus, their implementation varied significantly across regions, affecting overall efficacy. Additionally, public health campaigns promoting mask wearing, social distancing, and hygiene practices faced challenges due to inconsistent messaging and varying levels of public compliance [20].

Several theoretical models of protective behavior have been developed to describe how the relationship between motivating factors and COVID-19 risk reduction behavior is mediated by intentions. One such model is the protection motivation theory (PMT). Developed by R.W. Rogers in 1975 [21], the PMT explains how people are motivated to react in a protective manner to threats. The theory proposes that people protect themselves based on four main factors: perceived severity, perceived vulnerability, response efficacy, and self-efficacy. The PMT is often used to analyze the preventive behavior of individuals towards various issues, including health risks like COVID-19. According to a study by Schmees [22], the PMT helps elucidate the cognitive intentions of individuals to protect themselves against risks and hazards, such as contracting and transmitting COVID-19. Milne et al. [23] further stated that the PMT is useful in predicting and intervening in health-related behaviors. Applying the PMT to COVID-19 protection in the Philippines involves highlighting the seriousness of the virus through public health messaging, distributing demographic-specific information to target vulnerabilities, conveying the efficacy of vaccination and mask use, providing practical advice and resources, and addressing barriers like misinformation and lack of access to healthcare. By implementing these PMT-based strategies, the Philippines can effectively motivate individuals to adopt behaviors that reduce the spread of COVID-19, contributing to the nation's efforts in combating the pandemic.

The theory of planned behavior (TPB) is another model used to characterize the specific behavior of an individual towards a threat such as COVID-19 disease. Hanson et al. [24] stated that the theory of planned behavior (TPB) assumes an individual's behavior sensibly results from all available information, whether consequences are explicitly or implicitly taken into consideration. In addition, the theory also suggests that a person's actions are based on their intention to behave in such a manner. Three (3) variables are considered to understand human behavior further: attitude, subjective norms, and perceived behavioral control. Attitude is the perceived behavior of a person towards a particular situation, while subjective norms are an individual's perception of what other people think about a specific subject. On the other hand, perceived behavioral control is the ability of oneself to consciously contain one's behavior [25]. In connection to this, a study by Gibson et al. [26] stated that attitude, subjective norms, and perceived behavioral control are influential factors to consider in developing a protective behavior that helps mitigate the spread of the COVID-19 virus. In addition, Aschwanden [27] found that attitudes, subjective norms, and perceived behavioral control were significant predictors of individuals' intentions to engage in behaviors such as mask wearing and social distancing. The study highlighted the importance of enhancing positive attitudes and leveraging social influence to improve compliance with preventive measures. Given its capacity to effectively analyze and influence human behavior, the theory of planned behavior (TPB) is essential to employ in the Philippines' fight against COVID-19. By thoroughly comprehending the factors that influence behavior, including attitudes, subjective norms, and perceived behavioral control, the TPB enables the creation of customized interventions that align with the multifaceted cultural environment of the Philippines.

Integrating the theory of planned behavior (TPB) and protection motivation theory (PMT) for COVID-19 protection offers a comprehensive framework that addresses a wide range of psychological factors influencing preventive behaviors. The TPB focuses on attitudes, subjective norms, and perceived behavioral control, which are essential for un-

derstanding behavioral intentions [7], while the PMT examines threat appraisal (perceived severity and vulnerability) and coping appraisal (response efficacy and self-efficacy) [28], providing insights into motivational processes. Combining these theories allows for a holistic understanding of the factors driving COVID-19 protective behaviors and enhances the predictive power of behavior models. This integration facilitates the development of targeted interventions, addressing multiple barriers by catering to different motivational factors and improving public health messaging. Practical applications include creating public health campaigns that emphasize the severity of COVID-19 and the social responsibility of preventive measures, implementing community programs that educate and build support networks, and designing interventions that boost self-efficacy and response efficacy while reinforcing positive attitudes and perceived control. By leveraging both the TPB and PMT, public health authorities can foster more effective and sustainable behavior change to combat the pandemic. Therefore, integrating both the PMT and TPB is highly significant and relevant in determining people's intentions towards various entities in protective behavior against the virus.

1.2. Conceptual Framework

The proposed conceptual framework shown in Figure 1 is based on the existence of two (2) models, namely, the protection motivation theory (PMT) and the theory of planned behavior (TPB). In addition, ergonomic factors are integrated into the TPB and PMT models to determine whether the considered variables affect Filipinos' protective behavior, i.e., physical, cognitive, and macro ergonomics. According to Yazdanpanah et al. [20], the PMT was developed by Rogers [21] and is a theory that is well known and widely used in social psychology and health studies. Furthermore, Helmes [29] stated that this theory describes the factors considered if an individual can or fails to perform a recommended health preventive behavior. On the other hand, the TPB is based on the premise that individuals make logical and reasonable decisions based on the information available to them [30]. The TPB is an influential and popular framework for studying human action and is widely applied for studying behavior and further changes in behavior [31]. Based on the study conducted by Gurses et al. [32], it is proven that human factors and ergonomics (HFEs) are highly relevant and necessary to improve pandemic management and preparedness further. In addition, ergonomics is essential in developing improved responses to burnouts, emergencies, and crises [33]. Moreover, Boutebal et al. [34] stated that ergonomic psychology applies to developing preventive behavior in all aspects (e.g., social life, daily activities, public places, etc.). Ergonomics is the discipline dedicated to optimizing human well-being and performance by designing products, systems, and environments that align with people's capabilities, limitations, and preferences. It encompasses considerations of physical, cognitive, organizational, and environmental factors to enhance efficiency, safety, and comfort [35]. Ergonomic psychology, a subset of psychology, delves into how individuals interact with their work environment and the psychological aspects affecting human behavior and performance within these settings [36]. When integrated with the theory of planned behavior (TPB), both ergonomics and ergonomic psychology contribute to understanding and influencing behavior, particularly in the context of adopting COVID-19 protective measures. By addressing psychological factors such as attitudes, subjective norms, and perceived behavioral control, they inform interventions that optimize environments, tools, and information to promote compliance with preventive behaviors. This comprehensive approach aids in fostering positive attitudes, social norms, and behavior change towards COVID-19 preventive measures by addressing both psychological and environmental determinants.

There are many studies that have utilized the PMT and TPB worldwide regarding health behaviors. In many countries, the PMT is used to determine and examine the factors affecting people's motivation for protective behavior and intention regarding vaccination information and intake for COVID-19 or towards COVID-19 itself [37,38]. In the Philippines, Prasetyo et al. [39] conducted a study that applied the PMT and TPB to examine the factors

affecting the perceived effectiveness of the preventive measures that Filipinos implemented during the ECQ. The only study currently available utilizes the PMT and TPB models in the Philippines regarding protective behavioral intention during the COVID-19 pandemic.

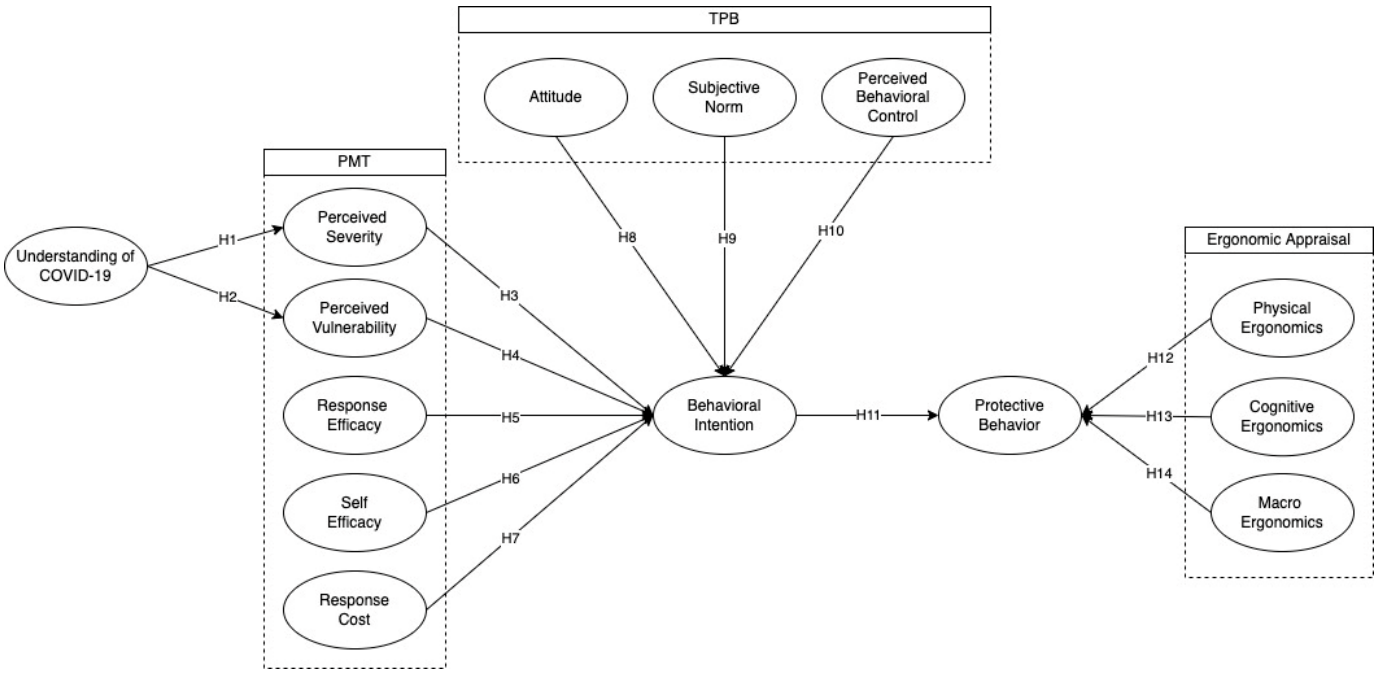

Figure 1. Conceptual framework.

Several behavioral theories have been established as strategic foundations for promoting the adoption of COVID-19 preventive measures. However, academic research on the utilization of ergonomic-based indicators to assess individuals' preparedness for COVID-19 has been limited. These theories encompass a range of models such as the health belief model [40], social cognitive theory [41], and the theory of planned behavior [42], among others. While these models provide valuable insights into the factors influencing behavior, incorporating ergonomic-based indicators could offer a more holistic understanding of individuals' readiness to adhere to preventive measures.

In light of these, having a preventive disposition towards the pandemic may help mitigate the further outbreak of the virus. As previously mentioned, an individual's behavior and intention can be perceived as protection from a particular health commodity, in this case, COVID-19. Thus, this study aimed to examine the factors affecting the behavioral protection of Filipinos from COVID-19 using the protection motivation theory (PMT) and theory of planned behavior (TPB). This study will also examine the integration of ergonomic factors (i.e., physical, cognitive, and macro) to determine how it affects the behavioral protection of Filipinos from COVID-19.

1.3. Aims of the Study

Despite significant challenges encountered in the Philippines, such as strains on the healthcare system and economic hardships, ongoing efforts in vaccination and public health campaigns have been crucial in managing the pandemic. The response to COVID-19 in the Philippines offers valuable lessons for improving preparedness and resilience in the face of future health crises. This study aims to explore the factors influencing Filipinos' behavioral protection against COVID-19 by integrating the theory of planned behavior, protection motivation theory, and ergonomic appraisal.

This study shall provide an overview and a better understanding of the preventive behavior developed by Filipinos from COVID-19. In addition, this study's findings could serve as a framework for future researchers who aim to extend the study's findings by

utilizing other health-related protective behavior models. This study's primary focus is on assessing factors affecting Filipinos' behavioral intentions against COVID-19. Also, this study aimed to underpin the critical motivational points that affect an individual's preventive behavior and intention during the current pandemic. The target participants of the study are limited only to any Filipino currently residing in the Philippines during the COVID-19 pandemic.

Research Hypotheses

The novel coronavirus and its many variants continuously cause severe trauma and health implications worldwide [43]. In a study conducted by Wyper et al. [44], results showed that people with underlying comorbidity are highly vulnerable to the virus. With that, the World Health Organization stated that understanding COVID-19 and its implications is essential to comprehend the severity of the virus [45]. Therefore, the following hypothesizes are made:

H1. *Understanding COVID-19 (UT) positively and significantly influences the perceived severity (PS) of COVID-19 for Filipinos.*

H2. *Understanding COVID-19 (UT) positively and significantly influences Filipinos' perceived vulnerability (PV) to COVID-19.*

Perceived severity (PS) is considered an important factor in explaining the health-related behaviors of an individual [46]. This is because perceived severity is the perception of oneself regarding the intensity of the harm, which can be a significant determinant in developing preventive behaviors for health-related risks [47]. Moreover, in the study conducted by Fragkaki et al. [48], the results show that people with high levels of perceived severity engage more in behavioral changes than those who do not. It was also stated that people who consider a situation highly risky tend to engage in behavioral changes, specifically changing to protective behaviors [49]. Thus, the following is hypothesized:

H3. *Perceived severity (PS) positively and significantly influences Filipinos' behavioral intention (BI) to protect themselves against COVID-19.*

Perceived vulnerability (PV) assesses a person's perception of the likelihood that they will experience the risk and be victimized by the persistent threat [50]. This states that perceived vulnerability is also an important concept that evaluates the development of preventive behavior of an individual. An essential factor in the development of protective behavior is the experience of being exposed to the threat itself, since those who have experienced such a threat perceive a higher vulnerability to the risk than those who do not [51]. Therefore, the formulated hypothesis is as follows:

H4. *Perceived vulnerability (PV) has a positive and significant influence on Filipinos' behavioral intention (BI) to protect themselves against COVID-19.*

Response efficacy (RE) was identified by Rogers et al. [51] as the most crucial sub-concept of coping appraisal, as it describes the perception of an individual towards the recommended preventive measure to be successful [52]. Moreover, Zhang et al. [53] identify response efficacy as the extent of an individual's beliefs on how effective recommended response mechanisms and preventive actions of groups (i.e., government, medical practitioners, official research groups, etc.) against the COVID-19 virus. Furthermore, Neuwirth et al. [54] determined that response efficacy can increase the probability of an individual adopting the recommended coping response. Thus, the hypothesis formulated is as follows:

H5. *Response efficacy (RE) has a positive and significant influence on Filipinos' behavioral intention (BI) to protect themselves against COVID-19.*

Self-efficacy (SE) is the perception or belief of an individual that they can perform the recommended preventive measures and actions. It is also stated that positive efficacy increases an individual's confidence to take preventive actions and their capability to cope with the threat [55]. Moreover, it is observed that when the recommended preventive response is perceived to be effective and feasible, people are motivated to develop a protective behavior to mitigate and avert the risk [56]. It was also stated in a study conducted by Karademas and Thomadakis [57] that self-efficacy is a major and significant predictor of any health-related behavior, be it physical or psychological—which leads to the following hypothesis:

H6. *Self-efficacy (SE) positively and significantly influences Filipinos' behavioral intention (BI) to protect themselves against COVID-19.*

Response cost (RC), as explained in the study of Khani Jeihooni et al. [58], is the sub-concept of coping appraisal in the protection motivation theory that deals with the cost-related aspects of adopting a protective behavior (e.g., monetary cost, time, effort, etc.). In addition, it is also expected that the effect of response cost decreases the probability of an individual adopting the preventive measures recommended. However, it was observed that low costs might change an individual's perception—thus encouraging them to adopt the recommended preventive actions [59]. Therefore, the following is hypothesized:

H7. *Response cost (RC) has a positive and significant influence on Filipinos' behavioral intention (BI) to protect themselves against COVID-19.*

Attitude (AT) is an individual's positive or negative view of the effectiveness of a particular behavior, which is also considered a significant predictor of preventive behavior [37]. Furthermore, it was observed that attitude plays an important role in predicting prevention-related behavioral intention in a study conducted during the Ebola pandemic [60]. A study by Clemens et al. [61] shows that attitude is a major predictor of people's behavioral intention towards handwashing, which is a recommended preventive measure, especially during the pandemic. Thus, the hypothesis constructed is as follows:

H8. *Attitude (AT) positively and significantly influences Filipinos' behavioral intention (BI) to protect themselves against COVID-19.*

A subjective norm (SN) is considered a predictor of the protective behavior of an individual but is affected by the perception of influential people around them [62]. Furthermore, it was stated in the literature that subjective norms are a significant factor in predicting the social distancing intention of people during the COVID-19 pandemic [63,64]. Thus, subjective norms are also a significant factor in behavioral intention in the overall aspects of COVID-19 [65]. Given this context, the formulated hypothesis is as follows:

H9. *Subjective norms (SN) positively and significantly influence Filipinos' behavioral intention (BI) to protect themselves against COVID-19.*

Behavioral control (BC) is identified as a significant contributing predictor of intention, which leads to an intention becoming a behavior afterward [66]. Moreover, Ajzen and Madden [67] stated that, based on their experiments, it was observed that the perceived behavioral control of an individual significantly contributes to the prediction of intention and behavior. In Hong Kong, it was observed that the perceived behavioral control of nurses could predict behavior substantially through intentions towards hygienic practices, which are crucial to have nowadays [68]. Therefore, the following is hypothesized:

H10. *Perceived behavioral control (PBC) positively and significantly influences Filipinos' behavioral intention (BI) to protect themselves against COVID-19.*

Behavioral intention (BI) is the tendency of an individual to act towards a perceived behavior [69]. In a study conducted by Shi et al. [70], based on the results, behavioral intention significantly influences the development of protective behavior in an individual. It was also noted by Conner et al. [71] that motivation towards protective behavior is observed to have a substantial direct relationship. Furthermore, Trifiletti et al. [72] demonstrated that behavioral intention significantly affects the development of protective behavior in an individual, as it was observed that people tend to adopt a preventive response based on their emotions and intentions. Given this context, the following is hypothesized:

H11. *Behavioral intention (BI) positively and significantly influences the protective behavior (PB) of Filipinos against COVID-19.*

Physical ergonomics (PE) is the ability to perform and carry out physical tasks by moving the body [73]. In this study, the use of face masks, face shields, vaccines, and other barriers that are tangibly available and usable by people for protection, especially during this COVID-19 pandemic, were considered factors for physical ergonomic appraisal. Kabir et al. [74] expressed that due to the limited supply of vaccines during the COVID-19 pandemic, using face masks is an effective protective behavior against the virus. However, a change in one's behavior is required to promote the use of face masks. Ronen et al. [75] investigated the use of a face shield, and based on their experiment's results, the face shield was determined to be an effective piece of protective gear against COVID-19. However, similar to the use of face masks, there is a requirement to change one's protection behavior to use the said gear. Moreover, an individual's overall perception of the vaccination program significantly predicts protective behavior against the current pandemic. Still, not all have the same perception concerning the medicinal advancements available, which is why a change in protective behavior is also needed [5]. Lastly, in a study conducted by Nachega et al. [76], using a contact tracing app/form is determined to be an effective strategy to control health-related diseases, specifically the COVID-19 virus. This means that the use of contact tracing apps/forms can be correlated to protective behavior, since it is defined as a protective measure against COVID-19. Thus, the formulated hypothesis is as follows:

H12. *Physical ergonomics (PE) positively and significantly influences Filipinos' protective behavior (PB) against COVID-19.*

Cognitive ergonomics (CE) studies brains and behavior and deals with mental perception, thinking, knowledge, memory, and how interaction with the system affects the factors stated [77,78]. Edmonds-Wilson et al. [79] conducted a study wherein they stated that our hands are considered a critical vector in transmitting COVID-19. Alzyood et al. [80] stated that COVID-19 further reiterates that handwashing is an important hygienic measure to prevent transmitting and contracting the disease. However, Gadinga and Tweeten [81] observed that people who engage in handwashing and further sanitization have more knowledge and a protective intention about the importance of such hygienic practices. Furthermore, Noh et al. [82] explained that social distancing is also considered a recommended and effective protective measure against the transmission of the virus but is entirely based on individuals' perceptions. Lastly, it was proven that the availability of information regarding the pandemic and the COVID-19 virus significantly affects the development of preventive behavior [83]. Given this information, the following is hypothesized:

H13. *Cognitive ergonomics (CE) has a positive and significant influence on the protective behavior (PB) of Filipinos against COVID-19.*

Macro ergonomics (ME) is the sub-discipline of ergonomics that deals with harmonizing the overall work design, system, and environment [84,85]. In Malaysia, it was observed that e-government and social media platforms are practical tools to engage and encourage people to develop protective behaviors against the pandemic [85]. Furthermore,

Min et al. [86] stated that having complete trust in the government is associated with protective behavior. It was proven by the study that the recommended preventive behavior and actions are more likely to be adopted if both trust and positive emotions towards the government exist. Moreover, in Europe, it was determined that people's perceived effectiveness of the response action was high since they were highly aware and informed during the early stages of the pandemic [87]. Thus, it is possible that information disseminated by the government significantly affects an individual's preventive behavior. In this context, the hypothesis formulated is as follows:

H14. *Macro ergonomics (ME) has a positive and significant influence on the protective behavior (PB) of Filipinos against COVID-19.*

2. Methodology

2.1. Respondents of the Study

The target participants of this study were Filipinos residing within NCR and CALABARZON (Region IV-A), which have the most significant number of COVID-19 cases in the Philippines. The main reason for choosing these regions as the study's target respondents is that the nation's most densely inhabited area is the NCR, which encompasses Metro Manila. Because of the high population density that promotes quick virus spread, this region is vital for researching COVID-19 behavioral protection. On the other hand, CALABARZON, comprising the provinces of Cavite, Laguna, Batangas, Rizal, and Quezon, is geographically adjacent to the NCR. The high level of interaction and movement between these regions contributed to similar patterns of virus spread. CALABARZON is the most populous region in the Philippines and a significant industrial hub. The region's demographic and economic characteristics make it a valuable area for studying the interplay between public health measures and economic resilience. Thus, studying areas with the highest cases provides critical insights into how the virus spreads in densely populated and economically active regions. It also allows for a detailed examination of the effectiveness of various containment and mitigation strategies.

The data collection for this study spanned three months, from October to December 2022, which coincided with the ongoing COVID-19 pandemic, potentially shaping the behaviors and attitudes of respondents. To adhere to pandemic-related restrictions, an online survey via Google Forms was chosen as the data collection method. This approach facilitated remote participation, prioritizing safety and convenience for both researchers and respondents. The self-administered survey meant that participants completed the questionnaire independently, without direct researcher interaction. Employing multiple cross-sectional designs, data was gathered simultaneously from distinct respondent groups, enhancing the study's comprehensiveness. The survey link was disseminated over three months across various social media platforms, including Instagram, Facebook, Twitter, WeChat, and Viber, ensuring broad outreach and maximizing the sample size. Geographically, the study targeted Filipinos residing in the National Capital Region (NCR) and CALABARZON (Region IV-A), narrowing down the participant pool to ensure relevance and specificity to these areas of interest. Overall, these meticulous methodological choices aimed to capture a diverse range of perspectives while navigating the challenges posed by the pandemic and ensuring the study's validity and applicability to the designated regions.

The target number of respondents was at least 2700. The minimum target for respondents was justified based on the calculations of Adam [88], which state that the required respondents for categorical data with a population size greater than 1,000,000, a margin error of 0.05, and a significance level of 90% should be at least 2700.

2.2. Questionnaire

The survey questionnaire for this study contained 76 questions separated into five (5) parts. The first part of the questionnaire inquired about the basic demographic profile

of respondents using 5-item questions, i.e., age, gender, highest educational attainment, monthly income, and COVID-19 history. The COVID-19 history of respondents was considered part of the respondent's profile because González-Castro et al. [50] stated that people who had first-hand experience with the threat had higher perception than those who had not.

The second part of the questionnaire consisted of 5 items based on the understanding of COVID-19 utilizing a 5-point Likert scale, where 1 equated to strongly disagree and 5 to strongly agree. The measures used in this section were based on previous studies [44,89–91].

The third part of the questionnaire contained the indicators based on PMT and TPB models, which consisted of 40 items where all answers were on a 5-point Likert scale ranging from strongly disagree to strongly agree. Five (5) latent factors used in the survey consisted of perceived severity, perceived vulnerability, response efficacy, self-efficacy, and response costs, all of which are constructs of the PMT model. The three (3) latent factors used in the survey, attitude, subjective norm, and perceived behavioral control, are constructs of the TPB model. The developed measures for each construct were based on previous studies [92–111].

The fourth part of the questionnaire consisted of 16 items regarding the ergonomic factors that are considered to have an impact on the protective behavior of an individual. The questions on this part of the survey were all answered on a 5-point Likert scale ranging from strongly disagree to strongly agree. The measures for each latent variable were based on previous studies [112–125].

The last part of the questionnaire consisted of 10 items regarding the behavioral intention and protective behavior of Filipinos from COVID-19. This part of the survey consists of 10 items where all answers are on a 5-point Likert scale ranging from strongly disagree to strongly agree. Table 1 shows the measures for each construct, which were based on previous studies [59,86,126].

Table 1. Indicators for Measurement.

Construct	Items	Measure	Supporting References
Understanding COVID-19	UT1	I do understand the transmission of COVID-19.	Prasetyo et al. [39]; Chuenyindee et al. [43]; Li et al. 89]; Munzert et al. [90]
	UT2	I do understand the general symptoms of COVID-19.	
	UT3	I do understand the protocol if I have the symptoms that might lead to COVID-19.	
	UT4	I do understand which hospital can treat COVID-19 patients.	
	UT5	I do understand the costs in applying protective actions against COVID-19.	
Perceived Severity	PS1	I find COVID-19 is a serious disease.	Prasetyo et al. [39]; Paital et al. [91]; Frounfelker et al. [93]; Grover et al. [103]; Bashirian et al. [105]; Basheti et al. [106];
	PS2	I find COVID-19 can lead to death.	
	PS3	I find COVID-19 is more severe than any other disease.	
	PS4	I find COVID-19 can affect mental health.	
	PS5	I think it is very expensive to pay the medical expenses for COVID-19.	
Perceived Vulnerability	PV1	I think I am very vulnerable to COVID-19.	Prasetyo et al. [39]; Coccia [101]; Tanoue et al. [104]
	PV2	I think my neighborhood is very vulnerable to COVID-19.	
	PV3	My past experiences make me believe that I am likely to get sick when my friends are sick.	
	PV4	I have a history of susceptibility to infectious diseases.	
	PV5	I think there is a chance that my family will be infected by COVID-19.	

Table 1. *Cont.*

Construct	Items	Measure	Supporting References
Response Efficacy	RE1	The use of preventive measures prevents the transmission of COVID-19.	Yazdanpanah et al. [20]; Hanson et al. [33]; Meyer et al. [109]; Persada et al. [125]
	RE2	The use of preventive measures prevents the outbreak of COVID-19.	
	RE3	The use of preventive measures protects me from COVID-19.	
	RE4	The use of preventive measures prevents possible lockdowns in the community.	
	RE5	The use of preventive measures protects other people from COVID-19.	
Self-Efficacy	SE1	If I were to engage in social distancing, I would lessen my chances of developing COVID-19.	Ansari-Maoghaddam [37]; Cattelino et al. [99]; Tabernero et al. [100]; Ritchie et al. [108]
	SE2	If I were to maintain home isolation, I would lessen my chances of developing COVID-19.	
	SE3	If I and others living in my home were to maintain home isolation, I would have a lower chance of developing COVID-19.	
	SE4	If I were to be vaccinated, I would lessen my chances of developing serious COVID-19 symptoms.	
	SE5	If I were to follow safety protocols, I would lessen my chances of developing COVID-19.	
Response Cost	RC1	The cost of medicines for COVID-19 is high.	Yazdanpanah et al. [20]; Tabernero et al. [100]; Kim et al. [107]; Meyer et al. [109]
	RC2	The cost of hospitalization for COVID-19 is high.	
	RC3	Too much effort is needed for our society to follow the measures to respond to COVID-19.	
	RC4	It is very time-consuming for our society to follow the measures to respond to COVID-19.	
	RC5	It is very expensive for our society to follow the measures to respond to COVID-19.	
Behavioral Intention	BI1	I intend to protect myself from COVID-19 infection.	Hanson et al. [33]; Prasetyo et al. [39]; Bashirian et al. [105]; Griffin et al. [127]
	BI2	I intend to prepare medicines for COVID-19.	
	BI3	I intend to seek information about how to prepare for COVID-19.	
	BI4	I intend to follow safety protocols to protect myself from COVID-19.	
	BI5	I intend to stay at home during the COVID-19 surge.	
Protective Behavior	PB1	I protect myself from people with COVID infection.	Yazdanpanah et al. [20]; Hanson et al. [33]; Lahiri et al. [47]; Kowalski and Black [124]
	PB2	I protect myself from people with flu symptoms.	
	PB3	I protect myself from places with a high risk for COVID-19.	
	PB4	I protect myself by following safety protocols.	
	PB5	I protect myself from COVID-19 by rescheduling my travel plans.	
Attitude	AT1	I will be protected from COVID-19 infection if I adopt the preventive measures recommended.	Prasetyo et al. [39]; Li et al. [89]; Frounfelker et al. [93]; Tran et al. [94]; Hossain et al. [95]
	AT2	It is very convenient if I adopt preventive measures recommended.	
	AT3	I will be less anxious if I adopt preventive measures recommended.	
	AT4	I think that the recommended preventive measures are effective and necessary.	
	AT5	I think it is important to get vaccinated for COVID-19 to protect people from being infected.	
Subjective Norm	SN1	People who are important to me think I should practice preventive measures recommended.	Gibson et al. [35]; Prasetyo et al. [39]; Ullah et al. [96]; Seong and Hong [97]; Aldalaykeh et al. [98]
	SN2	People who are important to me think I should get the COVID-19 vaccine.	
	SN3	People who are important to me follow all recommended preventive measures.	
	SN4	People who are important to me will want me to go to mass gatherings/public places.	
	SN5	People who are important to me think I should get help when showing symptoms for COVID-19 infection.	

Table 1. *Cont.*

Construct	Items	Measure	Supporting References
Perceived Behavioral Control	PBC1	I am confident that I can follow the recommended preventive measures, even if my family/friends did not.	Gibson et al. [35]; Frounfelker et al. [93]; Ullah et al. [96]; Seong and Hong [97]; Aldalaykeh et al. [98]
	PBC2	I believe that practicing preventive measures recommended by the Philippine government is completely up to me.	
	PBC3	Whether or not I get the COVID-19 vaccine is completely up to me.	
	PBC4	I believe that going to mass gatherings/public places is completely up to me.	
	PBC5	The decision to seek help for COVID-19 infection is completely up to me.	
Physical Ergonomic Appraisal	PE1	I use a face mask to prevent COVID-19 infection.	Karaivanov [110]; Al-Salem [112]; Senerat et al. [113]; Das et al. [114]; Ju et al. [115];; Manikandan [121]; Kowalski et al. [124]
	PE2	I use a face shield to prevent COVID-19 infection.	
	PE3	I use contact tracing apps to prevent COVID-19 infection.	
	PE4	I prefer to use a barrier in public places to prevent COVID-19 infection.	
	PE5	I get vaccinated to prevent COVID-19 infection.	
Cognitive Ergonomic Appraisal	CE1	I practice social distancing to prevent COVID-19 infection.	Karaivanov [110]; Senerat et al. [113]; Macdonald [116]; Mikal et al. [117]; Barak et al. [119]; Ye et al. [120]; Kowalski et al. [124]
	CE2	I do not go to public places to prevent COVID-19 infection.	
	CE3	I do not attend mass gatherings to prevent COVID-19 infection.	
	CE4	I keep informed about the latest update on COVID-19.	
	CE5	I wash my hands using soap and water to prevent COVID-19 infection.	
	CE6	I sanitize my hands before touching my face to prevent COVID-19 infection.	
Macro ergonomic Appraisal	ME1	I trust the government response in COVID-19.	Liu [120]; Barrafrem et al. [123]; Ye and Kowalski et al. [124]; Min et al. [128]
	ME2	I believe the safety protocols of government are effective.	
	ME3	I believe the government effectively responds to COVID-19.	
	ME4	I believe the government is strict in implementing lockdowns.	
	ME5	I believe the government establishes effective communication with the public about COVID-19.	

2.3. Structural Equation Modeling

Similar to regression-based analysis (multiple and logistics) and analysis of variance, structural equation modeling (SEM) is a method used to simultaneously analyze and determine the causal relationships among various variables, which results in a better understanding of the theoretical concepts considered in the framework [129,130]. In this study, the use of partial least square SEM (PLS-SEM) using Smart PLS 4.1.0.0. was recommended due to its popular "causal-predictive" approach to the latent variables [131]. In addition, PLS-SEM is a powerful tool that can estimate a relationship between multiple constructs, indicator variables, and paths with minimum demands [132,133]. Moreover, it is widely used in many disciplines due to its capability to determine and confirm whether a relationship between two variables exists or not. Because of its capability, the use of PLS-SEM significantly increased and is widely applied in various areas of study such as marketing [134], software engineering [135], human resources management [131], accounting [136], business management [137], and risk analysis [138]. In this study, PLS-SEM was applied to the gathered data to measure the relationship of PMT and TPB indicators with behavioral intention, which is also considered an indicator, as well as the ergonomic factors of Filipinos for developing protective behavior against the COVID-19 pandemic.

3. Results

3.1. Respondent's Profile

The summary of the demographic profile of the 3000 respondents shows that majority of respondents were female and fell within the 21-to-30 age group. Additionally, most

respondents were college undergraduates. Concerning monthly income, the majority earned less than ₱15,000 per month. Finally, regarding COVID-19 history, the majority of respondents had never been infected with the virus. The results are shown in Table S1.

3.2. Result of Initial SEM

Presented in Table 2 is the initial structural equation model for determining the factors that affect the protective behavior of Filipinos against COVID-19. The table indicates that there are 14 latent variables and 71 indicators. As stated in the study of Hair et al. [139], the most crucial part of interpreting PLS-SEM results is to first analyze the quality of the reflective measurement model. During analysis, reflective measurements in terms of reliability and validity, loading, Cronbach's alpha (α), composite reliability (CR), average variance extracted (AVE), Fornell–Larcker criterion, and heterotrait–monotrait (HTMT) ratio are considered [140]. The first step in analyzing the reflective measurements is to guarantee that the outer loading of each indicator surpasses a threshold of 0.708 [141]. The second step is to ensure that the CR and Cronbach's alpha reach acceptable values. Specifically, the CR and Cronbach's alpha must have acceptable values of at least 0.70 [142,143]. The third step is to evaluate the convergent validity of the constructs by using the average variance extracted. The AVE of each latent variable must be higher than the standard of 0.50 [139]. It can be seen in Table 3 that the model can be regarded as valid and reliable, as all values of each construct surpassed the threshold for each standard.

Table 2. Consistency Reliability and Convergent Validity.

Construct	Items	Mean	S.D.	FL (≥0.7)	α (≥0.7)	CR (≥0.7)	AVE (≥0.5)
Understanding of the Virus	UT1	4.76	0.48	0.770	0.830	0.880	0.595
	UT2	4.76	0.47	0.807			
	UT3	4.77	0.50	0.714			
	UT4	4.31	0.88	0.765			
	UT5	4.58	0.69	0.799			
Perceived Severity	PS1	4.80	0.48	0.874	0.761	0.863	0.678
	PS2	4.70	0.60	0.830			
	PS3	4.44	0.63	-			
	PS4	4.80	0.48	-			
	PS5	4.76	0.53	0.764			
Perceived Vulnerability	PV1	4.20	0.79	0.818	0.827	0.878	0.592
	PV2	4.14	0.80	0.801			
	PV3	4.15	0.77	0.752			
	PV4	4.07	0.76	0.707			
	PV5	4.21	0.79	0.762			
Response Efficacy	RE1	4.54	0.68	0.852	0.914	0.936	0.745
	RE2	4.54	0.71	0.847			
	RE3	4.60	0.64	0.892			
	RE4	4.54	0.75	0.811			
	RE5	4.64	0.60	0.909			
Self-Efficacy	SE1	4.54	0.70	0.822	0.863	0.902	0.649
	SE2	4.59	0.74	0.789			
	SE3	4.55	0.70	0.833			
	SE4	4.60	0.69	0.701			
	SE5	4.65	0.62	0.874			
Response Cost	RC1	4.61	0.67	0.800	0.812	0.862	0.556
	RC2	4.75	0.55	0.752			
	RC3	4.41	0.85	0.721			
	RC4	4.01	1.10	0.725			
	RC5	4.13	1.04	0.729			

Table 2. *Cont.*

Construct	Items	Mean	S.D.	FL (≥0.7)	α (≥0.7)	CR (≥0.7)	AVE (≥0.5)
Attitude	AT1	4.60	0.63	0.810	0.848	0.892	0.623
	AT2	4.48	0.75	0.744			
	AT3	4.50	0.77	0.787			
	AT4	4.48	0.70	0.831			
	AT5	4.72	0.60	0.770			
Subjective Norms	SN1	4.67	0.66	0.794	0.816	0.871	0.575
	SN2	4.69	0.69	0.739			
	SN3	4.50	0.79	0.746			
	SN4	4.20	0.79	0.725			
	SN5	4.53	0.75	0.786			
Perceived Behavioral Control	PBC1	4.62	0.62	0.752	0.819	0.859	0.550
	PBC2	4.15	1.13	0.757			
	PBC3	4.15	1.20	0.710			
	PBC4	4.29	0.97	0.709			
	PBC5	4.13	1.16	0.779			
Behavioral Intention	BI1	4.79	0.47	0.826	0.854	0.896	0.633
	BI2	4.56	0.64	0.713			
	BI3	4.63	0.64	0.808			
	BI4	4.73	0.55	0.848			
	BI5	4.69	0.61	0.775			
Physical Ergonomics	PE1	4.89	0.38	0.891	0.734	0.883	0.79
	PE2	3.54	1.43	0.773			
	PE3	3.88	1.30	0.767			
	PE4	4.24	0.77	-			
	PE5	4.84	0.49	0.887			
Cognitive Ergonomics	CE1	4.62	0.65	0.743	0.830	0.875	0.538
	CE2	4.38	0.65	0.717			
	CE3	4.40	0.66	0.716			
	CE4	4.42	0.68	0.732			
	CE5	4.72	0.56	0.739			
	CE6	4.70	0.62	0.753			
Macro Ergonomics	ME1	3.33	1.42	0.928	0.942	0.956	0.813
	ME2	3.56	1.27	0.913			
	ME3	3.23	1.47	0.930			
	ME4	3.58	1.29	0.817			
	ME5	3.40	1.40	0.915			
Protective Behavior	PB1	4.77	0.52	0.791	0.817	0.873	0.578
	PB2	4.64	0.60	0.785			
	PB3	4.71	0.57	0.781			
	PB4	4.72	0.54	0.725			
	PB5	4.57	0.77	0.717			

The fourth step in interpreting the reflective measurements of PLS-SEM results is evaluating their discriminant validity using the Fornell–Larcker criterion and heterotrait–monotrait ratio (HTMT) [141]. According to Henseler et al. [142], using the Fornell–Larcker criterion alone may not be enough to establish discriminant validity for each measure. Thus, it is proposed to use the HTMT ratio in the assessment, as it provides more significant results than the Fornell–Larcker criterion. With that, Ab Hamid et al. [143] recommended that in using the HTMT ratio to assess significant discriminant validity among all constructs, the value must not exceed the threshold of 0.85. As shown in Tables 3 and 4, the values for each construct are well within the desired range of values. Therefore, the model and its constructs offer reliability and validity.

Table 3. Discriminant Validity: Fornell–Larcker Criterion.

	AT	PBC	BI	CE	ME	PB	PE	PS	PV	RC	RE	SE	SN	UT
AT	0.789													
PBC	0.524	0.742												
BI	0.683	0.485	0.795											
CE	0.659	0.560	0.722	0.733										
ME	0.363	0.454	0.279	0.419	0.902									
PB	0.601	0.448	0.780	0.695	0.271	0.760								
PE	0.555	0.431	0.682	0.628	0.298	0.619	0.889							
PS	0.477	0.436	0.540	0.481	0.226	0.525	0.478	0.824						
PV	0.436	0.484	0.412	0.506	0.581	0.372	0.225	0.315	0.769					
RC	0.511	0.490	0.485	0.502	0.350	0.409	0.474	0.480	0.486	0.746				
RE	0.686	0.499	0.593	0.572	0.337	0.554	0.499	0.488	0.430	0.458	0.863			
SE	0.740	0.487	0.694	0.591	0.296	0.609	0.504	0.497	0.414	0.490	0.655	0.806		
SN	0.614	0.535	0.603	0.622	0.401	0.564	0.558	0.495	0.418	0.609	0.530	0.554	0.758	
UT	0.533	0.488	0.581	0.626	0.289	0.575	0.579	0.535	0.473	0.487	0.511	0.470	0.562	0.772

Table 4. Discriminant Validity: Heterotrait–Monotrait (HTMT) Ratio.

	AT	PBC	BI	CE	ME	PB	PE	PS	PV	RC	RE	SE	SN
PBC	0.531												
BI	0.797	0.486											
CE	0.781	0.623	0.844										
ME	0.408	0.536	0.313	0.500									
PB	0.720	0.455	0.830	0.825	0.311								
PE	0.694	0.464	0.858	0.782	0.114	0.793							
PS	0.595	0.477	0.668	0.599	0.264	0.664	0.639						
PV	0.528	0.581	0.494	0.629	0.662	0.452	0.288	0.394					
RC	0.597	0.587	0.545	0.598	0.450	0.459	0.551	0.559	0.621				
RE	0.780	0.521	0.670	0.649	0.360	0.643	0.608	0.587	0.493	0.506			
SE	0.861	0.497	0.803	0.689	0.331	0.726	0.633	0.613	0.488	0.551	0.736		
SN	0.733	0.597	0.720	0.750	0.464	0.686	0.715	0.627	0.517	0.732	0.616	0.659	
UT	0.628	0.537	0.688	0.743	0.334	0.691	0.731	0.663	0.575	0.585	0.589	0.549	0.679

In Table 5, the model fit analysis is presented to further show the validity of the proposed model. As seen in the table, all values for the standardized root mean square residual (SRMR), chi^2, and normal fit index (NFI) exceeded the thresholds adopted from previous studies [144,145]. Therefore, this indicates that the proposed model is acceptable.

Table 5. Model Fit.

Model Fit for SEM	Parameter Estimates	Minimum Cut-Off	Recommended By
SRMR	0.074	<0.08	Hu and Bentler [146]
(Adjusted) Chi-Square/dF	3.505	<5.0	Hooper [147]
Normal Fit Index (NFI)	0.964	>0.90	Baumgartner and Homburg [144]

3.3. Results of Final SEM

Table 6 presents the results after PLS-SEM was performed to test the hypothesized factors affecting the protective behavior of Filipinos against COVID-19. It can be seen that the protective behavior of Filipinos from COVID-19 was significantly affected by behavioral intention (β = 0.533, p = 0.001), cognitive ergonomics (e = 0.241, p = 0.004), and macro ergonomics (β = 0.212, p = 0.003). Moreover, the table also shows that behavioral intention was significantly influenced by perceived severity (β = 0.157, p = 0.033), self-efficacy (β = 0.301, p = 0.001), attitude (β = 0.218, p = 0.005), and subjective norms (β = 0.173, p = 0.014). Furthermore, an understanding of COVID-19 (β = 0.535, p = 0.001; β = 0.473, p = 0.001) was found to have a significant impact on perceived severity and perceived vulnerability. However, perceived vulnerability (β = 0.042, p = 0.462), response efficacy (β = 0.054, p = 0.467), response cost (β = 0.009, p = 0.874), and perceived behavioral control (β = 0.021, p = 0.686) showed no significant influence on behavioral intention. Lastly, physical ergonomics (β = 0.102, p = 0.171) was found to have no significant impact on protective behavior from COVID-19.

Table 6. Structural Model Analysis.

Hypothesis Path		Beta Coefficient (β)	p-Value	Result	Significance	Decision
1	UT→PS	0.535	<0.001	Positive	Significant	Accept
2	UT→PV	0.473	<0.001	Positive	Significant	Accept
3	PS→BI	0.157	0.033	Positive	Significant	Accept
4	PV→BI	0.042	0.462	Positive	Not Significant	Reject
5	RE→BI	0.054	0.467	Positive	Not Significant	Reject
6	SE→BI	0.301	<0.001	Positive	Significant	Accept
7	RC→BI	0.009	0.874	Positive	Not Significant	Reject
8	AT→BI	0.218	0.005	Positive	Significant	Accept
9	SN→BI	0.173	0.014	Positive	Significant	Accept
10	PBC→BI	0.021	0.686	Positive	Not Significant	Reject
11	BI→PB	0.533	<0.001	Positive	Significant	Accept
12	PE→PB	0.102	0.171	Positive	Not Significant	Reject
13	CE→PB	0.241	0.004	Positive	Significant	Accept
14	ME→PB	0.212	0.003	Positive	Significant	Accept

Table 7 displays the outcomes of an internal model evaluation based on the coefficient of determination (R^2) and predictive relevance (Q^2). The final R^2 represents the predictive ability of the exogenous latent variables' combined impact on the endogenous variables [139]. The generated R^2 values for this model are 65% for protective behavior, 60.1% for behavioral intention, 28.6% for perceived severity, and 22.1% for perceived vulnerability. This implies that this model has the predictive ability to explain the protective behavior of Filipinos against COVID-19, since an R^2 score of 0.20 or 20% is considered

high for studies on behavioral discipline [147]. In addition, the data analysis shows that all the endogenous constructs in the model have Q^2 values greater than zero, which means they have satisfactory predictive relevance. Q^2 is a measure that checks how well a model can predict outcomes. To calculate it, some data is held back, and the model is built using the rest. Then, the held-back data is used to predict the outcomes, and Q^2 measures how accurate these predictions are. If the Q^2 value is positive, it means the model can predict outcomes effectively, which is good [145].

Table 7. Coefficient of Determination and Predictive Relevance.

Latent Variable	R^2	R^2 Adjusted	Q^2
Perceived Severity	0.286	0.248	0.342
Perceived Vulnerability	0.221	0.218	0.421
Behavioral Intention	0.601	0.525	0.382
Protective Behavior	0.650	0.629	0.289

4. Discussion

This study investigated the factors affecting the protective behavior of Filipinos from COVID-19 by using the models of protection motivation theory and the theory of planned behavior with the integration of ergonomic appraisal factors. To further understand, partial least square structural equation modeling (PLS-SEM) was utilized to analyze and conduct hypothesis testing of the relationships between factors influencing the protective behavior of Filipinos from COVID-19, namely, understanding of COVID-19 (UT), perceived severity (PS), perceived vulnerability (PV), response efficacy (RE), self-efficacy (SE), response cost (RC), attitude (AT), subjective norms (SN), behavioral control (BC), behavioral intention (BI), physical ergonomics (PE), cognitive ergonomics (CE), and macro ergonomics (ME).

The results of the PLS-SEM analysis of the model showed that 9 out of the 14 hypotheses are accepted and have a significant relationship. The results indicate that behavioral intention (BI) showed the most significant influence on protective behavior against COVID-19. This means that the degree to which people are willing to cooperate and the degree to which they do so are closely related to the degree of behavioral willingness that people exhibit. This suggests that individuals with strong attitudes are more likely to maintain their beliefs and act accordingly [148]. In other words, strong attitudes towards protective behavior contribute to individuals' willingness to engage in it consistently over time. Strong attitudes towards recommended protective measures are more likely to exhibit sustained compliance with those measures, aligning with the broader goal of effective long-term adherence. It was observed in the study of Lama et al. [149] that people with prior behavioral intention to perform preventive measures against a health-related illness were more likely to develop a protective behavior against COVID-19. Furthermore, Tang et al. [150] observed that across any demographic profile, people are most likely to develop a protective behavior if they have the intention to do so. Lastly, Lüdecke [151] and von dem Khosravi [152] stated that specific information regarding the disease is necessary for people to develop an intention in adopting a protective behavior. Therefore, in order for the government to more effectively guide people to follow the officially recommended protective behaviors, it should give full consideration to people's willingness to engage in these and enhance people's cooperation. This can promote the effectiveness and sustainability of the implementation of these behaviors to a certain extent, and it can also contribute to the formation of better hygiene habits in day-to-day life.

The understanding of COVID-19 (UT) was also found to have positive significant impact on perceived severity and perceived vulnerability. This explains that an individual's awareness about the dangers of the virus will increase the individual's perception of the severity of the virus. In a study by Khosravi [152], knowledge and understanding of the disease can affect a person's intention to develop preventive measures. Moreover, it

was also stated that constant worrying about acquiring the infection affects a person's emotional response, which can trigger protective behavior against a threat. Furthermore, Cori et al. [153] mentioned that knowledge plays a vital role in how individuals' risk perception is affected. Thus, a better understanding of the risk, which is the pandemic, could improve the perceived severity of the risk and the perceived vulnerability of an individual. However, information may not be accessible to individuals in nations where poverty is widespread. Thus, it is proposed that government officials must have a plan to educate those who do not have direct access to data and information regarding the pandemic [154].

It was also proven that behavioral intention was significantly influenced by perceived severity (PS) and self-efficacy (SE). This is an indication that Filipinos are more likely to develop an intent to apply protective behavior to their lifestyle based on their perception of the severity and possible health implications of COVID-19. According to Berg and Lin [155], perceived severity and self-efficacy are two of the main factors that were found to significantly impact individuals' behavioral intentions to adopt a preventive behavior. Furthermore, people tend to engage in protective measures and develop protective behavior if it lessens the probability that they contract the virus. Previous research has shown similar findings, wherein perceived severity and self-efficacy are the factors that have a major impact on the intention to engage in protective behavior against respiratory illnesses such as COVID-19 [156].

Attitude (AT) and subjective norms (SN) were also found to have a significant impact on behavioral intention. This is an indication that the opinion of the people that surround an individual matters to that individual regarding whether they should follow the recommended protective measures or not. In addition, this also proved that when the recommended protective behaviors are effective, they is more likely to be adopted. This is supported by the study of Seale et al. [157], who observed that individuals who are surrounded by people, whether family, peers, or relatives, who believe in complying with the recommended protective measures to prevent themselves from acquiring the disease are most likely to adopt the same behaviors. Furthermore, Li et al. [89] stated that the strict application of recommended protective measures and behaviors, whether from the government, family, friends, or themselves, made people more likely to follow and comply. On the other hand, based on the results of the current study, PBC has shown no significant influence on behavioral intention. Hagger et al. [63] explained that people's intention to change behavior is highly unlikely to be influenced by perceived behavioral control. As Conner et al. [158] explained, in similar health-related situations, some behavioral intentions are based on the satisfaction of other people rather than themselves.

In addition, cognitive ergonomics (CE) and macro ergonomics (ME) showed significant relationships towards protective behavior against COVID-19. This proves that people tends to follow social protocols (i.e., social distancing, avoiding mass gatherings and public places) and hygienic practices (i.e., handwashing and sanitizing) to prevent them from acquiring the virus. Moreover, it also proves that people are more likely to follow social protocols and adopt protective behavior when it is strictly implemented and recommended by the government and its agencies. This is supported by the study conducted by Economou [159], wherein it is stated that based on the authors' analysis, physical social distancing was indicated by stigma. It was also observed that people found it more sensible to keep a social distance than to talk to a stranger. Furthermore, Meier et al. [160] found that social distancing is a significant predictor of protective behavior and is known to be an effective protective measure. In line with that, Adiyoso and Wilopo [64] stated that social media plays a huge role in changing the intention to adopt a protective behavior, which in this case is social distancing. Moreover, trust in the government was associated with fear and hope—thus, protective behavior and the intention to comply with recommended preventive measures are highly adopted [161]. Lastly, Siegrist and Zingg [162] stated that trust and confidence in the government are observed due to the guidance of medical experts and personnel during the pandemic.

On the contrary, perceived vulnerability (PV), response efficacy (RE), and response cost (RC) showed insignificant impacts on behavioral intention. Mortada et al. [56] stated that perceived vulnerability had little relevance to health-related behavioral intentions. In addition, Kok et al. [163] stated that response efficacy had an insignificant impact on behavioral intention to adopt protective behavior against the pandemic and comply with the recommended preventive measures. Lastly, similar to the studies conducted by Min et al. [86] and Teasdale et al. [164], response cost showed no significant influence on behavioral intention to adopt protective behavior, as the increase in cost may reduce engagements with recommended protective behavior, especially in areas of poverty.

Physical ergonomics (PE) was also found to have no significant impact on the protective behavior of Filipinos against COVID-19. Based on the study conducted by Martinelli et al. [165], physical barriers across nations have different implementation methods. Thus, this created a difference in opinion regarding personal protective equipment application. Because of this, some people tend to disregard the recommended use of physical protective equipment. However, the use of protective equipment may have an impact on preventing COVID-19 transmission, but not significantly [77]. According to the Mayo Clinic [166], a surgical face mask is highly recommended. Still, it does not apply with the help of other protective equipment such as a face shield, since there is not enough evidence of its significant impact on COVID-19 protection.

Given that the Philippines has yet to achieve a COVID-19-free status, it becomes crucial to delve into how individuals can adopt protective behaviors and adhere to the recommended preventive measures. Enhancing the dissemination of accurate information holds the potential to improve Filipino citizens' willingness to embrace these protective behaviors and measures. Additionally, both private and public organizations can leverage the findings of such studies to design programs aimed at motivating and encouraging Filipinos to cultivate protective behaviors against the virus.

4.1. Theoretical Contributions

The novel coronavirus (COVID-19) has impacted the whole world significantly in various ways and with varying severity. Each individual who has been infected with the virus shows differences in terms of health impact. This can explain the relationship between the host, virus, and environment [167]. The present study investigated the factors influencing the protective behavior of Filipinos against COVID-19. The indicators of this study are based on the models of the PMT and TPB, as well as ergonomic integration factors. Using the study's findings, future academicians and medical practitioners or personnel may look into how threat and coping factors, maladaptive behaviors, and ergonomic factors affect the protective behavior of Filipinos. In addition, the proposed and developed model in the current study can be used as a theoretical framework for evaluating studies in similar disciplines.

4.2. Practical Implications

To fully understand how to convince Filipinos to further develop protective behaviors against COVID-19, the results of this study have highlighted the importance of disseminating and educating Filipinos regarding the coronavirus. It is evident that understanding COVID-19 played a huge role in the intention to develop protective behavior. Thus, developing programs that educate people regarding necessary protective measures to be adopted during this pandemic, especially those who live in rural areas and other cities where poverty is prominent, is crucial. Furthermore, the findings of the study can be used by local government units to develop educational programs or seminars that could help the community fully understand the severity of the current pandemic, especially now that the government has allowed face-to-face (F2F) classes to be conducted among all educational levels. Lastly, the findings of the study can be used by the government to implement new and improved preventive measures and strategies against COVID-19, since macro

ergonomics proved to be one of the significant factors that affect the protective behavior of Filipinos against the virus.

4.3. Limitations

Despite producing a promising outcome, the study faces a few limitations. Due to time constraints and limited social reach, the study gathered only a moderate number of respondents outside NCR and Region IV-A (CALABARZON). Thus, a broader survey scope may help improve the study's outcomes. Furthermore, the statistics of demographics showed that majority of the respondents belonged to the younger age group (30 years old and below). This specific demographic composition raises concerns about the extent to which our findings can be considered representative of the broader population. The homogeneity of our sample means that certain subgroups, such as older adults, individuals from rural areas, or those with different educational or socio-economic backgrounds, were underrepresented or not represented at all. Due to the lack of representativeness, our ability to generalize the findings is significantly limited. The behaviors, attitudes, and outcomes observed in our study may not accurately reflect those of the larger, more diverse population. Thus, it is recommended to include more respondents belonging to the higher age bracket (30 years old and above). In addition, the study did not consider gender, COVID-19 history, type of location (urban or rural), religion, culture, or income as mediating factors affecting the protective behavior, since a skewed result can be observed from an online survey. Thus, it is proposed that future researchers integrate these factors in their study to confirm the proposed hypotheses of this study. Future research could investigate these aspects to provide a more comprehensive understanding of the factors affecting behavioral protection during the pandemic. Lastly, it is recommended that researchers recognize and incorporate the direct influence of perceived behavioral control on behavior, particularly in the context of promoting COVID-19 protective measures. By doing so, researchers can achieve a more comprehensive understanding of the factors shaping behavior. This holistic approach will enable the development of more effective interventions aimed at promoting adherence to COVID-19 protective measures. Additionally, exploring the interplay between perceived control and other psychological factors can provide valuable insights into how to tailor interventions to address individual needs and enhance overall compliance with recommended protocols.

5. Conclusions

Due to the lack of information and studies analyzing the ergonomic-related factors and protective behavior, it is essential to fully understand what factors influence the perception of Filipinos towards developing a protective behavior against the COVID-19 pandemic and how. The results of the study showed that understanding COVID-19 significantly influenced the perceived severity of COVID-19 and vulnerability of Filipinos to the virus. Furthermore, perceived severity, self-efficacy, attitude, and subjective norms were found to influence behavioral intention, affecting the development of protective behavior. Moreover, cognitive and macro ergonomics significantly impacted Filipinos' protective behavior.

With that, more inclusive information and improved health programs to prevent and mitigate the further transmission of COVID-19 are recommended. This study can help inform and educate people about the severity of the virus and the necessary protective behaviors to be adopted. Moreover, disseminating factual information to impoverished areas may help improve individuals' understanding of the pandemic. Thus, future researchers may use this study as a theoretical framework to further determine other factors that may influence protective behavior.

While this study provides valuable insights, it is important to consider that the unique cultural, historical, and geographical aspects of the Philippines might make it challenging to generalize the findings to other countries. The strong community ties, religious influences, and logistical complexities specific to the Philippines are factors that might not be as relevant or influential in other contexts. Therefore, while the study adds to the broader

understanding of pandemic responses, the specific findings should be interpreted with caution when applying them to different national contexts.

In conclusion, the unique response of the Philippines to COVID-19, shaped by its stringent lockdown measures, logistical challenges, cultural dynamics, and community-oriented practices, offers critical lessons and insights. These aspects underscore the importance of context-specific strategies in managing public health crises and highlight the need for tailored approaches that consider the socio-cultural and geographical nuances of each country.

Supplementary Materials: The following supporting information can be downloaded at: https://www.mdpi.com/article/10.3390/covid4060052/s1, Table S1: Summary Statistics of Demographics.

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References

1. World Health Organization. Who Director-General's Opening Remarks at the Media Briefing on COVID-19—11 March 2020. Available online: https://www.who.int/director-general/speeches/detail/who-director-general-s-opening-remarks-at-the-media-briefing-on-COVID-19---11-march-2020 (accessed on 15 February 2023).
2. Atalan, A. Is the lockdown important to prevent the COVID-19 pandemic? effects on psychology, environment and economy-perspective. *Ann. Med. Surg.* **2020**, *56*, 38–42. [CrossRef] [PubMed]
3. Department of Health Website. When Will the COVID-19 Vaccines Be Available to Me? Available online: https://doh.gov.ph/Vaccines/when-will-the-COVID-19-available-to-me (accessed on 15 February 2023).
4. Chen, Y.-L.; Lin, Y.-J.; Chang, Y.-P.; Chou, W.-J.; Yen, C.-F. Differences in the protection motivation theory constructs between people with various latent classes of motivation for vaccination and preventive behaviors against COVID-19 in Taiwan. *Int. J. Environ. Res. Public Health* **2021**, *18*, 7042. [CrossRef] [PubMed]
5. Paton, D. Disaster preparedness: A social-cognitive perspective. *Disaster Prev. Manag. Int. J.* **2003**, *12*, 210–216. [CrossRef]
6. Rampal, L.; Liew, B.S.; Choolani, M.; Ganasegeran, K.; Pramanick, A.; A Vallibhakara, S.; Tejativaddhana, P.; Hoe, V.C. Battling COVID-19 pandemic waves in six South-East Asian countries: A real-time consensus review. *Med. J. Malays.* **2020**, *75*, 613–625.
7. Hapal, K. The Philippines' COVID-19 Response: Securitising the Pandemic and Disciplining the Pasaway. *J. Curr. Southeast Asian Aff.* **2021**, *40*, 224–244. [CrossRef]
8. Coker, R.J.; Hunter, B.M.; Rudge, J.W.; Liverani, M.; Hanvoravongchai, P. Emerging infectious diseases in southeast Asia: Regional challenges to control. *Lancet* **2011**, *377*, 599–609. [CrossRef] [PubMed]
9. Talabis, D.A.S.; Babierra, A.L.; H. Buhat, C.A.; Lutero, D.S.; Quindala, K.M.; Rabajante, J.F. Local government responses for COVID-19 management in the Philippines. *BMC Public Health* **2021**, *21*, 1711. [CrossRef]
10. Filip, R.; Puscaselu, R.G.; Anchidin-Norocel, L.; Dimian, M.; Savage, W.K. Global Challenges to Public Health Care Systems during the COVID-19 Pandemic: A Review of Pandemic Measures and Problems. *J. Pers. Med.* **2022**, *12*, 1295. [CrossRef]
11. Sumaylo, D.J. *Engaging Isolated Communities in Disaster Preparation and Communication in the Philippines*; Springer Nature: Berlin/Heidelberg, Germany, 2023; Volume 11.
12. Dayrit, M.M.; Lagrada, L.P.; Picazo, O.F.; Pons, M.C.; Villaverde, M.C. The Philippines health system review. *Health Syst. Transit.* **2018**, *8*. Available online: https://iris.who.int/handle/10665/274579 (accessed on 21 October 2022).

13. de Lara-Tuprio, E.P.; Estuar, M.R.J.E.; Sescon, J.T.; Lubangco, C.K.; Castillo, R.C.J.T.; Teng, T.R.Y.; Tamayo, L.P.V.; Macalalag, J.M.R.; Vedeja, G.M. Economic losses from COVID-19 cases in the Philippines: A dynamic model of health and economic policy trade-offs. *Humanit. Soc. Sci. Commun.* **2022**, *9*, 111. [CrossRef]
14. Sabahelzain, M.M.; Hartigan-Go, K.; Larson, H.J. The politics of COVID-19 vaccine confidence. *Curr. Opin. Immunol.* **2021**, *71*, 92–96. [CrossRef] [PubMed]
15. Anastacio, A. Challenges, difficulties, and opportunities of nurses during COVID-19 pandemic: An assessment of disaster nursing care experience. *Eubios J. Asian Int. Bioeth.* **2020**, *30*, 344.
16. Capili, J.T.; Luis, L.M.G.; Asuncion, J.E.L.; Luyun, J.L.; Canapi, J.B.; Rimban, E.L. Narratives of hospital health care professionals during the pandemic in the Northern Philippines: A phenomenological study. *Jàmbá-J. Disaster Risk Stud.* **2022**, *14*, 1284. [CrossRef] [PubMed]
17. Sawada, Y.; Sumulong, L. Macroeconomic Impact of COVID-19 in Developing Asia. 2021. Available online: https://journals.co.za/doi/abs/10.4102/jamba.v14i1.1284 (accessed on 21 October 2022).
18. Lavado, R.F.; Nowacka, K.; Raitzer, D.A.; Rodgers, Y.V.D.M.; Zveglich, J.E., Jr. COVID-19 disparities by gender and income: Evidence from the Philippines. *Int. Labour Rev.* **2022**, *161*, 107–123. [CrossRef] [PubMed]
19. Cocal, C.J. Effectiveness of the Philippine Government's Responses to COVID-19 Pandemic. *J. Sci. Res. Rep.* **2021**, *27*, 44–53. [CrossRef]
20. Yazdanpanah, M.; Abadi, B.; Komendantova, N.; Zobeidi, T.; Sieber, S. Some at risk for COVID-19 are reluctant to take precautions, but others are not: A case from rural in southern Iran. *Front. Public Health* **2020**, *8*, 562300. [CrossRef] [PubMed]
21. Rogers, R.W. A protection motivation theory of fear appeals and Attitude change1. *J. Psychol.* **1975**, *91*, 93–114. [CrossRef] [PubMed]
22. Schmees, R. The Role of Cognitive Appraisals and Past Protective Behavior in Future Protection Motivation: Applying Protection Motivation Theory to the COVID-19 Pandemic. Essay.utwente.nl. 2020. Available online: https://essay.utwente.nl/85449/ (accessed on 8 November 2022).
23. Milne, S.; Orbell, S.; Sheeran, P. Combining motivational and volitional interventions to promote exercise participation: Protection motivation theory and implementation intentions. *Br. J. Health Psychol.* **2002**, *7*, 163–184. [CrossRef] [PubMed]
24. Hanson, C.L.; Crandall, A.; Barnes, M.D.; Novilla, M.L. Protection motivation during COVID-19: A cross-sectional study of family health, media, and economic influences. *Health Educ. Behav.* **2021**, *48*, 434–445. [CrossRef]
25. Brookes, E. The Theory of Planned Behavior. Available online: https://www.simplypsychology.org/theory-of-planned-behavior.html (accessed on 7 February 2023).
26. Gibson, L.P.; Magnan, R.E.; Kramer, E.B.; Bryan, A.D. Theory of planned behavior analysis of social distancing during the COVID-19 pandemic: Focusing on the intention–behavior gap. *Ann. Behav. Med.* **2021**, *55*, 805–812. [CrossRef]
27. Aschwanden, D.; Strickhouser, J.E.; Sesker, A.A.; Lee, J.H.; Luchetti, M.; Terracciano, A.; Sutin, A.R. Preventive behaviors during the COVID-19 pandemic: Associations with perceived behavioral control, attitudes, and subjective norm. *Front. Public Health* **2021**, *9*, 662835. [CrossRef] [PubMed]
28. Norman, P.; Boer, H.; Seydel, E.R.; Mullan, B. *Protection Motivation Theory. Predicting and Changing Health Behaviour: Research and Practice with Social Cognition Models*; McGraw-Hill Education: New York, NY, USA, 2015; Volume 3, pp. 70–106.
29. Helmes, A.W. Application of the protection motivation theory to genetic testing for breast cancer risk. *Prev. Med.* **2002**, *35*, 453–462. [CrossRef] [PubMed]
30. Ryan, S.; Carr, A. Applying the biopsychosocial model to the management of rheumatic disease. *Rheumatology* **2010**, 63–75. Available online: https://www.sciencedirect.com/science/article/abs/pii/B978044306934500005X?via=ihub (accessed on 21 October 2022).
31. Ajzen, I. Perceived behavioral control, self-efficacy, locus of control, and the theory of planned behavior1. *J. Appl. Soc. Psychol.* **2002**, *32*, 665–683. [CrossRef]
32. Gurses, A.P.; Tschudy, M.M.; McGrath-Morrow, S.; Husain, A.; Solomon, B.S.; Gerohristodoulos, K.A.; Kim, J.M. Overcoming COVID-19: What can human factors and ergonomics offer? *J. Patient Saf. Risk Manag.* **2020**, *25*, 49–54. [CrossRef] [PubMed]
33. Wooldridge, A.R.; Carman, E.-M.; Xie, A. Human factors and ergonomics (HFE) applications in responses to the COVID-19 pandemic: Lessons learned and considerations for methods. *Appl. Ergon.* **2022**, *102*, 103733. [CrossRef] [PubMed]
34. Boutebal, S.E.; Benkhelifa, F.; Azzeddine, M. Prevention measures of COVID-19 pandemic: What can ergonomics offer? *Psychol. Soc. Santé L'Environ.* **2021**, *5*, 109–112.
35. Berlin, C.; Adams, C. *Production Ergonomics: Designing Work Systems to Support Optimal Human Performance*; Ubiquity Press: London, UK, 2017.
36. Wickens, C.D.; Helton, W.S.; Hollands, J.G.; Banbury, S. *Engineering Psychology and Human Performance*; Routledge: London, UK, 2021.
37. Ansari-Moghaddam, A.; Seraji, M.; Sharafi, Z.; Mohammadi, M.; Okati-Aliabad, H. The protection motivation theory for predict intention of COVID-19 vaccination in Iran: A structural equation modeling approach. *BMC Public Health* **2021**, *21*, 1165. [CrossRef]
38. Lin, Y.-J.; Yen, C.-F.; Chang, Y.-P.; Wang, P.-W. Comparisons of motivation to receive COVID-19 vaccination and related factors between frontline physicians and nurses and the public in Taiwan: Applying the Extended Protection Motivation Theory. *Vaccines* **2021**, *9*, 528. [CrossRef]

39. Prasetyo, Y.T.; Castillo, A.M.; Salonga, L.J.; Sia, J.A.; Seneta, J.A. Factors affecting perceived effectiveness of COVID-19 prevention measures among Filipinos during enhanced community quarantine in Luzon, Philippines: Integrating Protection Motivation Theory and extended theory of planned behavior. *Int. J. Infect. Dis.* **2020**, *99*, 312–323. [CrossRef]
40. Abraham, C.; Sheeran, P. *The Health Belief Model. Predicting Health Behaviour: Research and Practice with Social Cognition Models*; University of Buckingham Press: Buckingham, UK, 2015; Volume 2, pp. 30–55.
41. Luszczynska, A.; Schwarzer, R. Social cognitive theory. *Fac. Health Sci. Public* **2015**, *2015*, 225–251.
42. Ajzen, I. The theory of planned behavior: Frequently asked questions. *Hum. Behav. Emerg. Technol.* **2020**, *2*, 314–324. [CrossRef]
43. Chuenyindee, T.; Ong, A.K.; Prasetyo, Y.T.; Persada, S.F.; Nadlifatin, R.; Sittiwatethanasiri, T. Factors affecting the perceived usability of the COVID-19 contact-tracing application "Thai chana" during the early COVID-19 omicron period. *Int. J. Environ. Res. Public Health* **2022**, *19*, 4383. [CrossRef] [PubMed]
44. Wyper, G.M.; Assunção, R.; Cuschieri, S.; Devleesschauwer, B.; Fletcher, E.; Haagsma, J.A.; Hilderink, H.B.; Idavain, J.; Lesnik, T.; Von der Lippe, E.; et al. Population vulnerability to COVID-19 in Europe: A burden of disease analysis. *Arch. Public Health* **2020**, *78*, 47. [CrossRef] [PubMed]
45. Rod, J.E.; Oviedo-Trespalacios, O.; Cortes-Ramirez, J. A brief-review of the risk factors for COVID-19 severity. *Rev. Saúde Pública* **2020**, *54*, 60. [CrossRef] [PubMed]
46. Weinstein, N.D. Health risk appraisal and optimistic bias. *Int. Encycl. Soc. Behav. Sci.* **2001**, 6612–6615. [CrossRef]
47. Lahiri, A.; Jha, S.S.; Chakraborty, A.; Dobe, M.; Dey, A. Role of threat and coping appraisal in protection motivation for adoption of preventive behavior during COVID-19 pandemic. *Front. Public Health* **2021**, *9*, 678566. [CrossRef] [PubMed]
48. Fragkaki, I.; Maciejewski, D.F.; Weijman, E.L.; Feltes, J.; Cima, M. Human responses to COVID-19: The role of optimism bias, perceived severity, and anxiety. *Personal. Individ. Differ.* **2021**, *176*, 110781. [CrossRef] [PubMed]
49. Tang, C.-C.; Chen, H.; Wu, W.-W. Factors influencing the protective behavior of individuals during COVID-19: A transnational survey. *Sci. Rep.* **2021**, *11*, 21654. [CrossRef]
50. González-Castro, J.L.; Ubillos-Landa, S.; Puente-Martínez, A.; Gracia-Leiva, M. Perceived vulnerability and severity predict adherence to COVID-19 protection measures: The mediating role of instrumental coping. *Front. Psychol.* **2021**, *12*, 674032. [CrossRef]
51. Rogers, R.W.; Cacioppo, J.T.; Petty, R.E. Cognitive and physiological processes in fear appeals and attitude change: A revised theory of protection motivation. *Soc. Psychophysiol. Sourceb.* **1983**, 153–177. Available online: https://cir.nii.ac.jp/crid/1570572700020740224 (accessed on 21 October 2022).
52. Floyd, D.L.; Prentice-Dunn, S.; Rogers, R.W. A meta-analysis of research on Protection Motivation theory. *J. Appl. Soc. Psychol.* **2000**, *30*, 407–429. [CrossRef]
53. Zhang, W.; Xiong, S.; Zheng, Y.; Wu, J. Response efficacy and self-efficacy mediated the relationship between perceived threat and psychic anxiety among college students in the early stage of the COVID-19 pandemic. *Int. J. Environ. Res. Public Health* **2022**, *19*, 2832. [CrossRef] [PubMed]
54. Neuwirth, K.; Dunwoody, S.; Griffin, R.J. The Influence of Severity, Vulnerabilty, and Response Efficacy on Information Seeking and Behavioral Intention. 40. 1995. Available online: https://eric.ed.gov/?id=ED388997 (accessed on 21 October 2022).
55. Witte, K. Fear control and danger control: A test of the extended parallel process model (EPPM). *Commun. Monogr.* **1994**, *61*, 113–134. [CrossRef]
56. Mortada, E.; Abdel-Azeem, A.; Al Showair, A.; Zalat, M. Preventive behaviors towards COVID-19 pandemic among healthcare providers in Saudi Arabia using the Protection Motivation Theory. *Risk Manag. Healthc. Policy* **2021**, *14*, 685–694. [CrossRef] [PubMed]
57. Karademas, E.C.; Thomadakis, C. COVID-19 pandemic-related representations, self-efficacy, and psychological well-being in the general population during lockdown. *Curr. Psychol.* **2021**, *42*, 4523–4530. [CrossRef] [PubMed]
58. Khani Jeihooni, A.; Bashti, S.; Erfanian, B.; Ostovarfar, J.; Afzali Hasirini, P. Application of protection motivation theory (PMT) on skin cancer preventive behaviors amongst primary school students in rural areas of FASA City-Iran. *BMC Cancer* **2022**, *22*, 21. [CrossRef]
59. Kim, J.; Yang, K.; Min, J.; White, B. Hope, fear, and consumer behavioral change amid COVID-19: Application of protection motivation theory. *Int. J. Consum. Stud.* **2021**, *46*, 558–574. [CrossRef] [PubMed]
60. Gamma, A.E.; Slekiene, J.; von Medeazza, G.; Asplund, F.; Cardoso, P.; Mosler, H.-J. Contextual and psychosocial factors predicting ebola prevention behaviours using the Ranas approach to behaviour change in Guinea-Bissau. *BMC Public Health* **2017**, *17*, 446. [CrossRef]
61. Clemens, K.S.; Matkovic, J.; Faasse, K.; Geers, A.L. The role of attitudes, affect, and income in predicting COVID-19 behavioral intentions. *Front. Psychol.* **2021**, *11*, 567397. [CrossRef]
62. Norazryana, M.D.; Namazi, H.; Maresova, P. Predictors of COVID-19 preventive behavior adoption intention in Malaysia. *Front. Psychol.* **2021**, *12*, 567397.
63. Hagger, M.S.; Smith, S.R.; Keech, J.J.; Moyers, S.A.; Hamilton, K. Predicting social distancing intention and behavior during the COVID-19 pandemic: An Integrated Social Cognition Model. *Ann. Behav. Med.* **2020**, *54*, 713–727. [CrossRef]
64. Adiyoso, W.; Wilopo. Social distancing intentions to reduce the spread of COVID-19: The extended theory of planned behavior. *BMC Public Health* **2021**, *21*, 1836. [CrossRef]

65. Khan, O.; Daddi, T.; Slabbinck, H.; Kleinhans, K.; Vazquez-Brust, D.; De Meester, S. Assessing the determinants of intentions and behaviors of organizations towards a circular economy for plastics. *Resour. Conserv. Recycl.* **2020**, *163*, 105069. [CrossRef]
66. Fitch, J.L.; Ravlin, E.C. Willpower and perceived behavioral control: Influences on the intention-behavior relationship and Postbehavior attributions. *Soc. Behav. Personal. Int. J.* **2005**, *33*, 105–124. [CrossRef]
67. Ajzen, I.; Madden, T.J. Prediction of goal-directed behavior: Attitudes, intentions, and perceived behavioral control. *J. Exp. Soc. Psychol.* **1986**, *22*, 453–474. [CrossRef]
68. Sin, C.S.; Rochelle, T.L. Using the theory of planned behaviour to explain hand hygiene among nurses in Hong Kong during COVID-19. *J. Hosp. Infect.* **2022**, *123*, 119–125. [CrossRef] [PubMed]
69. Ghosh, P.; Jhamb, D. Examining virtual classroom platforms in hospitality education. In *Handbook of Research on the Platform Economy and the Evolution of E-Commerce*; IGI Global: Hershey, PA, USA, 2021; pp. 435–462.
70. Shi, G.; Zhong, X.; He, W.; Liu, H.; Liu, X.; Ma, M. Factors influencing protective behavior in the post-COVID-19 period in China: A cross-sectional study. *Environ. Health Prev. Med.* **2021**, *26*, 95. [CrossRef] [PubMed]
71. Conner, M.; Wilding, S.; Norman, P. Does Intention Strength Moderate the Intention–Health Behavior Relationship for COVID-19 Protection Behaviors? *Ann. Behav. Med.* **2024**, *58*, 92–99. [CrossRef]
72. Trifiletti, E.; Shamloo, S.E.; Faccini, M.; Zaka, A. Psychological predictors of protective behaviours during the COVID-19 pandemic: Theory of planned behaviour and risk perception. *J. Community Appl. Soc. Psychol.* **2021**, *32*, 382–397. [CrossRef]
73. Mehta, R.K.; Parasuraman, R. Neuroergonomics: A review of applications to physical and cognitive work. *Front. Hum. Neurosci.* **2013**, *7*, 889. [CrossRef]
74. Kabir, K.M.; Risa, T.; Tanimoto, J. Prosocial behavior of wearing a mask during an epidemic: An evolutionary explanation. *Sci. Rep.* **2021**, *11*, 12621. [CrossRef] [PubMed]
75. Ronen, A.; Rotter, H.; Elisha, S.; Sevilia, S.; Parizer, B.; Hafif, N.; Manor, A. Investigation of the protection efficacy of face shields against aerosol cough droplets. *J. Occup. Environ. Hyg.* **2020**, *18*, 72–83. [CrossRef] [PubMed]
76. Nachega, J.B.; Atteh, R.; Ihekweazu, C.; Sam-Agudu, N.A.; Adejumo, P.; Nsanzimana, S.; Rwagasore, E.; Condo, J.; Paleker, M.; Mahomed, H.; et al. Contact tracing and the COVID-19 response in Africa: Best practices, key challenges, and lessons learned from Nigeria, Rwanda, South Africa, and Uganda. *Am. J. Trop. Med. Hyg.* **2021**, *104*, 1179–1187. [CrossRef] [PubMed]
77. Parasuraman, R. Neuroergonomics: Research and practice. *Theor. Issues Ergon. Sci.* **2003**, *4*, 5–20. [CrossRef]
78. Colovic, G. Ergonomic workplace. *Manag. Technol. Syst. Garment Ind.* **2011**, 80–105.
79. Edmonds-Wilson, S.L.; Nurinova, N.I.; Zapka, C.A.; Fierer, N.; Wilson, M. Review of Human Hand Microbiome Research. *J. Dermatol. Sci.* **2015**, *80*, 3–12. [CrossRef]
80. Alzyood, M.; Jackson, D.; Aveyard, H.; Brooke, J. COVID-19 reinforces the importance of handwashing. *J. Clin. Nurs.* **2020**, *29*, 2760–2761. [CrossRef]
81. Gadinga, N.; Tweeten, S. Factors Affecting Hand Washing Compliance. NursingAnswers.net. Available online: https://nursinganswers.net/essays/factors-affecting-hand-washing-6246.php (accessed on 21 October 2022).
82. Noh, J.Y.; Seong, H.; Yoon, J.G.; Song, J.Y.; Cheong, H.J.; Kim, W.J. Social distancing against COVID-19: Implication for the control of influenza. *J. Korean Med. Sci.* **2020**, *35*, e182. [CrossRef]
83. Šuriņa, S.; Martinsone, K.; Perepjolkina, V.; Kolesnikova, J.; Vainik, U.; Ruža, A.; Vrublevska, J.; Smirnova, D.; Fountoulakis, K.N.; Rancans, E. Factors related to COVID-19 preventive behaviors: A structural equation model. *Front. Psychol.* **2021**, *12*, 676521. [CrossRef]
84. Minucciani, V.; Saglar Onay, N. (Eds.) *Well-Being Design and Frameworks for Interior Space*; IGI Global: Hershey, PA, USA, 2020.
85. Kettunen, J.; Putkonen, A.; Hyrkkänen, U. Complexity Factors in Networked and Virtual Working Environments. In *Encyclopedia of Information Science and Technology*, 2nd ed.; IGI Global: Hershey, PA, USA, 2009; pp. 634–640.
86. Min, C.; Shen, F.; Yu, W.; Chu, Y. The relationship between Government Trust and preventive behaviors during the COVID-19 pandemic in China: Exploring the roles of knowledge and negative emotion. *Prev. Med.* **2020**, *141*, 106288. [CrossRef] [PubMed]
87. Bish, A.; Michie, S. Demographic and attitudinal determinants of protective behaviours during a pandemic: A review. *Br. J. Health Psychol.* **2010**, *15*, 797–824. [CrossRef] [PubMed]
88. Adam, A.M. Sample size determination in survey research. *J. Sci. Res. Rep.* **2020**, *26*, 90–97. [CrossRef]
89. Li, J.-B.; Yang, A.; Dou, K.; Cheung, R.Y. Self-control moderates the association between perceived severity of coronavirus disease 2019 (COVID-19) and mental health problems among the Chinese public. *Int. J. Environ. Res. Public Health* **2020**, *17*, 4820. [CrossRef]
90. Munzert, S.; Selb, P.; Gohdes, A.; Stoetzer, L.F.; Lowe, W. Tracking and promoting the usage of a COVID-19 contact tracing app. *Nat. Hum. Behav.* **2021**, *5*, 247–255. [CrossRef] [PubMed]
91. Paital, B.; Das, K.; Parida, S.K. Inter Nation Social Lockdown versus medical care against COVID-19, a mild environmental insight with special reference to India. *Sci. Total Environ.* **2020**, *728*, 138914. [CrossRef] [PubMed]
92. Li, J.; Liu, X.; Zou, Y.; Deng, Y.; Zhang, M.; Yu, M.; Wu, D.; Zheng, H.; Zhao, X. Factors affecting COVID-19 preventive behaviors among university students in Beijing, China: An empirical study based on the extended theory of planned behavior. *Int. J. Environ. Res. Public Health* **2021**, *18*, 7009. [CrossRef] [PubMed]
93. Frounfelker, R.L.; Santavicca, T.; Li, Z.Y.; Miconi, D.; Venkatesh, V.; Rousseau, C. COVID-19 experiences and social distancing: Insights from the theory of planned behavior. *Am. J. Health Promot.* **2021**, *35*, 1095–1104. [CrossRef] [PubMed]

94. Tran, Q.A.; Nguyen, H.T.; Bui, T.V.; Tran, N.T.; Nguyen, N.T.; Nguyen, T.T.; Nguyen, H.T.; Nguyen, S.H. Factors associated with the intention to participate in coronavirus disease 2019 frontline prevention activities among nursing students in Vietnam: An application of the theory of planned behavior. *Front. Public Health* **2021**, *9*, 699079. [CrossRef]
95. Hossain, M.B.; Alam, M.Z.; Islam, M.S.; Sultan, S.; Faysal, M.M.; Rima, S.; Hossain, M.A.; Mamun, A.A. Health belief model, theory of planned behavior, or psychological antecedents: What predicts COVID-19 vaccine hesitancy better among the Bangladeshi adults? *Front. Public Health* **2021**, *9*, 711066. [CrossRef]
96. Ullah, I.; Lin, C.Y.; Malik, N.I.; Wu, T.Y.; Araban, M.; Griffiths, M.D.; Pakpour, A.H. Factors affecting pakistani young adults' intentions to uptake COVID-19 vaccination: An extension of the theory of planned behavior. *Brain Behav.* **2021**, *11*, e2370. [CrossRef] [PubMed]
97. Seong, B.-H.; Hong, C.-Y. Does risk awareness of COVID-19 affect visits to national parks? analyzing the tourist decision-making process using the theory of planned behavior. *Int. J. Environ. Res. Public Health* **2021**, *18*, 5081. [CrossRef] [PubMed]
98. Aldalaykeh, M.; Al-Hammouri, M.M.; Rababah, J.; Al-Dwaikat, T. COVID-19 help-seeking behaviors: Application of the theory of planned behavior. *Psychol. Belg.* **2021**, *61*, 391–400. [CrossRef] [PubMed]
99. Cattelino, E.; Testa, S.; Calandri, E.; Fedi, A.; Gattino, S.; Graziano, F.; Rollero, C.; Begotti, T. Self-efficacy, subjective well-being and positive coping in adolescents with regard to COVID-19 lockdown. *Curr. Psychol.* **2021**, *42*, 17304–17315. [CrossRef] [PubMed]
100. Tabernero, C.; Castillo-Mayén, R.; Luque, B.; Cuadrado, E. Social Values, self- and collective efficacy explaining behaviours in coping with COVID-19: Self-interested consumption and physical distancing in the first 10 days of confinement in Spain. *PLoS ONE* **2020**, *15*, e0238682. [CrossRef] [PubMed]
101. Coccia, M. Factors determining the diffusion of COVID-19 and suggested strategy to prevent future accelerated viral infectivity similar to COVID. *Sci. Total Environ.* **2020**, *729*, 138474. [CrossRef] [PubMed]
102. Díaz, A.; Soriano, J.F.; Beleña, Á. Perceived vulnerability to disease questionnaire: Factor Structure, Psychometric Properties and gender differences. *Personal. Individ. Differ.* **2016**, *101*, 42–49. [CrossRef]
103. Grover, S.; Dua, D.; Sahoo, S.; Mehra, A.; Nehra, R.; Chakrabarti, S. Why all COVID-19 hospitals should have mental health professionals: The importance of Mental Health in a worldwide crisis! *Asian J. Psychiatry* **2020**, *51*, 102147. [CrossRef] [PubMed]
104. Tanoue, Y.; Nomura, S.; Yoneoka, D.; Kawashima, T.; Eguchi, A.; Shi, S.; Harada, N.; Miyata, H. Mental health of family, friends, and co-workers of COVID-19 patients in Japan. *Psychiatry Res.* **2020**, *291*, 113067. [CrossRef]
105. Bashirian, S.; Jenabi, E.; Khazaei, S.; Barati, M.; Karimi-Shahanjarini, A.; Zareian, S.; Rezapur-Shahkolai, F.; Moeini, B. Factors associated with preventive behaviours of COVID-19 among hospital staff in Iran in 2020: An application of the Protection Motivation Theory. *J. Hosp. Infect.* **2020**, *105*, 430–433. [CrossRef]
106. Basheti, I.A.; Nassar, R.; Barakat, M.; Alqudah, R.; Abufarha, R.; Mukattash, T.L.; Saini, B. Pharmacists' readiness to deal with the coronavirus pandemic: Assessing awareness and perception of roles. *Res. Soc. Adm. Pharm.* **2021**, *17*, 514–522. [CrossRef] [PubMed]
107. Kim, D.G.; Lee, C.W. Exploring the roles of self-efficacy and technical support in the relationship between techno-stress and counter-productivity. *Sustainability* **2021**, *13*, 4349. [CrossRef]
108. Ritchie, K.; Chan, D. The emergence of cognitive COVID. *World Psychiatry* **2021**, *20*, 52–53. [CrossRef] [PubMed]
109. Meyer, N.; Niemand, T.; Davila, A.; Kraus, S. Correction: Biting the bullet: When self-efficacy mediates the stressful effects of COVID-19 beliefs. *PLoS ONE* **2022**, *17*, e0265330. [CrossRef] [PubMed]
110. Karaivanov, A.; Kim, D.; Lu, S.E.; Shigeoka, H. COVID-19 vaccination mandates and vaccine uptake. *SSRN Electron. J.* **2021**, *6*, 1615–1624.
111. Lin, Y.-H.; Liu, C.-H.; Chiu, Y.-C. Google searches for the keywords of "Wash hands" predict the speed of national spread of COVID-19 outbreak among 21 countries. *Brain Behav. Immun.* **2020**, *87*, 30–32. [CrossRef] [PubMed]
112. Al-Salem, W.; Moraga, P.; Ghazi, H.; Madad, S.; Hotez, P.J. The emergence and transmission of COVID-19 in European countries, 2019–2020: A comprehensive review of timelines, cases and containment. *Int. Health* **2021**, *13*, 383–398. [CrossRef] [PubMed]
113. Senerat, A.M.; Pope, Z.C.; Rydell, S.A.; Mullan, A.F.; Roger, V.L.; Pereira, M.A. Psychosocial and behavioral outcomes and transmission prevention behaviors: Working during the coronavirus disease 2019 pandemic. *Mayo Clin. Proc. Innov. Qual. Outcomes* **2021**, *5*, 1089–1099. [CrossRef] [PubMed]
114. Das, A.K.; Islam, M.N.; Billah, M.M.; Sarker, A. COVID-19 pandemic and Healthcare Solid Waste Management strategy—A mini-review. *Sci. Total Environ.* **2021**, *778*, 146220. [CrossRef]
115. Ju, M.J.; Oh, J.; Choi, Y.-H. Changes in air pollution levels after COVID-19 outbreak in Korea. *Sci. Total Environ.* **2021**, *750*, 141521. [CrossRef]
116. Macdonald, J.A.; Westrupp, E.M.; Bennett, C.; Berkowitz, T.; Youssef, G.J.; Toumbourou, J.W.; Tucker, R.; Andrews, F.J.; Evans, S.; Teague, S.J.; et al. Child, parent, and Family Mental Health and functioning in Australia during COVID-19: Comparison to pre-pandemic data. *Eur. Child Adolesc. Psychiatry* **2021**, *32*, 317–330.
117. Mikal, J.P.; Wurtz, R.; Grande, S.W. Social media as a modern emergency broadcast system: A longitudinal qualitative study of social media during COVID-19 and its impacts on social connection and social distancing compliance. *Comput. Hum. Behav. Rep.* **2021**, *4*, 100137. [CrossRef] [PubMed]
118. Amiri, A. Role of social distancing in tackling COVID-19 during the first wave of pandemic in Nordic region: Evidence from daily deaths, infections and needed hospital resources. *Int. J. Nurs. Sci.* **2021**, *8*, 145–151. [CrossRef] [PubMed]

119. Barak, N.; Sommer, U.; Mualam, N. Urban attributes and the spread of COVID-19: The effects of density, compliance and socio-political factors in Israel. *Sci. Total Environ.* **2021**, *793*, 148626. [CrossRef] [PubMed]
120. Ye, M.; Lyu, Z. Trust, risk perception, and COVID-19 infections: Evidence from multilevel analyses of combined original dataset in China. *Soc. Sci. Med.* **2020**, *265*, 113517. [CrossRef]
121. Manikandan, N. Are social distancing, hand washing and wearing masks appropriate measures to mitigate transmission of COVID-19? *Vacunas* **2020**, *21*, 136–137. [CrossRef] [PubMed]
122. Chatterjee, R.; Bajwa, S.; Dwivedi, D.; Kanji, R.; Ahammed, M.; Shaw, R. COVID-19 risk assessment tool: Dual Application of Risk Communication and Risk Governance. *Prog. Disaster Sci.* **2020**, *7*, 100109. [CrossRef] [PubMed]
123. Barrafrem, K.; Tinghög, G.; Västfjäll, D. Trust in the government increases financial well-being and general well-being during COVID-19. *J. Behav. Exp. Financ.* **2021**, *31*, 100514. [CrossRef]
124. Kowalski, R.M.; Black, K.J. Protection motivation and the COVID-19 virus. *Health Commun.* **2020**, *36*, 15–22. [CrossRef]
125. Persada, S.; Miraja, B.A.; Prasetya, P.; Mulia Wibawa, B.; Nadlifatin, R. Understanding Indonesian citizen's intentions to take personal protective measures and follow a stay-at-home order to limit the spread of COVID-19. *Humanit. Soc. Sci. Rev.* **2020**, *8*, 158–168. [CrossRef]
126. Tong, K.K.; He, M.; Wu, A.M.; Dang, L.; Chen, J.H. Cognitive factors influencing COVID-19 vaccination intentions: An application of the protection motivation theory using a probability community sample. *Vaccines* **2021**, *9*, 1170. [CrossRef] [PubMed]
127. Griffin, B.; Conner, M.; Norman, P. Applying an extended protection motivation theory to predict COVID-19 vaccination intentions and uptake in 50–64 year olds in the UK. *Soc. Sci. Med.* **2022**, *298*, 114819. [CrossRef]
128. Min, J.; Kim, J.; Yang, K. How generations differ in coping with a pandemic: The case of restaurant industry. *J. Hosp. Tour. Manag.* **2021**, *48*, 280–288. [CrossRef]
129. Chin, W.; Cheah, J.-H.; Liu, Y.; Ting, H.; Lim, X.-J.; Cham, T.H. Demystifying the role of causal-predictive modeling using partial least squares structural equation modeling in Information Systems Research. *Ind. Manag. Data Syst.* **2020**, *120*, 2161–2209. [CrossRef]
130. Chin, W.W.; Marcoulides, G. The partial least squares approach for structural equation modeling. *Mod. Methods Bus. Res.* **1998**, *295*, 295–336.
131. Hair, J.F., Jr.; Sarstedt, M.; Hopkins, L.; Kuppelwieser, V.G. Partial least squares structural equation modeling (PLS-SEM). *Eur. Bus. Rev.* **2014**, *26*, 106–121. [CrossRef]
132. Hair, J.F.; Ringle, C.M.; Sarstedt, M. PLS-SEM: Indeed a silver bullet. *J. Mark. Theory Pract.* **2011**, *19*, 139–152. [CrossRef]
133. Russo, D.; Stol, K.-J. PLS-SEM for software engineering research. *ACM Comput. Surv.* **2021**, *54*, 78. [CrossRef]
134. Ringle, C.M.; Sarstedt, M.; Mitchell, R.; Gudergan, S.P. Partial least squares structural equation modeling in HRM research. *Int. J. Hum. Resour. Manag.* **2018**, *31*, 1617–1643. [CrossRef]
135. Nitzl, C.; Chin, W.W. The case of partial least squares (PLS) path modeling in Managerial Accounting Research. *J. Manag. Control* **2017**, *28*, 137–156. [CrossRef]
136. Guzman, J.; Recoco, G.A.; Pandi, A.W.; Padrones, J.M.; Ignacio, J.J. Evaluating workplace safety in the oil and gas industry during the COVID-19 pandemic using Occupational Health and safety vulnerability measure and partial least square structural equation modelling. *Clean. Eng. Technol.* **2022**, *6*, 100378. [CrossRef] [PubMed]
137. Hair, J.F.; Hult, G.T.; Ringle, C.M.; Sarstedt, M.; Danks, N.P.; Ray, S. Evaluation of reflective measurement models. *Classr. Companion Bus.* **2021**, 75–90.
138. Hwui, S.C.; Lay, Y.F. Examining the reliability and validity of research instruments using partial least squares structural equation modeling (PLS-SEM). *J. Balt. Sci. Educ.* **2018**, *17*, 239–251.
139. Hair, J.F.; Risher, J.J.; Sarstedt, M.; Ringle, C.M. When to use and how to report the results of PLS-SEM. *Eur. Bus. Rev.* **2019**, *31*, 2–24. [CrossRef]
140. Diamantopoulos, A.; Sarstedt, M.; Fuchs, C.; Wilczynski, P.; Kaiser, S. Guidelines for choosing between multi-item and single-item scales for Construct Measurement: A predictive validity perspective. *J. Acad. Mark. Sci.* **2012**, *40*, 434–449. [CrossRef]
141. Tavakol, M.; Dennick, R. Making sense of Cronbach's alpha. *Int. J. Med. Educ.* **2011**, *2*, 53–55. [CrossRef] [PubMed]
142. Henseler, J.; Ringle, C.M.; Sarstedt, M. A new criterion for assessing discriminant validity in variance-based structural equation modeling. *J. Acad. Mark. Sci.* **2014**, *43*, 115–135. [CrossRef]
143. Ab Hamid, M.R.; Sami, W.; Mohmad Sidek, M.H. Discriminant validity assessment: Use of Fornell & Larcker criterion versus HTMT criterion. *J. Phys. Conf. Ser.* **2017**, *890*, 012163.
144. Baumgartner, H.; Homburg, C. Applications of structural equation modeling in marketing and Consumer Research: A Review. *Int. J. Res. Mark.* **1996**, *13*, 139–161. [CrossRef]
145. Hair, J.F.; Sarstedt, M.; Ringle, C.M.; Mena, J.A. An assessment of the use of partial least squares structural equation modeling in Marketing Research. *J. Acad. Mark. Sci.* **2011**, *40*, 414–433. [CrossRef]
146. Hu, L.; Bentler, P.M. Cutoff criteria for fit indexes in covariance structure analysis: Conventional criteria versus new alternatives. *Struct. Equ. Model. Multidiscip. J.* **1999**, *6*, 1–55. [CrossRef]
147. Hooper, D.; Coughlan, J.; Mullen, M.R. Structural equation modelling: Guidelines for determining model fit. *Semant. Sch.* **2008**, *6*, 53–60.
148. Conner, M.; Norman, P. Understanding the intention-behavior gap: The role of intention strength. *Front. Psychol.* **2022**, *13*, 923464. [CrossRef] [PubMed]

149. Lama, Y.; Budenz, A.; Gaysynsky, A.; Iles, I.A.; Sylvia Chou, W.-Y. Factors associated with COVID-19 behavioral intentions: Findings from an online survey. *Am. J. Health Promot.* **2022**, *36*, 1183–1192. [CrossRef] [PubMed]
150. Tang, Z.; Miller, A.S.; Zhou, Z.; Warkentin, M. Does government social media promote users' information security behavior towards COVID-19 scams? cultivation effects and protective motivations. *Gov. Inf. Q.* **2021**, *38*, 101572. [CrossRef] [PubMed]
151. Lüdecke, D.; von dem Knesebeck, O. Protective behavior in course of the COVID-19 outbreak—Survey results from Germany. *Front. Public Health* **2020**, *8*, 572561. [CrossRef] [PubMed]
152. Khosravi, M. Perceived risk of COVID-19 pandemic: The role of public worry and trust. *Electron. J. Gen. Med.* **2020**, *17*, em203. [CrossRef] [PubMed]
153. Cori, L.; Bianchi, F.; Cadum, E.; Anthonj, C. Risk perception and COVID-19. *Int. J. Environ. Res. Public Health* **2020**, *17*, 3114. [CrossRef] [PubMed]
154. Reuben, R.C.; Danladi, M.M.; Saleh, D.A.; Ejembi, P.E. Knowledge, attitudes and practices towards COVID-19: An epidemiological survey in north-central Nigeria. *J. Community Health* **2020**, *46*, 457–470. [CrossRef]
155. Berg, M.B.; Lin, L. Prevalence and predictors of early COVID-19 behavioral intentions in the United States. *Transl. Behav. Med.* **2020**, *10*, 843–849. [CrossRef]
156. Tang, C.S.-K.; Wong, C.-Y. Psychosocial factors influencing the practice of preventive behaviors against the severe acute respiratory syndrome among older Chinese in Hong Kong. *J. Aging Health* **2005**, *17*, 490–506. [CrossRef] [PubMed]
157. Seale, H.; Heywood, A.E.; Leask, J.; Sheel, M.; Thomas, S.; Durrheim, D.N.; Bolsewicz, K.; Kaur, R. COVID-19 is rapidly changing: Examining public perceptions and behaviors in response to this evolving pandemic. *PLoS ONE* **2020**, *15*, e0235112. [CrossRef] [PubMed]
158. Conner, M.; Godin, G.; Sheeran, P.; Germain, M. Some feelings are more important: Cognitive attitudes, affective attitudes, anticipated affect, and blood donation. *Health Psychol.* **2013**, *32*, 264–272. [CrossRef] [PubMed]
159. Economou, M. Social distance in COVID-19: Drawing the line between protective behavior and stigma manifestation. *Psychiatriki* **2021**, *32*, 183–186. [CrossRef] [PubMed]
160. Meier, K.; Glatz, T.; Guijt, M.C.; Piccininni, M.; van der Meulen, M.; Atmar, K.; Jolink, A.T.C.; Kurth, T.; Rohmann, J.L.; Zamanipoor Najafabadi, A.H. Public perspectives on protective measures during the COVID-19 pandemic in the Netherlands, Germany and Italy: A survey study. *PLoS ONE* **2020**, *15*, e0236917. [CrossRef] [PubMed]
161. Jurriaan, O.; Jma, D.; Rm, D.; van der Weerd, W.; Van Steenbergen, J.E. Monitoring the level of Government Trust, risk perception and intention of the general public to adopt protective measures during the influenza A (H1N1) pandemic in the Netherlands. *BMC Public Health* **2011**, *11*, 575.
162. Siegrist, M.; Zingg, A. The role of Public Trust during pandemics. *Eur. Psychol.* **2014**, *19*, 23–32. [CrossRef]
163. Kok, G.; Jonkers, R.; Gelissen, R.; Meertens, R.; Schaalma, H.; de Zwart, O. Behavioural intentions in response to an influenza pandemic. *BMC Public Health* **2010**, *10*, 174. [CrossRef] [PubMed]
164. Teasdale, E.; Yardley, L.; Schlotz, W.; Michie, S. The importance of coping appraisal in behavioural responses to pandemic flu. *Br. J. Health Psychol.* **2011**, *17*, 44–59. [CrossRef]
165. Martinelli, L.; Kopilaš, V.; Vidmar, M.; Heavin, C.; Machado, H.; Todorović, Z.; Buzas, N.; Pot, M.; Prainsack, B.; Gajović, S. Face masks during the COVID-19 pandemic: A simple protection tool with many meanings. *Front. Public Health* **2021**, *8*, 606635. [CrossRef]
166. Mayo Clinic. Can Face Masks Protect against the Coronavirus? Mayo Clinic; Mayo Clinic Staff. Available online: https://www.mayoclinic.org/diseases-conditions/coronavirus/in-depth/coronavirus-mask/art-20485449 (accessed on 5 December 2023).
167. Samadizadeh, S.; Masoudi, M.; Rastegar, M.; Salimi, V.; Shahbaz, M.B.; Tahamtan, A. COVID-19: Why does disease severity vary among individuals? *Respir. Med.* **2021**, *180*, 106356. [CrossRef] [PubMed]