**ARTICLE**

# Provoking Buying Behaviors Amid Crises: Unfolding the Underlying Mechanisms of Psychological Impairments

**Muhammad Waleed Ayub Ghouri[1], Guofeng Wang[2], Muhammad Ali Hussain[3], Zhisheng Li[1,*] and Tachia Chin[1]**

[1]School of Management, Zhejiang University of Technology, Hangzhou, 310023, China

[2]School of Management and Economics, University of Electronic Science and Technology of China, Chengdu, 611731, China

[3]Business School, NingboTech University, Ningbo, 315100, China

*Corresponding Author: Zhisheng Li. Email: zhishengli23@163.com

## ABSTRACT

Crises in the past have caused devastating, long-lasting impacts on the global economy. The after-effects always bring some dynamic and rigorous challenges for businesses and governments. Such challenges have always been a point of discussion for scholars. The recent COVID-19 pandemic emaciated the global economy, leaving everyone mired in uncertainty, fear, and psychological impairments. One of the headwind features utilized by consumers during pandemic was panic buying (PB), which must be explored in various contexts for policymakers and practitioners. To address this gap, this study deployed a moderated mediation mechanism, integrating the health belief model (HBM) and competitive arousal theory (CAT) to excavate the notions underlying PB with the intrusion of evolved real-time psychological disorders: intolerance of uncertainty (IU) and cyberchondria (CYC). The study was conducted as a natural experiment in a South Asian developing economy using online surveys. It found that health beliefs—perceived severity (PSV) and perceived susceptibility (PSC)—positively impact perceived arousal (PA), which causes PB, and that PA has a sturdy mediator role. Moreover, in the relationship between health beliefs and arousal, the different psychological disorders were found to have significant moderating roles The study findings can help mitigate risk uncertainties and panic situations and thus contribute to consumers' wellbeing.

## KEYWORDS

Panic buying; health belief model; mental health; competitive arousal theory; intolerance of uncertainty; cyberchondria

## Introduction

The COVID-19 pandemic has inevitably destroyed the global economy and severely affected billions of people, filling them with fear and panic. The situation consistently impacted individuals' mental and physical health [1]. Due to the novelty of the pandemic, several questions and concerns for people have surfaced [2]. Such crises, though they might disrupt economic development for some time, might have a lasting impact on individuals' mental health and social stability [3]. Moreover, the pandemic has adversely affected global e-commerce and reshaped consumers' buying behavior [4]. An overt unusual behavior that has evolved is PB: "the action of buying a particular product or commodity in relatively excessive quantity due to sudden fears of upcoming scarcity or price increase" [5,6]. Panic buying (PB) cannot be considered a new phenomenon, but since it has been highlighted as an unexpected or unusual behavior triggered during the pandemic, it needs further exploration [7]. Individually, panic has been portrayed as a subjective and emotional state that significantly impacts behavior. PB, an irrational, socially undesirable behavior caused by uncertainty and fear, occurs when numerous customers stockpile life necessities to minimize an

anticipated future threat [6,8]. Sheu et al. examined whether PB can be considered a reasonable or irrational response to forthcoming disasters or emergencies [9]. Several recent studies have investigated the nascency of PB during the pandemic and proposed several psychological factors that can cause this behavior [10]. Communal among the studies are explanations that characterize PB as the perception of scarcity, severity, susceptibility, situational uncertainty, and social influence. PB has also been claimed as a form of self-protective behavior, an unexpected behavioral response to the pandemic [8]. Prior literature on PB has assumed it to be a multifaceted phenomenon linked to or triggered by numerous factors, including neuro-psychological impairments [11], thinking styles [12], and emotional elements, such as anxiety and arousal [5]. Recent literature has incorporated surrogate theories and models to enlighten this embryonic concept in the context of the COVID-19 pandemic. Some prominent approaches include the stimulus-organism-response framework, anticipated regret theory, behavioral inhibition system theory, reactance theory, expectancy theory, dual system theory, belief model (HBM), and competitive arousal theory (CAT) [5,6]. A few studies have recently focused on PB from a health belief perspective. It thus seems necessary to move PB research forward from this perspective by examining emotions, psychological impairments, and actual PB behavior in light of a crisis such as the COVID-19 pandemic.

Panic can be considered a subjective and emotional state that significantly impacts behavior. PB has been labeled as an irrational, socially undesirable behavior motivated by uncertainty and fear. Numerous customers stockpile life necessities to minimize the effect of an anticipated future threat. Therefore, by integrating individuals' health beliefs with CAT, this study attempted to investigate the mediating role of perceived arousal (PA).

The different waves and variants of the COVID-19 pandemic psychologically disturbed consumers. Owing to mental trauma, they grew extra-cautious about their health which propels them to perform numerous health-related online searches. This process is called cyberchondria (CYC). This study is the first to explore CYC's moderating effect as a psychological disorder with a far-reaching and profound impact on consumers' buying behavior.

Another detrimental state that occurred due to the uncertain nature of the pandemic is intolerance. With the rapid and constant change in governmental policies, the news overflow on global media regarding the unexpected occurrence and evolving nature of the pandemic in different regions triggered intolerable uncertainty among people. People became furious about the ongoing situation and felt compelled to engage in unusual behaviors to minimize uncertainty. Intolerance of uncertainty (IU) has been identified as a psychological disorder that occurs during unusual situations [13,14]. Presently, no study has analyzed the moderating role of IU as a panic disorder that fuels arousal and forces individuals to engage in unusual behaviors, such as stockpiling, hoarding, or PB.

The drastic gusts of the pandemic in the South Asian region left several economies enormously scattered and fragile and rendered them inconsistent in their recovery. Most countries remain vulnerable to the transformed headwinds, such as high inflation rates, high fiscal deficits, and deteriorating current reserves, which ultimately harm their growth. Pakistan, with 212 million people, is the 4th most populous country in the Asian continent. When it comes to internet users, it is the 10th most populous country in the world. Until now, Pakistan has recorded the world's 29th-highest death toll (approximately 25,788 deaths) and 29th-highest toll of confirmed cases (approximately 1,160,119 cases) [15]. Pakistan encountered five waves of the pandemic, and the Pakistanis were found hoarding or stockpiling items such as rice, cooking oil, and flour [5]. During the fourth wave, with cases increasing because of the severely transmissible delta variant, Pakistan imposed restrictions in many major cities [16]. As per National Command and Operation Center Pakistan, the delta variant spreads faster and increases chances of infection and hospitalization.

This study was operationalized in a kind of natural experiment setting, when Pakistan went into lockdown and its population was quarantined. The situation also provided an opportunity to conduct a timely investigation of consumer buying behavior during a real-time crisis that caused significant anxiety and uncertainty. Moreover, after the pandemic, with more people adopting contactless buying and selling modes, the Pakistani e-commerce market experienced a drastic boost [17,18]. As per the latest data issued by the State Bank of Pakistan, the country had a year-on-year growth of 78.9% in volume and 33.5% in value in the fiscal year 2020—i.e., from July 01, 2019 to June 30, 2020 [17]. Thus, since the country experiencing a boost in online sales during the pandemic, which can be related to PB, the online shopping stats increased the validity of our natural experiment.

Therefore, to bridge the aforementioned gap, we proposed our comprehensive theoretical model integrated with health beliefs (i.e., perceived severity (PSV) and perceived susceptibility (PSC)) and CAT to assess PB during the COVID-19 pandemic. Furthermore, we delineated the moderating roles of psychological disorders that evolved during the pandemic (i.e., IU and CYC). We explored online consumers' behaviors during a crisis, particularly their health beliefs and excited emotional state with the intervention of evolved psychological disorders caused by health anxiety and uncertainty. Thus, our research, conducted in a unique environment, offers interesting insights for policymakers and businesses that will help them respond efficiently during a crisis and learn about the impact of psychological impairments.

**Theoretical Development**

*Competitive arousal theory*
Competitive arousal, Russell and Mehrabian elucidated [19], is a neurophysiological basis underlying particular activities that fuel humans from sleep to excitement. A large body of literature on the effects of arousal suggests that a state of psychological excitation can restrict attention capacity [20], lead to low deliberation, less information processing, and increase risk-taking. Recent studies have highlighted that

competitive arousal offers parasomnias a means for understanding unusual behavioral outcomes [21]. Competitive arousal's innate nature triggers unusual behaviors (impulsive buying, for instance) and, thus, unfavorable decisions [22]. The competitive arousal theory offers attributes to explain different psychological aspects, such as emotions, excitements, beliefs, and behavioral reactions [23]. Several studies have focused on competitive arousal in the auction context and uncovered possible antecedents (i.e., perceived rivalry and time pressure) that accelerate arousal and may inhibit bidders' decision-making power. Islam et al. found that limited time scarcity and limited product scarcity triggers competition among consumers [5], fueling their competitive arousal and leading them toward PB. Similarly, Wu et al. deployed CAT to explore the sturdiest indirect impact of scarcity of time and quantity on impulse purchases [21]. Furthermore, several scholars have argued that the degree of PA is highly congruent with an individual's level of excitement, enthusiasm, and motivation in a particular situation [24]. The unexpected situations that emerged during the COVID-19 pandemic, such as shortened store hours, limited shopping time, and supply deficits, increased pressure and developed a sense of competition or panic among consumers, who, in response, engaged in unusual purchases. According to Singh et al. [25], competition among consumers, which emerges due to the heightened arousal caused by the pandemic, fuels their desire to stockpile necessities to minimize situational risks, thus affecting consumer's well-being. Hence, a competitive arousal model was deliberated as a proper theoretical lens to investigate PB. It can, subsequently, uncover the underlying mechanism of time and quantity scarcity as a threat that induces PB.

*Health belief model*
Numerous studies have deployed the HBM to better understand individuals' reasons for engaging in health-conscious activities [26]. According to the theory, health-related behavior evolves from an amalgamation of several factors, such as PSC, PSV, perceived barriers, perceived benefits, cues to action, and self-efficacy [27,28]. HBM has been widely deployed in a health-based intervention context [29], and its constructs have been deemed as the sturdiest sources to explain the concept of scarcity during the pandemic [30,31]. Only a few studies have mainly integrated time and product scarcity as sound predictors of negative emotional states that reshape consumers' mindsets to satisfy their physiological needs through unusual purchase behaviors. Generally, the focal concept in HBM is the change in belief that consequently leads to the change in behavior [32]. Strong health beliefs tend to change individuals' mindset and push them to adopt preventive measures, such as vaccinations, stockpiling, and so on [33]. HBM is considered the most significant and commonly used behavioral change theory among others, such as social cognitive theory (SCT), theory of reasoned action (TRA), and trans theoretical model [34,35]. Furthermore, HBM is a holistic approach that covers consumer protection motivation behavior in response to the pandemic threat [30]. Similarly, PB can be considered an adequate behavior

to cope with health-related worries and protect oneself from future constraints, such as stockouts of essential products, lockdowns, and so on. Additionally, the underlying constructs in HBM have been found to be crucial predictors of disease-preventive behavior, such as wearing masks, staying at home, and so on [36,37]. Similarly, several scholars have argued that PB can be considered a preventive health behavior, as it keeps individuals safe from being infected and minimizes the fear of stockout due to supply disruptions [30].

*Competitive arousal theory and the health belief model*
However, in line with previous studies, HBM does not fully account for PB behavior; therefore, it could be combined with other theories to understand PB more comprehensively [38]. For instance, Chua et al. combined HBM with perceived scarcity and anticipated regret theory to investigate the determinants of PB [30]. Similarly, Fallah Zavareh et al. integrated HBM with risk theories to study an individual's buying intention [38]. Kroke et al. investigated the reasons for vaccination acceptance as an outcome variable by combining two distinct perspectives: HBM and the theory of planned behavior [33]. Carpenter accentuated that both PSV and susceptibility act as non-related beliefs to the behavior and suggested indulging possible moderators with HBM to arrive at more comprehensive results instead of relying on subjective reasoning [39]. Prior scholars have classified health beliefs into threat perception and behavioral evaluation. In the current study, we incorporated threat perception as health beliefs encompassing two sub-dimensions: PSC as a belief about the probability of contracting COVID-19, and PSV as a belief about the seriousness of contracting COVID-19 [40]. A recent study integrated CAT and the theory of planned behavior to determine the antecedents of stockpiling and customer well-being [25]. Thus, we integrated HBM with competitive arousal to develop a more holistic, brief, and adequate justification for PB during a pandemic.

**Hypotheses Development**

*Perceived severity and perceived arousal*
PSV is an individual's anticipated degree of detriment from contracting COVID-19 [30]. As a subdimension of HBM, PSV proposes that individuals are motivated to adopt self-protection behavior to minimize risks. They are more concerned about the severity of risk when faced with uncertain situations. Moreover, individual anticipation regarding the severity of the environment can birth negative emotions, such as anxiety, that determine behavioral changes and buying patterns [6]. Yuen et al. argued that individuals have inner feelings of like to be a victim of disease during the pandemic [8]. Such negative emotions trigger individuals to engage in PB to safeguard themselves from any potential damage. Telch et al. posited that the severity of a perceived threat may urge individuals to follow unnecessary safety measures to overcome negative emotions [41]. In addition, fears of long waiting queues and shortage of products can induce anxiety among individuals and lead to PB. It has also been observed that collectivist societies,

such as China and Pakistan, perceive high severity when facing pandemics. Several scholars who investigated the antecedents of PB during the pandemic found that its severity augmented the fear of stockout in the market and enforced PB [42]. Similarly, in their work on scarcity during the pandemic, elucidated that a high ratio of stockout in the market increases competition between people, which accelerates their arousal levels to quickly stock daily necessities to minimize fear or risk. In addition, Wu et al. extended the concept of scarcity and highlighted that the fear of goods shortage in the market fuels consumers' arousal to compete with their surroundings and buy excessively [21]. Thus, we concluded that PSV increases risk, anxiety, and fear of stockout, which leads to competition between individuals and results in high arousal.

H1a: PSV has a positive influence on PA.

*Perceived susceptibility and perceived arousal*
PSC refers to consumers' risk perception and the likelihood of being infected by COVID-19. Earlier studies have linked this subdimension of HBM with environmental risks [43]. Health-related risks are the core reasons that inform an individual's motivation to perform health precautionary behaviors [39]. Moreover, as per the principles of HBM, an individual will never be motivated to engage in health preventive behaviors unless they are aware about health risks. Yoshitake et al. posited that PSC to tuberculosis played a crucial role in identifying an individual's frequency to adopt preventive behaviors [36], such as wearing masks in crowded areas. Furthermore, the high probability of contracting COVID-19 placed strict restrictions on social activities and freight carriages. Consequently, this disrupted the supply chain, which, in turn, increased consumers' doubts related to product unavailability and limitations. Numerous scholars have elucidated that the extensive risk of getting infected will enforce a high perception of scarcity among consumers [31]. This high perception augments competition between people, enforcing a high level of arousal to quickly buy and stock all essential things at home. We thus assumed that the PSC of the COVID-19 pandemic possesses attributes capable of inducing competition among people and stimulate arousal to engage in stockpiling.

H1b: PSC has a positive influence on PA.

*Perceived arousal and panic buying*
Several past and recent scholars have argued about the role of arousal as a crucial ingredient in decision-making [44,45]. Individuals with high arousal levels are more inclined to engage in high risk-taking behaviors and loss aversion [45]. According to Kumar et al. [46], the advantages of food delivery apps during COVID-19 aroused customers' intention to use them consistently. Furthermore, strong competition during shopping affects consumers' psychological states and stimulate them to make unusual buying decisions. Several scholars have incorporated arousal in competitive situations such as online auction research, which leads to auction fever. In their study on auction fever, Ku et al. considered the competitive arousal model and found that high arousal can cause the bidder to make an

irrational decision and bid above the limit [47]. In addition, some scholars who focused on PA elucidated the role of heightened arousal in impulse buying and PB during the pandemic, i.e., impulse and obsessive [21]. We thus assumed that a high level of arousal during the pandemic will motivate people to make irrational and unusual decisions, such as PB.

H2: PA has a positive influence on PB.

Following the arguments discussed in H1a, H1b, and H2, we expected PSV and PSC to influence PB through the mediating mechanism of PA. Previous studies offer enough support to posit this comprehensive relationship in our model. A recent study devised a model to investigate the positive impact of environmental factors on consumer buying decisions through PA as a mediator [21]. Moreover, referring to the mediating role of negative emotions, a recent study found that several psychological factors induced negative emotions, such as anxiety, during the COVID-19 pandemic and triggered panic purchasing [5]. Subsequently, multiple scholars discovered the mediating role of cognitive and emotional mechanisms between environmental factors and behavioral responses such as PB. Thus, pertinent to the above discussion, we considered the state of arousal a negative emotion retrieved during a competition among individuals to prevent themselves from getting infected. We also hypothesized that the induced negative emotion acts as a mediator between the health belief constructs and PB.

H3: PA will mediate the relationship between (H3a) PSV, (H3b) PSC, and PB.

*The moderating role of the intolerance of uncertainty*
IU is the cognitive bias that strongly influences an individual's experience, interpretational capacity, and possible reactions in uncertain situations. It has been associated with emotional, cognitive, and behavioral responses to an undeniable state of uncertainty [48]. Additionally, it has been termed a trait characteristic and has been associated with negative beliefs concerning uncertain situations and their consequences. Several studies have linked it with multiple psychopathologies, such as health-related anxieties and panic disorders [49]. With the deployment of CAT, we argued that IU moderates different health belief and PA constructs. IU can cause individuals to feel restless and incompetent due to resource depletion, which may motivate them to engage in unusual behaviors and minimize their adverse situational circumstances. We thus suggested that IU would strengthen the positive relationship between different conceptions of health beliefs and negative emotions.

Moreover, a high public IU will generate more fear of the pandemic. Subsequently, those with high IU are incapable of absorbing the aversive response caused by the perception of uncertainty in the environment. Moreover, Dugas et al. found that those with high IU will encounter high-risk perception related to their cognitive interpretation bias, convincing them to perceive the current situation as threatening. A high IU will upsurge health risk perceptions and propel competition between people for survival. Subsequently, this will boost arousal levels, and people will engage in hoarding or stockpiling to minimize the risk of

getting infected. Contrary to this, individuals with low IU are generally more stable and proactive, have control over their actions, and are thus less swayed by negative impulses.

H4: IU moderates the positive relationship between (H4a) PSV, (H4b) PSC, and PA such that the association is stronger when IU is higher.

*The moderating role of cyberchondria*
CYC refers to an individual state of being overly concerned and stressed about health, which propels individuals to perform excessive, compulsive, and repetitive health-related online searches that generate heightened fear, distress, and anxiety. This phenomenon is derived from the combination of "Cyber," which is taken from cyberspace, and "hypochondria," which refers to excessive anxiety pertinent to health [50]. Our study is the first to propose that CYC moderates the relationship between different conceptions of health-related constructs and emotions. In accordance with CAT, we argue that CYC causes individuals to lose temperament, decreases satisfaction levels, and increases functional impairment. In light of this, the unpredictable and novel situations experienced by these individuals would ultimately force them to reveal the negative emotions cause by psychological factors. Considering the nascency of CYC, several scholars have conducted systematic reviews and revealed it as a multidimensional construct by associating it with health anxiety, hypochondriasis, problematic internet usage, and obsessive-compulsive disorder [51,52].

An empirical study postulated that high CYC among individuals will increase their fear of COVID-19 [53]. High CYC intensifies individual avoidance behaviors or safety behaviors related to the COVID-19 pandemic [54]. In light of the above discussion, we believe that the COVID-19 pandemic induces a high state of CYC in people, thus strengthening the relationship between the risk perceptions (i.e., PSV and PSC) of being infected, which fuels health anxiety and causes competition among people to quickly adopt pandemic preventive actions, such as stockpiling or hoarding.

H5: CYC moderates the positive relationship between (H5a) PSV, (H5b) PSC, and PA such that the association is stronger when CYC is higher.

The arguments discussed above provide enough basis to devise a comprehensive model in which PA mediates the relationship between the HBM dimensions and PB, and IU

and CYC moderate the relationship between the HBM constructs and PA. Furthermore, in light of our propositions, we further argue that IU and CYC will strengthen the positive indirect effect of PA, intending to measure the association between the HBM constructs and PB by deploying a moderated mediation model [55]. Concerning the prior discussion, high IU and CYC will strengthen the link between the HBM dimensions and PA. Similarly, the indirect linkage between the HBM constructs and PB will be stronger via PA. Noticeably, people with high IU and CYC during the COVID-19 pandemic will feel psychologically disturbed, which will boost their perception of severity and susceptibility and trigger a heightened state of arousal to enforce panic purchases. Contrastingly, those with a low level of IU and CYC will generally be psychologically stronger and experience a minimal state of arousal, allowing them to overcome panic.

H6: IU positively moderates the indirect relationship between (H6a) PSV, (H6b) PSC, and PB via PA, such that the association is stronger when CYC is higher.

H7: CYC positively moderates the indirect relationship between (H7a) PSV, (H7b) PSC, and PB via PA, such that the association is stronger when CYC is higher.

The Theoretical Model of this paper is shown in Fig. 1.

**Materials and Methods**

*Materials*
To test our hypothesized conceptual model, we conducted an online survey using Google Docs and targeted online consumers living in Pakistan. The questionnaire was developed in English, the official language of Pakistan, and the online survey method was considered appropriate, as the fourth wave of the pandemic was evolving in the country and the government imposed a smart lockdown [15]. Keeping in mind the suitability of the situation within our study context, the data was administered between July 14, 2021 and August 30, 2021. In many developing countries, a massive increase in online buying was observed due to prolonged lockdowns [56]. Consequently, this supported the condition of our actual research design since the new variant and lockdown created an uncertain situation, and people were dependent on online media for updates regarding health measures. Moreover, due to the severity of the delta variant, the population was gripped by panic.
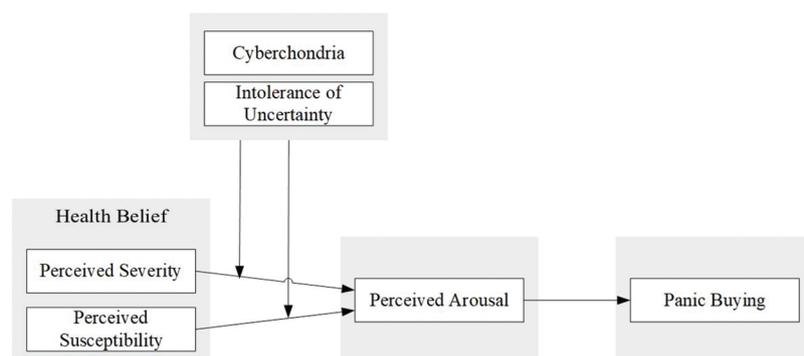


**FIGURE 1.** Theoretical model.

The first version of the questionnaire also passed a pretest with selected groups of professors researching consumer behavior, platform businesses, and students in the specific field. During the pretest phase, the context, vocabulary, grammar, and so on, of selected items were revised and modified to ensure that the respondents could easily understand them.

We employed the snowball sampling technique and a referral-based scenario to recruit our participants and disseminating the questionnaires through a link. The participants were mainly university faculty, private and public business sector managers, supervisors, and people in senior positions. The complete sample was attained through interpersonal relationship chains, including colleagues, subordinates, and students. This sampling technique is suitable for achieving hard-to-reach populations; it is cost-effective and configures higher participation rates [57]. The participants included have shopped online at least once a month during the pandemic. We also rewarded the respondents for encouragement and support. We received 595 responses. All the participants expressed their willingness to voluntarily participate in the survey, and we assured each of them about the confidentiality of the data and their anonymity. After deleting the invalid responses, including the same answers or those containing a pattern, we were left with 509 qualified responses for analysis, with a response rate of 85.55%. The sample demographics included 58.2% males and 41.8% females, with 82.9% ages ranging from 21 to 30; 30.5% and 39.7% had completed bachelor's and master's, respectively; the income of 68.2% was between 50,000 and 150,000 Pakistani Rupees; 79.4% had household members from 1 to 4 persons. Furthermore, 72.1% were students and employees, and 19.1% came under the category of business owners and self-employed.

*Methods and procedures*
The measurements of constructs were critically adapted from previous research, and a six-point Likert scale—1 (strongly disagree) to 6 (strongly disagree)—was used. In the beginning, the respondents completed four items of the PSV adapted scale ($\alpha = 0.86$). We then incorporated a three-item scale adapted to measure PSC ($\alpha = 0.94$). Toi measure PA, we adapted a four-item scale ($\alpha = 0.87$) from Russell and Mehrabian [19]. To measure PB, we adapted a seven-item scale ($\alpha = 0.93$). To assess the IU, a 12-item scale was adapted ($\alpha = 0.97$), and lastly, a four-item scale was adapted to measure CBC [54] ($\alpha = 0.89$).

*Control variables*
According to prior research, demographic variables may influence the intended dependent variables. Age, education, personal income, and household members were thus incorporated as demographics, as they can measure the intense effects of independent variables and maintain the robustness of the findings [58].

*Exploratory factor analysis*
To determine the applicability of EFA, the Bartlett test of sphericity and the Kaiser-Meyer-Olkin (KMO) measure of sample adequacy were used. The suitable chi-squares,

degrees of freedom, and significant levels of $p < 0.001$ were found in the construct measurements. The KMO index was found to have a range between 0 to 1, reaching 1 when each variable was accurately predicted without introducing inaccuracy in the other variables. All the measurements fell within the desirable KMO range of 0.70 or above. These two tests offered sufficient proof of EFA's applicability. Table 1 displays the results of the EFA analysis. Additionally, the factor loading for each item was greater than 0.70, which is acceptable.

*Analytical plan*
Confirmatory factor analysis (CFA) was computed to assess our measurement model. Further, we conducted path analysis to test our hypotheses. The mediation effects were checked using 10,000 bootstrapped samples by following the guidelines of Preacher et al. [59]. Mplus 8.0 was initiated to complete the analysis [55]. A structural model was tested to determine validity and reliability, which includes composite reliability (CR) and average variance extracted (AVE). The reliability and CR values (Table 2) exceeded the 0.70 cutoff. For all the constructs, the AVE ranged between 0.593 and 0.841.

To assess the moderation effects, a simple slope analysis was initiated to estimate the simple slopes at high (i.e., 1 SD above the mean value) and low (i.e., 1 SD below the mean value) using 10,000 bootstrapped samples. Subsequently, to examine the hypothesis H4 (a) and (b), PA was regressed over the controlled variables, independent variables (i.e., PSV and PSC), moderator (i.e., IU), and their probable interactions accordingly. Similarly, for H5 (a) and (b), PA was regressed over all the controlled variables, independent variables (i.e., PSV and PSC), moderator (i.e., CYC), and their probable interactions accordingly. The predictors and moderating variables were kept mean-centered before developing the interaction terms.

**Results**

*Assessment of common method variance*
To examine the common method bias, a preliminary data analysis was conducted. Following the recommended procedural remedies during the survey, we ensured the data's confidentiality and the respondents' anonymity. Statistically, we employed Harman's single-factor test and loaded all the measured items into the exploratory factor analysis to obtain the required results. Furthermore, the explained variance extracted by the first-order factor was 32.55%, which is clearly below the cut-off limit of 50%.

To further assess the biases and ambiguities, we incorporated the single common method factor approach suggested by Malhotra et al. [22]. Because Harman's single-factor test provided an assessment regardless of ruling out the impacts of common method biases. For this purpose, we compared the calculated fit indices of our theoretical model with that of the single-factor model to evaluate our study's common method variance. The new CMV model demonstrated a reasonable fit ($\chi^2_{(521)} = 1839.00$, CFI = 0.91, TLI = 0.90, RMSEA = 0.06, SRMR = 0.07), but the model comparison showed that CMV did not fit

**TABLE 1**

**Results of the exploratory factor analysis**

| Constructs and measurement items | Loadings | Bartlett test of sphericity | KMO |
|---|---|---|---|
| *Perceived susceptibility* | | | |
| 1. I might be infected by COVID-19 if I went to local markets/shops for purchasing necessary goods during lockdown period | 0.909 | Approx. Chi square = 1362.07 Df = 3 Sig = 0.000 | 0.772 |
| 2. I would be infected by COVID-19 if I go to bank for doing transactions | 0.907 | | |
| 3. After touching any printed currency, I use hand sanitizer to reduce COVID-19 infection risk | 0.900 | | |
| *Perceived severity* | | | |
| 1. I am afraid of being infected by COVID-19 if I go to local markets/shops for shopping | 0.842 | Approx. Chi square = 1235.45 Df = 6 Sig = 0.000 | 0.681 |
| 2. If I go to local markets/shops for shopping and get infected by COVID-19, I may suffer from any chronic disease in the long run | 0.814 | | |
| 3. If I go to local markets/shops for shopping and get infected by COVID-19, it will hinder my personal relationships | 0.746 | | |
| 4. If I go to local markets/shops for shopping and get infected by COVID-19, I will have difficulty with my life | 0.768 | | |
| *Perceived arousal* | | | |
| 1. I feel stimulated to purchase online during pandemic | 0.827 | Approx. Chi square = 1143.54 Df = 6 Sig = 0.000 | 0.747 |
| 2. I feel excited to purchase online during pandemic | 0.774 | | |
| 3. I feel wide awake to purchase online during pandemic | 0.792 | | |
| 4. I feel aroused to purchase online during pandemic | 0.813 | | |
| *Panic buying* | | | |
| 1. Fear drives me to buy things to stock at home | 0.778 | Approx. Chi square = 2468.39 Df = 21 Sig = 0.000 | 0.914 |
| 2. The fear of not having the products that I need leads me on buying more things | 0.773 | | |
| 3. I panic when I think that essential products may run out from the shelves, so that is why I prefer to buy them in bulk | 0.831 | | |
| 4. Fear drives me to buying more than I usually do | 0.856 | | |
| 5. Panic makes me buy more things than I usually do | 0.840 | | |
| 6. One way to relieve the feeling of uncertainty is to make sure that I have, at home, a good amount of the products that I need | 0.798 | | |
| 7. The feeling of uncertainty influences my buying habits | 0.761 | | |
| *Intolerance of uncertainty* | | | |
| 1. When it's time to act, uncertainty paralyzes me | 0.885 | Approx. Chi square = 7082.76 Df = 66 Sig = 0.000 | 0.974 |
| 2. Uncertainty keeps me from living a full life | 0.873 | | |
| 3. The smallest doubt can stop me from acting | 0.866 | | |
| 4. I must get away from all uncertain situations | 0.882 | | |
| 5. When I am uncertain, I can't function very well | 0.879 | | |
| 6. I should be able to organize everything in advance | 0.849 | | |
| 7. It frustrates me not having all the information I need | 0.865 | | |

(Continued)

**Table 1 (continued)**

| Constructs and measurement items | Loadings | Bartlett test of sphericity | KMO |
|---|---|---|---|
| 8. I always want to know what the future has in store for me | 0.865 | | |
| 9. Unforeseen events upset me greatly | 0.876 | | |
| 10. I can't stand being taken by surprise | 0.857 | | |
| 11. A small unforeseen event can spoil everything, even with the best of planning | 0.875 | | |
| 12. One should always look ahead so as to avoid surprises | 0.867 | | |
| *Cyberchondria* | | | |
| 1. After reading information about COVID-19 online, I feel confused | 0.752 | Approx. Chi square = 1147.70 Df = 6 Sig = 0.000 | 0.774 |
| 2. I feel frightened after reading information about COVID-19 online | 0.851 | | |
| 3. I feel frustrated after reading information about COVID-19 online | 0.847 | | |
| 4. Once I start reading information about COVID-19 online, it is hard for me to stop | 0.777 | | |

significantly better than baseline model 1 ($\chi^2$ [$df$ = 15] = 695.23, $p$ < 0.01). It was thus evident that the common method bias was totally within the threshold limits, and we proceeded with further analysis.

*Preliminary analysis*

Based on our sample, we deployed Mplus 8.3 to conduct a series of confirmatory factor analyses. The six-factor model —containing PSV, PSC, PA, PB, IU, and CYC—fitted the data significantly better than all the other nested models [$\chi^2$ (506) = 1143.8, Comparative Fit Index (CFI) = 0.96, Tucker–Lewis Index (TLI) = 0.95, Root Mean Square Error of Approximation (RMSEA) = 0.05, and Standardized Root Mean Square Residual (SRMR) = 0.04]. Comparatively, the five-factor model [$\Delta\chi^2$ ($\Delta$df) = 222.73 (5), $p$ < 0.001], a four-factor model [$\Delta\chi^2$ ($\Delta$df) = 912.05 (6), $p$ < 0.001], a three-factor model [$\Delta\chi^2$ ($\Delta$df) = 281.38 (1), $p$ < 0.001], a two-factor model [$\Delta\chi^2$ ($\Delta$df) = 721.35 (2), $p$ < 0.001], and one-factor model [$\Delta\chi^2$ ($\Delta$df) = 5146.27 (7), $p$ < 0.001] were

not found to be up to the mark. The obtained results offer sufficient support for the discriminability of all variables (Table 3).

*Descriptive analysis*

To examine the psychometric properties of our research model, bivariate correlations and Cronbach alpha were computed. The detailed results are shown in Table 4. The Cronbach's alpha of each construct was above 0.85, which comes under the threshold of 0.7 [60].

*Hypotheses testing*

The unstandardized path coefficients for the direct and indirect effects are portrayed in Table 5. As anticipated, the result reveals that PSV had the most positive and sturdiest effect on PA (b = 0.24, SE = 0.05, $p$ < 0.001). Similarly, PSC had a significant positive impact on PA (b = 0.18, SE = 0.04, $p$ < 0.001). Hence, hypotheses H1 (a) and H1 (b) were fully supported. We also found PA's significant and positive impact on PB (b = 0.47, SE = 0.06, $p$ < 0.001), thus confirming H2. As illustrated in Table 3, PA positively mediated the relationship between PSV and PB (indirect effect = 0.11, 95%CI [0.07, 0.17]). Moreover, a significant positive mediation was noticed between PSC and PB through PA (indirect effect = 0.19, 95%CI [0.05, 0.13]). H2 (a) and H2 (b) were thus supported.

Further extending the interpretations toward moderation effects, Table 6 delineates the significant interactive effect between PSV and IU on PA (b = 0.09, SE = 0.03, $p$ < 0.01). Subsequently, Fig. 2 shows that the simple slope of PSV and IU on PA was significant when IU was high (b = 0.14, SE = 0.03, $p$ < 0.001) rather than low (b = 0.04, SE = 0.03, ns), lending support to H4 (a). Similarly, the results elucidate the significant interactive effect between PSC and IU on PA (b = 0.08, SE = 0.03, $p$ < 0.01). Additionally, Fig. 3 portrays that the simple slope of PSC and IU on PA was found to be

**TABLE 2**

**Mean, standard deviation, composite reliability, and average variance extracted**

| Variables | M | SD | CR | AVE |
|---|---|---|---|---|
| 1. PSC | 3.94 | 1.36 | 0.974 | 0.757 |
| 2. PSV | 4.32 | 1.18 | 0.925 | 0.637 |
| 3. PA | 4.47 | 1.15 | 0.878 | 0.644 |
| 4. PB | 4.69 | 1.04 | 0.873 | 0.633 |
| 5. IU | 4.34 | 1.20 | 0.850 | 0.593 |
| 6. CYC | 4.39 | 1.22 | 0.941 | 0.841 |

Note: N = 509; M = Mean, SD = Standard Deviation, CR = Composite Reliability, AV = Average Variance Extracted.

TABLE 3

**Results of confirmatory factor analysis**

| Models | $\chi^2$ | d.f. | $\chi^2$/d.f. | CFI | TLI | RMSEA | SRMR |
|---|---|---|---|---|---|---|---|
| *Six-factor model:* PSC, PSV, PA, CYC, IU, PB | 1143.77 | 506 | 2.26 | 0.96 | 0.95 | 0.04 | 0.03 |
| *Five-factor model:* PA and PB combined | 1366.50 | 511 | 2.67 | 0.94 | 0.93 | 0.05 | 0.05 |
| *Four-factor model:* PSC and PSV combined | 2278.55 | 517 | 4.40 | 0.88 | 0.87 | 0.07 | 0.08 |
| *Three-factor model:* PSC and PSV combined into one factor; PSV and PB combined into one factor | 2559.93 | 518 | 4.94 | 0.86 | 0.85 | 0.08 | 0.08 |
| *Two-factor model:* PSC and PSV combined into one factor; PA and PB combined into one factor; CYC and IU combined into one factor | 3281.28 | 520 | 6.31 | 0.81 | 0.80 | 0.09 | 0.11 |
| *One-factor model:* All variables combined | 8427.55 | 527 | 15.99 | 0.47 | 0.44 | 0.16 | 0.19 |

Note: $\chi^2$ = chi-squared value; *d.f.* = degrees of freedom; CFI = comparative fit index, TLI = Tucker–Lewis index; RMSEA = root mean square error of approximation, SRMR = standardized root mean square residual.

TABLE 4

**Correlations**

| Variables | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1. Age | | | | | | | | | | | |
| 2. Gender | 0.22 | | | | | | | | | | |
| 3. Education | 0.19** | −0.05 | | | | | | | | | |
| 4. Personal income | 0.26 | 0.01 | 0.06 | | | | | | | | |
| 5. Household members | 0.13 | −0.01 | −0.00 | −0.01 | | | | | | | |
| 6. PSC | −0.03 | −0.03 | −0.01 | -0.09* | −0.01 | (0.94) | | | | | |
| 7. PSV | −0.01 | 0.00 | −0.01 | −0.03 | 0.00 | 0.38** | (0.86) | | | | |
| 8. PA | −0.03 | −0.02 | −0.01 | −0.02 | −0.03 | 0.24** | 0.28** | (0.87) | | | |
| 9. PB | −0.03 | 0.01 | −0.04 | −0.04 | −0.04 | 0.24** | 0.28** | 0.47** | (0.93) | | |
| 10. IU | −0.04 | 0.01 | −0.02 | 0.06 | −0.02 | 0.19** | 0.29** | 0.07 | 0.11* | (0.97) | |
| 11. CYC | −0.05 | 0.02 | −0.05 | 0.05 | −0.03 | 0.27** | 0.29** | 0.27** | 0.26** | 0.36** | (0.88) |

Note: N = 509; Internal reliabilities (Cronbach alpha coefficients are specified along the diagonal parenthesis), **correlation is significant at the 0.01 level (two-tailed), and *correlation is significant at the 0.05 level (two-tailed).

TABLE 5

**Bootstrapping results for unstandardized indirect effects from SEM**

| Path | Coeff. | SE | 95%CI | Path | Indirect effect | 95%CI |
|---|---|---|---|---|---|---|
| PSC → PA | 0.18*** | 0.04 | [0.12, 0.25] | PSC → PA → PB | 0.09*** | [0.05, 0.13] |
| PSV → PA | 0.24*** | 0.05 | [0.17, 0.32] | PSV → PA → PB | 0.11*** | [0.07, 0.17] |
| PA → PB | 0.47*** | 0.06 | [0.37, 0.56] | | | |

Note: N = 509; ***$p < 0.001$, **$p < 0.01$, *$p < 0.05$; 95%CI (95% Confidence Interval for Bootstrapping with 10,000 subsamples).

significant when IU was high (b = 0.13, SE = 0.03, $p < 0.001$) rather than low (b = 0.03, SE = 0.03, ns), thus supporting H4 (b).

Subsequently, as per the moderation results projected in Table 7, a positive significant interactive effect between PSV and CYC on PA was observed as anticipated in our study (b = 0.12, SE = 0.04, $p < 0.01$). Moreover, as per Fig. 4, the simple slope of PSV and CYC on PA was significant when CYC was high (b = 0.17, SE = 0.04, $p < 0.001$) rather than low (b = 0.07, SE = 0.04, ns), confirming the sturdiest support to H5 (a). Similarly, a positive significant interactive effect between PSC and CYC on PA was also noticed (b = 0.09, SE = 0.04, $p < 0.05$). Furthermore, Fig. 5 shows that the simple slope of PSC and CYC on PA was significant when CYC was high (b = 0.14, SE = 0.04, $p < 0.001$) rather than low (b = 0.03, SE = 0.04, ns), thus endorsing H5 (b).

Regarding moderated mediation effects, the indirect impact of PSV on PB through PA was found to be

TABLE 6

Regression results for interaction effects 1

| Variables | Model 1 | | | Model 2 | | |
|---|---|---|---|---|---|---|
| | Coeff | SE | 95%CI | Coeff | SE | 95%CI |
| *Mediator variable model with PA as dependent variable* | | | | | | |
| *Control variables* | | | | | | |
| Age | −0.01 | 0.06 | [−0.10, 0.08] | −0.00 | 0.06 | [−0.10, 0.09] |
| Gender | 0.00 | 0.09 | [−0.15, 0.15] | 0.02 | 0.09 | [−0.13, 0.17] |
| Education | −0.02 | 0.04 | [−0.08, 0.03] | −0.03 | 0.04 | [−0.09, 0.03] |
| Personal income | −0.05 | 0.04 | [−0.12, 0.03] | −0.03 | 0.05 | [−0.10, 0.05] |
| Household members | −0.05 | 0.06 | [−0.16, 0.06] | −0.05 | 0.07 | [−0.15, 0.06] |
| *Independent variables* | | | | | | |
| PSV | 0.26*** | 0.05 | [0.17, 0.34] | | | |
| PSC | | | | 0.18*** | 0.04 | [0.12, 0.25] |
| *Moderator variable* | | | | | | |
| IU | 0.07** | 0.04 | [0.00, 0.14] | 0.08 | 0.04 | [0.02, 0.15] |
| *Interactive effects* | | | | | | |
| PSV X IU | 0.09** | 0.03 | [0.04, 0.15] | | | |
| PSC X IU | | | | 0.08** | 0.03 | [0.03, 0.13] |

Note: N = 509; ***$p < 0.001$, **$p < 0.01$, *$p < 0.05$; 95%CI (95% Confidence Interval for Bootstrapping with 10,000 subsamples).
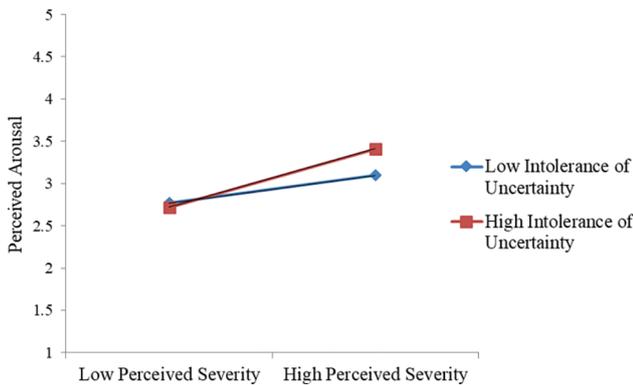


**FIGURE 2.** The moderation effect of IU on the relationship between PSV and PA.
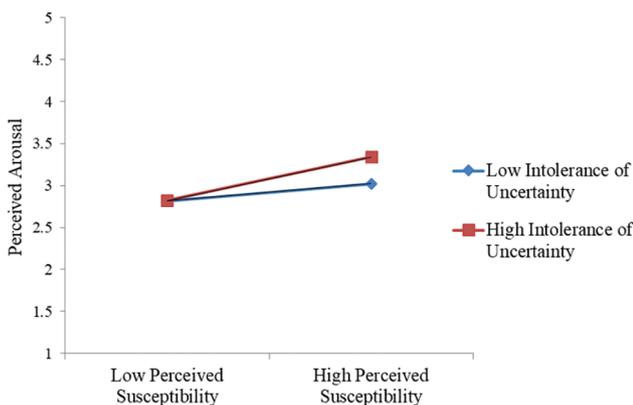


**FIGURE 3.** The moderation effect of IU on the relationship between PSC and PA.

significant when IU was high (indirect effect = 0.04, 95%CI [0.02, 0.06]) compared to when it was low (indirect effect = 0.01, 95%CI [−0.00, 0.03]), and the indirect effect difference among these two level settings was significant (indirect impact = 0.04, 95%CI [0.02, 0.07]), lending support to H6 (a). Likewise, the indirect effect of PSC on PB through PA was found to be significant when IU was high (indirect effect = 0.02, 95%CI [0.01, 0.04]) compared to when it was low (indirect effect = 0.02, 95%CI [−0.00, 0.02]), and the indirect effect difference among these two level settings was significant (indirect effect = 0.04, 95%CI [0.02, 0.06]), also confirming the sturdiest support to H6 (b). Subsequently, the indirect effect of PSV on PB through PA was found to be significant when CYC was high (indirect effect = 0.04, 95%CI [0.02, 0.06]) compared to when it was low (indirect effect = 0.01, 95%CI [0.00, 0.03]), and the indirect effect difference among these two level settings was significant (indirect effect = 0.06, 95%CI [0.03, 0.09]), endorsing hypothesis H7 (a). Likewise, as anticipated, the indirect effect of PSC on PB through PA was found to be significant when CYC was high (indirect effect = 0.02, 95%CI [0.01, 0.04]) compared to when it was low (indirect effect = 0.00, 95%CI [-0.00, 0.02]). The indirect effect difference among these two levels settings was significant (indirect effect = 0.04, 95%CI [0.01, 0.07]), thus confirming H7 (b).

## Discussion and Conclusion

### Discussion of results

Our research aimed to explore the unprecedented level of PB behaviors during the COVID-19 pandemic pertinent to the theoretical guidelines defined by the HBM and CAT. Since all our hypotheses were supported, our study is in line with

TABLE 7

Regression results for interaction effects 2

| Variables | Model 1 | | | Model 2 | | |
|---|---|---|---|---|---|---|
| | Coeff | SE | 95%CI | Coeff | SE | 95%CI |
| *Mediator variable model with PA as dependent variable* | | | | | | |
| *Control variables* | | | | | | |
| Age | −0.01 | 0.06 | [−0.11, 0.08] | −0.02 | 0.06 | [−0.11, 0.07] |
| Gender | 0.01 | 0.09 | [−0.14, 0.15] | 0.02 | 0.09 | [−0.12, 0.16] |
| Education | −0.02 | 0.03 | [−0.07, 0.04] | −0.01 | 0.04 | [−0.07, 0.04] |
| Personal income | −0.04 | 0.05 | [−0.11, 0.04] | −0.03 | 0.05 | [−0.10, 0.04] |
| Household members | −0.07 | 0.06 | [−0.17, 0.04] | −0.06 | 0.06 | [−0.15, 0.05] |
| *Independent variables* | | | | | | |
| PSV | 0.21*** | 0.05 | [0.13, 0.30] | | | |
| PSC | | | | 0.14*** | 0.04 | [0.08, 0.20] |
| *Moderator variable* | | | | | | |
| CYC | 0.24*** | 0.05 | [0.15, 0.32] | 0.24*** | 0.05 | [0.15, 0.30] |
| *Interactive effects* | | | | | | |
| PSV X CYC | 0.12** | 0.04 | [0.06, 0.18] | | | |
| PSC X CYC | | | | 0.09* | 0.04 | [0.02, 0.14] |

Note: N = 509; ***$p < 0.001$, **$p < 0.01$, *$p < 0.05$; 95%CI (95% Confidence Interval for Bootstrapping with 10,000 subsamples).
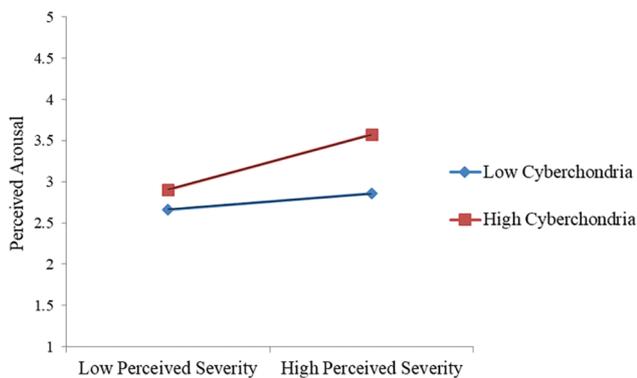


FIGURE 4. The moderation effect of CYC on the relationship between PSV and PA.
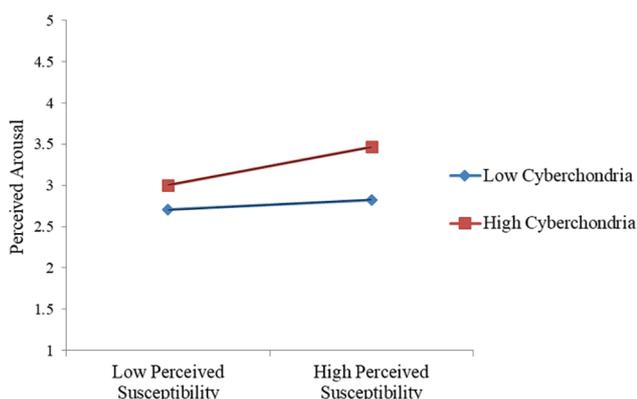


FIGURE 5. The moderation effect of CYC on the relationship between PSC and PA.

the finding of Chua et al. that health beliefs—i.e., PSV and PSC —significantly fuel arousal during the pandemic and place consumers in an alarming situation, which leads to PB. Following past studies, our study is the first to demonstrate the imperative role of PA as the sturdiest mediator. PA was identified as an important self-conscious emotion that induces PB during a crisis. Interestingly, our findings are consistent with the guidelines of the competitive arousal model [47]. Our study thus signifies that people with high emotional elements get electrified when they experience fear and risk from their nearby surroundings, which pushes them to engage in unusual behaviors that can reduce the intensity of their risk and fear [30].

Furthermore, as per our findings, CYC and IU, the psychological disorders that are induced during a crisis [51], are the dominant moderators that intensify the positive relationship between health beliefs and PA, while triggering several psychological disorders that fuel the emotional state of consumers and, ultimately, augment their panic. The above statement seems pertinent to Islam [5], which indicates that Pakistan as a developing economy, has observed hoarding or PB of products such as rice, cooking oil, and flour during the COVID-19 pandemic. Lastly, our findings interestingly signify the imperative role of moderators and a mediator by confirming the moderated mediation hypotheses.

*Theoretical contributions*
Our study offers several theoretical contributions to the fields of marketing, psychology, technology use, crisis, and consumer wellbeing. First, only a few studies have explored PB during the COVID-19 pandemic from a health belief viewpoint [6]. Additionally, we integrated the HBM with

CAT to offer an in-depth understanding of PB during a crisis. Second, we used real-time data that we acquired when the delta variant was at its peak and a majority of the respondents were experiencing the trauma of being quarantined once again. The natural integration of real-time heightened panic due to governmental restrictions in response to the delta variant proved opportune for testing the underlying mechanism of PB. Third, though numerous scholars have argued about PB mechanisms in developed or emerging economies, such as the USA, China, Singapore, India, and the UK, our study is the first to focus on a South Asian developing economy that implemented a lockdown and closed several institutions to tackle with the delta variant. Fourth, while many studies have discussed the dominating role of PA, our study is the first to explore the sturdiest role of PA as a mediator. Heightened PA as an emotional element, we found, is the robust cause of PB when a situation is highly risky and uncertain. Fifth, we contribute significantly to the literature by exploring the role of psychological disorders, i.e., CYC and IU, as robust moderators that strengthen the relationship between health beliefs, i.e., PSV, PSC, and PA. Consistent with prior literature, a consumer's psychological state affects their intentions and behaviors. Our study is the first to examine two pandemic-induced psychological problems that strongly affected individuals' health beliefs, emotional states, and shopping behavior. Finally, as per the literature discussed, our findings on panic buying during a crisis are inconsistent and inadequate. Several scholars have disagreed with panic response literature pertinent to its severity and duration [61]. Our study depicts that panic evolved during a severe crisis such as the COVID-19 pandemic, intensifies health beliefs and emotions, and enforces unusual buying behavior, such as panic buying. Therefore, our findings enhance the past arguments on technology use, consumer well-being, and panic buying during natural disasters and crises.

*Practical implications*

Our findings have numerous significant implications for scholars, marketers, policymakers, and the WHO. First, we found that health beliefs, such as PSC and PSV, positively affect PA, which leads to PB. Instead of panicking, the government, media, commerce, community and religious leaders, and family and friends could collectively offer mental health protection prompts to each other. To help consumers make decisions, policymakers should explicitly implement preventive measures and pandemic monitoring. Second, we found that individuals with strong emotions would fuel up rapidly in a panic scenario and stockpile or hoard stuff to reduce their fear, thereby causing stockouts. Early pandemic preparation and robust communication methods are essential to reduce consumer dissatisfaction. Inducing efficient e-supply chain techniques to ensure product availability or restricting things per person to sustain supply chain flow can eliminate public stockout concerns. To diminish irrational fear, "Share and Care" campaigns and ethical responsibility messages should be broadcast across several media channels. Third, we highlighted the moderating role of psychological disorders, i.e., CYC and IU, and we found that most people were

unintentionally affected by these disorders due to adverse technology use and information overload during the pandemic. This may be due to their lack of awareness and disturbed mindset or due to the unorganized planning by the government, media, and retailers. To handle this, the government should properly combat bogus news and rumors, and online retailers and suppliers should confirm product availability. Finally, the pandemic forced many physical enterprises to close, which affected suppliers and the economy, thus indicating a need for rapid digital transformation in every aspect—from the supply chain to medical channels and from the government to the public—to ensure transparency so that each stakeholder can know about the ongoing process and policies.

**Limitations and Future Research**

Besides the significant contributions of our study to consumer well-being literature during a crisis, it contains several limitations that must be addressed. First, the COVID-19 pandemic affected several economies, particularly in South Asia. South Asian countries combine several cultures, traditions, and values, which may provide readers with various viewpoints. However, we only studied Pakistan due to time and resource constraints. We consider this a limitation and welcome future scholars to validate our model in other countries. Second, because of the lockdown, we relied more on online surveys, but future research may use various data-gathering methods in different situations to test the model's applicability. Third, our measuring instruments were adapted in the context of the pandemic due to the non-availability of a mature measuring scale. Future researchers should thus focus on COVID-19 measuring scales. Fourth, we incorporated some of the related psychological disorders that have been validated in the context of health beliefs and attitudinal variables. The pandemic has caused psychological disturbances that can alter purchase behavior. Futuresychiatric disorders to learn more about PB behavior. to learn more about PB behavior Fifth, we incorporated control variables that were found to be insignificant so future researchers can add some significant control variables to enhance the study context. Finally, since our model included only two major health belief components, future scholars can use more constructs to broaden the PB context and investigate their association in diverse cultures.

**Author Contributions:** The authors confirm contribution to the paper as follows: study conception and design: M. W., G. W.; data collection: G. W., M. A.; analysis and interpretation of results: M. W., Z. L.; draft manuscript

preparation: M. W., Z. L., T. C. All authors reviewed the results and approved the final version of the manuscript.

**Availability of Data and Materials:** All the data and the materials could be accessed upon the request to the corresponding author with reasonable protocols.

**Ethics Approval:** All participants provided written informed consents before to complete the survey, in accordance with the Declaration of Helsinki, and researchers guaranteed the anonymity of data. The Ethics Committee of the University, determined that data collection posed no risk and thus, was exempt from ethics submission.

**Conflicts of Interest:** The authors declare that they have no conflicts of interest to report regarding the present study.

## References

1. Yu YJ, Yu YJ, Hu JX. COVID-19 among Chinese high school graduates: psychological distress, growth, meaning in life and resilience. J Health Psychol. 2022;27(5):1057–69.

2. Denfeld Q, Erickson E, Valent A, Villasana L, Zhang Z, Myatt L, et al. COVID-19: challenges and lessons learned from early career investigators. J Womens Health. 2020;29(6):752–4.

3. Zeng Y, Qiu S, Alizadeh A, Liu T. How challenge stress affects mental health among college students during the COVID-19 pandemic: the moderating role of self-efficacy. Int J Ment Health Pr. 2021;23(2):167–75.

4. Billore S, Anisimova T. Panic buying research: a systematic literature review and future research agenda. Int J Consum Stud. 2021;45(4):777–804. doi:10.1111/ijcs.12669.

5. Islam T, Pitafi AH, Arya V, Wang Y, Akhtar N, Mubarik S, et al. Panic buying in the COVID-19 pandemic: a multi-country examination. J Retail Consum Serv. 2021;59:102357. doi:10.1016/j.jretconser.2020.102357.

6. Omar NA, Nazri MA, Ali MH, Alam SS. The panic buying behavior of consumers during the COVID-19 pandemic: examining the influences of uncertainty, perceptions of severity, perceptions of scarcity, and anxiety. J Retail Consum Serv. 2021;62:102600. doi:10.1016/j.jretconser.

7. Arafat SMY, Kar SK, Marthoenis M, Sharma P, Hoque Apu E, Kabir R. Psychological underpinning of panic buying during pandemic (COVID-19). Psychiatry Res. 2020;289:113061. doi:10.1016/j.psychres.2020.113061.

8. Yuen KF, Wang X, Ma F, Li KX. The psychological causes of panic buying following a health crisis. Int J Environ Res Public Health. 2020;17(10):3513.

9. Sheu JB, Kuo HT. Dual speculative hoarding: a wholesaler-retailer channel behavioral phenomenon behind potential natural hazard threats. Int J Disast Risk Reduc. 2020;44:101430.

10. Wang L, Yang N, Zhou H, Mao X, Zhou Y. Pregnant women's anxiety and depression symptoms and influence factors in the COVID-19 pandemic in Changzhou. China Front Psychol. 2022;13:855545. doi:10.3389/fpsyg.2022.855545.

11. Grisham JR, Brown TA, Savage CR, Steketee G, Barlow DH. Neuropsychological impairment associated with compulsive hoarding. Behav Res Ther. 2007;45(7):1471–83.

12. Herjanto H, Amin M, Purington EF. Panic buying: the effect of thinking style and situational ambiguity. J Retail Consum Serv. 2021;60:102455.

13. Su J, Wei E, Clark C, Liang K, Sun X. Physical exercise, sedentaary behaviour, sleep and depression symptoms in chinese young adults during the COVID-19 pandemic: a compositional isotemporal analysis. Int J Ment Health Promot. 2022;24(5):759–69.

14. Pinciotti CM, Riemann BC, Abramowitz JS. Intolerance of uncertainty and obsessive-compulsive disorder dimensions. J Anxiety Disord. 2021;81(1):102417. doi:10.1016/j.janxdis.2021. 102417.

15. Unicef Situation Report. Pakistan Huminitarian Situation Report No. 28. 2021. Available from: https://www.unicef.org/documents/pakistan-humanitarian-situation-report-september-2021. [Accessed 2022].

16. Business Standard. Pakistan imposes restrictions in major cities as fourth wave grips country. Business Standard. 2021. Available from: https://www.business-standard.com/article/international/pakistan-imposes-restrictions-in-major-cities-as-fourth-wave-grips-country-121080201426_1.html 1/7. [Accessed 2021].

17. The News. Pandemic-promoted online shopping becoming new normal in Pakistan. The News. 2021. Available from: https://www.thenews.com.pk/print/789606-pandemic-promoted-online-shopping-becoming-new-normal-in-pakistan. [Accessed 2021].

18. Xinhuanet. Feature: pandemic-promoted online shopping becoming new normal in Pakistan. 2021. Available from: http://www.xinhuanet.com/english/asiapacific/2021-02/13/c_139741338.htm#:-:text=AccordingtoIatestdata,2019toJune. [Accessed 2021].

19. Russell JA, Mehrabian A. Evidence for a three-factor theory of emotions. J Res Pers. 1977;11(3):273–94.

20. Mano H. Judgments under distress: assessing the role of unpleasantness and arousal in judgment formation. Organ Behav Hum Decis Process. 1992;52(2):216–45.

21. Wu Y, Xin L, Li D, Yu J, Guo J. How does scarcity promotion lead to impulse purchase in the online market? A field experiment. Inf Manag. 2021;58(1):103283.

22. Malhotra D. The desire to win: the effects of competitive arousal on motivation and behavior. Organ Behav Hum Decis Process. 2010;111(2):139–46.

23. Bagozzi RP, Gopinath M, Nyer PU. The role of emotions in marketing. J Acad Mark Sci. 1999;27:184–206.

24. Donovan RJ, Rossiter JR. Store atmosphere: an environmental psychology approach. J Retailing. 1982;70(3):283–94.

25. Singh G, Slack NJ, Sharma S, Dhir A. Stockpiling intentions and customer well-being during the COVID-19 pandemic. J Consum Aff. 2023;57(3):1039–65. doi:10.1111/joca.12522.

26. Janz NK, Becker MH. The health belief model: a decade later. Health Educ Behav. 1984;11(1):1–47.

27. Rosenstock IM. The health belief model and nutrition education. J Can Diet Assoc. 1982;43(3):184–92.

28. Skinner CS, Tiro J, Champion VL. Background on the health belief model. Health Behav. Theory Res Pract. 2015;75:1–34.

29. Limbu YB, Gautam RK, Pham L. The health belief model applied to COVID-19 vaccine hesitancy: a systematic review. Vaccines. 2022;10(6):973.

30. Chua G, Yuen KF, Wang X, Wong YD. The determinants of panic buying during COVID-19. Int J Environ Res Public Health. 2021;18(6):1–28.

31. Li X, Zhou Y, Wong YD, Wang X, Yuen KF. What influences panic buying behaviour? A model based on dual-system theory and stimulus-organism-response framework. Int J Disast Risk Re. 2021;64:102484.

32. Iacob CI, Daniela I, Eugen A, Daniel C. COVID-19 Pandemic worry and vaccination intention: the mediating role of the health belief model components. Front Psychol. 2021;12:674018. doi:10.3389/fpsyg.2021.

33. Kroke AM, Ruthig JC. Conspiracy beliefs and the impact on health behaviors. Appl Psychol Health Well Being. 2022;14(1):311–28.

34. Zimmerman R, Vernberg D. Models of preventive health behavior: comparison, critique, and meta-analysis. Adv Med Sociol. 1994;4:45–67.

35. Painter JE, Borba CPC, Hynes M, Mays D, Glanz K. The use of theory in health behavior research from 2000 to 2005: a systematic review. Ann Behav Med. 2008;35(3):38–362.

36. Yoshitake N, Omori M, Sugawara M, Akishinonomiya K, Shimada S. Do health beliefs, personality traits, and interpersonal concerns predict TB prevention behavior among Japanese adults? PLoS One. 2019;14(2):e0211728.

37. Nowak B, Brzóska P, Piotrowski J, Sedikides C, Żemojtel-Piotrowska M, Jonason PK. Adaptive and maladaptive behavior during the COVID-19 pandemic: the roles of dark triad traits, collective narcissism, and health beliefs. Pers Individ Dif. 2020;167:110232.

38. Fallah Zavareh M, Mohamadi Hezaveh A, Nordfjærn T. Intention to use bicycle helmet as explained by the health belief model, comparative optimism and risk perception in an Iranian sample. Transp Res Part F Traffic Psychol Behav. 2018;54(2018):248–63.

39. Carpenter CJ. A meta-analysis of the effectiveness of health belief model variables in predicting behavior. Health Commun. 2010;25(8):661–9.

40. Hong W, Liu RD, Ding Y, Hwang J, Wang J, Yang Y. Cross-country differences in stay-at-home behaviors during peaks in the covid-19 pandemic in China and the United States: the roles of health beliefs and behavioral intention. Int J Environ Res Public Health. 2021;18(4):1–15.

41. Telch MJ, Lancaster CL. Is there room for safety behaviors in exposure therapy for anxiety disorders? In Exposure therapy: rethinking the model-refining the method. New York: Springer; 2012. p. 313–34. doi:10.1007/978-1-4614-3342-2_18.

42. Han L, Zhan Y, Li W, Yuqing Xu, Yan Xu, Zhao J. Associations between the perceived severity of the COVID-19 pandemic, cyberchondria, depression, anxiety, stress, and lockdown experience: cross-sectional survey study. JMIR Public Health Surveill. 2021;7(9):1–12.

43. Nisbet EKL, Gick ML. Can health psychology help the planet? Applying theory and models of health behaviour to environmental actions. Can Psychol. 2008;49(4):296–303.

44. Bechara A, Damasio AR. The somatic marker hypothesis: a neural theory of economic decision. Games Econ Behav. 2005;52(2):336–72.

45. Adam MTP, Krämer J, Müller MB. Auction fever! how time pressure and social competition affect bidders' arousal and bids in retail auctions. J Retailing. 2015;91(3):468–85.

46. Kumar S, Shah A. Revisiting food delivery apps during COVID-19 pandemic? Investigating the role of emotions. J Retail Consum Serv. 2021;62:102595.

47. Ku G, Malhotra D, Murnighan JK. Towards a competitive arousal model of decision-making: a study of auction fever in live and internet auctions. Organ Behav Hum Decis Process. 2005;96(2):89–103.

48. Freeston MH, Rhéaume J, Letarte H, Dugas MJ, Ladouceur R. Why do people worry? Pers Individ Dif. 1994;17(6):791–802.

49. Korte C, Friedberg RD, Wilgenbusch T, Paternostro JK, Brown K, Kakolu A, et al. Intolerance of uncertainty and health-related anxiety in youth amid the COVID-19 pandemic: understanding and weathering the continuing storm. J Clin Psychol Med Settings. 2021;29:645–53.

50. Starcevic V, Berle D. Cyberchondria: an old phenomenon in a new guise? In: Mental health in the digital age: grave dangers, great promis. New York: Oxford Academic; 2015. p. 106–17. doi:10.1093/med/9780199380183.003.0006.

51. Vismara M, Caricasole V, Starcevic V, Cinosi E, Dell'Osso B, Martinotti G, et al. Is cyberchondria a new transdiagnostic digital compulsive syndrome? A systematic review of the evidence. Compr Psychiatry. 2020;99:152167.

52. Zheng H, Sin SCJ, Kim HK, Theng YL. Cyberchondria: a systematic review. Internet Res. 2021;31(2):677–98.

53. Yam FC, Korkmaz O, Griffiths MD. The association between fear of COVID-19 and smartphone addiction among individuals: the mediating and moderating role of cyberchondria severity. Curr Psychol. 2021;42(3):2377–90. doi:10.1007/s12144-021-02324-z.

54. Jokic-Begic N, Korajlija AL, Mikac U. Cyberchondria in the age of COVID-19. PLoS One. 2020;15(12):1–17.

55. Muller D, Judd CM, Yzerbyt VY. When moderation is mediated and mediation is moderated. J Pers Soc Psychol. 2005;89(6):852–63.

56. Rao Y, Saleem A, Saeed W, Ul Haq J. Online consumer satisfaction during COVID-19: perspective of a developing country. Front Psychol. 2021;12:1–12.

57. Baltar F, Brunet I. Social research 2.0: virtual snowball sampling method using facebook. Internet Res. 2012;22(1):57–74.

58. Borah P, Su Y, Xiao X, Ka D, Lee L. Incidental news exposure and COVID-19 misperceptions: a moderated-mediation model. Comput Human Behav. 2022;129:107173.

59. Preacher KJ, Rucker DD, Hayes AF. Addressing moderated mediation hypotheses: theory, methods, and prescriptions. Multivariate Behav Res. 2007;42(1):185–227.

60. Bagozzi RP, Yi Y. Specification, evaluation, and interpretation of structural equation models. J Acad Mark Sci. 2012;40:8–34.

61. Quarantelli EL. Disaster related social behavior: summary of 50 years of research. Preliminary paper #280. University of Delaware, Disaster Research Center. 1999.