

# Behavioral Immune System, Psychological Immune System, and General Psychophysical Health during COVID-19 Pandemic: A Qualitative Exploration

<sup>1</sup>Aishwarya Jaiswal   <sup>2</sup>Sreeja Das   <sup>3</sup>Yogesh Kumar Arya   <sup>4</sup>Sunil K Verma   <sup>5</sup>Tushar Singh

*With innate biological immunity proving inept and an acute lack of effective SARS-CoV-2 medication or vaccination, strict restrictive, preventive, and protective measures were introduced worldwide. Despite flattening the pandemic-growth curve, these were met with resistance and heightened psychopathology among the masses. Recognizing individuals' unique adaptations to supporting and protecting their health before or when any disease-state emerges in their body or the population around them has implications for population health and public health programs. Humans have evolved a concomitant behavioural immune system (BIS), a coordinated suite of psychological mechanisms (affective-cognitive-behavioral) that motivate prophylactic avoidance of infectious-disease vectors. They also possess a psychological immune system (PIS) comprising personal resilience resources and adaptive capacities that can promote psychological health-protective behaviors. The present phenomenological study explores the dynamics of general populations' experiences during the COVID-19 pandemic to understand their behavioural immune, psychological immune, and general psychophysical health functioning and the association between them. An attempt has been made to validate the BIS model (Schaller & Park, 2011) and the PIS (Olah, 1996) within the pandemic context. Semi-structured and in-depth telephonic interviews were conducted with thirty-five participants. The data was analysed using directed qualitative content analysis. Participants had deteriorated psychophysical health and an activated BIS. Increased BIS was associated with negative attitudes and outcomes. PIS resources helped maintain functionality, positivity, and stress resistance, and those with lower behavioural immune activation and psychological immunity had more health-related complaints. The study demonstrates that BIS and PIS are important factors for health behaviour and well-being and suggests a more integrative approach to health research.*

**Keywords:** Behavioral Immune System, Psychological Immune System, General Health, COVID-19, Qualitative

<sup>1</sup>Research Scholar, Department of Psychology, Faculty of Social Sciences, Banaras Hindu University-221005, Varanasi, Uttar Pradesh India.

<sup>2</sup>Assistant Professor, Amity University Jaipur, Rajasthan, India.

<sup>3</sup>Professor, Department of Psychology, Faculty of Social Sciences, Banaras Hindu University-221005, Varanasi, Uttar Pradesh, India.

<sup>4</sup>Associate Professor, Department of Applied Psychology, Vivekananda College, New Delhi, 110095, India.

<sup>5</sup>Assistant Professor (**Corresponding Author**), Department of Psychology, Faculty of Social Sciences, Banaras Hindu University-221005, Varanasi, Uttar Pradesh, India.  
Email: [tusharsinghalld@gmail.com](mailto:tusharsinghalld@gmail.com)

## Introduction

The resurfacing of COVID-19-like new acute diseases beckons the need for a systematic understanding of behavioral health in population-level disease and the relationships among biology, behavior, and population health (Saad & Prochaska, 2021). Individual health behaviour is important for stopping the spread of infectious diseases (ID) and making sure people follow rules that protect health. Acknowledging individuals' distinct psychological and behavioral adaptations and contributions towards supporting and protecting their own health before or when any (chronic

or acute) disease-state like a coronavirus emerges in their body or their population has important implications for both population health and public health programs (Saad & Prochaska, 2021; Troisi, 2020). Understandings from previous disease outbreaks (e.g., Ebola, SARS) indicate that psychological attitudes and affective reactions significantly impact decisions to adopt protective health behavior (Panzeri et al., 2020). Understanding how health behaviours, like the biological immune system, can be strengthened in the general population could support advances in the 21st century. Likewise, personal resilience resources and adaptive coping can promote psychological health and well-being even amidst the pandemic. Psychological immunity (PI)-boosting interventions can help curb pandemic-linked psychopathologies (Jaiswal et al., 2020).

Schaller and Duncan (2007) proposed the existence of a Behavioral Immune System (BIS)- a coordinated suite of psychological mechanisms that allow individuals to identify potential sources of pathogens, enables disease-relevant affective and cognitive responses to those perceptual cues and facilitates the behavioral avoidance of contagious sources and infections (Murray & Schaller, 2016). Despite being generally effective in combating pathogens (e.g., coronavirus) and infection, the biological immune system is limited owing to being reactive and metabolically costly (Shook et al., 2020). BIS reduces the infection-likelihood and conserves the biological immune system. BIS works contemporaneously with the biological immune system and could compensate for lowered biological immunity (Díaz et al., 2020).

The Perceived Vulnerability to Disease (PVD) (Duncan et al., 2009) conceptual construction comprising Perceived Infectability- reflecting one's general perception about their disease susceptibility and Germ Aversion- reflecting one's affective-behavioral responses to potential pathogens has increasingly been utilized to assess BIS activation (Bacon & Corr, 2020; Makhanova & Shepherd, 2020). Pandemics activate BIS (McKay & Asmundson, 2020), as reflected by individual's PVD, and is associated with stronger reactions to the COVID-19 threat, attitudes towards other people and lockdown measures, and increased conforming to social normative behaviors and attitudes

(e.g., social distancing, etc.) and can prevent the population-wide spread of novel IDs like COVID-19 (Bacon & Corr, 2020; Makhanova & Shepherd, 2020). The psychological processes within BIS could be targeted and potentially modified to encourage behavior change in response to pathogen threats (Shook et al., 2020). However, prior to the COVID-19 pandemic, only one study considered pathogen avoidance in actual-threat situation. Moreover, none examined association between trait pathogen avoidance and people's psychological and behaviors reactions during a pandemic (Makhanova & Shepherd, 2020).

Researchers (e.g., Glaser & Kiecolt-Glaser, 2005) also uphold the existence of a psychological immune system (PIS) operating parallel to the biological immune system and encompassing a substantial amount of health-related phenomena that are outside the scope of the behavioral immune model. In 1996, Oláh advanced a comprehensive model of psychological immune and held PIS to be "a multidimensional and integrated unit of personal resilience resources or adaptive capacities" providing immunity against stress and trauma (Oláh, 2009). Psychological immune resources have a strong association with life satisfaction, physical and mental health, well-being, and mediate psychological adjustment-mental health linkage (Jaiswal et al., 2020). Boosting PI can be an effective stress-mitigating and health-promoting resource in response to the current or future psychopathology resulting from the coronavirus pandemic.

Understandings gained from behavioural and psychological immune functioning may have implications for the simultaneous protection of physiological and mental health during the COVID-19 pandemic. However, our investigation observed a comparative paucity of studies focusing on the general people's subjective perception of their psycho-behavioral adaptations and psychophysical health during the coronavirus pandemic.

### **The Present Study**

Using a phenomenological approach and directed content analysis, this study tried to understand people's general health and functioning, their health behaviours and behavioural adaptations to reduce the risk of coronavirus infection, their adaptive strategies and

psychological adaptations to deal with the pandemic and its restrictions. The psycho-behavioral adaptations and functioning were investigated within Schaller and Park's (2011) BIS framework and Olah's (1996) PIS model. Besides, the association between the behavioural immune system, psychological immune system, and general health functioning was explored. The study findings provide practical insights for designing anti-COVID public health campaigns and mental health-promoting interventions.

### Methods

A qualitative study using an empirical phenomenological approach was conducted. Semi-structured and in-depth telephonic interviews were conducted after obtaining informed consent from the participants. Further, the interviews were recorded, transcribed verbatim, and analysed using directed qualitative content analysis.

### Participants

Participants (n=35) were Indian nationals with no known psychiatric history/ symptoms and/or involvement with corona patients and were under COVID-19-induced lockdown at the time of the study. The majority were aged between 20 and 40, married, had a private job, belonged to the middle-income group, and were single earners. Study recruitment was guided by information redundancy (Sandelowski, 1995). The detailed demographic characteristics of participants are provided in Table 1.

**Table 1**  
**Demographics of participants (n=35)**

Demographics	Categories	N (%)
Gender	Male	15 (42.86)
	Female	20 (57.14)
Age (Years)	20-40	15 (42.86)
	41-60	10 (28.57)
	61-80	10 (28.57)
Marital Status	Married	20 (57.14)
	Unmarried	13 (37.14)
	Separated	1 (2.86)
	Widowed	1 (2.86)
Occupation	Student	2 (5.71)
	Housewife	8 (22.86)
	Government Employee	10 (28.57)
Socioeconomic category	Private Job	15 (42.86)
	Low	2 (5.71)
	Medium	30 (85.71)
Earning Members in Family	High	3 (8.57)
	Single-earner	14 (40.00)
	Dual-earner	10 (28.57)
	More than 2 earners	6 (17.14)

### Data Collection

The research team developed the research questions for the interview. The interviewer had the freedom to alter the questions' sequence and ask additional probing questions based on the participant's responses. Some sample questions included in the interview protocol are provided in Table 2. The duration of the interviews ranged between 45 to 60/ minutes, depending on the information shared by the participants. The interviews conducted in native languages were transcribed, translated into English, and proofread by a native English speaker.

**Table 2**  
**Sample questions in the Interview Protocol**

<b>General Demographic and COVID-19-related information</b>
o "What is your name, and how old are you?"
o "When and how did you first come to know about COVID-19?"
<b>General Health functioning</b> (open-ended questions followed by targeted questions)
o "How has the pandemic and lockdown affected you and your health functioning?"
o "Has pandemic altered your sleep quality and duration (time)?"
(asked if the participant previously reported having sleep-related problems)
<b>Behavioral Immune System functioning</b> (open-ended questions followed by targeted questions)
o "Do you find yourself susceptible to COVID-19 infection?"
o "What is your general opinion about your immunity?"
<b>Psychological Immune System functioning</b> (open-ended questions followed by targeted questions)
o "How are you taking care of your personal life?"
o "What measures are you adopting to cope with issues encountered due to the pandemic?"

### Analysis

The data was analyzed in accordance with the suggestions of Hsieh and Shannon (2005) and Assarroudi et al. (2018). The interviews were read carefully several times to enhance familiarity with the data set. While reading the interview transcripts, important statements were highlighted to identify initial codes. Then the statements were placed in the subcategories following the theoretical models. The predetermined categories for data coding were “general health functioning,” “behavioural immune system functioning,” and “psychological immune system functioning.” The subcategories were also determined based on emergent themes and frameworks. The qualitative data analysis software NVivo was also employed to facilitate data analysis.

### Results and Discussion

Findings indicate that social networking sites (SNSs) and tools, particularly Facebook and WhatsApp Messenger, followed by press media in the following order: television news channels > newspapers > radio > others (blogs, online reports, etc.), were the leading

sources of COVID-19 awareness and information for the respondents. Most respondents initially thought of COVID-19 as a “Chinese infection,” dubbed its global spread a rumor, and gave coronavirus serious consideration only after the imposition of lockdown. The majority reported an infection threat and family members’ families as an initial reaction and/or concern in response to the SARS-CoV-2 spread. The most common physical health issues reported were fatigue (71.42%), myalgia (62.86%), headaches (57.14%), nausea (42.86%), cough (37.14%), and chills (28.57%). Similarly, fear (94.29%), anxiety (91.43%), insomnia (85.71%), psychological distress (74.29%), and depressive symptoms (54.29%) were the most commonly reported psychological health issues. The majority of respondents (88.57%) reported social disconnection as a major well-being hindrance.

The major themes, sub-themes, their meaning, and the connection between theoretical frameworks and the participants’ narratives on psychological and behavioural adaptations are provided in Table 3.

**Table 3**  
**Major themes, sub-themes, their meaning, and sample participant narratives**

Major Themes	Sub-themes	Meaning within the coronavirus context	Examples of Participant’s Narratives
<b>General Health functioning</b>	General Health	Perceived overall (physical, mental, social) health functioning.	“In general, I am not feeling well. I do not know what the reason is. No one anyways cares for the senior citizens.” ( <i>Participant 26</i> )
	Physical functioning	The ability to carry out daily life’s basic and instrumental activities without any limitation.	“I used to run 5 Kilometers daily (laughingly), but now, I can’t even walk (high pitch and loud tone). My flat is really small, and so my physical activity level has become zero.” ( <i>Participant 1</i> )
	Social functioning	The quality of environmental interactions, one’s ability to fulfill social roles and carry out normal social activities without any limitation.	“I was an active member of the community <i>Satsang</i> (spiritual discourse). I used to sing <i>Bhajans</i> (devotional songs and hymns) daily, and everyone appreciated it. But now, (with a pause) all that has completely stopped. I feel so detached from the community.” ( <i>Participant 27</i> )
	Psychological well-being	The balance of experienced (positive, negative) and perceived (happiness, satisfaction) feelings	“I think I haven’t smiled even once since the last two months”(Participant 23) “I don’t have anyone to understand me or share my feelings.” ( <i>Participant 8</i> )

Major Themes	Sub-themes	Meaning within the coronavirus context	Examples of Participant's Narratives
<b>Behavioral Immune System functioning</b>	Perceived infection risk	The inference of infection risk from appearance-based (ailing, unfit) and/or physiologic response- and condition-based (sneezing, coughing) perceptual cues	<p>"My milkman had red eyes and skin rashes. He seemed to have transmitted the virus. I gave him his due money and told him that we would buy packet milk or use milk powder from now, and he does not need to come anymore." (<i>Participant 31</i>)</p> <p>"I am highly susceptible to catch infections. (Silence) Hmm...and in my family, I am always the first one to catch any prevalent infection" (<i>Participant 15</i>)</p> <p>"These migrants are spreading the virus. They are really dirty and stupid." (<i>Participant 32</i>)</p>
	Germ Aversion	It reflects emotional discomfort and aversive affective and behavioral responses in contexts connoting a relatively high likelihood of pathogen transmission.	<p>"Seeing street sweeper hold my house's door while taking waste bin disgusts me. Out of worry, I sanitize my door daily. These sanitizations workers carry infections."(<i>Participant 21</i>)</p> <p>"Whenever someone comes close to me in the vegetable market, I feel very angry and want to push that person away. I have also become obsessed with cleaning and sanitization" (<i>Participant 14</i>)"</p> <p>...a boy near me suddenly sneezed. I became anxious and moved 10 feet away". (<i>Participant 34</i>)</p> <p>"Now I wash my hands for 20+ seconds and daily sanitize my phone and other objects and conform to all government regulations for safety against COVID-19 ". (<i>Participant 24</i>)</p>
	Positive thinking	The cognitive personality dimensions that facilitate positive outcome anticipation in situations that are beyond one's control.	"India is a religious country. God will save us all from all viruses. Nothing bad will happen to anyone's family" ( <i>Participant 33</i> )"India will soon develop herd immunity, and everything will be fine." ( <i>Participant 18</i> )
	Sense of Control	Upholding a sense of control or influence over life events.	"Though gym closure affected my fitness regime, it could not stop me from staying fit. I started following fitness bloggers on Instagram and practiced yoga to maintain fitness" ( <i>Participant 12</i> )
	Sense of Coherence	The belief that either life circumstance could understand, comprehended, and managed	We are taking all the possible precautions. social distancing, washing hands, sanitizing. We have understood that this is the only way to handle the current problem." ( <i>Participant 25</i> )
<b>Psychological Immune System functioning</b>			

Major Themes	Sub-themes	Meaning within the coronavirus context	Examples of Participant's Narratives
	Sense of self-growth	A enduring belief in one's tendency towards constant overachievement and personality enhancement.	"Baking was my hobby. During the lockdown, I got a chance to pursue my hobby again. Baking new stuff every day and sharing it online makes me so happy and accomplished. Everyone who watches my videos appreciates me." ( <i>Participant 22</i> )
	Creative self-concept	Strong belief in one's creative potential, self-esteem, and accomplishments.	"I used to write <i>Shayari</i> (Urdu poetry) during my school-college days. This lockdown gave me the chance to revive my poetry talents. I have organized three online <i>Mushairas</i> (poetic symposiums) and have received huge admiration from others in my community." ( <i>Participant 20</i> )
	Self-efficacy	Beliefs in one's capacity to execute behaviors desired to produce the specific outcomes.	"My school decided to start online classes from March 26. I am a good teacher but not tech-savvy. But I learned all skill and am now conducting online classes well." ( <i>Participant 11</i> )
	Goal orientation	The ability to sustain motivation and determination for task accomplishment despite adversities and obstacles.	"I am finding work from home very difficult due to poor network connection and children around. Still, I don't give any excuses and try hard not attend all meetings and complete all assigned work on time." ( <i>Participant 9</i> )
	Problem-solving capacity	The ability to handle problems using new ideas and alternative solutions derived from reconstructed learned experiences.	"I couldn't go to the gym or buy gym equipment. So, I looked for alternatives like filled water bottles for weight lifting and continued my workout. I can't simply sit and waste time cursing the situation. I mean...I'm not the only one who is suffering." ( <i>Participant 7</i> )
	Change and challenge orientation	Openness to new experiences, intrinsic motivation towards environmental exploration, and anticipation of changes as adaptive and positive.	"I and my daughter joined an online dance class. We had never danced before. It kept us so happy, busy, and motivated. New learning each day and greater connectivity from people across India. Dance and music add positivity to life." ( <i>Participant 16</i> )" "My grandson taught me to use smartphones. I'm glad lockdown happened." ( <i>Participant 29</i> )
	Social monitoring capacity	The ability to achieving future aims by sensitive and selective observation and utilization of social or environmental knowledge.	"Most women in my society had maids for cooking and didn't know how to cook. I proposed to start an online cooking class for them. It not only brought me money but also helped them. Further, my social connections increased." ( <i>Participant 35</i> )
	Social mobilizing capacity	The ability to advance one's aim via motivating, forcing, governing, and directing human resources.	"My husband and I wanted to do some charity work for the poor but could not afford to do it alone. I contacted all of my apartment members. It took a week to convince them, but, finally, we distributed food packets to people in a nearby slum for ten days." ( <i>Participant 10</i> )

Major Themes	Sub-themes	Meaning within the coronavirus context	Examples of Participant's Narratives
	Social creating capacity	The social resource creating ability, even in situations wherein they aren't clearly evident.	"To keep children involved, I requested all the elders I know to host story-telling sessions for my children. This made both my children and elders in my society active and busy. Don't know why is there such a buzz around coronavirus and if its is seriously this serious that a lockdown shall be imposed." ( <i>Participant 6</i> )
	Synchronicity	The ability to be "in flow" with the surrounding environment together with maintaining maximal concentration on both the personal and environmental issues.	"I used to keep myself updated on COVID-related information and on how many actives cases were there in my 2 Kilometers radius. However, I simultaneously ensured that all this did not make me or my family members panic or disrupt our normal functioning." ( <i>Participant 4</i> )
	Impulse control	The behavior management ability, attained by exercising rational control over spontaneous actions.	My husband and I had daily arguments during the initial phase of lockdown. When we realized it was negatively affecting our kids, we started controlling our impulsive behaviors." ( <i>Participant 5</i> )
	Emotion control	The emotional regulation ability involving regulation of the negative feelings of anxiety, worry, depression, etc., arising out of anticipation of failure.	"I had a campus selection, but, later, the company withdrew the job offer. All efforts seemed a waste, and I felt I wouldn't find a job now. Initially, I got very worried and quite depressed. However, now I have reconciled myself and am looking for off-campus placement options." ( <i>Participant 2</i> )
	Irritability control	The ability to control and constructively regulate impatience and anger stemming from unsatisfied essential needs.	"I was finding no self-time for personal care and relaxation and began taking out my frustration and anger on my kids (Gasped). However, to remain calm, I have started following a Yoga program on television." ( <i>Participant 3</i> )

### General Health Functioning

All participants unanimously reported that the COVID-19 pandemic and the associated restrictive and preventive measures like social distancing, isolation, lockdown, etc. affected their everyday functioning and overall health. This is in line with contemporary studies observing the general population's health during the COVID-19 pandemic (Nochaiwong et al., 2021). While younger respondents reported that their lives went "off-routine", the elderly complaint of not being taken care of sufficiently (e.g., Participant 26). Physical and psychological issues such as tiredness, muscle pain, headaches, sore throat and cough, fear, anxiety, hopelessness, sleeping difficulty, lack of future direction,

psychosocial distress, and depressive symptoms were common across age groups. While the social life was already disrupted, excessive COVID-related information over digital media resulted in cognitive overload, irritation, feeling of worthlessness, and heightened uncertainty pertaining to the duration and extension of lockdown exaggerated the existing concerns. Our study findings support other contemporary studies (e.g., Pecanha et al., 2020) examining psychophysical health during the pandemic. Moreover, other researchers also observed that while social isolation leads to cognitive dissonance, conventional and social media triggered public stress (Depoux et al., 2020).

Physical activity is imperative for improving physiological immunity and mental health. During the pandemic, research (Ammar et al., 2020) found that a lack of physical activity had a negative impact on people's psychological well-being. During the initial phases of lockdown, people were anxious. Their sleep pattern was disturbed, they developed a more sedentary lifestyle, and they lacked the motivation to engage in at-home physical exercises.

### **Behavioral Immune System Functioning**

Almost all participants had an activated behavioral immune, which was suggested by their hypersensitivity to even superficial coronavirus-transmitting perceptual/environmental cues, extremely aversive affective reactions to suspected infection-transmitters or transmitting sources, and practice of extreme infection-avoidance behaviors. The findings were plausible and in line with other contemporary research (e.g., Hromatko et al., 2021; Miłkowska et al., 2021) comparing pre- and post-pandemic BIS activation and reporting heightened BIS post-COVID-19 pandemic. Hypersensitivity to coronavirus infection cues and extreme discomfort within environments such as the vegetable market, crowded streets, etc., connote higher coronavirus transmission likelihood. This is likely as pandemics inherently activate BIS (McKay & Asmundson, 2020). Practicing health-protective, conforming to government regulations, and avoiding and condemning anyone with even mild ailment were shared responses. Uncertainty and fear had grown as the number of asymptomatic cases increased. Health anxiety and the surfacing of obsessive-compulsive behaviors (e.g., washing hands every 5 minutes) were also observed in some participants. Other researches examining BIS (e.g., Shook et al., 2020) also had similar observations. As with other studies (e.g., Mikowska et al., 2021), our study also observed that women had a higher BIS activation.

While BIS activation is imperative for practising health-protective behaviors and complying with infection-preventive regulations, heightened BIS translates to detrimental consequences such as out-group prejudice, xenophobia, etc. Stigma against those involved in essential services (e.g., sanitization) and some specific religious and workgroup activities were reported. For instance, Participant 21 reported, "Seeing the street sweeper hold my house's door while taking the waste bin disgusts me... Few participants (e.g., participant 32) reported anti-migrant and xenophobic

attitudes and blamed migrants for spreading the virus. BIS perceives out-group membership as a cue for infectiousness, and out group prejudice was also a common observation during the initial coronavirus wave (Bressan, 2021). Numerous instances of stigmatization, discrimination, and ostracization of medical and sanitation workers have been reported in India since the initial phase of the lockdown. Heightened BIS was also associated with increased health anxiety (e.g., participant 31) and compulsive cleaning (e.g., participant 14).

Both the BIS and the anti-COVID public health campaigns share the same goals, viz., avoiding physical contact with people and the objects' touched by them (Ackerman et al., 2021). Measures such as posting disgusting images on social media can effectively promote preventive behavior (Liu et al., 2020) via optimal BIS activation. Given the importance of the BIS in disease avoidance (e.g., practising health behaviors) and relevant manifest desirable (e.g., conformism) and undesirable (e.g., xenophobia) psychosocial phenomena, it should be a key component of anti-COVID public health strategies (Troisi, 2020). It shall be kept into consideration that the mass-level strategies (campaigns, regulations, media reporting, etc.) do not lead to BIS "misfiring" with its associated deleterious consequences.

### **Psychological Immune System Functioning**

The study findings highlight the prophylactic relevance of PIS. Positive thinking, self-efficacy, problem-solving capacity, social creating capacity, and impulse control were the most employed psychological immune resources. Participants were introspective about ways to regulate and control their irritation and emotions. Those with a positive appraisal of themselves and their environment, the ability to identify, create, and modify the social resource, and regulate their feelings and emotions were better able to cope with the pandemic. This is probable, as previous empirical evidence highlights that high PIS functioning is associated with better stress-resistance and coping in stressful and traumatic situations, lower psychopathology risk, and better physical and mental health (Bóna, 2014). Adaptive coping was also employed to counteract the negative outcomes that could have probably surfaced due to activated behavioral immune. For instance, Participant 32 reported, "On hearing that migrants would cross my city as well, I started shivering. But to calm myself

down, I immediately engaged in optimistic thoughts about my family's safety and well-being". Researchers (e.g., Jaiswal et al., 2020) postulate that enhanced psychological immunity can be a health-protective resource during the pandemic.

While participants reporting high PIS simultaneously reported lower health complications and less aversive emotional and behavioral reactions against the pandemic and probable infection-transmitters. Some even had an empathetic attitude towards migrants and treated them as victims of the pandemic. However, participants (e.g., Participant 6) with excessively high PIS undermined the gravity of the COVID-19 problem and reported a sort of optimism bias. While unrealistic optimism can have certain short-range psychological benefits, improper assessment of hazardous circumstances could make it dangerous. Despite the evolutionary origin of optimism bias, it is not deemed "optimal" in every situation, particularly in the face of novel risk sources/factors such as a global pandemic (Gassen et al., 2021). Thus, it is suggested that it be kept in mind that these PI-boosting efforts are made in coordination with the BIS-promoting health campaigns so that they do not unintentionally promote 'unrealistic optimism' among the masses that could hamper virus-containment efforts.

### **Behavioral Immune, Psychological Immune, and Health**

While all participants unanimously reported deteriorated health status and functioning, those with heightened BIS reported strictly conforming to all recommended behaviors, from staying at home, consuming Kadha (a poly-herbal decoction) to daily practising Dhyana (meditation) and Pranayamas (breath regulation exercises). However, despite this, they had higher and more frequent health complaints and discomfort. This is plausible owing to the established behavioral-biological immune linkage (Gassen et al., 2018). Throughout the conversation, they innumera- bly kept blaming some suspected sources for virus transmission and their condition (i.e., locked within the home) compared to those not reporting any extreme coronavirus avoidance attitudes and behaviors. Empirical investigations have also found that BIS contributes significantly to preferred interpersonal distances, social cognition, and emotions. Those with more reactive BIS had higher perceived infectability, experienced more negative emotions towards strangers and preferred keeping larger physical distances from

them, and had a higher inclination towards punishing those not adhering to the social and official COVID-containment rules and regulations (Hromatko et al., 2021).

People's resilience resources will be very good at keeping them mentally stable, and those who used adaptive coping strategies had less pain, fear, and health problems. Those who reported higher utilisation of PIS resources even saw the lockdown phase as an opportunity, devising novel ways to maintain social connections, acquiring new knowledge, and displaying a "this too shall pass" attitude in response to the crisis. The PIS intensity was based on how much and what kind of resilience resources and adaptive abilities a person used to stay stable and deal with the pandemic. Interestingly, those with both heightened BIS and heightened PIS reported engagement in appropriate health behaviors, more functional adaptation, and reported better health and lower psychiatric complaints than those with 'low BIS activation and high PIS' and 'high BIS activation and low PIS'. Lower BIS and heightened PIS promoted unrealistic optimism, which could counteract the anti-COVID health-promoting efforts. Similarly, increased BIS and decreased PIS would result in psychopathology and negative social consequences such as xenophobia, which would persist even after the pandemic ended. This suggests that, given the unprecedented circumstance, higher BIS activation worked better than lower activation for promoting health behavior.

The findings suggest that ensuring the practice of appropriate health behaviors and conformity to COVID-containment regulations, preventing damaging psychosocial consequences, and ensuring health and well-being demand efforts that promote coordinated BIS-PIS functioning.

### **Conclusion**

This study attempted to understand general populations' psychophysical health functioning and their psychological and behavioral adaptations during the COVID-19 pandemic (lockdown) using the phenomenological approach. A directed qualitative content analysis was performed using Schaller and Park's (2011) Behavioral Immune System theory and framework, as well as Olah's (1996) Psychological Immune System theory and framework. The findings show that people's health was deteriorating and they had an overactive behavioural immune, and that using psychological immune resources helped them better

adjust and cope with the pandemic circumstances, as well as maintain stability and positivity. Activated behavioral immune was imperative to practicing appropriate health behavior and ensuring conformity to COVID-containment measures, while psychological immunity was critical to overall well-being. Overactive behavioural and psychological immunity, on the other hand, may result in negative psychosocial consequences and unrealistic optimism.

Findings demonstrate that behavioral and psychological immune systems hold significance for health-promoting efforts and anti-COVID public health campaigns. But the success of these efforts, campaigns, or protocols depends on and requires careful thought about how they might affect behaviour and the way the mind and immune system work together. The study findings validate the behavioral

immune and the psychological immune models in the context of the pandemic and add to the existing theoretical knowledge base of these two immune systems. Though these findings could not be generalized, they provide practical insights to anti-COVID policymakers and public health campaign designers. They also have implications for public response to future epidemics or pandemics. Future theoretical and empirical research into the behavioral-psychological immune link will be carried out.

#### Statements and Declarations

#### Competing Interests

The author(s) have declared no potential conflicts of interest, financial or non-financial, with respect to the research, authorship, and/or publication of this article.

#### References

- Ackerman, J. M., Tybur, J. M., & Blackwell, A. D. (2021). What Role Does Pathogen-Avoidance Psychology Play in Pandemics? *Trends in Cognitive Sciences*, 25(3), 177–186. <https://doi.org/10.1016/j.tics.2020.11.008>
- Ammar, A., Brach, M., Trabelsi, K., Chtourou, H., Boukhris, O., Masmoudi, L., Bouaziz, B., Bentlage, E., How, D., Ahmed, M., Müller, P., Müller, N., Aloui, A., Hammouda, O., Paineiras-Domingos, L. L., Braakman-Jansen, A., Wrede, C., Bastoni, S., Pernambuco, C. S., ... Hoekelmann, A. (2020). Effects of COVID-19 Home Confinement on Eating Behaviour and Physical Activity: Results of the ECLB-COVID19 International Online Survey. *Nutrients*, 12(6), 1583. <https://doi.org/10.3390/nu12061583>
- Assarroudi, A., Heshmati Nabavi, F., Armat, M. R., Ebadi, A., & Vaismoradi, M. (2018). Directed qualitative content analysis: the description and elaboration of its underpinning methods and data analysis process. *Journal of Research in Nursing*, 23(1), 42–55. <https://doi.org/10.1177/1744987117741667>
- Bacon, A. M., & Corr, P. J. (2020). Behavioral Immune System Responses to Coronavirus: A Reinforcement Sensitivity Theory Explanation of Conformity, Warmth Toward Others and Attitudes Toward Lockdown. *Frontiers in Psychology*, 11, 3203. <https://doi.org/10.3389/fpsyg.2020.566237>
- Bóna, K. (2014). *An Exploration of the Psychological Immune System in Hungarian Gymnasts* [University of Jyväskylä].
- Bressan, P. (2021). Strangers look sicker (with implications in times of COVID 19). *BioEssays*, 43(3), 2000158. <https://doi.org/10.1002/bies.202000158>
- Depoux, A., Martin, S., Karafillakis, E., Preet, R., Wilder-Smith, A., & Larson, H. (2020). The pandemic of social media panic travels faster than the COVID-19 outbreak. In *Journal of Travel Medicine* (Vol. 27, Issue 3). Oxford University Press. <https://doi.org/10.1093/jtm/taaa031>
- Díaz, A., Beleña, Á., & Zueco, J. (2020). The role of age and gender in perceived vulnerability to infectious diseases. *International Journal of Environmental Research and Public Health*, 17(2). <https://doi.org/10.3390/ijerph17020485>
- Duncan, L. A., Schaller, M., & Park, J. H. (2009). Perceived vulnerability to disease: Development and validation of a 15-item self-report instrument. *Personality and Individual Differences*, 47(6), 541–546. <https://doi.org/10.1016/J.PAID.2009.05.001>
- Gassen, J., Nowak, T. J., Henderson, A. D., Weaver, S. P., Baker, E. J., & Muehlenbein, M. P. (2021). Unrealistic Optimism and Risk for COVID-19 Disease. *Frontiers in Psychology*, 12, 1847. <https://doi.org/10.3389/fpsyg.2021.647461/BIBTEX>
- Gassen, J., Prokosch, M. L., Makhanova, A., Eimerbrink, M. J., White, J. D., Proffitt Leyva, R. P., Peterman, J. L., Nicolas, S. C., Reynolds, T. A., Maner, J. K., McNulty, J. K., Eckel, L. A., Nikonova, L., Brinkworth, J. F., Phillips, M. D., Mitchell, J. B., Boehm, G. W., & Hill, S. E. (2018). Behavioral immune system activity predicts downregulation of chronic basal inflammation. *PLOS ONE*, 13(9), e0203961. <https://doi.org/10.1371/journal.pone.0203961>
- Glaser, R., & Kiecolt-Glaser, J. K. (2005). Stress-induced immune dysfunction: implications for health. *Nature Reviews Immunology*, 5(3), 243–251. <https://doi.org/10.1038/nri1571>

- Hromatko, I., Grus, A., & Kolderaj, G. (2021). Do Islanders Have a More Reactive Behavioral Immune System? Social Cognitions and Preferred Interpersonal Distances During the COVID-19 Pandemic. *Frontiers in Psychology, 12*, 1497. <https://doi.org/10.3389/fpsyg.2021.647586/BIBTEX>
- Hsieh, H. F., & Shannon, S. E. (2005). Three approaches to qualitative content analysis. *Qualitative Health Research, 15*(9), 1277–1288. <https://doi.org/10.1177/1049732305276687>
- Jaiswal, A., Singh, T., & Arya, Y. K. (2020). “Psychological Antibodies” to Safeguard Frontline Healthcare Warriors Mental Health Against COVID-19 Pandemic-Related Psychopathology. *Frontiers in Psychiatry, 11*, 590160. <https://doi.org/10.3389/fpsyg.2020.590160>
- Liu, Z., Geng, H., Chen, H., Zhu, M., & Zhu, T. (2020). Exploring the Mechanisms of Influence on COVID-19 Preventive Behaviors in China’s Social Media Users. *International Journal of Environmental Research and Public Health, 17* (23), 8766. <https://doi.org/10.3390/ijerph17238766>
- Makhanova, A., & Shepherd, M. A. (2020). Behavioral immune system linked to responses to the threat of COVID-19. *Personality and Individual Differences, 167*, 110221. <https://doi.org/10.1016/j.paid.2020.110221>
- McKay, D., & Asmundson, G. J. G. (2020). Substance use and abuse associated with the behavioral immune system during COVID-19: The special case of healthcare workers and essential workers. *Addictive Behaviors, 110*, 106522. <https://doi.org/10.1016/j.addbeh.2020.106522>
- Milkowska, K., Galbarczyk, A., Mijas, M., & Jasienska, G. (2021). Disgust Sensitivity Among Women During the COVID-19 Outbreak. *Frontiers in Psychology, 12*, 844.
- Murray, D. R., & Schaller, M. (2016). The behavioral immune system: Implications for social cognition, social interaction, and social influence. In *Advances in Experimental Social Psychology* (Vol. 53, pp. 75–129). Academic Press Inc. <https://doi.org/10.1016/bs.aesp.2015.09.002>
- Nochaiwong, S., Ruengorn, C., Thavorn, K., Hutton, B., Awiphan, R., Phosuya, C., Ruanta, Y., Wongpakaran, N., & Wongpakaran, T. (2021). Global prevalence of mental health issues among the general population during the coronavirus disease-2019 pandemic: a systematic review and meta-analysis. *Scientific Reports, 11*(1), 10173. <https://doi.org/10.1038/s41598-021-89700-8>
- Olah, A. (1996). *A megküzdés személyiség tényezői: A pszichológiai immunrendszer és mérésének módszere (Personality factors of coping: The psychological immune system and its measurement) [Doctoral dissertation]*. Doctoral dissertation) Eötvös Loránd
- Oláh, A. (2009). Psychological immunity: A new concept of coping and resilience. *Coping and Resilience International Conference*, 69–69.
- Panzeri, M., Ferrucci, R., Cozza, A., & Fontanesi, L. (2020). Changes in Sexuality and Quality of Couple Relationship During the COVID-19 Lockdown. *Frontiers in Psychology, 11*, 2523. <https://doi.org/10.3389/fpsyg.2020.565823>
- Pecanha, T., Goessler, K. F., Roschel, H., & Gualano, B. (2020). Social isolation during the COVID-19 pandemic can increase physical inactivity and the global burden of cardiovascular disease. In *American Journal of Physiology - Heart and Circulatory Physiology* (Vol. 318, Issue 6, pp. H1441–H1446). American Physiological Society. <https://doi.org/10.1152/ajpheart.00268.2020>
- Saad, J. M., & Prochaska, J. O. (2021). An adaptive behavioral immune system: a model of population health behavior. *Humanities and Social Sciences Communications, 8*(1), 92. <https://doi.org/10.1057/s41599-021-00759-0>
- Sandelowski, M. (1995). Sample size in qualitative research. *Research in Nursing & Health, 18*(2), 179–183. <https://doi.org/10.1002/nur.4770180211>
- Schaller, M., & Duncan, L. A. (2007). The behavioral immune system: Its evolution and social psychological implications. In *Evolution and the social mind: Evolutionary psychology and social cognition*. (pp. 293–307). Routledge/Taylor & Francis Group. <https://psycnet.apa.org/record/2006-20474-018>
- Schaller, M., & Park, J. H. (2011). The Behavioral Immune System (and Why It Matters). *Current Directions in Psychological Science, 20*(2), 99–103. <https://doi.org/10.1177/0963721411402596>
- Shook, N. J., Sevi, B., Lee, J., Oosterhoff, B., & Fitzgerald, H. N. (2020). Disease avoidance in the time of COVID-19: The behavioral immune system is associated with concern and preventative health behaviors. *PLOS ONE, 15*(8), e0238015. <https://doi.org/10.1371/journal.pone.0238015>
- Troisi, A. (2020). Fear of COVID-19: Insights from evolutionary behavioral science. *Clinical Neuropsychiatry, 17*(2), 72–75. <https://doi.org/10.36131/CN20200207>

Received: 19.12.2022

Revision Received :29.12.2022

Accepted : 03.03.2023

