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Public buying behaviors during the COVID-19 pandemic: the influence of attitude and perceived social norms from a presumed media influence perspective

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Episodes of mass buying occurred in many parts of the world during the COVID-19 pandemic in 2020. This study applied the influence of presumed media influence model (IPMI) model to examine the development of intention to make more purchases during the pandemic in Singapore. The results, which were based on a sample of 1,007 Singaporeans, showed that presumption of media influence on others positively predicted intention to make more purchases, through attitude toward making more purchases and perceived subjective norms of making more purchases. These psychological and behavioral outcomes were associated with people's attention to media content that reflected the mass-buying episodes in Singapore and the government's attempt at assuring citizens that the country maintains an ample supply of goods during the pandemic. The positive associations in the IPMI model lend a media and communication perspective to explain the common proposition that consumers reacted to the social norms of making more purchases during the pandemic. The theoretical implications for future IPMI studies and practical implications for key stakeholders are discussed.

KEYWORDS

influence of presumed media influence, public buying behaviors, COVID-19, media attention, perceived social norms, attitude toward making more purchases

1. Introduction

Gunther and Storey (2003) developed the influence of presumed media influence (IPMI) model with the proposition that media viewers behave, or develop behavioral intention, based on the attention that they pay to a media content, presumption of others' attention to the same content, presumption of influence of the content on others, and attitude toward the matter covered in the content. At a later stage in IPMI research, scholars included dimensions of perceived social norms (i.e., perceived descriptive norms, perceived injunctive norms, and perceived subjective norms; Paek, 2009; Liao et al., 2016; Ho et al., 2020a)

as other outcomes of presumed media influence on others. The indirect media effect—through presumed media influence on others—is exemplified by the reactions of Jewish settlers in the Gaza Strip, which is located near Israel. The settlers developed intention to resist evacuations, based on a presumption that negative media representations of themselves influenced Israelis' opinions (Tsfati and Cohen, 2005). Applying the IPMI model in a positive context, Hong and Kim (2019) found that college students perceived descriptive norms of healthy dieting and developed intention to follow, based on a presumption that related media content influenced other students' intention to eat healthily. An important premise upon which Gunther and Storey (2003) developed the IPMI model is that media viewers can develop positive and negative presumptions of media influence on others.

Arguably, positive and negative presumptions of media influence on others develop in response to media viewers' attention to content with positive and negative representations of societal matters. IPMI research developed with explications of the attention construct along positive and negative dimensions (e.g., attention to *pro-smoking* and *anti-smoking* contents; *civil* and *uncivil* comments; Paek, 2009; Yoo et al., 2016; Wang and Jiang, 2017; Wang and Kim, 2020). Scholars also explicated the attention construct along possible aspects of societal matters (e.g., healthy living: attention to content on healthy eating and exercising; health matters: attention to content on safe sex, nutritional diet, and skin cancer; Ho et al., 2016; Hong and Kim, 2019). Table 1 consolidates dimensions of media content across a range of social contexts in IPMI studies. On one hand, these explications enabled validations of the argument on the positive and negative valences of presumption of media influence on others. On the other hand, within a social context, such explications provide practical insights on the implications of attention to media contents on behaviors/behavioral intention. These developments have contributed to the media psychology literature.

As shown in Table 1, the IPMI model has been applied in social contexts ranging from matters of personal importance (e.g., health; Ho et al., 2014, 2016; Hong and Kim, 2019) to issues of international interest (e.g., environmentalism and international conflicts; Tsfati, 2007; Dohle et al., 2021; Yang et al., 2021). In recent years, IPMI scholars examined how presumption of influence of falsehood on others influenced media viewers' behaviors/behavioral intentions, in terms of showing support for regulations and education, as well as performing acts of authentication and counteractions (e.g., Cheng and Chen, 2020; Ho et al., 2020b; Wintterlin et al., 2021; Shi et al., 2022; Sun et al., 2022). Another research direction is examinations of buying behaviors during crises: Davison (1983) highlighted the possibility of people stocking up goods for themselves under the presumption that reports of good shortage would influence others to hoard. Tewksbury et al. (2004) provided empirical evidence to the relationship between presumption of influence of media reports on crises and buying behaviors. Tal-Or et al. (2010) also considered the impact of media content on retail situations (i.e., sugar shortage) on people's reactions. Altogether, these studies pertain to matters of social interest and carry important social implications.

This study applies the IPMI model within the context of mass buying during the COVID-19 pandemic. Taking direction from the explications of the attention to media construct according to social contexts, this study explicates the construct along two dimensions: (a) attention to media content on the general public's buying patterns and (b) attention to media content on the government's assurance of ample goods supply. In doing so, this study contributes to the IPMI literature by considering how attention to media contents that cover crises and to those that attempt to address crises would play differential roles in influencing behavioral intention. Through the IPMI model, this study will show that mass-buying behaviors can be prompted by perceived subjective norms of making more purchases. Therefore, studies in crisis management can gain insights on this possibility and devise strategies to attenuate the behaviors. Finally, this study adds to the scant IPMI research on mass-buying behaviors mentioned earlier (Davison, 1983; Tewksbury et al., 2004; Tal-Or et al., 2010). In doing so, we expand the focus that these studies placed on media viewers' attention to content on others' buying patterns during crises with an additional pathway involving attention to media content on the government's assurance of ample goods supply.

In applying the IPMI model within the context of the COVID-19 pandemic, this study addresses a gap in the research on the psychology underlying mass-buying behaviors during crises. Conforming to social norms is a common explanation (e.g., Patent, 2020; Spencer-Oatey et al., 2020; Whitehead, 2020). It is also believed that the prioritization of self-preservation motivated people to buy more (Sim et al., 2020). These authors added that people would assert control over potential disruptions to their grocery-shopping routines and perception of impending uncertainty by purchasing more essentials. While insightful, these explanations lacked a media perspective for a behavior likely to be influenced by attention to related media content. This is a possibility that Arafat et al. (2020) raised: triggered by images of mass buying, people presumed scarcity and rushed to secure what they thought they would need. The attributions to attention to media content, development of perception on societal-level impact, and conforming to social norms align with the theoretical arguments of the IPMI model. Applying the IPMI model to trace the psychology underlying mass-buying behaviors during crises subsumes these factors under a theoretical framework.

2. Context of study: Singapore

During the early stages of the COVID-19 pandemic in 2020, news of lockdowns around the world triggered mass buying in many countries. Some of the countries were South Korea, Italy, the United States, and France (e.g., Knoll, 2020; The Straits Times, 2020a). The situation in Singapore was no exception. The first episode took place on 7 February, when the Singapore government raised the Disease Outbreak Response System Condition[1] to signal that the infectious respiratory virus was beginning to spread in the community (Goh, 2020). The situation repeated on 16 March when the neighboring country Malaysia, from which Singapore imports daily essentials, announced a nationwide lockdown

1 The Disease Outbreak Response System Condition (DORSCON) is a color-coded framework that the Singapore government implements to signal the severity of diseases and the protocols that Singaporeans should adopt during disease outbreaks (gov.sg., 2020).

TABLE 1 Dimensions of media content in IPMI studies.

Authors	Context/Social Issue	Dimensions of media content within context/social issue
Nunkoo et al. (2023)	Tourism	■ Pro-tourism ■ Anti-tourism
Dohle et al. (2021)	International debt conflict	■ Germany's media coverage of Greece ■ Greece's coverage of Germany
Duong and Liu (2021)	News prevalence	■ High prevalence ■ Low prevalence
Yang et al. (2021)	Environmentalism	■ Pro-environmental ■ Environmental crisis
Wang and Kim (2020)	Online civility	■ Civil comments ■ Uncivil comments
Hong and Kim (2019)	Health	■ Safe sex ■ Nutritional diet ■ Skin cancer
Åkestam (2018)	Gender stereotype	■ Gender stereotyped portrayals ■ Non-stereotyped portrayals
Paek (2009), Yoo et al. (2016), Wang and Jiang (2017)	Health	■ Pro-smoking ■ Anti-smoking
Ho et al. (2016)	Health	■ Healthy diet ■ Physical activity
Ho et al. (2014)	Health	■ Pro-drinking ■ Anti-drinking
Boukes et al. (2014)	News objectivity	■ Objective news ■ Opinionated news
Tsfati (2007)	Minority alienation	■ Israeli media ■ Arab media

(Elangovan and Lim, 2020). When the Singapore government implemented on 3 April a series of circuit-breaker[2] measures, people flocked to stores again in view of the impending restrictions to movement (Loke, 2020). Images of long queues, empty shelves, and loaded carts in supermarkets around Singapore emerged on various social media platforms (How, 2020; Ong, 2020). The local press also reported the episodes (e.g., Lim, 2020; The Straits Times, 2020b). The unprecedented behaviors captured public attention and made news headlines.

Key stakeholders addressed the situation swiftly. In the evening of 7 February, then Minister of Trade and Industry Chan Chun Sing assured Singaporeans over *Facebook* that the country maintained a healthy stockpile and that the supply lines from trading countries were secure. He also made a clarion call for Singaporeans to refrain from stockpiling (Tan, 2020), while reminding people that buying rationally will prevent errant retailers from cashing in on the frenzied buying behaviors (Oh, 2020). Member of Parliament Seah Kian Peng, who also served as the chief executive officer of the largest supermarket chain *FairPrice*, urged Singaporeans to respond rationally and assured that their stores would remain open (CNA, 2020a). The next day, *TODAY* reported that supermarket chains replenished their shelves overnight. The heads of other supermarket chains also assured buyers that they had sufficient supplies from "well-diversified" sources. The report included images of stockpiles at the supermarkets' distribution centers (Tan, 2020; TODAY, 2020), presumably to emphasize that there was sufficient stock. On 8 February, Prime Minister Lee Hsien Loong reiterated that it was not necessary to engage in mass buying because the country would not restrict movement completely (CNA, 2020b). In the following months, the government consistently stressed its ability to meet local demands for goods through trade and local production (Subhani, 2020; Tan, 2020; Zhuo and Goh, 2020). Although the mass-buying episodes emerged unexpectedly and re-emerged in bouts with major announcements, the government assured citizens that access to essential goods and services would not be disrupted.

3. Influence of presumed media influence

3.1. The first component of the IPMI model

The first component of the IPMI model posits that people develop presumption of media influence on others. When people pay attention to a media content, they would presume that others pay attention to the same content. This proposition is based on the persuasive press inference (Gunther, 1998), which argues that people presume extensive reach of a content that is disseminated

2 The circuit breaker is a period of partial lockdown that the Singapore government implemented from 7 April to 1 June 2020. During this period, the sales and delivery of essential goods and services continued while movement was largely restricted (Abu Baker, 2020).

over the media. Drawing upon the small number bias (Tversky and Kahneman, 1971), Gunther (1998) postulated that people develop presumptions that the sample of media content that one views is the same as what others are viewing. The small number bias explains that people tend to generalize from a small amount of data. As mentioned, the IPMI model has motivated a series of research in contexts, such as health and current affairs. Arguably, the extensive and regular coverage of the COVID-19 situation around the world renders this category of media content as current affairs. Past IPMI studies that were conducted in a range of social contexts have found strong support for the relationships in the first component of the IPMI model (e.g., Sun and Sun, 2021; Yang et al., 2021; Chen et al., 2022; Ho et al., 2022; Qin, 2022). The crucial points about the first component are that people develop presumption of others' media attention and of media influence on others based on their attention to the media.

In this study, we make an important distinction between exposure to media content and attention to media content: media exposure refers to a state of having seen some content while media attention refers to devoting cognitive effort to process certain content (McGuire, 2001). Based on the argument that media attention is a better proxy of cognitive effects than mere media exposure (Chaffee and Schleuder, 1986; McGuire, 2001), we postulate relationships with attention to media content. First, for media content on the general public's buying patterns, we posit:

H_1: Attention to media content on the general public's buying patterns is positively associated with presumed others' attention to the media content.

H_2: Presumed others' attention to media content on the general public's buying patterns is positively associated with presumed influence of the content on others.

Relatedly, we posit the following for media content on the government's assurance:

H_3: Attention to media content on the government's assurance of ample goods supply is positively associated with presumed others' attention to the media content.

H_4: Presumed others' attention to media content on the government's assurance of ample goods supply is positively associated with presumed influence of the content on others.

3.2. The second component of the IPMI model

The second component of the IPMI model examines the attitudinal, normative, and behavioral outcomes of the presumed media influence on others. The fundamental idea being attitude toward a behavior and perception of social pressure to perform the behavior influencing behavior/behavioral intention. The earliest empirical test of the relationship between attitude and behavioral outcomes occurred in the seminal research on the IPMI model by Gunther and Storey (2003). The authors found support for the argument that presumption of influence of the radio drama that aimed to raise health workers' proficiency predicted positive attitude that the clients of the health workers held toward them and their intentions to interact with the workers. Subsequently, IPMI scholars drew upon the theory of reasoned (TRA; Fishbein and Ajzen, 1975) to explain how a favorable or unfavorable disposition toward a behavior would motivate behavioral intention and enactment (e.g., Chia, 2006; Ho et al., 2016). The TRA also explained that subjective norms (i.e., social pressure) would likewise have the same influences. IPMI scholars have expanded the normative aspect with explications of social norms into the descriptive, injunctive, and subjective dimensions (e.g., Paek, 2009; Ho et al., 2014, 2020a; Hong and Kim, 2019). Fishbein and Ajzen (1975) argued that since people can exercise volitional control over their behaviors, behavioral intention can be taken as the most direct determinant of volitional behaviors. Hence, we consider behavioral intention as a proxy for behavior and posit relationships with intention to make more purchases.

3.2.1. Intention to make more purchases

The mass-buying incidents in Singapore took place amid intense media coverage of the developments of the COVID-19 pandemic and others' buying behaviors, as well as viewers' attention to the government's public communication. Examinations of how intention to make more purchases developed amid these types of media coverage are crucial for providing authorities insights into how media influence develops during crises. The insights can inform interventions for preventing the misallocation of goods and strain on supply chains (Nikolopoulos et al., 2020). In this section, we examine the associations of presumed media influence on others with intention to make more purchases.

3.2.2. Attitude toward making more purchases

Attitudinal and behavioral changes are outcomes of presumed media influence on others. Building on the argument that extensive reach of media content can exert substantial influence on public opinion, Gunther (1998) explained that an audience could form independent conclusions about what others could be thinking. At the aggregated level, the audience perceives the formation of public opinion. Gunther and Storey (2003) argued that people would react to their perception of widespread public opinions by adjusting their attitudes and behaviors. Attitude refers to evaluation of a subject matter (Eagly and Chaiken, 1995). Mutz (1998) explained that the consensus heuristics is one of the possible mechanisms underlying the influence that information that originate from the social realm has on human's reactions. In this process, information on consensus triggers people to associate what is popular with what would be wise to do, and this inadvertently shapes attitude. According to Tal-Or et al. (2009), people would coordinate their actions with their presumptions of how the media has already induced others to act. One example is transacting shares based on the presumption of the influence of news reports on stock markets on others' buying and selling behaviors (Davison, 1983). Liao et al. (2016) found that presumption of influence of pro-environmental messages on others was positively associated with attitude toward performing pro-environmental behaviors, which was in turn positively associated

with intention to carry out the acts. Ho et al. (2020b) found that scientists' presumption of harm of fake science news on other scientists and the general public were positively associated with attitude toward tackling the falsehood and support for efforts to combat them. This study examines how people align their attitude and behavioral intention with presumption of influence of the media content on others' buying patterns and of the government's assurance.

H_5: Presumed media influence of media content (a) on the general public's buying patterns and (b) on the government's assurance of ample goods supply are positively associated with favorable attitude toward making more purchases.

H_6: Favorable attitude toward making more purchases is positively associated with intention to make more purchases.

3.2.3. Perceived social norms

Normative influence is another dimension of the second component of the IPMI model. In line with the persuasive press inference, scholars have considered how presumption of wide reach and strong media influence can prompt audiences to think that social norms emerge with other viewers' attention to persuasive content (e.g., Chia and Gunther, 2006). In group settings, different types of social norms convey expectations for compliance with common or socially accepted practices. Specifically, perceived descriptive norms refers to people's presumptions of the pervasiveness of a behavior or attitude. Perceived injunctive norms refers to presumptions of others' approval or disapproval for behaving in certain ways or holding a certain attitude. Finally, perceived subjective norms refers to presumptions of others' expectations to behave or think in certain manners (Rimal and Lapinski, 2015). An audience's compliance with their presumption of media influence on others reflects alignment of behaviors with their presumption of social norms (Tal-Or et al., 2009). Based on the notion of group norms, people tend to adjust their thoughts and behaviors either to gain acceptance or to prevent receiving sanctions for non-compliance (Hogg, 2016). Past research provided evidence of the positive association among the first component of the IPMI model, the three dimensions of perceived social norms, and behavioral intention (Ho et al., 2014, 2016, 2020a, 2022; Wang and Jiang, 2017; Hong and Kim, 2019). Building on the IPMI research that considered the three dimensions of social norms, we posit:

H_7: Presumed media influence of media content (a) on the general public's buying patterns and (b) on the government's assurance of ample goods supply are positively associated with perceived descriptive norms of making more purchases.

H_8: Perceived descriptive norms of making more purchases is positively associated with intention to make more purchases.

H_9: Presumed media influence of media content (a) on the general public's buying patterns and (b) on the government's assurance of ample goods supply are positively associated with perceived injunctive norms of making more purchases.

H_{10}: Perceived injunctive norms of making more purchases is positively associated with intention to make more purchases.

H_{11}: Presumed media influence of media content (a) on the general public's buying patterns and (b) on the government's assurance of ample goods supply are positively associated with perceived subjective norms of making more purchases.

H_{12}: Perceived subjective norms of making more purchases is positively associated with intention to make more purchases.

Figure 1 presents the hypothesized IPMI model.

4. Method

4.1. Sampling

Data collection took place between 6 July and 29 July 2020, after obtaining approval from the university's Institutional Review Board. We engaged a panel survey company to administer an online survey among 1,007 Singapore citizens and permanent residents. To represent the Singapore population, we employed quota sampling by age, gender, ethnicity, and education level. We based the sampling on the statistics given by the Singapore Department of Statistics. (2020). The survey company awarded the respondents who completed the survey with points that they could accumulate and exchange for gifts.

4.2. Sample

To qualify, potential respondents had to be Singapore citizens or permanent residents, and at least 21 years old. The respondents' ages ranged from 21 to 83 years old; the median age of the sample was 45 ($M = 45.89$; $SD = 15.16$)[3,4]. There was an equal proportion of both genders. For ethnicity, 76.1 percent of the sample was Chinese, 12.5 percent Malay, 8.5 percent Indian, and 2.9 percent was of other ethnicities. The median education level was the completion of diploma and professional qualification.[5] Except for age and education level, the demographics of the sample reflected the Singapore population in 2020. The proportion of both genders and all ethnic groups in the sample was within ±3% margin of the population.

3 The median age in Singapore was 41.1. The higher median age of the sample could be due to 21 years old being the minimum age for participation in this study.

4 Compared with the population, the sample consisted of a higher proportion of respondents in the age groups below 60. There was a smaller proportion of respondents in the "60 and above" age group in the sample than in the population. The demographic of the sample is likely a reflection of the population who access the Internet.

5 For education level, there was a smaller proportion of respondents in the "less than secondary" and a higher proportion of respondents in the "university" groups in the sample than in the population. As before, the demographic of the sample is likely a reflection of the profile of the population who access the Internet.

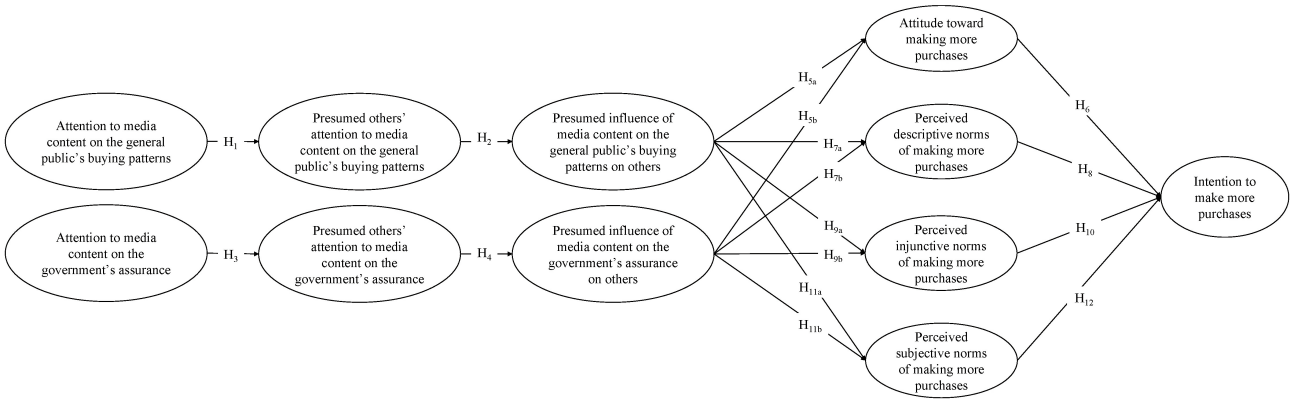

FIGURE 1
The hypothesized IPMI model.

4.3. Measurements

Unless stated otherwise, all items were measured using a 5-point Likert scale. Supplementary Table S1 presents the wordings, descriptive statistics, and standardized factor loadings. All factor loadings were significant ($p < 0.001$). Supplementary Table S2 presents the correlations among the factors.

For the attention to media content factors,[6] respondents indicated how much attention (1 = no attention at all to 5 = a lot of attention) they paid to media content on the general public's buying patterns and the government's assurance of ample supply of goods (e.g., "When reading newspapers, either in print or online, how much attention do you pay to media content on the general public's buying patterns?). A higher score represented a higher level of attention to the two types of media content (the general public's buying patterns: $M = 3.45$, $SD = 1.01$; the government's assurance of ample supply of goods: $M = 3.58$, $SD = 1.00$). The items were adapted from Chia et al. (2012).

For the presumed others' attention to media content factors, respondents indicated how much attention (1= no attention at all to 5 = a lot of attention) they thought others paid to media content on the general public's buying patterns and the government's assurance of ample supply of goods (e.g., "How much attention do you think others pay to the general public's patterns of buying groceries, household items, and electronics since the onset of COVID-19 on newspaper (either in print or online)?"). A higher score represented a higher level of presumption of others' attention (the general public's buying patterns: $M = 3.70$, $SD = 0.85$; the government's assurance of ample supply of goods: $M = 3.76$, $SD = 0.85$). The items were adapted from Chia et al. (2012).

For the presumed media influence on others factors, respondents indicated how much influence (1 = no influence at all to 5 = very large influence) they thought media content on the general public's buying patterns and the government's assurance of ample supply of goods had on others (e.g., "How much influence do you think media content on the general public's buying patterns since the onset of COVID-19 has on other people's purchase of groceries?"). A higher score represented a higher level of presumption (the general public's buying patterns: $M = 3.75$, $SD = 0.82$; the government's assurance of ample supply of goods: $M = 3.60$, $SD = 0.92$). The items were adapted from Tsfati (2007).

For the attitude toward making more purchases factor, respondents indicated how they felt about making more purchases than usual to meet their daily needs since the onset of COVID-19. They answered the questions using 5-point semantic difference scales (e.g., "inconvenient :: convenient"). A higher score represented a stronger attitude ($M = 3.20$, $SD = 0.95$). The items were adapted from Rezaei and Valaei (2018).

For the perceived descriptive norms of making more purchases factor, respondents indicated how much they agreed (1 = strongly disagree to 5 = strongly agree) with statements on others (e.g., "family members") making more purchases to meet their daily needs since the onset of COVID-19. A higher score represented a stronger perception of descriptive norms ($M = 3.31$, $SD = 0.96$). The items were adapted from Ho et al. (2020a).

For the perceived injunctive norms of making more purchases factor, respondents indicated how much they agreed (1 = strongly disagree to 5 = strongly agree) with statements on others (e.g., "relatives") approving of them making more purchases to meet their daily needs since the onset of COVID-19. A higher score represented a stronger perception of injunctive norms ($M = 3.27$, $SD = 0.98$). The items were adapted from Ho et al. (2020a).

6 Prior to answering the questions for these two measurements on media attention, the respondents had to indicate whether they read print or online newspapers, watched news telecast either on TV or through online platforms, watched television programs either on TV or through online platforms, used the Internet (excluding viewing news content and watching TV programs), and used social media (excluding viewing news content and watching TV programs). Respondents who did not use any of these platforms skipped the corresponding items for media attention (e.g., respondents who did not use social media did not have to answer the items that measured attention to social media content on the general public's buying patterns and attention to social media content on the government's assurance of ample supply of goods. Their level of attention to the respective media content was coded as "1 = no attention at all" during data analysis.

For the perceived subjective norms of making more purchases factor, respondents indicated how much they agreed (1 = strongly disagree to 5 = strongly agree) with statements on others (e.g., "friends") expecting them making more purchases to meet their daily needs since the onset of COVID-19. A higher score represented a stronger perception of subjective norms (M = 3.19, SD = 1.02). The items were adapted from Ho et al. (2020a).

For the intention to make more purchases factor, participants indicated how much they agreed (1 = strongly disagree to 5 = strongly agree) with statements on their intention to buy more grocery items (e.g., "perishable food items") within the next three months. A higher score represented a stronger intention to purchase (M = 2.71, SD = 0.98). The items for this variable were adapted from Tal-Or et al. (2010).

5. Analytical approach

5.1. Structural equation modeling

We carried out structural equation modeling using *Mplus 8.4*. This included a confirmation of the measurement model through a confirmatory factor analysis (CFA) and a confirmation of the structural model. We included age, gender, ethnicity, education level, household size, income level, and the respondents' status as a grocery buyer as control variables in the confirmation of the structural model.

We assessed the statistical fit of the IPMI model using several criteria. The chi-square (χ^2) value should be non-significant ($p > 0.05$; Barrett, 2007). However, this fit index is sensitive to large sample sizes, which is the case of this study (i.e., 1,007). Therefore, a better index would be the relative chi-square (χ^2/df), which should be <5 for an acceptable fit (Schumacker and Lomax, 2004). The values of the comparative fit index (CFI) and the Tucker-Lewis index (TLI) should be above 0.95 to indicate a good fit (Hu and Bentler, 1999). A value lower than 0.05 for the root mean square error of approximation (RMSEA) indicates a good fit (Browne and Cudeck, 1993). Finally, the standardized root-mean-square residual (SRMR) should fall below 0.08 (Hu and Bentler, 1999). One requirement of the CFA procedure is removing items with factor loadings below 0.40 to ensure that resulting variables have good reliability (Stevens, 1992). As none of the factor loadings fell below this value in our analysis, we did not remove any items.

5.2. Mediation analysis

We also performed a mediation analysis using *Mplus 8.4* to estimate the mediation effects in the hypothesized IPMI model, which was from attention to media content on the general public's buying patterns and attention to media content on the government's assurance to intention to make more purchases. We ran the mediation analysis with bootstrapping (N = 10,000) at the 95 percent confidence interval.

6. Results

6.1. Structural equation modeling

The fit indices of the CFA were χ^2 = 2356.68 df = 823, $p < 0.001$; χ^2/df = 2.86; CFI = 0.96; TLI = 0.95; RMSEA = 0.04; SRMR = 0.05, suggesting a good fit. The hypothesized IPMI model also achieved good fit: χ^2 = 2782.41, df = 1079, $p < 0.001$, χ^2/df = 2.58, CFI = 0.96, TLI = 0.95, RMSEA = 0.04, SRMR = 0.07. This suggested that the proposed model was supported by the data. All the factor loadings were significant ($p < 0.001$). The model accounted for 49.9 percent of the variance in intention to make more purchases. Figure 2 presents the structural equation model with standardized path coefficients.

For the first component of the IPMI model, the results showed that attention to media content on the general public's buying patterns was positively associated with presumption of others' attention to the same media content ($\beta = 0.68, p < 0.001$), which in turn was positively associated with presumption of influence of the content on others' buying patterns ($\beta = 0.60, p < 0.001$). Similarly, attention to media content on the government's assurance of ample goods supply was positively associated with presumption of others' attention to the same media content (β = 0.70, $p < 0.001$); it was also positively associated with presumption of the influence of the content on others' buying patterns (β = 0.50, $p < 0.001$). Hence, H_1 to H_4 were supported. In short, the relationships posited in the first component of the IPMI model were supported.

For the second component, the results showed that presumed influence of the media content on the general public's buying patterns was not significantly associated with attitude toward making more purchases (β = −0.01, p = 0.87); however, the relationship between presumed influence of the media content on the government's assurance and attitude toward making more purchases was positive (β = 0.21, $p < 0.001$). Attitude toward making more purchases was positively associated with intention to make more purchases (β = 0.22, $p < 0.001$). Hence, H_{5a} was not supported, but H_{5b} and H_6 were supported.

Second, presumed influence of the content on the general public's buying patterns was positively associated with perceived descriptive norms of making more purchases ($\beta = 0.36, p < 0.001$). However, presumed influence of the government's assurance was not significantly associated with perceived descriptive norms of making more purchases (β = 0.02, p = 0.77). Further, perceived descriptive norms of making more purchases was not predictive of intention to make more purchases ($\beta = 0.11, p = 0.09$). Therefore, H_{7a} was supported, but H_{7b} and H_8 were not.

Third, for the relationships with perceived injunctive norms, the results showed that there was positive association with presumed influence of the content on the general public's buying patterns ($\beta = 0.27, p < 0.001$). Conversely, there was no significant association with presumed influence of the government's assurance ($\beta = 0.05, p = 0.32$). As it was in the previous instance, perceived injunctive norms of making more purchases was not predictive of

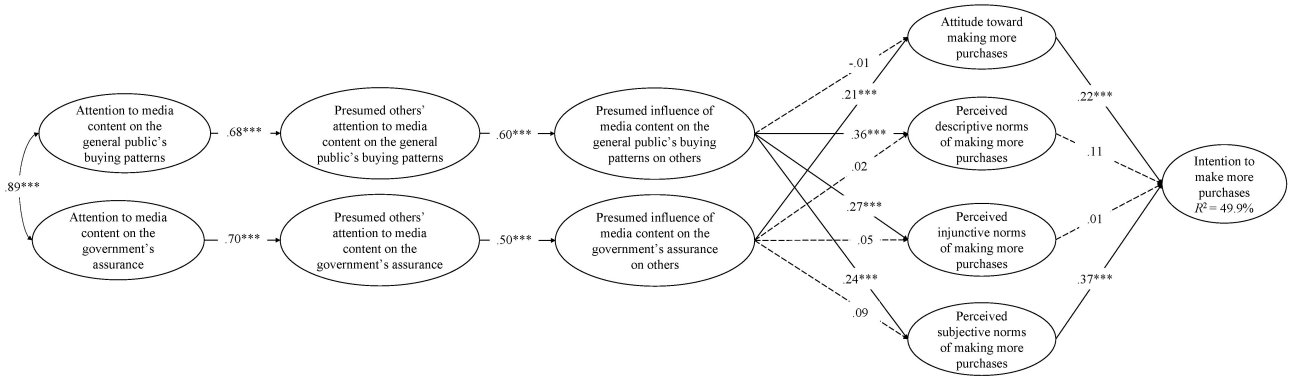

FIGURE 2
The IPMI model with standardized path coefficients. $^{*}p < 0.05$; $^{**}p < 0.01$, $^{***}p < 0.001$. The solid lines denote significant relationships, while the dashed lines denote non-significant relationships.

intention to make more purchases ($\beta = 0.01$, $p = 0.90$). Therefore, H_{9a} was supported, but H_{9b} and H_{10} were not.

Finally, presumed influence of the content on the general public's buying patterns was positively associated with perceived subjective norms for making more purchases ($\beta = 0.24$, < 0.001); presumed influence of the government's assurance was not significantly associated with the norms ($\beta = 0.09$, $p = 0.11$). Perceived subjective norms was positively associated with intention to make more purchases ($\beta = 0.37$, $p < 0.001$). Therefore, H_{11a} and H_{12} were supported, but H_{11b} was not.

In sum, intention to make purchases was predicted by positive attitude, which was predicted by presumed influence of the government's assurance; the outcome was also predicted by perceived subjective norms of making more purchases, which was predicted by presumed influence of media content on others' buying patterns on others.

6.2. Mediation analysis

Pertaining to the relationship between attention to media content on the general public's buying patterns and intention to make more purchases, the mediation by perceived subjective norms of making more purchases was significant ($\beta = 0.03$, $p < 0.05$); the mediations by attitude toward making more purchases ($\beta = -0.01$, $p = 0.07$), perceived descriptive norms of making more purchases ($\beta = 0.00$, $p = 0.75$), and perceived injunctive norms of making more purchases ($\beta = 0.01$, $p = 0.37$) were not significant. As for relationship between attention to media content on the government's assurance and intention to make more purchases, the mediation by attitude toward making more purchases was significant ($\beta = 0.03$, $p < 0.01$); the mediations by the three dimensions of perceived social norms of making more purchases were not significant (perceived descriptive norms: $\beta = 0.00$, $p = 0.85$; perceived injunctive norms: $\beta = 0.00$, $p = 0.45$; perceived subjective norms: $\beta = 0.02$, $p = 0.07$). In summary, two mediations, through attitude toward making more purchases and perceived subjective norms of buying more, were significant.

Table 2 summarizes the results of the indirect effects of attention to the two types of media content on purchase intention.

7. Discussion

Weighing in on the mass-buying situations that were sparked by lockdowns during the COVID-19 pandemic, scholars of various fields identified perception of social-level impact, self-preservation, assertation of control, and conforming to social norms as possible reasons for the behavior. Although these arguments lent some conceptual perspectives to aid understanding of the behavior, they have been sporadic, and lacked a media perspective. The media factor is worthy of scholarly consideration since local and international media outlets covered situations around the world and netizens shared them extensively on social media—all of which would, arguably, have gained widespread attention among media viewers.

Therefore, this study set out to provide an overarching theoretical explanation for the mass-buying behaviors by applying the IPMI model. In considering the roles of attention to media content, presumption of media influence on others, attitude, and perceptions of social norms, this study found that attention to media contents that reflected mass buying in Singapore and that related the government's assurance of ample goods supply were generally predictive of intention to make more purchases. These associations occurred through presumption of others' attention to both media contents, presumed media influence on others, attitude toward making more purchases, and perceived subjective norms of making more purchases. In sum, this theoretically-informed study contributes to extant literature on mass buying with empirical evidence that conforming to social norms and perception of societal-level impact (i.e., the prevailing factors) are tenable factors, and that the first component of the IPMI model comprises possible drivers of these socio-psychological factors.

Among these are several noteworthy findings. First, presumed influence of the content on the general public's buying behaviors on others was predictive of all the three dimensions of the perceived

TABLE 2 Standardized path coefficients of the mediated relationships in the hypothesized model.

Related media content	Path	Indirect path coefficient	95% CI	
			LL	UL
General public's buying pattern	Attention → presumed others' attention → presumed media influence on others → attitude → intention	−0.01	−0.02	0
	Attention → presumed others' attention → presumed media influence on others → descriptive norms → intention	0	−0.01	0.03
	Attention → presumed others' attention → presumed media influence on others → injunctive norms → intention	0.01	−0.01	0.03
	Attention → presumed others' attention → presumed media influence on others → subjective norms → intention	0.03*	0.01	0.06
Government's assurance	Attention → presumed others' attention → presumed media influence on others → attitude → intention	0.03**	0.01	0.04
	Attention → presumed others' attention → presumed media influence on others → descriptive norms → intention	0	0	0.01
	Attention → presumed others' attention → presumed media influence on others → injunctive norms → intention	0	0	0.02
	Attention → presumed others' attention → presumed media influence on others → subjective norms → intention	0.02	0.01	0.05

CI: Confidence interval; LL: Lower limit; UL: Upper limit; *$p < 0.05$; **$p < 0.01$; ***$p < 0.001$.

social norms of making more purchases, but presumed influence of the government's assurance of ample goods supply on others was not predictive of these perceived social norms. Second, regarding attitude toward making more purchases, presumed influence of the government's assurance of ample goods supply on others was predictive of the attitude. Conversely, presumed influence of the content on the general public's buying behaviors on others was not predictive of the attitude. Third, of all the dimensions of perceived social norms, only perceived subjective norms was predictive of intention to make more purchases. We expound upon these findings.

7.1. Predicting the social norms of making more purchases

The positive associations of presumed media influence on others with the three dimensions of perceived social norms of making more purchases are congruent with the research reviewed earlier (e.g., Ho et al., 2014, 2016, 2020a; Wang and Jiang, 2017; Hong and Kim, 2019). These results are indicative of people aligning their own standard for making more purchases with their presumption of others being influenced to do so. These results validate Tal-Or et al.'s argument that normative influence is an outcome of the presumed media influence on others.

In relation to the earlier discussion on social norms in group settings, we propose that a perception of similarity with others can further account for the results. In this study, the respondents' alignment of their standards (i.e., their perception of social norms) for making purchases with how they think others have been influenced could have occurred due to a sense of similarity with the others whom they presumed to be influenced by mass-buying media contents. Given the salience of the mass-buying scenes on social media and news reports, the respondents could have presumed media influence on grocery buyers. Meanwhile, they could have associated themselves with these similar others, on the basis of sharing the grocery-buyer identity. This proposition aligns with the self-categorization theory (Turner et al., 1987), which argues that the categorization of the self and others takes place with considerations of closeness to a group characteristic. In short, the respondents could have taken on a shared identity with a relevant group and developed thoughts that were representative of the group (i.e., perceived descriptive norms) and that related to their membership (i.e., adherence to perceived injunctive and subjective norms).

Along the same line of argument, we argue that presumed media influence of the government's assurance of the ample supply of goods on others was not predictive of perception of social norms of making more purchases because Singaporeans, whom the respondents presumed media influence on, were not perceived to be as similar to themselves as the "fellow grocery buyers" were. Singaporeans is likely to be the group of others in such a context because they are commonly understood to be the target audience of the government's public communication. Unlike the media contents that showed grocery buyers' mass-buying scenes,

the contents that conveyed the government's assurance of the ample supply of goods focused on food-security policies. The salience of social groups, group identity, and group norms were therefore considerably weaker in the latter instance. Consequently, a weak sense of similarity with others could have contributed to the non-significant relationship between presumed media influence on others and the motivation to align with perception of others' reactions. Comparing the presumed media influence on others-social norms relationships for the two types of media content considered, it is possible that the respondents' motivation to seek alignment with group norms can vary with their sense of similarity with the others whom they think are relevant to the media content.

7.2. Predicting the attitude toward making more purchases

Another noteworthy finding is that presumed media influence of the government's assurance of ample goods supply on others was predictive of attitude toward making more purchases. This result is congruent with past studies that found positive relationships between presumed media influence on others and attitude toward various subject matters (e.g., Paek and Gunther, 2007; Chia et al., 2012; Boukes et al., 2014). It also validates Gunther and Storey (2003) proposition that people adjust their attitude in alignment with their presumption of widespread media influence on others.

The difference in the associations of the two types of presumed media influence on others with attitude toward making more purchases points to the possibility of the respondents relying on the expert heuristics in the context of the government's assurance of ample goods supply. The authorities' (i.e., the ministers, member of parliament, and the heads of supermarket chains) statements on the stability of goods supply could have evoked the expert heuristic, thereby influencing the respondents to judge the information as accurate and reliable reflections of the prospect of the retail situation in Singapore. Further, according to the gateway belief model (van der Linden et al., 2015), emphasizing consensus among scientific experts on an issue can induce changes in individuals' thought processes. Hence, drawing upon this argument, we argue for the possibility that the apparent congruency in the experts' assurance about the government's ability to meet the demands for essentials during the pandemic could have cascading influence on the respondents' presumption of media influence on others and the formation of positive attitude. Particularly, the respondents' presumption of the positive media influence on other Singaporeans' buying patterns—possibly in terms of their ability to experience smooth grocery shopping during the pandemic—could have influenced their optimistic evaluation of making more purchases. Conversely, the reflections of the mass-buying patterns among the public—which were the antithesis of the statements of assurance—were intrinsically unable to evoke the expert heuristic and activate the gateway belief, and influence the positive attitude toward making more purchases. The inherent difference in the contents is a possible reason why the presumed influence of the content on the general public's buying behaviors on others was not predictive of the positive attitude.

7.3. The influence of perceived social norms on intention to purchase more

Although perceived subjective norms was predictive of intention to make more purchases, this study did not find complete support for the associations with perceived social norms. First, perceived descriptive norms was not predictive of intention to make more purchases. As discussed earlier, perceived descriptive norms refers to presumed *prevalence* of a belief, value, or practice. A likely reason for the non-significant association is that a perception of prevalence provides mere information about the reality that people presumed (Chung and Rimal, 2016). Such information neither provided strong compulsion to conform, nor imposed strong sanctions for non-compliance (Lapinski and Rimal, 2005). Second, perceived injunctive norms was not predictive of the intention. A disregard for what others would *approve* or *disapprove* about one's buying patterns for private consumption is a possible reason. This is especially so during a pandemic when people would make decisions based on what they think would be the best to protect themselves and their families, to the extent that others' sanctions were unimportant. In comparison, perceived subjective norms was predictive of the intention because as postulated, it was necessary to fulfill referent others' *expectations* to meet familial and individual needs for survival, work, and recreation. Overall, the precedence of complying to some social norms that impinges on wellbeing over others in a crisis explains the outcome.

7.4. Implications of the current study and directions for future research

7.4.1. Contributions to literature and directions for future research

Based on the foregoing explanations for the IPMI processes that took place through perceived subjective norms (i.e., associated with attention to media content on *the general public's buying patterns*) and attitude (i.e., associated with attention to media content on the *government's assurance of ample goods supply*), we consider the explications of the media attention construct along the following dimensions to be a new angle in IPMI studies: (a) coverage on crises and (b) coverage on attempts at addressing crises. The individual roles of attitude and perceived subjective norms in shaping purchase intention were illuminated through the considerations of these two types of media content. Foremost, this manner of explication adds to those highlighted in Table 1 (i.e., positive and negative dimensions; aspects of societal matters). Meanwhile, governments' assurance of ample good supply resembles what Coombs (1995) categorized as bolstering content, which attempts to align media viewers' perspective with positive situations in crises. This is an extension to the earlier IPMI studies that examined mass-buying behaviors (i.e., Davison, 1983; Tewksbury et al., 2004; Tal-Or et al., 2010), which considered only scenarios that portrayed crisis scenes. In sum, the explications by this study illuminated how attitudinal and normative factors can explain buying behaviors in a crisis.

The significant mediation between attention to media content on the government's assurance of ample goods supply and intention

to make more purchases can bring some insights to the field of crisis management. As explained, the expert heuristic could have cued media viewers to develop a positive attitude toward making *more* purchases and eventually develop purchase intention. While government assurance on ample goods supply can boost public confidence of stability amid crises, this study highlights the possibility of such messages driving up purchases. Although such messages are necessary for restoring some degree of order, public impressions of abundance and, consequently, continual episodes of mass buying run counter to the purpose of government assurance. Hence, the implication of this result for crisis management is highlighting the need for disseminating educational messages on individual- and community-level coping strategies (e.g., socially responsible buying; Arafat et al., 2021; Menon and Varadharajan, 2021) while assuring citizens that a country is able to cope with possible trade and retail challenges. The purpose is to equip the public with strategies that they can implement to help maintain the state of sufficiency. Future studies in crisis management can apply the IPMI model to examine how attention to educational content tailored for managing crises can shape responsible buying behaviors.

Earlier, we proposed that others whom people associate with a media content and whom they subsequently presume media influence on can shape the development of various relationships in the second component. Particularly, the perception of social norms in the IPMI model can develop in relation to the perception of similarity with the others relevant to the media content. Our considerations of two contrasting types of media content have enabled us to make the proposition that the relationships in the second component of the IPMI model developed in relation to the types of media content. To deepen the theoretical insights for presumed media influence on others-social norms relationships in relation to the type of media content, we propose that future studies not only explicate presumed media influence on others along the dimensions of the relevant others to the media contents considered, but also consider the influence of respondents' perception of similarity with the relevant others. In making this proposition, this study underscores social psychology as a possible mechanism underlying the developing of perceived social norms in the IPMI model.

7.4.2. Practical implications of the study

7.4.2.1. Practical implications for crisis periods

The pathways associating attention to the two types of media content with intention to make more purchases carry practical implications for governments, market authorities, and media personnel/organizations (i.e., key stakeholders). Informed by the significant mediation between media attention to the general public's buying patterns and intention to make more purchases, we recommend that alongside making official statements on onsets of crises, key stakeholders remind citizens to exercise discretion in sharing content on their shopping trips. The purpose is to prevent user-generated content from being misconstrued by others within their social media networks as expectations to make more purchases (i.e., perceived subjective norms) and spur mass-buying behaviors. In this regard, social media influencers need to refrain from drawing attention to their shopping trips and model controlled-buying because the parasocial relationships that product and lifestyle influencers maintain with followers can shape purchasing behaviors (Cheung et al., 2022). Also informed by the significant mediation between media attention to the government's assurance of ample goods supply and the same purchase intention, through a positive attitude toward making more purchases during the COVID-19 pandemic, we recommend that key stakeholders remind the public not to make more purchases on the basis of their positive evaluations of the effects of government interventions. Crucially, governments should remind citizens not to misconstrue having ample goods supply as a state of abundance. Overall, coordinating efforts among key stakeholders to curb mass-buying behaviors is crucial for reducing occurrences.

7.4.2.2. Practical implications for non- and post-crisis periods

Based on the possibility of consumers developing intention to make more purchases in association with paying attention to media contents on the general public's buying patterns during crises, the stakeholders can enact further actions post crises to reduce reoccurrences in future crises. Recall that perceived subjective norms of making more purchases was a mediator in hypothesized IPMI model. According to Reynolds and Seeger (2005), one purpose of post-crisis communication is to strengthen public's response strategies. Informed by the significant perceived subjective norms-intention relationship, we recommend that the key stakeholders raise awareness that aligning buying behaviors with others' expectations of themselves to buy more could aggravate crisis situations because hoarding can deprive others of their essential needs and strain supply chains. Crucially, the key stakeholders should emphasize in post-crisis periods, while mass-buying behaviors during crises are relatively clear in consumers' minds, that consumers base their decisions on needs, and not on potentially inaccurate perceptions of others' expectations on themselves.

On the marketing front, brands that have been affected by mass-buying behaviors during the COVID-19 pandemic could strengthen relationships with and among consumers during the endemic stage, so that they can leverage on brand networks to engage consumers in future crises. This strategy is informed by the positive associations of consumer interactions with consumers' brand engagements (Cheung et al., 2021). The viability of this approach lies in the possibilities for sharing information, providing advice, and solving problems over brand communities on social media platforms (Cheung et al., 2021). Cultivating such practices before the onset of future crises would be useful for curbing mass-buying behaviors because brands would have established strong networks to facilitate brand-consumer communication about goods availability. Brands can also leverage on these networks to spread important messages to external networks. The credibility that brands have established with consumers during non-crisis periods could help them garner support for their policies on ensuring stable goods supply when crisis communication takes place. This would be especially so for brands that produce daily essentials. Such messages by brands can complement governments' assurance of ample good supply or override the impact of people's attention to media content on mass-buying behaviors during crises.

Moreover, the strong interpersonal ties that consumers would have established since non-crisis periods would be helpful in setting expectations for fellow members to exercise responsible buying behaviors during crises. As the world grapples with climate change, political instability, and supply chain disruptions, more people are susceptible to food insecurity (The World Bank., 2022). Considering the possible IPMI processes that can take place during a pandemic—or any socio-economic crisis—stakeholders who are involved in managing crisis situations that can expedite the onset of food insecurity in their countries need to be cognizant of which socio-psychological factors can spark mass-buying behaviors and cultivate counteracting behaviors before onsets of crises.

7.4.3. Limitations of study

There are several limitations in this study. First, based on the principle of compatibility (Ajzen and Fishbein, 1977), there is an incompatibility in timeframe for the measures of attitude and behavioral intentions. Future studies should set compatible timeframes in measures for these variables. Second, we examined the development of the IPMI processes using cross-section data. Therefore, this study was not able to establish causality. Future studies should consider using panel data or conducting longitudinal studies to establish causality. Third, this study employed quota sampling, which is a non-probability-based sampling, to represent the Singapore population. Future studies could employ probability sampling to produce a more representative sample.

8. Conclusion

Applying the IPMI model to examine the mass-buying behaviors at the onset of COVID-19 lockdowns, this study has provided empirical evidence to support the argument that there is conformity to the norms of making more purchases: perceived subjective norms appears to outweigh the other dimensions of social norms in explaining intention to make more purchases. This is an important theoretical finding that adds insights to the common proposition about adherence to social norms of mass-buying behaviors. In addition, this study has shown that a positive attitude toward making more purchases that developed in association with attention to media content on the government's assurance of ample goods supply is another factor for the buying intention. Importantly, the incorporation of the IPMI model has enabled this study to establish the roles of the media and audience in shaping the abovementioned psychological processes—with the possibility of fellow grocery buyers and Singaporeans as the others whom viewers presumed the media contents to have influenced. Overall, this study has not only achieved the objective of providing a theoretical framework to explain the phenomenon, but also raised the possibility that social relation with others (i.e., perceived similarity with the others who are relevant to a media content) can inform further developments of the IPMI model.

Data availability statement

The original contributions presented in the study are included in the article/Supplementary material, further inquiries can be directed to the corresponding author.

Ethics statement

The studies involving human participants were reviewed and approved by the Nanyang Technological University Institutional Review Board. The patients/participants provided their written informed consent to participate in this study.

Author contributions

TJG and SSH designed the study and collected the data. TJG was responsible for data analysis and drafting the manuscript. SSH critically revised the work. Both authors contributed to the article and approved the submitted version.

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Conflict of interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

Publisher's note

Supplementary material

The Supplementary Material for this article can be found online at: https://www.frontiersin.org/articles/10.3389/fcomm.2023.1109595/full#supplementary-material

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