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Determinants of restaurant consumers' intention to practice COVID-19 preventive behavior: an application of the theory of planned behavior

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ABSTRACT

BACKGROUND/OBJECTIVES: The purpose of this study was to examine the effects of knowledge about coronavirus disease 2019 (COVID-19), attitude, subjective norm, and perceived behavioral control on behavioral intentions to practice COVID-19 preventive behaviors using the theory of planned behavior (TPB).

SUBJECTS/METHODS: A total of 519 restaurant customers' responses was collected in this study through an online self-administered questionnaire. Descriptive statistical analysis was performed on socio-demographic factors. One-way analysis of variance and t-test were conducted to determine differences in the constructs from the TPB according to age and sex. The hypotheses were tested using structural equation modeling (SEM).

RESULTS: SEM revealed the positive effect of knowledge about COVID-19 on attitude, subjective norm, and perceived behavioral control to prevent the spread of COVID-19 in restaurants. Attitude, subjective norm, behavior intention, and knowledge positively affected COVID-19 preventive behavior intentions in restaurants.

CONCLUSIONS: The results of this study confirmed that the TPB is helpful in elucidating the determinants of consumers' intention to practice COVID-19 preventive behavior in restaurants. These findings can help policy makers and professionals provide material for further public health interventions and inform them about awareness-raising, guidelines, and health education programs.

Keywords: COVID-19; restaurant; behavior; attitude; knowledge

INTRODUCTION

The COVID-19 epidemic was declared a global pandemic by the World Health Organization in March 2020. To prevent the spread of coronavirus disease 2019 (COVID-19), experts have suggested community lockdowns, social distancing, and stay-at-home orders. In the United States, the Centers for Disease Control and Prevention (2020) recommended 3 specific social-distancing behaviors: (i) stay at least 6 ft (≤ 2 m) away from other people, (ii) do not gather in groups, and (iii) stay out of crowded places and avoid mass gatherings [1]. The pandemic has affected people worldwide, disrupting the hospitality industry, including restaurants and cafes. In the early days of the spread of COVID-19 in the US, restaurant and

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cafe dine-in services were temporarily banned, and the government recommended only limited take-out services [2]. However, a year later, many restaurants have reopened in-store operations with strict social-distancing guidelines such as hand sanitizing, wearing masks, reducing capacity, and frequent cleaning of common areas [2].

In Korea, after the first confirmed case, social distancing was adopted as a primary guideline to minimize the risk of contamination and spread of infection [3]. Furthermore, the government announced guidelines that covered almost every aspect of daily life: wearing a mask when taking public transportation, staying at home if one has traveled abroad in the past 14 days or shows COVID-19 symptoms, and keeping a social distance of 2 m when going out or meeting other people. In addition, because COVID-19 is transmitted by droplets and close contact among people, the government proposed precautions for indoor service operators and consumers [4]. The precautions included an operational guide for social distance and non-face-to-face services within indoor environments and compliance with consumer prevention tips [5].

People in Korea and some Asian countries enjoy dining-out with others and sharing food [6]. Typically, in Korean restaurants, dishes are served in large pots and small communal dishes are shared within a group of dining mates. However, due to COVID-19, safety has become the topmost concern, and consumers are becoming aware of the risks of infection when dining-out [7]. Therefore, many restaurants have developed new approaches to providing meals that are relatively free from the risk of viral infection, which was a problem faced while serving Korean food even before the pandemic.

Recently, restaurants in South Korea have adopted serving options for one person and have provided kitchen scissors and clean chopsticks on shared plates to reduce COVID-19 infection. The Ministry of Agriculture Food and Rural Affairs of Korea has announced guidelines for developing a dietary culture to prevent COVID-19 that includes 3 precautions: first, diners are required to divide food from a single bowl into individual plates for consumption; second, the tableware should be hygienic; and third, all workers must wear masks [8]. The importance of these preventive behaviors in restaurants has been shown in the control of the COVID-19 epidemic. Personal preventive behavior is the basis for achieving the goals of the guidelines and maintaining personal hygiene and social distance in restaurants. Hence, there is a need to examine customers' perceived attributes to preventive behaviors in restaurants. Despite the government announcing guidelines for restaurant customers, it can be challenging to prevent the spread of COVID-19 if restaurant customers do not follow those guidelines. Therefore, the current research focuses on the intention to practice COVID-19 preventive behaviors in restaurants and the effects of influential variables on customers' behavioral intentions.

Previous studies revealed that individuals' preventive behaviors against diseases, such as severe acute respiratory syndrome (SARS), were influenced by individuals' knowledge of and attitude toward the disease [9,10]. To elucidate the effect of preventive behaviors against disease, scholars have examined various variables that affect behavior. For example, several studies have used the "theory of planned behavior" (TPB) [11,12] as a theoretical framework to examine preventive behaviors. The TPB suggests that an individual's behavioral intentions are related to multiple internal and external factors, including attitude, subjective norm, and perceived behavior control. Attitude refers to an individual's assessment of the positive or negative consequences that can result from preventive behaviors. Subjective norm refers to

the support of others and an individual's motivation to conform to the opinions of others. Perceived behavioral control refers to individuals' perceptions that a behavior is easy to carry out and that they have confidence in their ability to perform it [13]. Cheng and Ng [10] indicated that the TPB was valid in explicating SARS-preventive behaviors and confirmed the influential role of perceived behavior control. Furthermore, during the COVID-19 pandemic, several studies applied TPB methods and reported that psychological factors were significantly associated with preventive behaviors [14-16]. In addition, knowledge obtained through accurate information has a positive influence on health-related behavior [17,18]. Previous research has indicated that an individuals' knowledge of disease may lead to essential public adherence to guidelines [19,20]. Therefore, it is important to assess public knowledge to identify individual gaps and strengthen ongoing preventive efforts [21]. In light of these findings, knowledge of COVID-19 was incorporated into this study that implemented the TPB in predicting COVID-19 preventive behaviors in restaurants.

The Korean people became afraid to go out and eat out because of the COVID-19 pandemic. The government announced rules related to social distancing and guidelines for restaurant use to encourage safe eating out, but consumers may not be fully aware of those rules. This study aimed to obtain the basic data necessary for policy formulation and expansion in order to analyze the degree of consumer perception and behavior intention regarding restaurant usage guidelines related to COVID-19, which had not existed in the past.

The TPB was used to examine various healthy and preventive behaviors and the relationships among the tested variables. Previously, it was used as an effective model to explain individuals' intentions to preventive behavior against infectious diseases such as SARS and Middle East respiratory syndrome (MERS). Therefore, in this study, the TPB was deemed an appropriate approach to explain intention to practice COVID-19 preventive behavior in restaurants. In particular, the TPB makes it possible to measure not only individual attitudes but also variables such as social norms that are thought to have a significant effect on the prevention of infectious diseases. In particular, by utilizing the TPB, it is possible to measure not only individuals' attitudes but also variables such as social norms that are thought to have a significant effect on disease prevention behavioral intentions. Through the TPB, it is possible to obtain data that is theoretically and practically useful for the prevention of COVID-19.

Previous studies showed that knowledge was a significant predictor of intentions and behaviors in health areas [22,23]. Ajzen's study suggested that general knowledge was not correlated with behavior intention, but specific knowledge of people's interests affected behavior intention toward drinking alcohol [22]. Moreover, Dumitrescu et al. [23] used TPB to demonstrate that knowledge of oral health affected behavior intention.

Ajzen suggested that attitude, subjective norms, and perceived behavioral control significantly influenced behavior [13]. Many researches had examined that attitude, subjective norms, and perceived behavioral control were a significant antecedent of behavior intention and behavior in TPB [24-27]. Recent TPB-based research demonstrated that an influence of COVID-19 perception on behavior intention for "untact" tourism [24].

Therefore, the present study aimed to apply the TPB to explain restaurant consumers' intentions to practice COVID-19 preventive behaviors (**Fig. 1**). Specifically, the objectives of this study were: (1) to apply the TPB in measuring restaurant consumers' intentions to practice COVID-19 preventive behaviors, and (2) to examine the effect of knowledge about

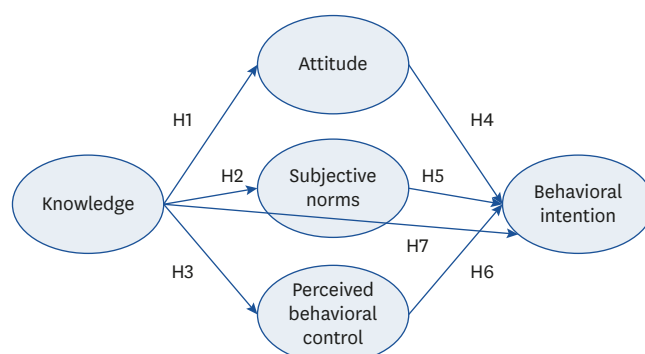


Fig. 1. Proposed research model.

COVID-19, attitude, subjective norm, and perceived behavioral control on behavior intention. The hypotheses proposed in this study are as follows:

- H1: knowledge about COVID-19 will influence attitude toward prevention of COVID-19 in restaurants.
- H2: knowledge about COVID-19 will influence subjective norm regarding prevention of COVID-19 in restaurants.
- H3: knowledge about COVID-19 will influence perceived behavioral control regarding prevention of COVID-19 in restaurants.
- H4: attitude will influence behavioral intention to practice COVID-19 preventive behavior in restaurants.
- H5: subjective norm will influence behavioral intention to practice COVID-19 preventive behavior in restaurants.
- H6: perceived behavioral control will influence behavioral intention to practice COVID-19 preventive behavior in restaurants.
- H7: knowledge about COVID-19 will influence behavioral intention to practice COVID-19 preventive behavior in restaurants.

SUBJECTS AND METHODS

Data collection

The sample population of this study comprised general adult restaurant consumers in South Korea. The participants were recruited by an online survey company that visited selected restaurants within 6 months before the survey. The survey was conducted from December 1 to 14, 2020 by a survey firm. The questionnaires were electronically distributed by email, and 519 responses to the questionnaires were received. The age distribution of the respondents was 18% in their 20s, 24% in their 30s, 26% in their 40s, 20% in their 50s, and 12% in their 60s. The age distribution was based on restaurant consumer census data obtained by quota sampling. Before the study, the questionnaire was verified and approved by the Korea National University of Transportation Institutional Review Board (IRB 2020-28).

Research instrument

The questionnaire was acquired from previous studies and revised to fit this study. The survey items consisted of 3 parts. The first part of the survey included the definition of COVID-19 preventive behavior in restaurants and details on item content. The study developed a standard for COVID-19 preventive behavior in restaurants based on guidelines from local

governments, the Ministry of Food and Drug Safety of Korea, the Ministry of Health and Welfare of Korea, the Ministry of Agriculture Food and Rural Affairs of Korea, and the Korea Disease Control and Prevention Agency. The standard COVID-19 preventive behavior in restaurants consisted of 8 items: “Using a personal dish in restaurants,” “Avoiding visit or minimizing time spent during busy times in restaurants,” “Keep away from people who aren't in your party in restaurants,” “Sitting in zigzag or in one direction as much as possible in restaurants,” “Wearing a mask when staying in restaurants except at eating,” “Use hand sanitizer and plastic gloves before and after use, such as common tongs, plates, and cutlery,” “Do not use together with wine glasses or tableware,” and “Don't share food on a plate”.

The second part of the survey consisted of questions about a consumer's perception regarding the prevention of COVID-19 in restaurants. The responses were scored on a 7-point Likert scale, except for the attitude question. The questionnaire items for knowledge about COVID-19 were scored on a 7-point Likert scale (1 = strongly disagree; 7 = strongly agree). The knowledge-related questions were adopted from those in a previous study and included 4 items [28]. The attitude construct was defined as “a person's feeling of favorableness or unfavorableness to a psychological object to preventing COVID-19 in restaurants” [29] and included 5 items, scored using a 7-point unipolar scale used in a previous study [27]. The subjective norm was defined as “the perceived social pressure to perform or not to perform measures for preventing COVID-19 in restaurants” [30] and contained 4 items, which were based on Bae and Chang's COVID-19 study [24], that were scored using a 7-point Likert scale. Perceived behavioral control was defined as “the perceived ease or difficulty of performing the behavior for preventing COVID-19 in restaurants” [31] and included 3 items from a previous study [24] and scored using a 7-point Likert scale. Behavior intention was defined as “performing actual behaviors when their intention to perform the behavior for preventing COVID-19 in restaurants becomes stronger” [6] and contained 4 items based on previous study [27] and scored using a 7-point Likert scale. All measurement items of the TPB are listed in **Table 1**.

Table 1. Measurement items of the theory of planned behavior for this study

Constructs	Measurement items
Knowledge	Have you ever heard about COVID-19? Do you know what COVID-19 is? Do you know the causes of COVID-19? Do you know the death rate for infected people by COVID-19?
Attitude	Bad-good Risky-safe Unnecessary-necessary Harmful-beneficial Foolish-wise
Subjective norm	Most people who are important to me think it is okay for me to practice COVID-19 preventive behavior in restaurants. Most people who are important to me support that I should practice COVID-19 preventive behavior in restaurants. Most people who are important to me understand that I should practice COVID-19 preventive behavior in restaurants. Most people who are important to me agree with me to practice COVID-19 preventive behavior in restaurants.
Perceived behavioral control	I have ability and skill to practice COVID-19 preventive behavior in restaurants. I have enough resources, time, and opportunities to practice COVID-19 preventive behavior in restaurants. I have information to practice COVID-19 preventive behavior in restaurants.
Behavior intention	I intend to practice COVID-19 preventive behavior in restaurants. I plan to practice COVID-19 preventive behavior in restaurants. I will make an effort to practice COVID-19 preventive behavior in restaurants. I will suggest that my family members practice COVID-19 preventive behavior in restaurants.

All measurement items except those for attitude were scored on a 7-point Likert scale (1: strongly disagree–7: strongly agree). Attitude measurement items were scored on a 7-point unipolar scale. COVID-19, coronavirus disease 2019.

The last part of the survey included socio-demographic questions, including sex, age, education, occupation, monthly household income, marital status, number of family members, and number of children.

Statistical analysis

The data were analyzed statistically using SPSS 26.0 for Windows and AMOS 27.0 programs. Descriptive statistical analysis was performed for the socio-demographic factors. One-way ANOVA and t-tests were conducted to examine differences in knowledge, attitude, subjective norm, perceived behavioral control, and behavior intention according to age and sex. Structural equation modeling (SEM) was conducted to confirm the reliability and validity of the measures and verify the hypotheses of the study.

RESULTS

Respondents' profiles

The socio-demographic profiles of the respondents are summarized as follows. Among the respondents, 49.1% were male, and 50.9% were female. The age group distribution was as follows: 20–29 years (18.5%), 30–39 years (23.9%), 40–49 years (25.8%), 50–59 years (19.8%), and over 60 years (11.9%). More than two-thirds of the respondents had a bachelor's degree (70.5%), followed by those who graduated high school (18.7%), those who had a graduate degree (10.4%), and those who graduated middle school (0.4%). Regarding occupations, office workers (36.6%), homemakers (15.0%), professionals (11.4%), and sales/services workers (9.6%) represented the majority. In terms of monthly household income, 39.0% of the respondents earned ₩2,000,000 to ₩3,999,999, followed by those earning ₩4,000,000 to ₩5,999,999 (24.5%), and those earning less than ₩2,000,000 (14.8%). Regarding marital status, about two-thirds of the respondents (63.0%) were married. The number of family members in a household was as follows: 4 (35.1%), 3 (29.9%), 2 (17.1%), and 1 (9.8%).

Differences in the TPB constructs according to sex

Table 2 summarizes each item in the 5 constructs of the TPB related to preventing COVID-19 spread in restaurants according to sex. Regarding knowledge, 'Have you ever heard about COVID-19?', 'Do you know what COVID-19 is?', and 'Do you know the causes of COVID-19?' were significantly different according to sex ($P < 0.001$, $P < 0.05$), with the average scores of females being higher than those of males. For attitude, 'Unnecessary-Necessary' and 'Bad-Good' were significantly difference according to sex ($P < 0.001$, $P < 0.05$), with the average scores of females being higher than those of males. Regarding subjective norm, all items were significantly different according to sex ($P < 0.01$, $P < 0.05$), with the average scores of females being higher than those of males. However, the average score of males in perceived behavioral control was higher than that of females, dissimilar to the results for the other variables, although the items of the perceived behavioral control to COVID-19 preventive behaviors in restaurants were not significantly different according to sex. Regarding behavior intention, responses to 'I plan to practice COVID-19 preventive behavior in restaurants,' 'I will make an effort to practice COVID-19 preventive behavior in restaurants,' and 'I will suggest that my family members practice COVID-19 preventive behavior in restaurants' were significantly different according to sex ($P < 0.01$), and the average scores of females were higher than those of males.

Table 2. Differences among theory of planned behavior constructs according to sex

Variables	Male	Female	Total	t-value
KN				
KN1	6.25 ± 0.99	6.56 ± 0.73	6.41 ± 0.88	-4.051***
KN2	6.13 ± 0.93	6.34 ± 0.86	6.24 ± 0.90	-2.598*
KN3	5.47 ± 1.29	5.70 ± 1.32	5.59 ± 1.31	-1.974*
KN4	5.45 ± 1.20	5.60 ± 1.21	5.53 ± 1.21	-1.389
AT				
AT1	6.11 ± 1.01	6.31 ± 1.00	6.21 ± 1.01	-2.315*
AT2	5.83 ± 1.35	5.94 ± 1.41	5.88 ± 1.38	-0.890
AT3	5.85 ± 1.42	6.31 ± 1.21	6.08 ± 1.34	-3.964***
AT4	5.78 ± 1.38	5.94 ± 1.53	5.86 ± 1.46	-1.759
AT5	5.64 ± 1.67	5.96 ± 1.49	5.80 ± 1.59	-1.274
SN				
SN1	5.53 ± 1.21	5.75 ± 1.04	5.64 ± 1.13	-2.323*
SN2	5.72 ± 1.03	5.93 ± 1.00	5.83 ± 1.02	-2.320*
SN3	5.80 ± 1.03	6.02 ± 0.90	5.91 ± 0.97	-2.622**
SN4	5.86 ± 1.01	6.06 ± 0.96	5.97 ± 0.99	-2.340*
PBC				
PBC1	5.25 ± 1.03	5.10 ± 1.16	5.17 ± 1.10	1.544
PBC2	5.28 ± 1.11	5.13 ± 1.16	5.20 ± 1.14	1.464
PBC3	5.44 ± 1.01	5.41 ± 1.01	5.42 ± 1.01	0.254
BI				
BI1	5.81 ± 1.01	6.05 ± 0.89	5.93 ± 0.95	0.100
BI2	5.89 ± 1.01	6.15 ± 0.88	6.02 ± 0.96	-2.857**
BI3	5.96 ± 0.97	6.19 ± 0.89	6.08 ± 0.94	-3.044**
BI4	5.85 ± 1.09	6.12 ± 0.95	5.99 ± 1.03	-2.963**

All measurement items except attitude were scored on a 7-point Likert scale (1: strongly disagree-7: strongly agree). Measurement items for attitude were score on a 7-point unipolar scale.

Data are presented as mean ± SD.

KN, knowledge; AT, attitude; SN, subjective norm; PBC, perceived behavioral control; BI, behavior intention.

* $P < 0.05$, ** $P < 0.01$, *** $P < 0.001$.

Differences in the TPB constructs according to age

Table 3 presents the means and SDs for each item in the 5 constructs of the TPB to prevent COVID-19 spread in restaurants according to age. Among the items for knowledge, 'Do you know the causes of COVID-19?' was significantly different according to age ($P < 0.05$), with the score of the participants in their 20s–40s being 5.72–5.73 points, higher than the scores of those in their 50s and 60s. Among the items for subjective norm, 'Most people who are important to me agree with me to practice COVID-19 preventive behavior in restaurants' was significantly different according to age ($P < 0.05$), with those in their 50s and 60s having scores of 6.06–6.26 points, which were higher than the scores of those in their 20s–40s. Among the items for behavior intention, 'I intend to practice COVID-19 preventive behavior in restaurants,' 'I plan to practice COVID-19 preventive behavior in restaurants,' and 'I will suggest that my family members practice COVID-19 preventive behavior in restaurants' were significantly different according to age ($P < 0.01$, $P < 0.05$), with the score of respondents in their 50s and 60s being higher than the score of those in their 20s–40s. Meanwhile, there was no significant difference related to attitude and perceived behavioral control and COVID-19 preventive behavior in restaurants by age group.

Results of the measurement model

Table 4 summarized the results of the confirmatory factor analysis (CFA). All of the standardized factor loadings, from 0.500 to 0.937, exceeded the recommended threshold of 0.5, and were significant at the $P < 0.001$ level [32]. Composite reliability ranged from 0.977 to 0.996 and exceeded the recommended level (0.7) for acceptability [33]. Moreover,

Table 3. Differences among the theory of planned behavior constructs according to age

Variables	20s	30s	40s	50s	60s	Total	F-value
KN							
KN1	6.44 ± 0.97	6.40 ± 0.94	6.37 ± 0.91	6.51 ± 0.74	6.32 ± 0.76	6.41 ± 0.88	0.626
KN2	6.30 ± 0.93	6.28 ± 0.96	6.26 ± 0.88	6.19 ± 0.83	6.06 ± 0.89	6.24 ± 0.90	0.858
KN3	5.72 ± 1.25	5.73 ± 1.37	5.73 ± 1.23	5.31 ± 1.34	5.26 ± 1.32	5.59 ± 1.31	3.221*
KN4	5.42 ± 1.40	5.51 ± 1.32	5.65 ± 1.15	5.51 ± 1.08	5.52 ± 0.99	5.53 ± 1.21	0.551
AT							
AT1	6.11 ± 1.09	6.27 ± 0.96	6.21 ± 0.94	6.19 ± 1.00	6.26 ± 1.16	6.21 ± 1.01	0.378
AT2	5.77 ± 1.42	5.84 ± 1.46	6.03 ± 1.20	5.93 ± 1.28	5.74 ± 1.71	5.88 ± 1.38	0.759
AT3	5.93 ± 1.28	6.11 ± 1.34	6.25 ± 1.17	6.02 ± 1.46	6.03 ± 1.53	6.08 ± 1.34	0.923
AT4	5.72 ± 1.44	5.91 ± 1.54	5.84 ± 1.48	5.87 ± 1.38	6.00 ± 1.44	5.86 ± 1.46	0.416
AT5	5.67 ± 1.56	5.88 ± 1.57	5.79 ± 1.69	5.87 ± 1.53	5.77 ± 1.57	5.80 ± 1.59	0.305
SN							
SN1	5.67 ± 1.09	5.68 ± 1.17	5.60 ± 1.09	5.58 ± 1.21	5.71 ± 1.09	5.64 ± 1.13	0.205
SN2	5.71 ± 1.10	5.85 ± 1.02	5.71 ± 1.05	5.97 ± 0.87	5.98 ± 1.02	5.83 ± 1.02	1.681
SN3	5.82 ± 1.08	5.96 ± 0.99	5.83 ± 1.00	5.99 ± 0.81	5.98 ± 0.95	5.91 ± 0.97	0.775
SN4	5.85 ± 1.11	5.99 ± 1.00	5.81 ± 1.01	6.06 ± 0.88	6.26 ± 0.79	5.97 ± 0.99	2.756*
PBC							
PBC1	5.02 ± 1.26	5.15 ± 1.12	5.15 ± 1.10	5.25 ± 0.99	5.37 ± 0.95	5.17 ± 1.10	1.137
PBC2	5.01 ± 1.29	5.19 ± 1.15	5.23 ± 1.10	5.29 ± 1.00	5.32 ± 1.14	5.20 ± 1.14	1.040
PBC3	5.26 ± 1.15	5.55 ± 0.92	5.46 ± 1.02	5.37 ± 0.89	5.44 ± 1.07	5.42 ± 1.01	1.243
BI							
BI1	5.75 ± 1.01	5.94 ± 0.99	5.86 ± 0.93	6.02 ± 0.92	6.23 ± 0.84	5.93 ± 0.95	3.959**
BI2	5.83 ± 0.91	6.03 ± 1.00	6.01 ± 1.01	6.06 ± 0.88	6.27 ± 0.91	6.02 ± 0.96	2.804*
BI3	5.94 ± 0.96	6.11 ± 0.96	6.00 ± 1.00	6.15 ± 0.81	6.31 ± 0.88	6.08 ± 0.94	2.077
BI4	5.77 ± 1.13	5.95 ± 1.07	5.97 ± 1.02	6.06 ± 0.92	6.31 ± 0.93	5.99 ± 1.03	2.757*

All measurement items except attitude were scored on a 7-point Likert scale (1: strongly disagree–7: strongly agree). Measurement items for attitude were scored on a 7-point unipolar scale.

Data are presented as mean ± SD.

KN, knowledge; AT, attitude; SN, subjective norm; PBC, perceived behavioral control; BI, behavior intention.

* $P < 0.05$, ** $P < 0.01$.

Table 4. Results of confirmatory factor analysis

Constructs	Items	Standardized factor loadings	SE	CR	AVE
KN	KN1	0.837	0.022	0.977	0.918
	KN2	0.935	0.023		
	KN3	0.569	0.076		
	KN4	0.500	0.070		
AT	AT1	0.715	0.036	0.979	0.904
	AT2	0.728	0.066		
	AT3	0.705	0.064		
	AT4	0.827	0.060		
	AT5	0.791	0.076		
SN	SN1	0.804	0.031	0.994	0.978
	SN2	0.911	0.015		
	SN3	0.937	0.012		
	SN4	0.916	0.013		
PBC	PBC1	0.789	0.039	0.981	0.946
	PBC2	0.819	0.040		
	PBC3	0.804	0.032		
BI	BI1	0.895	0.014	0.996	0.984
	BI2	0.907	0.013		
	BI3	0.937	0.010		
	BI4	0.901	0.016		

CR, composite reliability; AVE, average variance extracted; KN, knowledge; AT, attitude; SN, subjective norm; PBC, perceived behavioral control; BI, behavior intention.

the average variance extracted (AVE) ranged from 0.904 to 0.984 exceeded the minimum threshold of 0.5 [33]. Moreover, each variable in the AVE value exceeded the squared correlation coefficient, which achieved adequacy of discriminant validity, as shown in **Table 5**.

Table 5. Correlation matrix among the theory of planned behavior constructs

Measure	KN	AT	SN	PBC	BI
KN	1				
AT	0.286 (0.082)	1			
SN	0.408 (0.166)	0.498 (0.248)	1		
PBC	0.389 (0.151)	0.420 (0.176)	0.582 (0.339)	1	
BI	0.530 (0.281)	0.437 (0.191)	0.616 (0.379)	0.619 (0.383)	1

Model measurement fit: $\chi^2 = 515.110$ (df = 160, $P < 0.001$, $\chi^2/df = 3.219$), normed fit index = 0.935, incremental fit index = 0.954, Tucker-Lewis index = 0.945, confirmatory fit index = 0.954, root mean squared error of approximation = 0.065.

All factor loadings are significant at the 0.001 level.

KN, knowledge; AT, attitude; SN, subjective norm; PBC, perceived behavioral control; BI, behavior intention.

Thus, the measurement model fit was statistically assessed using several fit indices, and the CFA indicated good model fit ($\chi^2_{(160)} = 515.110$, $P < 0.001$, $\chi^2/df = 3.219$), as also indicated by the normed fit index (NFI) = 0.935, incremental fit index (IFI) = 0.954, Tucker-Lewis index (TLI) = 0.945, confirmatory fit index (CFI) = 0.954, and root mean squared error of approximation (RMSEA) = 0.065.

Testing the hypotheses using SEM

This study investigated the relationships between study variables, namely, knowledge, attitude, subjective norm, perceived behavioral control, and behavior intention to prevent COVID-19 spread in restaurants. The SEM results are presented in **Table 6** and **Fig. 2**. The measurement model fit statistics indicated a good fit of the data at a satisfactory level ($\chi^2 = 561.062$, df = 161, $P < 0.001$, NFI = 0.929, IFI = 0.948, TLI = 0.939, CFI = 0.948, and RMSEA = 0.069).

Table 6 shows that the paths for all of the study hypotheses were significant. H1, H2, and H3 were supported by positive standardized coefficients: 0.298 ($t = 5.460$, $P < 0.001$), 0.428 ($t = 7.538$, $P < 0.001$), and 0.398 ($t = 6.854$, $P < 0.001$), respectively. Thus, knowledge about COVID-19 positively influenced attitude, subjective norm, and perceived behavioral control to preventing COVID-19 spread in restaurants.

H4, H5, and H6 were supported by positive standardized coefficients of 0.106 ($t = 2.627$, $P < 0.05$), 0.277 ($t = 5.861$, $P < 0.001$), and 0.273 ($t = 5.898$, $P < 0.001$) respectively. Thus, attitude, subjective norm, and perceived behavioral control positively influenced COVID-19 preventive behavior intention in restaurants.

H7 was supported by a positive standardized coefficient of 0.314 ($t = 6.687$, $P < 0.001$). Thus, all hypotheses were supported in this study.

Table 6. Results of standardized parameter estimated

Hypothesized paths	Standardized path coefficient	t-value	Result
H1. KN → AT	0.298	5.460***	Supported
H2. KN → SN	0.428	7.538***	Supported
H3. KN → PBC	0.398	6.854***	Supported
H4. AT → BI	0.106	2.627*	Supported
H5. SN → BI	0.277	5.861***	Supported
H6. PBC → BI	0.273	5.898***	Supported
H7. KN → BI	0.314	6.687***	Supported

Model fit statistics: $\chi^2 = 561.062$, df = 161, $P < 0.001$, $\chi^2/df = 3.485$, normed fit index = 0.929, incremental fit index = 0.948, Tucker-Lewis index = 0.939, confirmatory fit index = 0.948, root mean squared error of approximation = 0.069.

KN, knowledge; AT, attitude; SN, subjective norm; PBC, perceived behavioral control; BI, behavior intention.

* $P < 0.05$, *** $P < 0.001$.

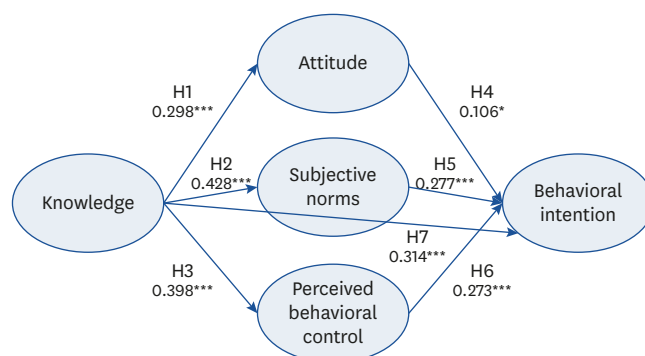


Fig. 2. Results from structural equation modeling.
* $P < 0.05$, *** $P < 0.001$.

DISCUSSION

This study applied the TPB approach to explain restaurant consumers' intentions to practice COVID-19 preventive behaviors. Differences according to respondent age among the TPB constructs showed that the average scores for knowledge about COVID-19 of those in their 20s–40s was higher than those of respondents in their 50s and 60s. The average attitude score did not differ by age, but the average scores for subjective norm, perceived behavioral control, and behavior intention did differ by age, with scores in respondents in their 50s and 60s being higher than those in their 20s and 40s. Moreover, differences by sex among the TPB constructs showed that the average scores of females' knowledge, attitude, subjective norm, and behavior intention were higher than those of males, but the average score of males' perceived behavioral control was higher than that of females.

This study examined the relationships of TPB constructs (knowledge, attitude, subjective norm, perceived behavioral control, and behavior intention) with the prevention of COVID-19 spread in restaurants. Knowledge about COVID-19 had a positive effect on attitude ($\beta = 0.298$, $t = 5.460$), subjective norm ($\beta = 0.428$, $t = 7.538$), and perceived behavioral control ($\beta = 0.398$, $t = 6.854$) for the prevention of COVID-19 in restaurants. Attitude ($\beta = 0.106$, $t = 2.627$), subjective norm ($\beta = 0.277$, $t = 5.861$), and perceived behavioral control ($\beta = 0.273$, $t = 5.898$) had a positive effect on COVID-19 preventive behavior intention in restaurants. Knowledge about COVID-19 ($\beta = 0.314$, $t = 6.687$) had a positive effect on COVID-19 preventive behavior intention in restaurants. The present study showed that restaurant consumers' intentions to practice COVID-19 preventive behaviors were significantly and positively associated with all of the TPB constructs. These findings confirm that the TPB approach is helpful for elucidating the determinants of consumers' COVID-19 preventive behaviors in restaurants.

Among the TPB constructs, the subjective norm ($\beta = 0.277$) and perceived behavioral control ($\beta = 0.273$) toward COVID-19 preventive behaviors were identified as important motivators in enhancing the intention to preventive behavior. Zhong et al. [34] indicated that subjective norm factors may directly affect consumers' dining-out decisions. Subjective norm, which focuses on the social nature of health decision-making, indicates the behavior of seeking advice from others and healthcare providers when individuals face difficult health decisions [35]. In South Korea, which tends to be a collectivist country, individuals with a strong collectivist orientation act for a group benefit rather than for themselves, and they are influenced by norms and obligations [36]. Therefore, subjective norm, which refers

to normative expectations from reference groups [37], has an important role in shaping Korean restaurant consumers' consumption behavior. This indicates that if family members or experts suggest the importance and necessity of COVID-19 preventive behaviors in restaurants, the consumer might recognize that importance and, as a result, enhance their behavior intention. This is in line with a similar study, which indicated that subjective norm and perceived behavioral control have a vital role in making decisions about preventive health behavior [38]. This finding is also in agreement with earlier studies [14,24,39,40]. Furthermore, Yastica et al. [41] indicated that perceived behavioral control was a major predictor of preventive health behavior. Considering the COVID-19 situation in South Korea, perceived behavioral control can be an important variable in predicting preventive behaviors in restaurants. Due to the recent outbreak, individuals are more likely to behave appropriately if they have access to familiar resources and tools to maintain COVID-19 preventive behaviors. This is consistent with a study by Das et al. [14], who reported that perceived behavioral control was the most prominent predictor of social-distancing behavior for COVID-19 prevention. Previous research has also indicated that the degree of perceived behavioral control affects individuals' behavior intentions [42,43].

Meanwhile, the results of this study showed a significant influence of attitude ($\beta = 0.106$) on behavior intention. This indicates that attitude is closely related to an individual's positive or negative emotions toward performing COVID-19 preventive behaviors. These findings are similar to those of Pedersen and Favero [44], who reported a significant relationship between positive attitudes toward COVID-19 and social-distancing behavior.

The present research results indicate that knowledge about COVID-19 has a strong direct influence on individuals' psychological factors and intention to behavior. These findings were similar to those in Cheng and Ng's [10] study on SARS-preventive behaviors, which showed that an individual's degree of knowledge positively shaped consumers' psychological factors and behavior intention. Ajzen [45] regarded knowledge as the basis for building attitudes, subjective norm, and perceived behavioral control. In particular, knowledge can be considered a resource because the accuracy of perceived behavior control is limited by the amount of information on behavior and the availability of resources [13]. The predictive power of perceived behavior and subjective norm control may be enhanced if there is sufficient information and knowledge about behavior. In addition, knowledge has a positive effect on attitudes toward behavior. This finding is in agreement with the findings of Yanti et al. [46]. Information on COVID-19, a novel and initially unknown disease, can be crucial for strengthening an individual's positive attitude by reducing the uncertainty of preventive behaviors and alleviating concerns.

COVID-19 has caused great difficulty for the food service industry. As government policies for social distancing continue to change, changing consumers' perceptions of restaurant use and changes in the mandated rules can help the food service industry overcome difficulties. Most importantly, consumers can thoroughly adhere to COVID-19 prevention guidelines for safe eating out in restaurants. In this study, we derived timely and meaningful results by investigating consumer perceptions of the newly enacted restaurant usage rules in the context of the COVID-19 pandemic.

By collecting and analyzing relevant data during an infectious disease epidemic, the results of this study have some theoretical implications. The TPB has been used to explain behaviors related to the prevention of MERS and SARS. Our analysis indicated that TPB is suitable

for application in predicting COVID-19 preventive behavior intention in restaurants. Thus, the TPB can be used effectively not only to explain behavior related to existing infectious diseases, but also to explain the preventive behavior associated with COVID-19 and safe eating practices in restaurants. In particular, we detected differences by age and sex among the TPB constructs. Also, to examine the relationships between variables, we investigated the factors that significantly affect COVID-19 preventive behavior intention. The results are not only applicable to restaurants, but could also be applied to explain various consumers' preventive behavior in multi-use facilities, such as those in the hotel industry and or used for conventions. In addition, it is possible to use the TPB to provide the primary data necessary for policy establishment and expansion to strengthen COVID-19 preventive behavior of consumers at multi-use facilities.

Furthermore, the results of this study can help policy makers and professionals provide material for additional public health interventions and inform public health services about awareness-raising, guidelines, and health education programs. In particular, there is a need for an educational program for consumers with a low degree of knowledge about COVID-19. Restaurant consumers' high level of knowledge of COVID-19 led to good and safe preventive behaviors during the COVID-19 pandemic. However, we observed sex and age differences in individual perceptions regarding COVID-19 preventive behaviors in restaurants. This finding is supported by previous studies in which older people, women, and more educated respondents had a better understanding of new infectious diseases [47,48]. Based on the results of this study, education related to COVID-19 preventive behavior should reflect sex and age differences. Thus, it is important to select educational content that suits each group's characteristics and utilize various communication tools. Especially, there should be a focus on media-based awareness-raising for young people and men in order to improve their knowledge of COVID-19.

However, even if individuals gained knowledge of COVID-19, they were less likely to take action if they did not share it with their reference group or lacked behavioral support. Seminars on COVID-19 and preventive behaviors can help improve participants' attitudes and behaviors as well as improve their knowledge. Cheng and Ng [10] suggested a social-level seminar, and indicated that its effectiveness would be improved when participants and reference groups participated together and shared the same knowledge and attitudes toward preventive behaviors among group members. In short, policymakers and experts must support the expansion of small group seminars on COVID-19 prevention in restaurants and provide accurate guidance that can be used in seminars.

In addition, the government should work to provide lists of restaurants that follow sanitary and distancing guidelines to reduce consumers' concerns about the safety of eating out. Consumers' behavioral intentions are heavily influenced by their reference group, so it is important to encourage safe restaurant usage and the sharing of relevant information. In short, the government must continue to publicize COVID-19 preventive behavior and provide safe restaurant lists through various media such as television, radio, online news, and social networking services.

Despite the theoretical and practical contributions of this study, it has limitations. While this study was conducted with restaurant consumers, such a study could also be applied to restaurant managers and employees. In addition, social distancing and wearing a mask to prevent COVID-19 has now become a social norm. This means that restaurant consumers'

perceptions of COVID-19 preventive behaviors will change in the future, making it necessary to track such perceptions and behaviors over time. Furthermore, as COVID-19 is a global issue, multinational studies should be undertaken to determine the similarities and differences among people from different regions and cultures.

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