Understanding Factor Influence in Mask-Wearing Intention Onboard Airplanes during COVID-19: Attitude as a Mediator

Jing Yu Pan, Dahai Liu

Abstract—Airlines in the US have taken protective measures to battle the COVID-19 pandemic, with a mask mandate being the most important one, especially in the aircraft cabin. As the airline industry is recovering from the pandemic, mask-wearing will eventually become a personal choice during a flight. Nevertheless, COVID-19 will continue to create uncertainty for a long time into the future, making it necessary to understand the attitude and voluntary use of masks by air travelers on airplanes even after masks are no longer mandatory. This study aimed to understand the relationship between demographic characteristics and mask-wearing intention in the US. For age, gender, income, educational, and ethnicity groups, this study examined three factors – subjective norms, risk avoidance, and information seeking and their influence on the mask-wearing intention onboard airplanes during COVID-19, and whether or not attitude toward masks was an important mediator. The results show that all demographic factors except gender could help to explain the group variations in factor impact and the mediating effect in mask-wearing intentions. In particular, Asian travelers had mask-wearing intentions that were not affected by attitude either directly or indirectly. These findings provide useful implications to enhance the health safety of air travelers, especially in the US where opposing views toward mask-wearing still widely exist.

Keywords—COVID-19, passenger demographics, aircraft cabin, mask-wearing intention, attitude as mediator.

I. INTRODUCTION

AMONG the many protective measures taken by airlines to protect passengers and crew members from COVID-19, mask-wearing on airplanes is crucial, given the small, enclosed aircraft cabin environment where passengers sit next to one another for prolonged periods, with a likely increased risk of COVID-19 infection. While there are many COVID-19 studies, very few focus on the relationship between passenger demographics and the intention to wear a mask onboard airplanes. A factor that can be particularly important in this context is attitude of air travelers toward mask-wearing. The importance of attitude towards following health recommendations during the pandemic has been recognized. Studies suggest that a positive public attitude is essential for achieving effective mask-wearing compliance [1]. In the US, however, opposing attitudes toward mask use are more common, with a small but vocal group of people holding a negative attitude about wearing masks in public [2]. While Pan and Liu [3] found attitude toward masks strongly influenced the

intention to wear a mask when flying during COVID-19, it remains unknown whether or not attitude mediates the relationship between the COVID-related factors identified in the literature and air travelers' mask-wearing intentions during flight, when passenger demographics are considered.

Studies have generally found that demographic factors are important and they can independently influence the development of adaptive or maladaptive coping responses [4]. Some studies suggest that different demographic groups have different coping strategies for the pandemic. For instance, Americans were shown to have high COVID-19 stress and certain demographic groups were particularly vulnerable to the stress effect, making them more or less likely to adhere to the Centers for Disease Control (CDC) guidelines [5]. While some demographic characteristics such as age have a relatively stable impact on compliance to the COVID-19 health recommendations [6], [3], [7], the impact of other factors like gender, income, and education level and COVID-19 responses are less clear [8]-[12]. This highlights the need to further examine the association between demographic characteristics and voluntary compliance with mask-wearing during COVID-19, especially among air travelers where such relationships have not been tested. The understanding is particularly important in countries with greatly diverse populations, such as the US [13].

In an effort to narrow the gaps in research, this study performed structural equation modeling analysis to examine the relationship between age, gender, education, income, and ethnicity with the use of masks by air travelers in the US. The purpose was to compare factor impacts on mask-wearing intentions across different demographic groups, while considering attitude as having either a direct or mediating effect to understand the mask-wearing intention.

II. LITERATURE REVIEW

A. Mask Use during COVID-19

Despite the evidence supporting the effect of masks, public acceptance of masks has been mixed [14]. Some studies have attempted to identify the factors that are related to mask use during COVID-19 [8], [15], [16]. Only limited studies examined mask use in air transport [3], [17]. Pan and Liu [3] found that attitude, risk avoidance, descriptive norms, and information seeking significantly affected passengers' mask-

Jing Yu Pan and Dahai Liu are with Embry-Riddle Aeronautical University, Daytona Beach, FL, USA (e-mail: panj@erau.edu, liu89b@erau.edu).

World Academy of Science, Engineering and Technology
International Journal of Psychological and Behavioral Sciences
Vol:16, No:11, 2022

wearing intention when flying during COVID-19, with attitude as the most important determinant. They also suggested age group difference regarding the impact of these factors. Their study, however, only aimed to explore air travelers' mask use at the general level, focusing on direct impact of factors on mask use intention. One major finding of their study was the strong and direct impact of attitude on mask-wearing intention onboard airplanes. Given the importance of attitude identified in their study, it is meaningful to investigate whether attitude mediates the relationship between key factors and the intention to use masks when flying during COVID-19, taking into account passenger demographics in the US. The present study aimed to answer these important questions.

The theoretical framework for this study is shown in Fig. 1. The model contained three independent variables (subjective norm, risk avoidance, and information seeking) and one dependent variable (mask-wearing intention onboard airplanes). Attitude was introduced to the model both as a direct determinant of mask-wearing intention and a mediating factor. The remainder of the literature review justifies the factor selection in this study.
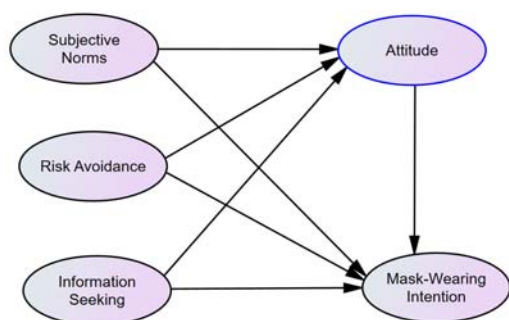

Fig. 1 Theoretical framework for mask-wearing intention

Attitude is a relatively stable psychological construct, with studies routinely reporting its direct effect on behavioral intentions in travel-related activities [18], [19]. Similar effects were observed in studies of mask-wearing in COVID-19. Studies found that attitude directly influenced mask use of leisure activity participants in Korea and it was significant in mask-wearing and post-pandemic mask-saving intentions in China [19], [7]. The effect of social norms on behavioral intention has also been observed during the pandemic. Recent studies showed that subjective norms significantly affected mask use intentions and behaviors, and it was the strongest predictor of mask use of international students [19], [20], [7].

Risk avoidance refers to the reduced willingness to engage in risky activities that are perceived as having negative outcomes [21]. In the context of COVID-19, people with perceived high risks of COVID-19 were more likely to demonstrate risk avoidance by engaging in health protection behaviors including washing hands, wearing a mask, and social distancing [22]. The direct relationship between risk factors and mask-wearing in COVID-19 has been reported in studies from different countries, indicating mask perceptions significantly enhanced mask-wearing behavior in Pakistan and perceived risks positively affected mask-saving intentions in China [23], [3], [19]. In air transportation, risk avoidance is a significant factor in the decision to wear masks onboard airplanes during COVID-19 [3]. It shows that air travelers perceiving higher risks of COVID-19 may have higher intention to wear a mask when flying.

Studies showed that a person's behavior is guided by the information given to him/her, and lack of relevant information often served as a barrier to engage in desired behavior [24], [19]. Information plays an essential role in the control of COVID-19. People generally react to COVID-19 by searching relevant information to form their health actions. This was observed in the US where people responded to the first reports of COVID-19 in their state immediately by seeking information of coronavirus, but searches for information regarding protective strategies including masks appeared to be slower [25]. Information seeking was relevant to this study because airline passengers interact with information available to them to make mask-wearing decisions when flying during COVID-19.

B. Attitude as a Mediator

The mediating effect of attitude has been successfully observed in many health- and safety-related studies, such as health behavior change [26], sensation seeking and traffic injury [27], and alcohol use of adolescents [28], to name just a few. Recent studies of COVID-19 also reported significant mediating effect of attitude. Potas et al. [29] investigated the mediating effect of attitude in the relationship between awareness and technology addiction of adolescents during COVID-19, taking gender into consideration. Results indicated a stronger indirect effect of attitude compared to that of awareness on the behavior of technology addiction, suggesting that awareness of technology addiction alone may not be sufficient in measuring actual behavior in the context of COVID-19. Another study examined attitude as a mediator in the relationship between risk perception of COVID-19 and health-protective behavior in the context of *untact* tourism in Korea [30]. Attitude exhibited a strong, significant mediating effect between affective risk perception and behavioral intention, indicating that risk perceptions contributed to the forming of the attitude toward *untact* tourism, which in turn affected the intention to engage in protective behaviors. In both studies, [29] and [30], the specific context of the COVID-19 outbreak was heavily emphasized, which may further enhance the mediating effect of attitude. Attitude can be a possible mediator in the relationship involving mask-wearing intention in COVID-19, given the vast opposing views of face masks in the US [2]. It is thus meaningful for this study to examine the mediating effect of attitude in addition to its direct impact on mask use.

C. Demographics and Mask Use in COVID-19

Adding to the growing knowledge of COVID-19 is the study findings of compliance behaviors with respect to protective measures based on different socio-demographic characteristics. The impact of age has been widely studied, likely due to the CDC analysis and messaging to the public regarding the risk of

World Academy of Science, Engineering and Technology
International Journal of Psychological and Behavioral Sciences
Vol:16, No:11, 2022

COVID-19 on older adults. Studies generally produced consistent results indicating the positive relationship between age and risk perception of COVID-19 [30] and the odds of an individual wearing a mask increased significantly with age [31], [7]. Regarding race and ethnicity, existing studies focused largely on comparison between Whites and other ethnic groups, demonstrating a generally consistent pattern. Compared to Whites, historically marginalized racial and ethnic groups were more likely to perceive COVID-19 to be a major threat to their personal health [32], [30]. Accordingly, Blacks, Latinos, and Asians were more likely to wear a mask in response to COVID-19. When gender was factored in, it was further revealed that White men were the least likely to wear masks while Asian men had the highest probability to wear masks during COVID-19 [32]. There were, however, divergent views on the impact of other important demographic factors on COVID-19 responses. The effect of education on mask use in COVID-19 has only been partially supported by the literature. While some studies indicated that people with higher educational attainment were more likely to wear face masks [12], [7], others suggested that educational attainment was negatively associated with mask-wearing in areas where mask-wearing behavior is less common, citing that highly educated but skeptical members of the public were less likely to blindly follow government recommendations of mask use especially given large amounts of inconsistent information of COVID-19 [8]. Studies of gender and mask-wearing also produced mixed results. Some studies found that men were less likely to report high levels of threat and fear of COVID-19 compared to women, to consider public health measures effective, and to have confidence in their ability to comply [9], [30]. Other studies suggested that, while there is a gender difference in the perception of masks, men and women were equally likely to wear face masks during the pandemic [10], [7]. Similarly, some researchers pointed to the significant role of income in mask-wearing, indicating people with higher income were more motivated to wear face masks in COVID-19 [7], while others found that mask-wearing during COVID-19 was more commonly reported among lower income groups [11]. These mixed views, coupled with the importance of socio-demographic characteristics on mask use, call for more empirical research in this area.

III. RESEARCH METHOD

This study adopted a survey design, using the online platform of Amazon Mechanical Turk (MTurk) to recruit participants. Data were collected between May 12 and May 15, 2021, when the vaccine rollout was making progress and cases were falling steadily across the US. Already, fully vaccinated people were allowed to resume some activities without the need to wear a mask [33]. With more people receiving vaccination, it is reasonable to predict further relaxation of COVID-19 restrictions across the country, including the mask mandate on airplanes. At the same time, however, COVID-19 continues to spread around the world, and brings uncertainties around the risk of COVID-19 even for those who are fully vaccinated. Consequently, many people may still feel the need to wear a mask in crowded settings even as masks are no longer

mandatory, especially in the aircraft cabin where social distancing is not possible. Conducting a survey on in-flight mask-wearing during this transitional time allowed participants to more accurately evaluate factors that would affect their mask-wearing intentions. The total sample size after data cleaning was 1,124, which satisfied the sample size requirement for structural equation modeling analysis [34].

A survey questionnaire was developed to collect data of air travelers and their intentions to wear masks when flying during COVID-19. For the purpose of this study, participants were given a scenario of flying during the time when some airlines started to remove mask mandate on airplanes, but COVID-19 continued to spread and may still present risks to public health. Participants were then asked to evaluate the statements of the relationships between potential impact factors and their behavioral intention to wear a mask during flight in the given scenario, using a five-point Likert scale (1 = strong disagreement and 5 = strong agreement). Table I shows the profile of the respondents.

TABLE I
RESPONDENTS' PROFILE

Variables	Category	Frequency	Percentage
Gender	Male	527	46.9
	Female	590	52.5
	Unidentified	7	0.6
Age	< 20	15	1.3
	20-30	264	23.5
	31-40	394	35.1
	41-50	223	19.8
	51-60	131	11.7
	> 60	96	8.5
Education	Completed some high school	8	0.7
	High school	221	19.7
	Bachelor's degree or equivalent	653	58.1
	Master's degree	197	17.5
	Higher than Master's degree	44	3.9
	Missing	1	0.1
Personal Income	< $25,000	143	12.7
	$25,000 - $50,000	345	30.7
	$50,001 - $75,000	282	25.1
	$75,001 - $100,000	178	15.8
	$100,001 - $125,000	71	6.3
	> $125,000	105	9.3
Ethnicity	Black or African American	85	7.6
	Asian	117	10.4
	Hispanic or Latino	65	5.8
	Pacific islander	4	0.4
	White	839	74.6
	Native American	11	1.0
	Missing	3	0.3

IV. RESULTS

A two-phase structural equation modeling approach was used to test the measurement model and the structural model. First, confirmatory factor analysis (CFA) was used to test and validate the measurement model (n = 1,121, outliers removed). In this analysis, the cutoff values established by Byrne [35] were adopted for model evaluation (CFI > .95, GFI > .90, CMIN/df < 3, and RMSEA < .05). Measures taken to improve the model fit included removing scale items with low factor loadings (< .70), removing scale items associated with large

World Academy of Science, Engineering and Technology
International Journal of Psychological and Behavioral Sciences
Vol:16, No:11, 2022

error scores, and model specification through correlating error terms with large values. Following these measures, the measurement models achieved satisfactory model fit (Chi-square/df = 2.671; GFI = .968; CFI = .991; RMSEA = .039). Reliability and validity of the model were then tested. Both values of Cronbach Alpha measuring the internal consistency of scale items and Construct Reliability (CR) exceeded the threshold of .70, indicating good reliability among scale items measuring their designated constructs. Construct validity of the model was established by convergent validity and discriminant validity of measurement. For the final measurement model,

factor loadings (> .70) and average variance extracted (AVE) (> .50) indicated sufficient convergent validity of the scale items. Discriminant validity (indicated by MSV) was assessed by comparing the AVE of a factor with the squared correlations of this factor with another factor. Only RA has a slightly higher score of MSV (.861) than its AVE (.857). As the difference is minor and the AVE of RA exceeded the threshold of .50, RA was retained in the model to avoid losing information. Table II summarizes the reliability and validity results of the measurement model.

TABLE II
MEASUREMENT MODEL – MODEL FIT RELIABILITY AND VALIDITY RESULTS

	Items	Cronbach's Alpha	Load Factor	AVE	CR	MSV
SN	People who are important to me think I should wear a mask when flying	0.949	.911	.823	.949	.691
	People who influence my behavior want me to wear a mask when flying		.874			
	Those whose opinion I value prefer that I wear a mask when flying		.928			
	People close to me recommend that I wear a mask when flying		.914			
RA	I'd rather wear a mask on the airplane, to feel protected against the virus	.940	.943	.857	.947	.861
	I'd rather wear a mask on the airplane, just to minimize uncertainty during flight		.918			
	I'd rather wear a mask on the airplane than regret not doing so		.916			
IS	I have actively sought out information about mask-wearing	.908	.791	.664	.908	.223
	I frequently check guidelines to face masks published by health organizations		.822			
	I rely on multiple sources for information of mask-wearing		.762			
	I always gather as much information as I can about mask-wearing		.920			
	I like to review information multiple times before making a decision about mask-wearing		.769			
AT	I think wearing a mask on the airplane is beneficial	.957	.939	.884	.958	.880
	I think wearing a mask on the airplane is wise		.936			
	I'm in favor of wearing a mask on the airplane		.945			
BI	I intend to wear a mask	.957	.945	.881	.957	.880
	My intention to wear a mask when flying is high		.941			
	I intend to continue to wear a mask when flying		.929			

SN = Subjective Norms; RA = Risk Avoidance, IS = Information Seeking; AT = Attitude; BI = Behavioral Intention

Following the validation of the measurement model, structural equation modeling analysis was then performed to identify direct factor impact and mediating effect in the relationships between SN, RA, IS and BI across various demographic groups. Table III summarizes the comparative results across the groups associated with the five demographic characteristics.

For age, the comparison was made between three groups - Young Travelers (18-40 years), Mid-aged Travelers (41-60 years), and Senior Travelers (older than 60 years). AT directly influenced mask-wearing intention across all age groups (.685, .582, and .468) for Young, Mid-aged, and Senior, respectively. For Young Travelers, SN (.194), RA (.724), and IS (.055) significantly affected mask-wearing intention (BI), but when attitude was introduced as the mediator, only RA had a direct (but reduced) effect on BI (.276). The indirect effect of AT (mediator) in the relationships of SN→AT→BI and RA→AT→BI were found to be significant, while it was not significant in IS→AT→BI. This showed that AT fully mediated the relationship between SN and BI, partially mediated the relationship between RA and BI, and did not mediate the relationship between IS and BI for young travelers. For Mid-aged Travelers, only RA directly affected BI and this relationship remained significant when AT presented as the mediator. A significant indirect effect was found for the paths of SN→AT→BI and RA→AT→BI. Thus, AT fully mediated

the relationship between SN and BI, and partially mediated the relationship between RA and BI for mid-aged travelers. For Senior Travelers, only RA significantly affected BI with and without attitude as a mediator. As such, AT partially mediated the relationship between RA and BI for senior travelers.

Regarding gender, AT, SN, RA, and IS directly affected mask-wearing intention of both male and female travelers, with similar magnitude of effect (.647, .154, .767 and .053 for male vs. .623, .143, .778, and .053 for female). For both genders, RA was the only significant factor in BI when AT was included as a mediator (.319 vs. .335), while SN only demonstrated a significant indirect effect on BI through AT. Thus, for both male and female travelers AT fully mediated the relationship between SN and BI, partially mediated the relationship between RA and BI, and it had no mediating effect between IS and BI.

Concerning education, AT most strongly impacted on the group holding a Bachelor's degree (.723), followed by the group with high school diploma (.526) and the group with Master's degree and above (.511). All three factors – SN, RA, and IS – significantly influenced mask-wearing intention of Bachelor's group (.129, .781, and .065) while SN and RA were significant in the Master's and above group (.207 and .710), and only RA was significant in the high school group (.854).

When AT was presented as the mediator, only RA showed direct impact on BI across all groups. All three factors demonstrated significant, indirect effect on BI through AT for

World Academy of Science, Engineering and Technology
International Journal of Psychological and Behavioral Sciences
Vol:16, No:11, 2022

the Bachelor's group while for the other two groups only SN and RA showed significant indirect effect. Therefore, for all educational groups, AT fully mediated the relationship between SN and BI and partially mediated the relationship between RA

and BI. A full mediation via AT was observed between IS and BI in Bachelor's group, while no mediation on this path was detected for the other two groups.

TABLE III
ATTITUDE AS A MEDIATOR

Demographic	Group (n)	Relationship	Direct Effect without Mediator	Direct Effect with Mediator	Indirect Effect	Confidence Low	Interval High	Conclusion
Age	Young (672)	SN - BI	.194***	-.015 (.666)	.199***	.124	.297	Full mediation
		RA - BI	.724***	.276***	.459***	.346	.595	Partial mediation
		IS - BI	.055**	.028 (.073)	.025 (.052)	0	.058	No mediation
tA		AT - BI	n/a	.685***	n/a	n/a	n/a	n/a
	Mid-Age (353)	SN - BI	.083 (.054)	-.029 (.506)	.119**	.053	.214	Full mediation
		RA - BI	.855***	.394***	.454**	.196	.707	Partial mediation
		IS - BI	.027 (.344)	.016 (.532)	.012 (.341)	-.015	.048	No mediation
		AT - BI	n/a	.582***	n/a	n/a	n/a	n/a
	Senior (96)	SN - BI	.052 (.487)	-.009 (.885)	.062	-.042	.166	No mediation
		RA - BI	.855***	.468***	.383**a	.091	.675	Partial mediation
		IS - BI	.087 (.076)	.082 (.060)	.007	-.503	.517	No mediation
		AT - BI	n/a	.470***	n/a	n/a	n/a	n/a
Gender	Male (524)	SN - BI	.154***	-.020 (.619)	.165***	.073	.282	Full mediation
		RA - BI	.767***	.319***	.458***	.302	.625	Partial mediation
		IS - BI	.053**	.027(.231)	.023 (.111)	-.005	.059	No mediation
		AT - BI	n/a	.647***	n/a	n/a	n/a	n/a
	Female (590)	SN - BI	.143***	-.015 (.656)	.158***	.099	.232	Full mediation
		RA - BI	.778***	.335***	.443***	.304	.588	Partial mediation
		IS - BI	.053**	.031 (.121)	.022 (.063)	-.001	.053	No mediation
		AT – BI	n/a	.623***	n/a	n/a	n/a	n/a
Education	High School (229)	SN - BI	.090 (.113)	-.046 (.393)	.143***	.053	.279	Full mediation
		RA - BI	.854***	.474***	.372***	.181	.584	Partial mediation
		IS - BI	.024 (.454)	.020 (.491)	.005 (.676)	-.024	.040	No mediation
		AT – BI	n/a	.526***	n/a	n/a	n/a	n/a
	Bachelor's (650)	SN - BI	.129***	-.034 (.280)	.160***	.090	.255	Full mediation
		RA - BI	.781***	.259***	.524***	.393	.666	Partial mediation
		IS - BI	.065**	.023 (.246)	.042 **	.013	.079	Full mediation
		AT – BI	n/a	.723***	n/a	n/a	n/a	n/a
	Master's and Above (241)	SN - BI	.207***	.046 (.474)	.148**	.022	.314	Full mediation
		RA - BI	.710***	.362**	.366**	.042	.700	Partial mediation
		IS - BI	.060 (.154)	.053 (.175)	-.001	-.064	.040	No mediation
		AT – BI	n/a	.511***	n/a	n/a	n/a	n/a
Income	Low (487)	SN - BI	.140***	-.012 (.737)	.146***	.077	.248	Full mediation
		RA - BI	.782***	.337***	.452***	.295	.617	Partial mediation
		IS - BI	.061**	.054 (.013)	.006 (.623)	-.020	.037	No mediation
		AT – BI	n/a	.611***	n/a	n/a	n/a	n/a
	Medium (281)	SN - BI	.077 (.176)	-.059 (.246)	.140**	.031	.287	Full mediation
		RA - BI	.873***	.339***	.529***	.348	.773	Partial mediation
		IS - BI	.019 (.542)	-.007 (.800)	.027 (.138)	-.010	.071	No mediation
		AT – BI	n/a	.695***	n/a	n/a	n/a	n/a
	High (353)	SN - BI	.184***	-.015 (.766)	.197***	.102	0.31	Full mediation
		RA - BI	.712***	.305***	.410***	.231	.589	Partial mediation
		IS - BI	.056 (.102)	.021 (.497)	.036**	.002	.085	Full mediation
		AT – BI	n/a	.640***	n/a	n/a	n/a	n/a
Ethnicity	White (839)	SN - BI	.146***	-.031 (.277)	.173***	.114	.245	Full mediation
		RA - BI	.780***	.313***	.471***	.358	.592	Partial mediation
		IS - BI	.049**	.029 (.082)	.019 (.067)	-.001	.045	No mediation
		AT – BI	n/a	.662***	n/a	n/a	n/a	n/a
	Asian (117)	SN - BI	-.018 (.768)	-.023 (.678)	.005 (.543)	-.024	n/a	No mediation
		RA - BI	.945***	.801***	.145 (.085)	-.029	n/a	No mediation
		IS - BI	.061 (.190)	.056 (.201)	.006 (.299)	-.004	n/a	No mediation
		AT – BI	n/a	.168 (.145)	n/a	n/a	n/a	n/a
	Others (162)	SN - BI	.287 (**)	.032 (-.736)	.262 (.062)	-.013	.771	No mediation
		RA - BI	.601***	-.002 (.989)	.602**	.291	1.356	Full mediation
		IS - BI	.053 (.355)	.017 (734)	.034 (.370)	-.054	.157	No mediation
		AT – BI	n/a	.909***	n/a	n/a	n/a	n/a

Note: a: For the senior age group bootstrapping only produced standard error (no confidence intervals and p values were produced) likely due to relatively small sample size. Standard error was then used to construct confidence intervals around the mediated effect. For the three factors, 95% confidence intervals were calculated by adding and subtracting the product of 1.96 and the standard error from the mediated effect [36].

World Academy of Science, Engineering and Technology
International Journal of Psychological and Behavioral Sciences
Vol:16, No:11, 2022

The income group comparison showed that AT most strongly affected middle income travelers' mask-wearing intention (.695), followed by high-income travelers (.640), and then low-income travelers (.611). SN, RA, and IS significantly influenced mask-wearing intention of low-income group while for the other two groups only some factors were significant (SN and RA for the high-income group and RA for middle-income group). When AT was introduced as the mediator, only RA showed a significant impact on BI across the three groups. For the high-income group the mediating effect was found for all paths, while for the other two groups such mediation effect was only observed between SN and BI, and RA and BI. Accordingly, AT fully medicated the relationship between SN and BI and it partially mediated the relationship between RA and BI for all three groups. No mediating effect was detected for IS→BI in the low- and medium-income groups while for the high-income group AT fully mediated this relationship.

Three ethnical groups including White Travelers, Asian Travelers, and Other Travelers were formed for comparison. For the White Travelers and Other Travelers, AT had a significant impact on BI (.662 and .909, respectively), while for Asian Travelers a direct impact of AT was not observed. In the absence of mediator, SN, RA, and IS significantly affected BI in White Travelers, SN and RA significantly affected BI in Other Travelers, and only RA affected BI in Asian Travelers. When AT was introduced as the mediator, only RA showed significant impact on BI in White Travelers and Asian Travelers. Noticeably, the Asian group showed only marginal decrease in the effect of RA before and after the mediator was introduced (.945 vs. .801), indicating a weak mediating effect of AT in the relationship between RA and BI in this group. The significant indirect mediating effect was observed only in White Travelers (SN→AT→BI and RA→AT→BI) and Other Travelers (RA→AT→BI). Thus, AT fully mediated the relationship between SN and BI and partially mediated the relationship between RA and BI in White Travelers while for Other Travelers a full mediating effect was observed between RA and BI. Noticeably, AT had no mediating effect for any of the three factors in Asian Travelers.

V. Conclusion

This study examined the impact of risk avoidance, social norms, and information-seeking on the intention of air travelers in the US to wear masks when flying during COVID-19, and whether or not their attitude toward masks mediated the relationship. All three factors showed direct impacts on mask-wearing intention, but the analysis also revealed a significant third-variable effect for the relationship between the three factors and mask-wearing intention, indicating that attitude strongly mediated toward mask-wearing. Thus, in the context of flying during COVID-19, the relationship between these factors and the decision to wear a mask may not be straightforward, and to more fully explain the mask-wearing intentions of air travelers, the effect of attitude as a mediator should be taken into account.

The demographic analysis revealed group variations with respect to mask-wearing intention. Young respondents showed a stronger effect of attitude toward mask-wearing, while the mask-wearing intention of older travelers was mainly driven by their desire to avoid the risk of COVID-19. Air travelers with a middle-income or a bachelor's degree were also more driven by attitude, compared to the other groups in their respective variable, when deciding to use a mask during COVID-19. The largest difference was observed among the ethnic groups, primarily between Asian and non-Asian air travelers. Attitude toward mask-wearing played a significant role among non-Asian Travelers, both directly and as a mediator, whereas the mask-wearing intention of Asian Travelers was almost entirely determined by risk avoidance, with no direct or indirect impact of attitude. No significant group variations regarding gender were observed among the respondents in terms of their mask-wearing intention when flying during COVID-19.

The findings of this study further the understanding of attitudinal impact and demographic segments, which can be used by airlines to develop service strategies that accommodate the needs of different air travelers. For example, by understanding that attitude has a greater influence among young travelers, compared to senior travelers who tend to consider risk avoidance when deciding to wear a mask, airlines can use specific service strategies to best serve each group. Moreover, some new patterns were revealed in this study that have useful policy implications. For example, the knowledge of attitudinal impact on different ethnic groups, both directly and indirectly, regarding the decision to wear a mask during flight can inform policy makers in promoting mask use among different ethnic populations of air travelers in the US. Future studies can expand on these findings and delve further into the mask-wearing behaviors of air travelers during a pandemic. As a research direction, cultural factors can also be considered to expand the conceptual framework. A comparative study may also provide additional insights into the effect of attitude on mask-wearing by air travelers.

References

[1] Cheok, G. J. W., Gatot, C., Sim, C. H. S., Ng, Y. H., Tay, K. X. K., Howe, T. S., & Koh, J. S. B. (2021). Appropriate attitude promotes mask wearing in spite of a significant experience of varying discomfort. *Infection, Disease & Health, 26*(2), 145-151. https://doi.org/10.1016/j.idh.2021.01.002

[2] Taylor, S., & Asmundson, G. J. G. (2021). Negative attitudes about facemasks during the COVID-19 pandemic: The dual importance of perceived ineffectiveness and psychological reactance. *PloS One, 16*(2), e0246317-e0246317. https://doi.org/10.1371/journal.pone.0246317

[3] Pan, J. Y., & Liu, D. (2022). Mask-wearing intentions on airplanes during COVID-19 – Application of theory of planned behavior model. *Transport Policy, 119*, 32–44. https://doi.org/10.1016/j.tranpol.2022.01.023

[4] Volk, A. A., Brazil, K. J., Franklin-Luther, P., Dane, A. V., & Vaillancourt, T. (2021). The influence of demographics and personality on COVID-19 coping in young adults. *Personality and Individual Differences, 168*, 110398-110398. https://doi.org/10.1016/j.paid.2020.110398

[5] Park, C. L., Russell, B. S., Fendrich, M., Finkelstein-Fox, L., Hutchison, M., & Becker, J. (2020). Americans' COVID-19 stress, coping, and adherence to CDC guidelines. *Journal of General Internal Medicine: JGIM, 35*(8), 2296-2303. https://doi.org/10.1007/s11606-020-05898-9

World Academy of Science, Engineering and Technology
International Journal of Psychological and Behavioral Sciences
Vol:16, No:11, 2022

[6] Niño, M., Harris, C., Drawve, G., & Fitzpatrick, K. M. (2021). Race and ethnicity, gender, and age on perceived threats and fear of COVID-19: Evidence from two national data sources. *SSM - Population Health, 13*, 100717-100717. https://doi.org/10.1016/j.ssmph.2020.100717

[7] Zhang, L., Zhu, S., Yao, H., Li, M., Si, G., & Tan, X. (2021). Study on factors of people's wearing masks based on two online surveys: Cross-sectional evidence from china. *International Journal of Environmental Research and Public Health, 18*(7), 3447. https://doi.org/10.3390/ijerph18073447

[8] Barceló, J., & Sheen, G. C. (2020). Voluntary adoption of social welfare-enhancing behavior: Mask-wearing in spain during the COVID-19 outbreak. *PloS One, 15*(12), e0242764-e0242764. https://doi.org/10.1371/journal.pone.0242764

[9] Brankston, G., Merkley, E., Fisman, D. N., Tuite, A. R., Poljak, Z., Loewen, P. J., & Greer, A. L. (2021). Socio-demographic disparities in knowledge, practices, and ability to comply with COVID-19 public health measures in canada. *Canadian Journal of Public Health, 112*(3), 363-375. https://doi.org/10.17269/s41997-021-00501-y

[10] Howard, M. C. (2021). Gender, face mask perceptions, and face mask wearing: Are men being dangerous during the COVID-19 pandemic? *Personality and Individual Differences, 170*, 110417-110417. https://doi.org/10.1016/j.paid.2020.110417

[11] Rader, B., White, L. F., Burns, M. R., Chen, J., Brilliant, J., Cohen, J., Shaman, J., Brilliant, L., Kraemer, M. U. G., Hawkins, J. B., Scarpino, S. V., Astley, C. M., & Brownstein, J. S. (2021). Mask-wearing and control of SARS-CoV-2 transmission in the USA: A cross-sectional study. *The Lancet. Digital Health, 3*(3), e148-e157. https://doi.org/10.1016/S2589-7500(20)30293-4

[12] Sinicrope, P. S., Maciejko, L. A., Fox, J. M., Steffens, M. T., Decker, P. A., Wheeler, P., Juhn, Y. J., Wi, C., Gorfine, M., & Patten, C. A. (2021). Factors associated with willingness to wear a mask to prevent the spread of COVID-19 in a midwestern community. *Preventive Medicine Reports, 24*, 101543-101543. https://doi.org/10.1016/j.pmedr.2021.101543

[13] The United States Census Bureau. (2020). National population by characteristics: 2010-2019. National Population by Characteristics: 2010-2019 (census.gov)

[14] Dzisi, E. K. J., & Dei, O. A. (2020). Adherence to social distancing and wearing of masks within public transportation during the COVID 19 pandemic. *Transportation Research Interdisciplinary Perspectives, 7*, 100191. https://doi.org/10.1016/j.trip.2020.100191

[15] Zhou, M., Long, P., Kong, N., & Campy, K. S. (2021). Characterizing Wuhan residents' mask-wearing intention at early stages of the COVID-19 pandemic. *Patient Education and Counseling, 104*(8), 1868-1877. https://doi.org/10.1016/j.pec.2020.12.020

[16] Pfattheicher, S., Nockur, L., Böhm, R., Sassenrath, C., & Petersen, M. B. (2020). The emotional path to action: Empathy promotes physical distancing and wearing of face masks during the COVID-19 pandemic. *Psychological Science, 31*(11), 1363-1373. https://doi.org/10.1177/0956797620964422

[17] Sotomayor-Castillo, C., Radford, K., Li, C., Nahidi, S., & Shaban, R. Z. (2021). Air travel in a COVID-19 world: Commercial airline passengers' health concerns and attitudes towards infection prevention and disease control measures. *Infection, Disease & Health, 26*(2), 110-117. https://doi.org/10.1016/j.idh.2020.11.002

[18] Hsiao, C., Yang, C. (2010). Predicting the travel intention to take high speed rail among college students. *Transportation Research Part F 13*(4), 277-287.

[19] Si, H., Shen, L., Liu, W., & Wu, G. (2021). Uncovering people's mask-saving intentions and behaviors in the post-COVID-19 period: Evidence from China. *Sustainable Cities and Society, 65*, 102626-102626. https://doi.org/10.1016/j.scs.2020.102626

[20] Sun, Y., Qin, B., Hu, Z., Li., H., Li, X., He, Y., & Huang, H. (2020). Predicting mask-wearing behavior intention among international students during COVID-19 based on the theory of planned behavior, *Ann Palliat Med,10*(4), 3633-3647.

[21] Lorian, C. N., & Grisham, J. R. (2011). Clinical implications of risk aversion: An online study of risk-avoidance and treatment utilization in pathological anxiety. *Journal of Anxiety Disorders, 25*(6), 840-848. https://doi.org/10.1016/j.janxdis.2011.04.008

[22] Dryhurst, S., Schneider, C. R., Kerr, J., Freeman, A. L. J., Recchia, G., van der Bles, Anne Marthe, Spiegelhalter, D., & van der Linden, S. (2020). Risk perceptions of COVID-19 around the world. *Journal of Risk Research, 23*(7-8), 994-1006. https://doi.org/10.1080/13669877.2020.1758193

[23] Irfan, M., Akhtar, N., Ahmad, M., Shahzad, F., Elavarasan, R. M., Wu, H., & Yang, C. (2021). Assessing public willingness to wear face masks during the COVID-19 pandemic: Fresh insights from the theory of planned behavior. *International Journal of Environmental Research and Public Health, 18*(9), 4577. https://doi.org/10.3390/ijerph18094577

[24] Pettigrew, K. E., Fidel, R., & Bruce, H. (2001). Conceptual frameworks in information behavior. *Annual Review of Information Science and Technology (ARIST), 35*, 43-78.

[25] Bento, A. I., Nguyen, T., Wing, C., Lozano-Rojas, F., Ahn, Y., & Simon, K. (2020). Evidence from internet search data shows information-seeking responses to news of local COVID-19 cases. *Proceedings of the National Academy of Sciences - PNAS, 117*(21), 11220-11222. https://doi.org/10.1073/pnas.2005335117

[26] Wood, C., Conner, M., Sandberg, T., Godin, G., & Sheeran, P. (2014). Why does asking questions change health behaviours? the mediating role of attitude accessibility. *Psychology & Health, 29*(4), 390-404. https://doi.org/10.1080/08870446.2013.858343

[27] Wang, H., Shi, L., & Schwebel, D. C. (2019). Relations between adolescent sensation seeking and traffic injury: Multiple-mediating effects of road safety attitudes, intentions and behaviors. *Traffic Injury Prevention, 20*(8), 789-795. https://doi.org/10.1080/15389588.2019.1666982

[28] Koning, I. M., van den Eijnden, Regina J. J. M, Engels, Rutger C. M. E, Verdurmen, J. E. E., & Vollebergh, W. A. M. (2011). Why target early adolescents and parents in alcohol prevention? the mediating effects of self-control, rules and attitudes about alcohol use. *Addiction (Abingdon, England), 106*(3), 538-546. https://doi.org/10.1111/j.1360-0443.2010.03198.x

[29] Potas, N., Açıkalın, Ş. N., Erçetin, Ş. Ş., Koçtürk, N., Neyişci, N., Çevik, M. S., & Görgülü, D. (2021). Technology addiction of adolescents in the COVID-19 era: Mediating effect of attitude on awareness and behavior. *Current Psychology (New Brunswick, N.J.),* , 1-17. https://doi.org/10.1007/s12144-021-01470-8

[30] Niño, M., Harris, C., Drawve, G., & Fitzpatrick, K. M. (2021). Race and ethnicity, gender, and age on perceived threats and fear of COVID-19: Evidence from two national data sources. *SSM - Population Health, 13*, 100717-100717. https://doi.org/10.1016/j.ssmph.2020.100717

[31] Haischer, M. H., Beilfuss, R., Hart, M. R., Opielinski, L., Wrucke, D., Zirgaitis, G., Uhrich, T. D., & Hunter, S. K. (2020). Who is wearing a mask? gender-, age-, and location-related differences during the COVID-19 pandemic. (research article). *PloS One, 15*(10), e0240785-e0240785. https://doi.org/10.1371/journal.pone.0240785

[32] Hearne, B. N., & Niño, M. D. (2021). Understanding how race, ethnicity, and gender shape mask-wearing adherence during the COVID-19 pandemic: Evidence from the COVID impact survey. *Journal of Racial and Ethnic Health* Disparities, https://doi.org/10.1007/s40615-020-00941-1

[33] Centers for Disease Control and Prevention. (2021). When you've been fully vaccinated. www.cdc.gov/coronavirus/2019-ncov/vaccines/fully-vaccinated.html

[34] Westland, J. C. (2010). Lower bounds on sample size in structural equation modeling. Electronic Commerce *Research and Applications, 9*(6), 476-487.

[35] Byrne, B. M. (2010). *Structural equation modeling with AMOS.* New York: Taylor and Francis Group.

[36] Lockwood, C. M., & Mackinnon, D. P. (1998). Bootstrapping the Standard Error of the Mediated Effect. SUGI 23: Bootstrapping the Standard Error of the Mediated Effect (psu.edu)