Perceived risk of using online transportation during the COVID-19 pandemic: A MIMIC-model approach

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Abstract
This study aims to assess the construct validity of the perceived risk scale on online transportation users during the COVID-19 outbreak at once to test whether this scale can produce information that is not influenced by individual characteristics using Multiple Indicators and Multiple Cause (MIMIC) models. The 251 participants from different regions in Indonesia, such as East Java, Central Java, West Java, and outside Java participated in this study. The confirmatory factor analysis (CFA) approach was used as the main method in data analysis. The result showed that this six-aspect contextualized version of the scale was fit. The MIMIC model showed that this scale was not influenced by covariate variables, such as age, domicile, sex, marital status, length of time using online transportation, types of online transportation services, and occupation (except private employee). For further research, the exploratory study of risk perception and analysis of the roles of socioeconomic factors are suggested to do.

Keywords: COVID-19, MIMIC model, online transportation, risk perception

Abstrak
Penelitian ini bertujuan untuk menguji validitas konstruk skala persepsi resiko pengguna transportasi daring selama pandemi COVID-19, sekaligus ingin mengetahui apakah skala ini mampu menghasilkan informasi yang tidak terpengaruh oleh karakteristik individu dengan menggunakan pemodelan Multiple Indicators and Multiple Cause (MIMIC). Partisipan sebanyak 251 orang dari empat kategori daerah di Indonesia yaitu Jawa Timur, Jawa Tengah, Jawa Barat dan Non-Jawa ikut serta dalam penelitian ini. Pendekatan *confirmatory factor analysi*s (CFA) di bawah the *structural equation modeling* (SEM) dipilih sebagai metode utama dalam analisis data. Hasil penelitian menunjukkan bahwa konstruk skala persepsi risiko pengguna transportasi daring dengan enam komponen dan telah dikontekstualisasikan ke dalam situasi pandemi COVID-19 terbukti fit. Selanjutnya, pemodelan MIMIC menunjukkan bahwa skala ini bersifat invarian atau dapat menghasilkan informasi yang konsisten sebab tidak terpengaruh oleh variabel-variabel kovariat, seperti usia, domisili, jenis kelamin, status perkawinan, tingkat pendidikan, lama menggunakan transportasi online, jenis transportasi daring yang digunakan, serta pekerjaan (kecuali karyawan swasta). Untuk riset selanjutnya, sangat disarankan untuk melakukan studi eksploratori mengenai persepsi risiko dan analisis dari peran kovariat sosio-ekonomi.

Kata Kunci: COVID-19, MIMIC model, persepsi risiko, transportasi daring

Introduction

The World Health Organization (2020) stated that Corona Virus Disease 2019 (COVID-19) has become a global pandemic and still continues to this day. In Indonesia, *Satgas Penanganan* COVID-19 (COVID-19 response acceleration task force) reported that the number of positive cases of COVID-19 in Indonesia has reached more than one million cases (Satuan Tugas Penanganan COVID-19, 2021). Data from *Komite Penanganan COVID-19 dan Pemulihan Ekonomi Nasional* (Committee for Handling COVID-19 and National Economic Recovery) shows that on the 16th of June 2021, there were 1,531,005 positive cases of COVID-19 in Indonesia. This number increased by 8,161 compared to the previous day. The number of active cases also reached 83,700. Based on the detail per province DKI Jakarta ranked the highest in the positive case with 440,071 cases, followed by West Java with 328,940 cases and Central Java with 215,684 cases (Komite Penanganan Corona Virus Disease 2019 (COVID-19) dan Pemulihan Ekonomi Nasional, 2021). The increase in COVID-19 cases encourages the Indonesian government to make national-scale regulations because it

threatens the security of all citizens (Everts, 2020).

New Habit Adaptation (NHA) is one of the Indonesian Government's policies to be applied by all Indonesian citizens. NHA consists of several points, such as 1) always use a mask when going out of the house; 2) avoid touching the eyes, nose, and mouth; 3) take a distance of more than one meter from other people when outside the house; 4) wash your hands with soap frequently; 5) always follow the development of information from trusted sources (Komite Penanganan Corona Virus Disease 2019 (COVID-19) dan Pemulihan Ekonomi Nasional, 2020a). Like the previous outbreak, most countries have remained the society to apply NHA especially when we travel to densely populated areas, visit hospitals, and use public transportation (Wang, 2014; Zhang, et al., 2019).

Another national-scale policy to minimize COVID-19 spread in Indonesia is *Pemberlakuan Pembatasan Sosial Berskala Besar* or PSBB (large-scale social restrictions) referring to the social distancing concept. Society applying social distancing or PSBB tends to avoid the public area with large crowds like shopping centers, markets, education institutions, and hospitals (Majid et al., 2020). As a response to PSBB enforcement, people who live in business, education, and other sectors are continuing their activities by adapting new normal habits. It is because they assume that restrictions and new normal adaptation are very effective to minimize COVID-19 transmission (Alauddin, et al., 2020).

Compliance with the implementation of the PSBB also depends on the risk perception of the COVID-19 outbreak. How risk perceptions are owned is the basis for community decision for choosing to do preventive behaviors or not and travel or stay at home during the pandemic (Hilyard, et al., 2010; Majid, et al., 2020; Rayani, et al., 2021; Wong & Sam, 2011). Those who perceive that they have a lower risk of being infected with COVID-19, tend to keep doing outside activities and violate quarantine regulations even though they know the consequences. This phenomenon also occurs in other pandemic situations like SARS and H1N1 (DiGiovanni et al., 2004; Hernández-Jover et al., 2012; Kamate et al., 2009).

In Indonesia, society seems not to realize that going outside during PSBB is harmful. A survey conducted by Komite Penanganan COVID-19 dan Pemulihan Ekonomi Nasional (2020b) proved that only 38.75% of participants rarely left the house during the PSBB, while the rest was still left the house. Those who left the house chose online transportation, as 20.60% of the participants used online motorcycle taxis (*ojek*) and another 20.03% chose online taxis.

According to the survey, the number of people who tend to go outside using online transportation was still high; online transportation providers need to have a standard risk perception instrument in the COVID-19 pandemic setting to produce representative data with the user perception. It is crucial since the behavior changing and perception toward online transportation in the pandemic era will affect users' behaviors in the post-pandemic.

The previous research had developed various risk perceptions of COVID-19 outbreak scale, namely The COVID-19 Perceived Risk Scale (Yıldırım & Güler, 2020), Questionnaire of Risk perception toward COVID-19 (Shahnazi, et al., 2020), COVID-19 Risk Perception Scale (Lu, et al., 2021; Padmanabhanunni & Pretorius, 2021), and Fear of COVID-19 Scale (Ahorsu, et al., 2020; Green, et al., 2021). Other than that there are some studies (Birhanu, et al., 2021; Fu, et al., 2021; Kader, et al., 2021) that adapted the risk perception of the previous outbreak to the COVID-19 context.

All instruments from previous studies have demonstrated good psychometric properties in reliability and construct validity. However, there has not been a single risk perception instrument of the COVID-19 outbreak that has been used or created in the context of online transportation during the COVID-19 pandemic. So far, we can only find the Perceived Risk Scale developed by Kusumayani et al (2019) in the context of online transportation before the COVID-19 outbreak in Indonesia. Therefore, this study aims to assess the psychometric properties of the Perceived Risk Scale of Online Transportation Customers in the COVID-19 outbreak.

This study also used the Multiple Indicators Multiple Cause (MIMIC) model to test construct validity by involving several covariate variables. By using the MIMIC model, the researcher wants to obtain a scale that is invariant or able to produce information that is not disturbed by the characteristics of the participants. MIMIC model is needed because if the scale is prone to population heterogeneity (demographic background, social and economic status, and environment) as covariate variables, it will tend to produce biased information (Widhiarso, 2012). Information bias from the data generated by the risk perception instrument may occur because the public's response to risk itself is influenced by factors such as daily experience and educational background (Dony et al., 2017; You, 2011). Thus, online transportation providers can enrich their understanding of risk perceptions among their users which can be used as consideration in policy or programs during and after the pandemic.

Methods

Participants

Convenience sampling was used to select participants from the population. The participants are 251 participants who used online transportation during the pandemic, with 192 participants are female and 59 are males. The average age of participants was 28.1 (SD = 8.52). In terms of marital status, 100 participants were married and the rest was single. Participants' domicile was divided into four categories: East Java (n=142), Central Java (n=44), West Java (n = 35), and outside Java (n = 30). The majority of participants were taking or had finished the bachelor program (n = 126). Regarding the occupations, 80 participants were private employees, 29 were entrepreneurs, 26 were civil servants, 45 participants were unemployed or working in other occupations, then the rest (79 participants) were students. For additional information, this research enabled participants to give information about how long they had used online transportation (*M = 2.9; SD = 1.18*) and how many service types were used in the pandemic situation (*M = 2.16; SD = 1.23*).

Measures

The researchers used a modification of the Perceived Risk Scale of Online Transportation Customers in Indonesia (Kusumayani et al., 2019). It consists of seven components called financial risk (RN), social risk (RS), time risk, physical risk (RF), functional risk (RG), psychological risk (RP), and overall risk (RU). As reported by developers this 7-component scale had good internal consistency (α = 0.888). In this study, the researchers did not include time risk as mentioned in the original scale because it was intended to measure the delay of a product could satisfy customers or not. Therefore, the researcher considers the time risk component irrelevant to the context of using online transportation during the COVID-19 pandemic.

The Perceived Risk Scale of Online Transportation Customers modified consists of 18 items with three items in each component. Each item would be rated by the participant on 5 points on Likert type scale (1 = extremely unlikely; 5 = extremely likely). Several examples items that had been contextualized are "*Saya khawatir akan tertular COVID-19 setelah menggunakan berbagai macam layanan angkutan online*" (I am worried that I will catch COVID-19 after using various online transportation services); "*Saya merasa tidak aman menggunakan layanan angkutan online di masa pandemi*" (I don't feel safe using online transportation services during pandemic);

"*Saya khawatir layanan yang diberikan oleh pengendara angkutan online di masa pandemi tidak sebaik biasanya*" (I am worried that the services provided by online transportation drivers during the pandemic are not as good as usual).

Procedures

First, the researchers did the modification of the Perceived Risk Scale of Online Transportation Customers by adjusting the scale context to COVID-19 pandemic situations and the services that be used (online transportation). Next, the researchers did data collecting using the online method. Data was obtained using an online questionnaire (Google Form). This method was chosen because it could reach a wide range of participants and is quite helpful for improving the research process (Creswell & Creswell, 2018). Moreover, the data collection process was performed during a pandemic. Even though this study was using the online method, researchers are able to obtain the data from participants (see Participants) who represent internet users in Indonesia. This is based on the results of a survey by Asosiasi Penyelenggara Jasa Internet Indonesia (2020) which found that the majority of internet users in Indonesia are female, occupied as students or private employees, and are domiciled on Java.

The participants were asked to fill in the demographic variables such as gender, marital status, domicile, education level, and occupation. Afterward, they were asked to fill out the modified risk perception scale. Then, the researchers did data cleansing and created the dummy variables of socio-demographics, such as domicile and occupation. Data analysis was done using several statistical applications, such as Jeffreys's Amazing Statistics Program (JASP), Analysis of Moment Structure (AMOS), and Jamovi.

Data analyses

Participant risk perception was analyzed using a Multiple Indicator Multiple Cause (MIMIC) method, the expansion of confirmatory factor analysis (CFA) involving covariates in the model. The MIMIC model tried to facilitate the heterogeneity of the population by involving a set of predictors or covariates in the model (Muthén, 1989). The main benefit of MIMIC was that this method can be applied to a smaller sample size because there was only one model in each analysis process (Widhiarso, 2012). In this study, CFA was applied using the item parceling technique in each component of risk perception.

The mentioned sociodemographic variables and information about the use of online transportation were used as a covariate in the MIMIC model (see Table 1). The researchers created some dummy sociodemographic variables

and selected a referred group to be compared with other groups. The dummy sociodemographic variables consisted of sex (males as a referred group), marital status (single as a referred group), domicile (East Java as a referred group), level of education (graduate program as a referred group), and occupation (civil servant as a referred group). Meanwhile, age, duration of online service use, and type of services used were needed as continuous variables.

The chi-square value, Tucker-Lewis Index (TLI), Comparative Fit Index (CFI), and Root Mean Square Error of Approximation (RMSEA) were used as the model accuracy index. Each index had its critical value to visualize the model fit. The model had a chi-square value more than the table chi-square value (p>0.05); the CFI and TLI values more than 0,95, and the RMSEA below 0,06 could be identified as a fit model (Hu & Bentler, 1999; Kline, 2014).

Table 1.
Characteristics of the study sample

Categorical /Ordinal Measures		N	%	Continuous Measures	N	M	SD
Gender	Male	59	23.5%	Age	251	28.1	8.52
	Female	192	76.5%	Year of transportation online use	251	2.90	1.18
Marital status	Married	100	39.8%	Types of online transportation services	251	2.16	1.23
	Single	151	60.2%				
Domicile	East Java	142	56.6%				
	Central Java	44	17.5%				
	West Java	35	13.9%				
	Outside Java	30	12.0%				
Education level	Senior Secondary Education	94	37.5%				
	Undergraduate	126	50.2%				
	Graduate	31	12.4%				
Occupation	Private employee	80	31.9%				
	Civil servant	26	10.4%				
	Entrepreneur	29	11.6%				
	Student	71	28.3%				
	Others	45	17.9%				

Results

Internal consistency reliability

Table 2 presents the internal consistency reliability of the Perceived Risk Scale of Online Transportation Customers. Reliability analysis was carried out by employing the single-trial administration approach using the Cronbach Alpha coefficient. From this analysis, it was observed that this scale had good internal consistency (α = 0.894). In addition, the corrected-item total correlations for the items of the scale were strong, ranging from 0,349 to 0,689.

Confirmatory Factor Analysis

After performing item score packaging to the same component, the researchers did a CFA analysis of six components of risk perception in online transportation users during the COVID-19 pandemic. Six components of risk perception exclude covariate variables and without correlation between residual indicators showed non-fit model accuracy index (p = 0.000, CFI = 0.833, TLI

= 0.721, RMSEA = 0,235). Through suggestions from modification indices (M.I), the researchers found a relatively high score of *model-constrained covariance* between several components. Next, the researchers did additional CFA analysis using components residual correlation as suggested by M.I. This process resulted in an acceptable model fit index (p= 0.049, CFI= 0.992, TLI= 0.975, RMSEA= 0.070). The modified model of CFA was applied in the MIMIC model analysis.

MIMIC Model of Risk Perception

The result of model fit showed transformation when covariates were included in the analysis (see Table 3). The result of the MIMIC model illustrates that the addition of sociodemographic variables implied to model fix index p = 0.002, CFI = 0.978, TLI = 0.945, RMSEA = 0.046). Nevertheless, the fit index of the MIMIC model was still acceptable, and all factor loadings remained significant.

The covariate difference among significant sociodemographic groups in the factor latent score or risk perception was only found in the

participant's occupation, specifically private employee (see Table 4 and Figure 1). Private employees had a latent score of 0.364 higher than civil servants. In addition to private employees, students with a latent score of 0.275 showed that marginally significant there is a slight difference in risk perception with civil servants. However, the risk perception measurement was invariant or not affected by population heterogeneity as a covariate variable i.e., age, domicile, gender, marital status, level of education, length of time using online transportation, types of online transportation services, and occupation (except private employee).

Table 2.
Internal consistency reliability

Item	item-rest correlation	if item dropped
RN 1	0.496	0.889
RN 2	0.497	0.889
RN 3	0.349	0.896
RS 1	0.544	0.888
RS 2	0.436	0.891
RS 3	0.579	0.887
RF 1	0.552	0.887
RF 2	0.405	0.892
RF 3	0.506	0.889
RG 1	0.610	0.885
RG 2	0.527	0.888
RG 3	0.606	0.886
RP 1	0.470	0.890
RP 2	0.559	0.887
RP 3	0.614	0.885
RU 1	0.622	0.886
RU 2	0.628	0.886
RU 3	0.689	0.883
Reliability		Value
Reliability (Cronbach $\alpha > 0.70$)		0.894

Table 3.
Factor loading and Model Fit Indices of Initial CFA Model, Modified CFA Model, and MIMIC Model

Component	Initial CFA Model	Modified CFA Model	MIMIC Model
Factor loading			
RN	0.692	0.580	0.568
RS	0.631	0.765	0.753
RF	0.589	0.405	0.400
RG	0.771	0.619	0.612
RP	0.803	0.732	0.723
RU	0.815	0.911	0.929
RF with RG	-	0.245	0.248
RF with RP	-	0.133	0.138
RS with RG	-	0.098	0.101
RG with RP	-	0.101	0.106
Model fit			
Probability	0.000	0.049	0.002
CFI	0.833	0.992	0.978
TLI	0.721	0.975	0.945
RMSEA	0.235	0.070	0.046

Notes. All factor loadings are significant at p<0,001

Table 4.
The impact of covariates on risk perception

Predictors	MIMIC Model			
	B	**S.E.**	**P**	**β**
Age	-0.001	0.006	0.808	-0.023
Central Java	-0.050	0.115	0.667	-0.035
West Java	0.029	0.112	0.796	0.018
Outside Java	0.128	0.115	0.266	0.077
Females	0.087	0.085	0.310	0.068
Married	0.085	0.104	0.413	0.077
Private Employee	0.424	0.152	**0.005***	**0.364***
Entrepreneur	0.213	0.169	0.208	0.126
Students	0.331	0.174	0.057	0.275
Others	0.248	0.160	0.121	0.176
Senior Secondary Education	0.021	0.144	0.887	0.018
Undergraduate	-0.025	0.129	0.848	-0.023
Length of time using online transportation	0.010	0.031	0.752	0.021
Types of online transportation services	-0.048	0.030	0.114	-0.109

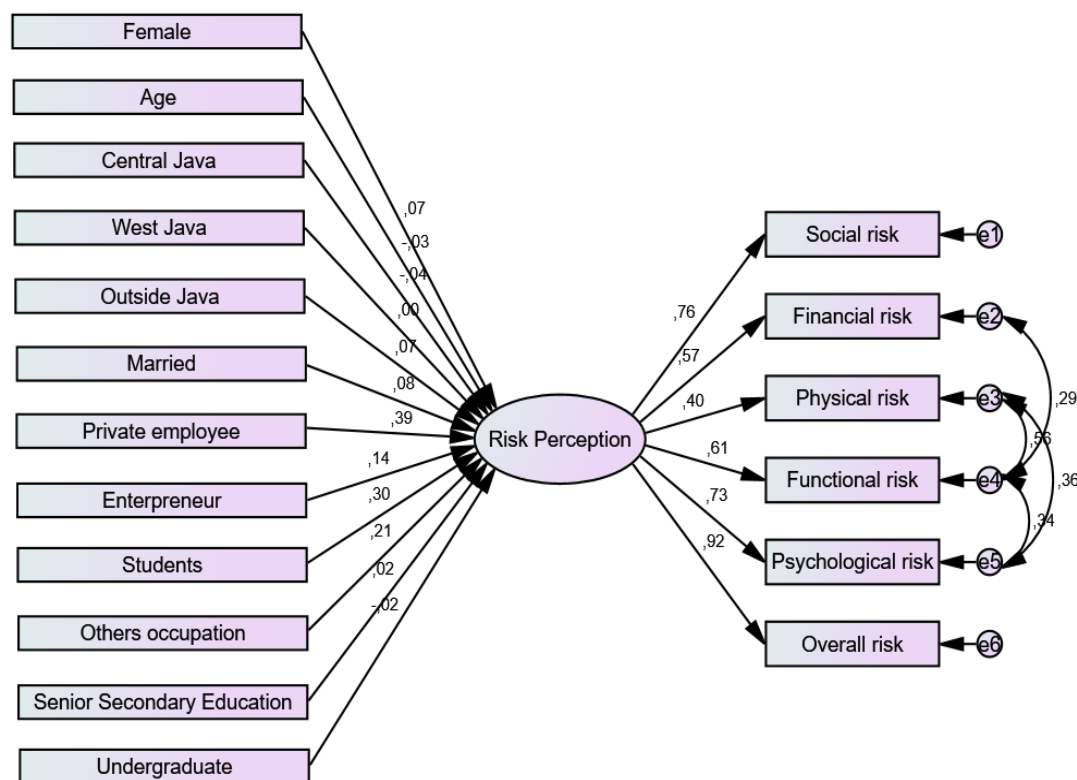*Notes. B*, unstandardized estimate; S.E., standard error; *β*, standardized estimate; *p<0.01;

Figure 1. Multiple Indicator Multiple Cause (MIMIC) model showing the impact of covariate variable on the risk perception as latent variable

Discussion

This study showed the use of a perceived risk model with six of 18 items verified by CFA. After that, it was verified using CFA in an overall sample that showed an average index fit model; next, this result was used for MIMIC model analysis. The risk perception of online transportation customers measurement using the MIMIC model proved that it was invariant to covariate variables such as age, domicile, sex, marital status, length of time using online transportation, types of online transportation services, and occupation (except private employee). In consequence, Borsboom (2006) stated that the invariant scale was able to accommodate the population heterogeneity.

Before measuring risk perception, it is important to know that there are two ways to understand risk perception as a feeling or experimental system and risk as an analysis or rational system (Epstein, 1994; Slovic et al., 2004). A sociodemographic covariate is a rational answer because it contains personal data that can be identified as personal identity. Whereas the answer related to the length of time using online transportation and types of online transportation services represent the result of participants' experiment during the use of online transportation services.

The findings showed that private employees had a higher level of perception of the risk of the COVID-19 outbreak when using online transportation services than civil servants. We argue that private employees are the most vulnerable to losing their jobs or becoming unemployed during this pandemic. Therefore, the private employees who are vulnerable to losing their jobs will consider the use of economic resources, not least when using online transportation services. Previous research has also shown that unemployed individuals have a higher perception of risk as a cause of fear than working individuals (Green et al., 2021; Mahmood et al., 2020). This may be due to the uncertainty of the COVID-19 crisis which has caused economic instability, so they become increasingly anxious (Wang et al., 2020).

Moreover, students who use online transportation during pandemics have a marginally significantly different risk perception than civil servants. This finding indicates that students tend to not have appropriate risk perception, thus they tend to underestimate to reduce their fear and anxiety, which disturbs the preventive action (Mant et al., 2021). How the perception of the risk of COVID-19 in students is based on the behavior of seeking health information related to COVID-19 (Rayani et al., 2021)

Thus, this study had proven that the Perceived Risk Scale of Online Transportation Customers during the COVID-19 pandemic when simultaneously used on a population consisting of private employees and students would tend to produce less consistent measurements. This needs to be taken into account because one of the most important measurement properties is the stability of the measurement results when applied to different individual characteristics (Widhiarso, 2012). In line with Chauvin (2018) that not considering the background related to how participants understand the risk before taking measurements can lead to inaccurate conclusions.

Generally, in the COVID-19 pandemic context, the health system and technology are related to society's risk perception. COVID-19 pandemic causes changes in several aspects, such as social patterns, demographic, and environmental. These changes cause the risk to the operation of the health system and can elicit the new measurement, ways, strategies, and risk management (Alauddin et al., 2020; de Amorim & de Andrade Guerra, 2020). Likewise, the machine learning-based technology used by online transportation providers can help them to modify their applications. Modifications that can be applied such as automatic tracking to notify if someone is infected by the virus, an early warning system to detect the mask use, and density of public transportation routes or safe lanes from the virus spreading areas (Moss & Metcalf, 2020).

As a response to the high public desire to travel during the COVID-19 pandemic, the online transportation provider makes some policies to prevent COVID-19 spread while using online transportation. For example, Gojek applies J3K policy or *jaga kesehatan* (take care of health), *jaga kebersihan* (keep clean), and *jaga keamanan* (keep safe) (Gojek, 2020). Grab as another online transportation provider also makes some policies to ensure the safety and comfort of its customer like restricting physical contact, providing medical tools (e.g. mask and hand sanitizer), and doing routine body temperature checks for Grab's partner (Grab, 2020). These regulations in this pandemic era can be seen as an adjustment between providers and customers to prevent the transmission of COVID-19 (Mondada et al., 2020). In addition, online transportation providers can use their internet-based applications to spread a balanced combination of efficacy messages and threat appeals to increase the self-protection responses which intend reduced customer risk perceptions. Birhanu et. al. (2021) have proven that internet-based media or applications are the main sources for people to get this information.

Conclusions

According to the results, it can be proven that the risk perception scale of online transportation users which has been contextualized with the COVID-19 pandemic situation has good internal consistency and the construct of this scale is fit. This scale can be classified as an invariant scale—in other words, this scale can produce consistent measurement results because it can accommodate population heterogeneity. However, after finding out the difference in risk perception in online transportation users between occupations, the suggestion for further research is to continue the study of the roles of socioeconomic covariates toward risk perception. Researchers

only meet the CFA model fit index after correlating the residual among components. Hence, the researchers also suggest doing exploratory research to examine the risk perception.

References

Ahorsu, D. K., Lin, C.-Y., Imani, V., Saffari, M., Griffiths, M. D., & Pakpour, A. H. (2020). The Fear of COVID-19 Scale: Development and Initial Validation. *International Journal of Mental Health and Addiction*. https://doi.org/10.1007/s11469-020-00270-8

Alauddin, M., Islam Khan, M. A., Khan, F., Imtiaz, S., Ahmed, S., & Amyotte, P. (2020). How can process safety and a risk management approach guide pandemic risk management? *Journal of Loss Prevention in the Process Industries*, *68*, 104310. https://doi.org/10.1016/j.jlp.2020.104310

Asosiasi Penyelenggara Jasa Internet Indonesia. (2020). *Laporan Survei Internet APJII 2019—2020* [Annual Report]. Asosiasi Penyelenggara Jasa Internet Indonesia & Indonesia Survey Center. https://apjii.or.id/survei

Birhanu, Z., Ambelu, A., Fufa, D., Mecha, M., Zeynudin, A., Abafita, J., Belay, A., Doyore, F., Oljira, L., Bacha, E., Feyisa, J., Hadis, Z., Ayele, K., Addisu, Y., Gutu, B., Tesfaye, D., Tilahun, T., Imana, G., Tolosa, T., … Kebede, Y. (2021). Risk perceptions and attitudinal responses to COVID-19 pandemic: An online survey in Ethiopia. *BMC Public Health*, *21*(1), 981. https://doi.org/10.1186/s12889-021-10939-x

Borsboom, D. (2006). When Does Measurement Invariance Matter?: *Medical Care*, *44*(Suppl 3), S176–S181. https://doi.org/10.1097/01.mlr.0000245143.08679.cc

Chauvin, B. (2018). Individual differences in the judgment of risks: Sociodemographic characteristics, cultural orientation, and level of expertise. In M. Raue, E. Lermer, & B. Streicher (Eds.), *Psychological Perspectives on Risk and Risk Analysis: Theory, Models, and Applications* (pp. 37–62). Springer International Publishing. https://doi.org/10.1007/978-3-319-92478-6

Creswell, J. W., & Creswell, J. D. (2018). *Research design: Qualitative, quantitative, and mixed methods approaches* (Fifth edition). SAGE.

de Amorim, W. S., & de Andrade Guerra, J. B. S. O. (2020). Pandemics, global risks and adaptation: Challenges for a changing world. *Research in Globalization*, *2*, 100023. https://doi.org/10.1016/j.resglo.2020.100023

DiGiovanni, C., Conley, J., Chiu, D., & Zaborski, J. (2004). Factors Influencing Compliance with Quarantine in Toronto During the 2003 SARS Outbreak. *Biosecurity and Bioterrorism: Biodefense Strategy, Practice, and Science*, *2*(4), 265–272. https://doi.org/10.1089/bsp.2004.2.265

Dony, J., Smith, K., & Knee, K. (2017, July 3). Risk Perception: Theories, Strategies, and Next Steps. *The Campbell Institute*. https://www.thecampbellinstitute.org/risk-perception-theories-strategies-and-next-steps/

Epstein, S. (1994). Integration of the cognitive and the psychodynamic unconscious. *American Psychologist*, *49*(8), 709–724. https://doi.org/10.1037/0003-066X.49.8.709

Fu, L., Wang, X., Deng, S., Zhang, Q., & Liu, Y. (2021). Informational support, risk perception, anti-pandemic motivation and behavior: A longitudinal study in China. *Current Psychology*. https://doi.org/10.1007/s12144-021-02071-1

Gojek. (2020). *J3K Pillars* [Technology company policy]. https://www.gojek.com/j3k/

Grab. (2020). *Bersama kita hadapi COVID-19* [Technology company policy]. https://www.grab.com/id/safety/covid-19/

Green, Z. A., Noor, U., Ahmed, F., & Himayat, L. (2021). Validation of the Fear of COVID-19 Scale in a Sample of Pakistan's University Students and Future Directions. *Psychological Reports*, 003329412110167. https://doi.org/10.1177/00332941211016754

Hernández-Jover, M., Taylor, M., Holyoake, P., & Dhand, N. (2012). Pig producers' perceptions of the Influenza Pandemic H1N1/09 outbreak and its effect on their biosecurity practices in Australia. *Preventive Veterinary Medicine*, *106*(3–4), 284–294. https://doi.org/10.1016/j.prevetmed.2012.03.008

Hilyard, K. M., Freimuth, V. S., Musa, D., Kumar, S., & Quinn, S. C. (2010). The Vagaries Of Public Support For Government Actions In Case Of A Pandemic. *Health Affairs*, *29*(12), 2294–2301. https://doi.org/10.1377/hlthaff.2010.0474

Hu, L., & Bentler, P. M. (1999). Cutoff criteria for fit indexes in covariance structure analysis: Conventional criteria versus new alternatives. *Structural Equation Modeling: A Multidisciplinary Journal*, *6*(1), 1–55. https://doi.org/10.1080/107055199095 40118

Kader, N., Elhusein, B., Al Abdulla, S., Hamza, A. H., Al Maslamani, M., Chandra, P., Perayil, R., Vincent, J., Gunashekaran, J., & Alabdulla, M. (2021). Risk Perception and Psychological Impact of COVID-19 Pandemic Among Healthcare Workers in Primary and Secondary Healthcare Settings in Qatar: A National Study. *Journal of Primary Care & Community Health*, *12*, 215013272110397. https://doi.org/10.1177/215013272110 39714

Kamate, S. K., Agrawal, A., Chaudhary, H., Singh, K., Mishra, P., & Asawa, K. (2009). Public knowledge, attitude and behavioural changes in an Indian population during the Influenza A (H1N1) outbreak. *The Journal of Infection in Developing Countries*, *4*(01), 007–014. https://doi.org/10.3855/jidc.501

Kline, P. (2014). *The New Psychometrics: Science, Psychology and Measurement*. Routledge. https://doi.org/10.4324/978131578781 7

Komite Penanganan Corona Virus Disease 2019 (COVID-19) dan Pemulihan Ekonomi Nasional. (2020a, June 18). *Ketahui: Adaptasi Kebiasaan Baru* [Government policy]. https://covid19.go.id/edukasi/apa-yang-harus-kamu-ketahui-tentang-covid-19/adaptasi-kebiasaan-baru

Komite Penanganan Corona Virus Disease 2019 (COVID-19) dan Pemulihan Ekonomi Nasional. (2020b, October 1). *Hasil Survei Perilaku Masyarakat di Masa Pandemi COVID-19* [Government report]. https://covid19.go.id/p/berita/pasien-sembuh-covid-19-jumlahnya-terus-meningkat-menjadi-429807-orang

Komite Penanganan Corona Virus Disease 2019 (COVID-19) dan Pemulihan Ekonomi Nasional. (2021). *Peta Sebaran* [Government report]. https://covid19.go.id/peta-sebaran

Kusumayani, A. I., Geshica, L., Arlianto, Nugroho, D. C., & Helmi, A. F. (2019). Are Go-Jek Services Really Safe? Developing a Perceived Risk Scale. *2nd International Conference on Intervention and Applied Psychology (ICIAP 2018)*, 1035–1042. https://doi.org/10.2991/iciap-18.2019.85

Lu, P., Kong, D., & Shelley, M. (2021). Risk Perception, Preventive Behavior, and Medical Care Avoidance among American Older Adults During the COVID-19 Pandemic. *Journal of Aging and Health*, *33*(7–8), 577–584. https://doi.org/10.1177/089826432110 02084

Mahmood, Q. K., Jafree, S. R., & Qureshi, W. A. (2020). The Psychometric Validation of FCV19S in Urdu and Socio-Demographic Association with Fear in the People of the Khyber Pakhtunkhwa (KPK) Province in Pakistan. *International Journal of Mental Health and Addiction*. https://doi.org/10.1007/s11469-020-00371-4

Majid, U., Wasim, A., Bakshi, S., & Truong, J. (2020). Knowledge, (mis-)conceptions, risk perception, and behavior change during pandemics: A scoping review of 149 studies. *Public Understanding of Science*, *29*(8), 777–799. https://doi.org/10.1177/096366252096 3365

Mant, M., Holland, A., & Prine, A. (2021). Canadian university students' perceptions of COVID-19 severity, susceptibility, and health behaviours during the early pandemic period. *Public Health in Practice*, *2*, 100114. https://doi.org/10.1016/j.puhip.2021.10 0114

Mondada, L., Bänninger, J., Bouaouina, S. A., Gauthier, G., Hänggi, P., Koda, M., Svensson, H., & Tekin, B. S. (2020). Doing paying during the Covid-19 pandemic. *Discourse Studies*, *22*(6), 720–752. https://doi.org/10.1177/146144562095 0860

Moss, E., & Metcalf, J. (2020). High Tech, High Risk: Tech Ethics Lessons for the COVID-19 Pandemic Response. *Patterns*, *1*(7), 100102. https://doi.org/10.1016/j.patter.2020.10 0102

Muthén, B. O. (1989). Latent variable modeling in heterogeneous populations. *Psychometrika*, *54*(4), 557–585. https://doi.org/10.1007/BF02296397

Padmanabhanunni, A., & Pretorius, T. (2021). The role of fortitude, loneliness, and depression in the association between risk perception of contracting COVID-19 and life satisfaction: Serial mediation analysis. *South African Journal of Psychology*, 008124632110378.

https://doi.org/10.1177/008124632110 37811

Rayani, M., Rayani, S., & Najafi-Sharjabad, F. (2021). COVID-19-related knowledge, risk perception, information seeking, and adherence to preventive behaviors among undergraduate students, southern Iran. *Environmental Science and Pollution Research*. https://doi.org/10.1007/s11356-021-14934-y

Satuan Tugas Penanganan COVID-19. (2021). *Analisis Data COVID-19 Indonesia* [Government report]. Komite Penanganan Corona Virus Disease 2019 (COVID-19) dan Pemulihan Ekonomi Nasional. https://covid19.go.id/berita/analisis-data-covid-19-indonesia-update-30-mei-2021

Shahnazi, H., Ahmadi-Livani, M., Pahlavanzadeh, B., Rajabi, A., Hamrah, M. S., & Charkazi, A. (2020). Assessing preventive health behaviors from COVID-19: A cross sectional study with health belief model in Golestan Province, Northern of Iran. *Infectious Diseases of Poverty*, *9*(1), 157. https://doi.org/10.1186/s40249-020-00776-2

Slovic, P., Finucane, M. L., Peters, E., & MacGregor, D. G. (2004). Risk as Analysis and Risk as Feelings: Some Thoughts about Affect, Reason, Risk, and Rationality. *Risk Analysis*, *24*(2), 311–322. https://doi.org/10.1111/j.0272-4332.2004.00433.x

Wang, C., Horby, P. W., Hayden, F. G., & Gao, G. F. (2020). A novel coronavirus outbreak of global health concern. *The Lancet*, *395*(10223), 470–473. https://doi.org/10.1016/S0140-6736(20)30185-9

Wang, K.-Y. (2014). How Change of Public Transportation Usage Reveals Fear of the SARS Virus in a City. *PLoS ONE*, *9*(3), e89405. https://doi.org/10.1371/journal.pone.00 89405

Widhiarso, W. (2012). Penerapan Model MIMIC untuk Menguji Konsistensi Hasil Pengukuran melalui Skala. *Journal of Education and Learning (EduLearn)*, *6*(2), 109. https://doi.org/10.11591/edulearn.v6i2. 153

Wong, L. P., & Sam, I.-C. (2011). Behavioral responses to the influenza A(H1N1) outbreak in Malaysia. *Journal of Behavioral Medicine*, *34*(1), 23–31. https://doi.org/10.1007/s10865-010-9283-7

World Health Organization. (2020). *Coronavirus disease 2019 (COVID-19)* (No. 72). https://apps.who.int/iris/bitstream/han dle/10665/331685/nCoVsitrep01Apr20 20-eng.pdf

Yıldırım, M., & Güler, A. (2020). Factor analysis of the COVID-19 Perceived Risk Scale: A preliminary study. *Death Studies*, 1–8. https://doi.org/10.1080/07481187.2020 .1784311

You, K. (2011). Education, risk perceptions, and health behaviors. In *MPRA Paper* (No. 35535; MPRA Paper). University Library of Munich, Germany. https://ideas.repec.org/p/pra/mprapa/3 5535.html

Zhang, C.-Q., Chung, P.-K., Liu, J.-D., Chan, D. K. C., Hagger, M. S., & Hamilton, K. (2019). Health Beliefs of Wearing Facemasks for Influenza A/H1N1 Prevention: A Qualitative Investigation of Hong Kong Older Adults. *Asia Pacific Journal of Public Health*, *31*(3), 246–256. https://doi.org/10.1177/101053951984 4082