

Mediating Effects of Risk Perception on Association Between Social Support and Coping with COVID-19: An Online Survey

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Abstract

Backgrounds:

This study aimed to develop a model for estimating the mediating effects of risk perception and confidence on the association between perceived social support and active coping with the coronavirus disease 2019 (COVID-19) pandemic among people in Taiwan.

Methods:

The data of 1,970 participants recruited from a Facebook advertisement was analyzed. Perceived social support, active coping with COVID-19, risk perception and confidence were evaluated using self-administered questionnaires.

Results:

The structural equation modeling was applied to verify the direct and indirect effects between variables. The mediation model demonstrated that lower perceived social support was significantly associated with a higher level of active coping with COVID-19, and this was mediated by a higher level of risk perception.

Conclusions:

The present study identified the importance of risk perception on the public's coping strategies during the COVID-19 pandemic.

Introduction

Public coping strategies for infective respiratory disease pandemics

Coronavirus disease 2019 (COVID-19) is a novel infectious disease, which emerged at the end of 2019 and soon became a health burden worldwide [1]. People may change their daily routines due to the adoption of protective behaviors against COVID-19 and they often search for additional information on the disease. Understanding how the public cope with a pandemic can help health professionals better understand the impact it has on their daily lives, the adequacy of policy for infection control, and the future outcomes of the pandemic. For instance, handwashing is the behavior most recommended by the World Health Organization to protect individuals from contracting COVID-19 [2]. Individuals who have no active coping strategies for the COVID-19 pandemic have a higher risk of being infected. For example, individuals with cognitive impairment and people with mental illness are vulnerable to COVID-19 infection as they have little awareness of risk and maladaptive coping strategies regarding personal protection [3]. A web-based survey of people in mainland China reported that those with negative coping strategies had a higher level of psychological distress during the COVID-19 epidemic [4]. Therefore, investigation into factors that predict active coping with the COVID-19 pandemic in the public is crucial for estimating the multi-dimensional impacts of COVID-19.

Influence of perceived social support

Whether perceived social support affects individuals' coping strategies against the threat of COVID-19 remains unclear. Previous research has demonstrated that higher social support was positively associated with problem-focused coping among the elders who experienced Typhoon Morakot in Taiwan [5]. A study of US populations revealed that support via financial security was a predictor of adherence to the Centers for Disease Control and Prevention (CDC) guidelines for infection control of COVID-19 [6]. However, how perceived social support influences coping strategies against COVID-19 was not clear. Therefore, whether there are factors that mediate the association between perceived social support and active coping with the COVID-19 pandemic warrants further study.

Associations between risk perception and confidence with active coping

A meta-analysis of experimental studies demonstrated that people's intentions and behavior were changed following heightened risk appraisals, including risk perceptions [7]. Regarding infective respiratory disease, a study recruiting Canadian adults revealed that worry regarding H1N1 was significantly associated with those individuals seeking a vaccination, indicating there is an association between perceived risks and coping changes [8]. However, another cross-sectional study with three timeline surveys demonstrated that the association between risk perception and behavior was inconclusive among the public during influenza pandemics [9]. Confidence in coping with the COVID-19 pandemic is also an important predictor of active coping with infective respiratory disease. Research has found that having more knowledge and information were significantly associated with self-efficacy in coping with severe acute respiratory syndrome [10] and COVID-19 [11]. Therefore, whether risk perception and confidence mediate the association between social support and active coping with COVID-19 warrants further study.

Aims of the current study

Adoption of adequate coping strategies for infective respiratory disease pandemics affects not only personal health but also the efficacy of infection control for the whole society. The aims of the present study were to identify any association between perceived social support and active coping with the COVID-19 pandemic, and the potentially mediating effects of risk perception and confidence.

Methods

Participants and procedure

Facebook users aged ≥ 20 years and living in Taiwan were recruited into this study between April 10th and April 23rd 2020. A Facebook advertisement was posted, which included a headline, main text, a pop-up banner and a web-link to the research questionnaire website. The recruiting advertisement was

designed to appear in the “News Feed” of Facebook, which is a streaming list of updates from the user’s connections (e.g. friends) and advertisers. A previous study indicated that News Feed advertisements are more effective in terms of recruitment metrics for research studies [12]. In order to increase its visibility, we also posted the online advertisement to the social medias, such as Line and Facebook group.

This study was approved by the Institutional Review Board of Kaohsiung Medical University Hospital (approval no. KMUHIRB-EXEMPT(I)20200011). Although participants were not given any incentive for their participation, at the end of the questionnaire we provided them with the URL links to the online COVID-19 Information Centers from the Taiwanese CDC, Kaohsiung Medical University Hospital, and the Medical College of National Cheng Kung University so they could search for useful information.

Questionnaires

Perceived social support

We estimated the levels of satisfaction with individuals perceived social support using three questions: “In the past week, did you receive satisfactory support from your 1) family, 2) friends, and 3) colleagues or classmates?” The responses were graded on a 5-point Likert scale, with scores ranging from 0 (entirely disappointed) to 4 (extremely satisfied). Higher total scores indicated more satisfaction with their level of perceived social support during the COVID-19 pandemic.

Active coping with COVID-19

In a previous study we developed 7 questions to assess the respondents’ level of active coping with the threats of COVID-19 during their daily lives [13]. These questions asked participants if they: 1) avoided going to crowded places, 2) kept good indoor ventilation, 3) cleaned or disinfected their house more often, 4) washed their hands more often, 5) wore a mask, 6) searched for information on COVID-19, and 7) avoided clinic visits or missed reservations at clinics in the past week. The responses were transformed into 0 (“no” or “yes, but not due to COVID-19”) and 1 (“yes, due to COVID-19”).

Risk perception toward COVID-19

According to Liao *et al* [13], we developed the following question to assess the severity of current worry towards COVID-19: “Please rate your level of current worry towards COVID-19.” The severity of current worry towards COVID-19 was rated from 1 (minimal) to 10 (extremely severe). We also developed 4 additional questions to evaluate the different categories of risk perception: 1) “If you developed flu-like symptoms tomorrow, would you be worried? Reply: 1 (not at all) to 5 (extremely)”, 2) “In the past week, have you worried about catching COVID-19? Reply: 1 (not at all) to 5 (extremely)”, 3) “How likely do you think it is that you will contract COVID-19 over the next 1 month? Reply: 1 (impossible) to 7 (guaranteed)”, and 4) “What do you think your chances are of getting COVID-19 over the next month compared with others outside your family? Reply: 1 (impossible) to 7 (guaranteed)”.

Confidence against COVID-19

Self-confidence about COVID-19 and perceived confidence in the local governments controlling the COVID-19 pandemic were assessed using the following 2 questions: 1) “How confident are you that you will overcome the threats of the COVID-19 pandemic?” and 2) “How confident are you that your city is controlling the COVID-19 pandemic?” The response was scored on a 5-point Likert scale, with scores ranging from 0 (not at all confident), 1 (not very confident), 2 (neutral), 3 (confident), and 4 (very confident). Higher scores indicate that the individual was more confident about overcoming the COVID-19 pandemic.

Statistical analysis

To examine the hypothesized multiple mediation model for the association between perceived social support and active coping with COVID-19, which was mediated by risk perception or confidence (Fig. 1), the following analyses were conducted using SPSS and AMOS version 23.0 for Windows (SPSS Inc., Chicago, IL, USA). We examined bivariate associations among the variables using Pearson’s correlation coefficient (*r*). Then, the two steps of structural equation modeling (SEM) were used. First, confirmatory factor analysis (CFA) was used to verify the association between latent variables and their indicators in the measurement model. Each question was composed of observed variables (indicators), and latent variables, which indicated perceived social support, active coping with COVID-19, risk perception, and confidence. Factor loading was used as an index to assess the scale reliability between indicators and the corresponding latent variables in the CFA. In addition, Cronbach’s α was reported to examine the internal consistency reliability. The range was considered acceptable if Cronbach’s α was > 0.5 [14].

Latent variable path analysis with maximum likelihood parameter estimations was used to estimate the model adequacy and the direct/indirect effects of perceived social support on active coping with COVID-19 through risk perception or confidence [15]. As a multiple mediator model, both mediators were applied into the model to assess and compare the mediating effects. As there was a relatively high proportion of females in the study cohort and the fact that the Kolmogorov-Smirnov test ($p < 0.001$) for age was significant, indicating that there was non-normal distribution, age and gender were also included within the multiple mediators’ model as covariates to adjust for their effects on the latent variables. Gender (female, male and transgender) was transformed into two dichotomous dummy variables (male vs. female; and transgender vs. female) for the analysis. The standardized estimates (beta coefficient; β) were reported for the predictive strength explained in the model.

We used the Sobel test to examine the mediating effect [16]. Furthermore, to test the adequacy of the model, multiple indices were applied to verify the goodness of fit. For each of these fit indices, the values indicating an acceptable model fit were as follows: Goodness of Fit Index ($GFI \geq 0.9$); Adjusted Goodness of Fit Index ($AGFI \geq 0.9$); Root-Mean Square Error of Approximation ($RMSEA < 0.08$); and Standardized Root Mean Square Residual ($SRMR \leq 0.08$) [17, 18].

Results

Descriptive statistics, CFA, and the correlation matrix

Initially, there were 2,031 respondents who filled in the online questionnaire. After exclusion of those respondents with missing values ($n = 31$) and those aged below 20 years ($n = 30$), there were a total of 1,970 participants (1,305 females, 650 males, and 15 transgender) included in the analysis. The mean age of participants was 37.81 ± 11.00 years. The correlation matrix with significance, mean and standard deviation for each indicator is shown in Table 1.

Table 1
The correlation matrix of observed variables.

	Mean	SD	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
1	0.94	0.23	0.13*	0.14*	0.16*	0.18*	0.09*	0.06*	0.18*	0.1*	0.18*	0.11*	0.04	-0.1*	-0.05*	0.01	< 0.01
2	0.88	0.32	-	0.24*	0.15*	0.12*	0.14*	0.09*	0.05*	0.05*	0.12*	0.04	< 0.01	-0.02	0.01	-0.01	-0.02
3	0.67	0.47		-	0.27*	0.19*	0.22*	0.15*	0.16*	0.21*	0.23*	0.09*	0.04	-0.09*	-0.07*	-0.02	-0.04
4	0.92	0.28			-	0.39*	0.18*	0.07*	0.16*	0.15*	0.16*	0.08*	0.07*	-0.05*	-0.04	0.03	-0.01
5	0.89	0.31				-	0.21*	0.1*	0.18*	0.18*	0.22*	0.13*	0.12*	-0.07*	-0.04	0.02	-0.004
6	0.76	0.43					-	0.12*	0.18*	0.17*	0.21*	0.11*	0.05*	-0.9*	-0.05*	-0.04	-0.05*
7	0.17	0.37						-	0.07*	0.13*	0.09*	0.08*	0.03	-0.1*	-0.04	-0.05*	-0.07*
8	3.93	0.92							-	0.45*	0.48*	0.27*	0.18*	-0.22*	-0.13*	0.01	-0.02
9	2.59	0.99								-	0.55*	0.46*	0.33*	-0.31*	-0.23*	-0.06*	-0.1*
10	6.14	2.25									-	0.37*	0.23*	-0.32*	-0.24*	-0.02	-0.05*
11	3.47	1.14										-	0.57*	-0.39*	-0.27*	-0.09*	-0.09*
12	3.53	1.28											-	-0.23*	-0.17*	-0.04	-0.02
13	2.41	0.84												-	-0.54*	0.16*	0.18*
14	2.32	0.95													-	0.12*	0.13*
15	2.98	0.80														-	0.62*
16	2.90	0.72															-
17	2.71	0.83															

*: $P < 0.05$; 1 = Coping-1; 2 = Coping-2; 3 = Coping-3; 4 = Coping-4; 5 = Coping-5; 6 = Coping-6; 7 = Coping-7; 8 = Risk-1; 9 = Risk-2; 10 = Risk-3; 11 = Risk-4; 12 = Risk-5; 13 = Risk-6; 14 = Con-1; 15 = Support-1; 16 = Support-2; 17 = Support-3.

Tests for the mediation model and estimated co-efficient paths

The first step of the SEM estimated the factor loadings through CFA (Table 2). The result of the reliability test was also presented, which indicated the acceptable range of reliability. After adjusting for age and gender, the multiple mediator model estimated the indirect and direct effects, and the estimated path co-efficient is illustrated in Fig. 2. We found that an indirect effect at a value of -0.06 reached statistical significance (Sobel test: $Z = -4.05$; $P < 0.05$), and this was based on the product terms of the path from perceived social support to risk perception ($\beta = -0.13$, $p < 0.001$) and the path from risk perception to active coping with COVID-19 ($\beta = 0.49$, $p < 0.001$). On the other hand, the mediating effect of confidence on the path between perceived social support and active coping with COVID-19 was not significant (Sobel test: $Z = 0.99$; $P = 0.32$). Moreover, the direct effect from perceived social support to active coping with COVID-19 was not statistically significant. The significance of the path analysis did not change after adjusting for age and gender.

These results confirm the mediating effect of risk perception on the association between perceived social support and active coping with COVID-19. Based on the model fit index, we found that the hypothesized model had an adequate model fit index for RMSEA (0.068), GFI (0.927), AGFI (0.902), and SRMR (0.069), indicating that our hypothesized mediation model was a good-fitting model.

Table 2
Principle component analysis for factors in the conceptual model

Latent variables / Observed variables	Factor loading	Cronbach's Alpha
Active coping with COVID-19		0.56
Avoid going to crowded places (Coping-1)	0.32	
Keep good indoor ventilation (Coping-2)	0.33	
Disinfect house more often (Coping-3)	0.50	
Wash hands more often (Coping-4)	0.55	
Wear a mask (Coping-5)	0.53	
Search information of COVID-19 (Coping-6)	0.40	
Prevent clinic visits or lost follow up (Coping-7)	0.23	
Risk perception		0.71
Develop flu-like symptoms tomorrow (Risk-1)	0.57	
Worried about catching COVID-19 last week (Risk-2)	0.76	
Rate current level of your worry to COVID-19 (Risk-3)	0.71	
How likely you will contract COVID-19 (Risk-4)	0.61	
Chances of getting COVID-19 next 1 month (Risk-5)	0.46	
Confidence against COVID-19		0.70
Self-confidence overcoming threats of COVID-19 (Con-1)	0.89	
Perceived confidence of regional government (Con-2)	0.61	
Perceived social support		0.81
Family members (Support-1)	0.69	
Friends (Support-2)	0.89	
Colleagues or classmates (Support-3)	0.75	

Discussion

Main findings of current study

In the current study, the indirect effect was found that lower perceived support was significantly associated with higher level of coping with COVID-19, which was mediated by higher level of risk perception. In addition, the direct effect from perceived social support to coping with COVID-19 and another indirect effect mediated by confidence against COVID-19 did not reach statistical significance.

Mediating effect of risk perception on the association between perceived social support and active coping with COVID-19

The current study found that a higher level of risk perception fully mediated the association between lower perceived support and a higher level of active coping with COVID-19. Although a previous study indicated that financial security predicted better coping strategies against COVID-19 [6], it might not be similar to the association between perceived social support and active coping with COVID-19. Perceived social support represents satisfaction with the general support provided by family, friends and colleagues/classmates, which represent broader domains than financial support. In addition, although it was not investigating infective respiratory diseases, a previous study demonstrated that a higher level of social support was associated with a lower perceived risk of breast cancer [19]. It was supposed that individuals with a higher level of perceived social support might feel that they were relatively safe, leading to optimism bias, which caused them to believe that they were less likely to experience negative events [20]. Individuals with such bias may underestimate their risk of COVID-19; however, further studies are warranted to test the effects of optimism bias on risk perception.

The current study found that a higher level of risk perception was associated with a higher level of active coping with COVID-19. Research addressing the association between risk perception and coping strategies in patients with diabetes found that those who had a low pre-morbid perception of risks often engaged in diabetes-related risky behaviors [21]. A systemic review demonstrated that healthcare workers' risk perceptions can influence their behavior towards patients and facilitate risk-mitigating strategies for emerging acute respiratory infection diseases [22]. Further prospective studies may provide a better understanding of for the temporal relationship between risk perception and active coping in relation to infective respiratory diseases.

The non-significant mediating effect of confidence on the association between perceived social support and active coping with COVID-19

The present study found that perceived social support was positively associated with confidence, whereas the association between confidence and coping with COVID-19 was not significant. A cross-sectional observational study on medical staff treating patients with COVID-19 in China, demonstrated that levels of social support were significantly associated with self-efficacy [23]. Self-efficacy represents how well one can execute courses of action required to deal with prospective situations, and indicates an individual's belief that they can overcome obstacles [24]. Although confidence against COVID-19 cannot be entirely compared with self-efficacy, the association between perceived social support and confidence observed in the current study deserves further investigation to explore the potential effect of social support on self-efficacy.

On the other hand, the insignificant association between confidence and active coping with COVID-19 means that confidence fails to significantly mediate the association between perceived social support and active coping with COVID-19. Since previous studies have emphasized the significant association between gathering information and confidence [11, 25], gathering information was only considered as part of active coping with COVID-19 in the current study. It is supposed that other factors among active coping with COVID-19 interfered with the association, and further research is necessary to determine the detailed interactions between confidence and coping strategies against COVID-19.

Limitations

The present study had several limitations which need to be addressed. First, possible selection bias might confound the results, as participants were only recruited through a Facebook advertisement. Second, it was limited to exploring the causal inference among the variables due to the cross-sectional design of this study. Finally, in Taiwan COVID-19 had a limited impact in comparison with other countries worldwide, so whether the results can be generalized to other countries is unclear and warrants further investigation.

Conclusion

The present study revealed that lower perceived social support was indirectly associated with increased active coping against COVID-19, and that this association was mediated by higher risk perception. However, the current study could not identify the mediating effect of confidence or a direct effect between perceived social support and active coping with COVID-19. Subjects who were satisfied with their social support might have optimism bias that weakened their risk perception and had a compromising effect on their motivation to cope with COVID-19. Therefore, besides sufficient support, it is important to enhance risk perception and reduce the effect of optimism bias during the COVID-19 pandemic. Timely and correct information about current threats and coping strategies against COVID-19 are necessary and should be announced by the authorities through traditional (newspapers or television news) and digital media. Public education on infection control is also necessary both during infectious disease outbreaks and at other times.

There are several suggestions for further research, which could help extend the findings of the present study. A paper-and-pencil questionnaire as opposed to a digital one, along with printed advertisements posted in public areas would be beneficial to also include non-netizens within the study population. Moreover, further studies investigating optimism bias and self-efficacy through the General Self-Efficacy Scale [26] may be helpful to explore how people cope with the threats of COVID-19.

Abbreviations

COVID-19: coronavirus disease 2019; CDC: Centers for Disease Control and Prevention; SEM: structural equation modeling; CFA: confirmatory factor analysis

Declarations

Acknowledgements

Not applicable.

Ethics approval and consent to participate

This study was approved by the Institutional Review Board of Kaohsiung Medical University Hospital (approval no. KMUHIRB-EXEMPT(I)20200011).

Consent for publication

We did not use informed consent because that it was an online survey. Online questionnaires were developed through Google Forms. Participation in the online survey was voluntary. Survey responses were kept anonymous.

Availability of data and materials

The datasets used and/or analyzed during the current study are available from the corresponding author on reasonable request by Cheng-Fang Yen. chfaye@cc.kmu.edu.tw

Competing interests

All authors declare that they have no conflicts of interest.

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Authors' contributions

Dian-Jeng Li: Conceptualization, Methodology, Formal analysis, Investigation, Writing - original draft. Nai-Ying Ko: Formal analysis, Data curation, Conceptualization. Yu-Ping Chang: Methodology, Data curation. Cheng-Fang Yen: Conceptualization, Methodology, Formal analysis, Project administration, Writing - review & editing. Yi-Lung Chen: Formal analysis, Writing - review & editing.

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Figures

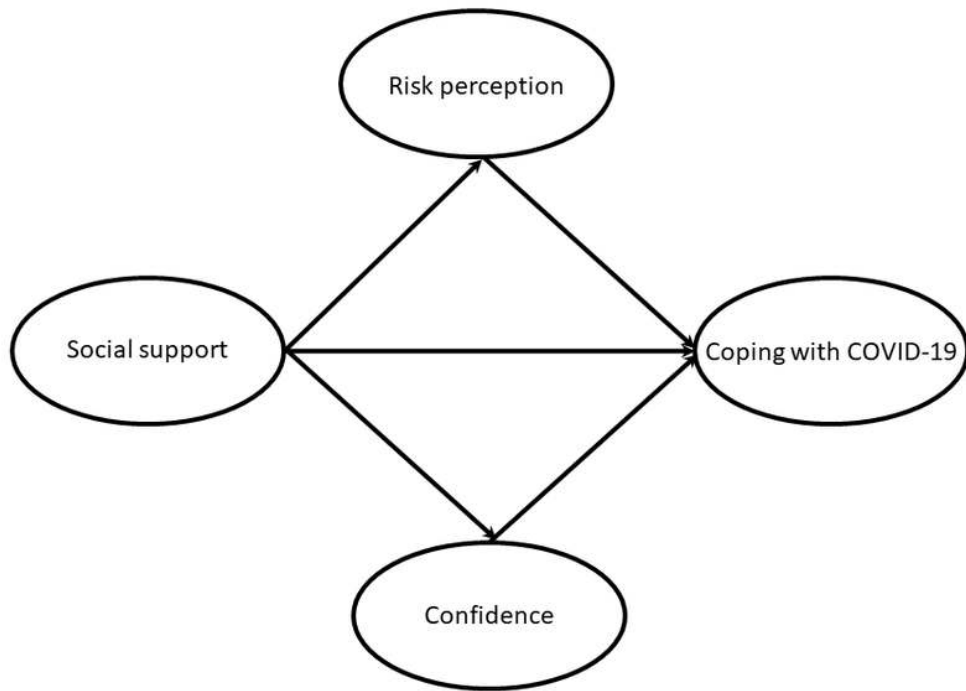


Figure 1

The conceptual model of mediating effect

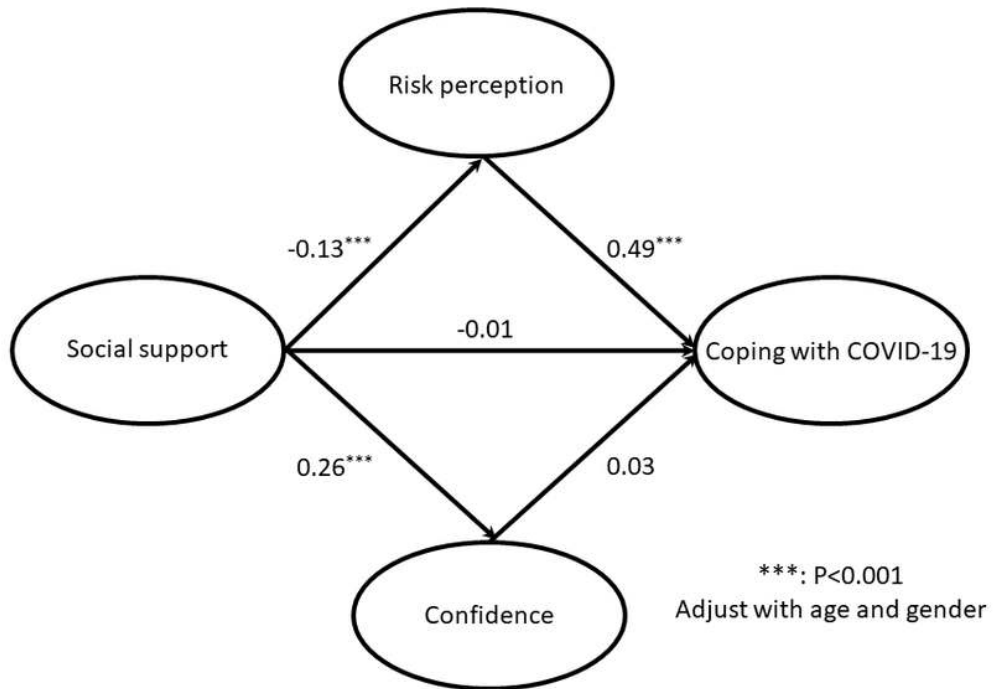


Figure 2

Final model of mediating effect indicating the estimated coefficients of the paths