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Big five personality traits and resilience as predictors for self-isolation adherence during COVID-19 pandemic

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ABSTRACT

Background & Aim: Results of previous studies on the role of personality traits and resilience in explaining health-oriented behaviors such as social/physical distance and self-isolation were inconsistent. The present study was conducted to determine the role of the five big personality traits and resilience in adherence to self-isolation during the COVID-19 pandemic.

Methods & Materials: A prospective longitudinal cohort study tracked 112 healthcare providers who tested positive for SARS-CoV-2. Using GPS data from their cell phones, researchers assessed self-isolation adherence over 14 days. Participants completed NEO-Five-Factor Inventory (NEO-FFI) and Connor–Davidson Resilience Scale (CD-RISC) questionnaires.

Results: Sixty-one (58.7%) of the subjects violated their self-isolation, and 43 (41.3%) did not violate it during the 14 days after PCR positivity for COVID-19. After adjustment for potential confounders, results showed that only two of the five big personality traits included, conscientiousness (AOR=1.37; 95%CI: 1.15–1.63) and neuroticism (AOR=0.85; 95%CI: 0.74–0.98), were significantly related to the self-isolation adherence. This means a one-unit increase in conscientiousness is associated with 37% higher odds of self-isolation adherence, while a one-unit increase in neuroticism reduces self-isolation adherence by 15%. Resilience was the main predictor for self-isolation adherence in which a one-unit increase in resilience score, the odds of adherence to self-isolation significantly increased by 18% (AOR=1.18, 95%CI: 1.07–1.30) (P<0.001).

Conclusion: The study suggests that fostering conscientiousness and resilience among individuals may enhance self-isolation commitment during pandemics. Further research is needed to explore the influence of agreeableness, extraversion, and openness to experience on self-isolation adherence.

Introduction

In December 2019, SARS-CoV-2, a new coronavirus causing COVID-19, emerged in Wuhan, China, leading to a global pandemic (1). The World Health Organization (WHO) declared it a public health emergency in January 2020 (2). To prevent the virus's spread, containment measures like social distancing and self-isolation were implemented (3). WHO and Centers for Disease Control and Prevention (CDC) recommend infected individuals, symptomatic or not, to self-isolate for 10-20 days to prevent further transmission (4). Isolation helps prevent the spread of SARS-CoV-2 to HCWs. As with all respiratory virus outbreaks, isolating COVID-19 patients is a vital precaution to safeguard HCWs, especially in intensive care units (5). Failure to adhere to isolation protocols can have severe health consequences for infected healthcare workers (HCWs). These consequences may include heart disease, stroke, type 2 diabetes, depression, anxiety, and even premature death. Additionally, families of infected HCWs are at risk of exposure.

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If HCWs do not isolate properly, they may unknowingly transmit the virus to family members, jeopardizing their health and well-being. Furthermore, the failure to isolate HCWs can contribute to community transmission, overwhelming healthcare systems, straining resources, and increasing the overall burden of COVID-19 on society (6). Iran's national guidelines require a 14-day self-isolation following a positive PCR test (7). However, these measures can lead to psychological effects such as anxiety and depression (8).

One of the most important ways to understand the role of personality traits in adapting to constraints is to examine the various dimensions of the big five personality traits. These traits, which include openness to experience, conscientiousness, extraversion, agreeableness, and neuroticism, significantly influence community behaviors and acceptance of group rules. They can predict health-oriented behaviors and individual responses to challenges (9). One of these concepts is conscientiousness, which predicts health-promoting and risk-avoiding behaviors. Conscientious people, who are defined by responsible activities, find it less bothersome to follow restrictions like self-isolation during the COVID-19 pandemic (10). Openness to experience, characterized by a desire for art and empathy, can predict behaviors conforming to social norms (11). The trait of agreeableness reflects individual differences in the concern for social harmony. Agreeableness is a personality trait reflecting a concern for social harmony. Agreeable individuals are generally kind, generous, trusting, and willing to compromise their interests for others, with an optimistic view of human nature. Neuroticism, on the other hand, is associated with experiencing negative emotions and unpleasant experiences, such as anger, anxiety, or depression (12). Extraversion, marked by a wide range of activities and a preference for social stimulation (12), may make it difficult for extroverts to adhere to social distancing guidelines (10). The widely accepted big five personality traits framework was used in this study to assess the participants' personality traits and their influence on adherence to self-isolation during infection as per national health guidelines (13).

Resiliency, an important human ability in stressful situations, helps increase problem resistance and adapt effectively to stress (14). It's a dynamic process that involves enduring hardship, bouncing back from difficulties, and recovering from challenging situations (15). Resilient individuals can thrive despite severe stress. As per Connor and Davidson, resilience isn't just about withstanding harm or danger, but also about actively and constructively engaging with one's environment (16). Two factors are essential to describe resilience: exposure to danger, injury, or threat, and positive adaptation in handling stressors (17). During the COVID-19 pandemic, factors like social isolation and fear of infecting others can affect the resilience of health workers (18). Conscientiousness and openness to experience are linked to health-oriented behaviors and can predict adaptive behaviors like social distancing (9). However, a study by German and Dutch researchers found conscientiousness wasn't a predictor of compliance with health guidelines. Neuroticism influences social distancing and rule-following during a pandemic, but those with higher neuroticism struggle more with coronary heart disease (10).

The existing body of research presents conflicting findings on the role of resilience and personality traits in predicting adherence to self-isolation during infectious disease outbreaks like COVID-19. While some studies suggest that resilience, high conscientiousness, openness to experience, and low neuroticism may contribute to compliance with health guidelines, others do not support these conclusions. Furthermore, health providers, due to their high exposure to and involvement in the COVID-19 pandemic, and their comprehensive understanding of the disease's transmission, transformability, and lethality, present a unique population for studying the impact of resilience and personality traits on self-isolation adherence. However, this area remains largely unexplored (19). Given these inconsistencies and gaps in the literature, this study aims to: 1) Examine the relationship between the five major personality traits and adherence to self-isolation. 2) Investigate the correlation between health providers' resilience and their adherence to self-isolation during the COVID-19 pandemic.

Methods

Design and participants

This prospective longitudinal cohort study was conducted in Sanandaj, the center of Kurdistan province, Iran. Health providers with SARS-CoV-2 positive who expressed willingness to participate in the study and consented to the installation of a unique tracking app (cell phone GPS tracking app) on their mobile phones were included in the study. They should not turn off their mobile phones for 14 days. The GPS program was owned by the telecommunications company. During the COVID-19 epidemic, the telecommunications company collaborated with the Ministry of Health to trigger an alert if someone violated quarantine. This GPS covered a radius of up to 3 kilometers. Participants were 112 health providers who were SARS-CoV-2 positive from 18 January to 18 February 2021.

Procedure

The list of all healthcare providers whose PCR test was positive was obtained from the National Health System (https://sib.muk.ac.ir), which was only available to the public health centers of the province. This project has been assessed and approved by an ethics committee at the Kurdistan University of Medical Sciences. The registry code of the project was: IR.MUK.REC.1400.220. Of the 112 healthcare providers diagnosed with COVID-19 approached, 109 agreed to participate in the study and completed the questionnaires. To protect their personal information, special numerical codes were assigned to each person and it was explained to them that the researchers defined them based on a set of codes and no one had access to their identity information such as names, surnames, and so on. During the follow-up of our cohort, it was found that 5 out of 109 participants in the study had turned their cell phone GPS tracking off during the isolation period and their data was not complete to determine if they were leaving or staying at their home. As a result, they were excluded from the study, and 104 healthcare providers diagnosed with COVID-19 were eventually included in our final analysis.

Questionnaires

Demographic form

Baseline demographic characteristics, including age, sex, education, clinical data such as pre-existing diseases (diabetes, cardiovascular diseases, and psychological disorders), and prior history of COVID-19, were gathered in a checklist. Data related to the participants' personality dimensions and resilience were collected by NEO-Five-Factor Inventory (NEO-FFI) (20), and Connor-Davidson Resilience Scale (CD-RISC) (16) standard questionnaires, respectively.

NEO Five-Factor Inventory (NEO-FFI)

The NEO-FFI-3 is a 60-item version of the NEO-PI-3 that provides a quick, reliable, and accurate measure of the five personality traits including neuroticism, extraversion, openness, agreeableness, and conscientiousness (20). This questionnaire has been translated and validated in Farsi by Garousi Farshi et al (2001). All questions in this questionnaire were based on a five-point Likert scale and ranged from strongly disagree to strongly agree. In the psychometric evaluation of the Farsi version of the NEO-FFI-3 questionnaire, the Cronbach's alpha coefficient of each of the main factors of neuroticism, extraversion, openness to experience, agreeableness, and conscientiousness were 0.86, 0.73, 0.56, 0.68, 0.71, respectively (21).

Resilience

Connor-Davidson Resilience Scale (CD-RISC) is the most widely used scale, which assesses psychological resilience. It was another questionnaire that we used in our study. This scale comprises 25 items rated on a 5-point Likert scale (0-4), with higher scores reflecting greater resilience (16) The results of its validity and reliability in Iran by Samani et al. confirmed its validity and reliability with Cronbach's alpha coefficient =87% (22). Our interesting outcome was the accuracy of self-isolation adherence during the 14 days which was determined through an alarming system of cell phone GPS of the study subjects.

Ethical considerations

This research has been performed in accordance with the Declaration of Helsinki. The proposal of the study has been evaluated and approved by the ethics committee at the Kurdistan University of Medical Sciences (Ethics code: IR.MUK.REC.1400.22). written informed consent was obtained from each participant before the data collection.

Statistical analysis

Means and standard deviations were used to describe quantitative data and frequency and percentage were used to summarize the categorized data. The Chi-square test of independence/ Fisher's exact test was used to examine the relationship between qualitative variables. The mean difference of quantitative variables between the two groups (individuals who adhered to or did not adhere to self-isolation) was evaluated using an independent samples t-test when normality was ascertained, otherwise, the Mann-Whitney U test was implemented. To reduce the effect of potential confounders, the relationship between the independent variables, including different dimensions of personality, resilience, demographic and clinical characteristics of healthcare providers diagnosed with COVID-19, and the study outcome (adhered to or did not adhere to self-isolation) was modeled using a multiple logistic regression model. All analyses were conducted in SPSS version 24, and a p-value of <5% was set for statistical significance.

Results

The data of 104 subjects, including 53 (51%) women and 51 (49%) men, were analyzed in the present study. The mean age of participants was 34.5 years, and 73% had a bachelor's degree or above. Sixty-one (58.7%) of the studied subjects violated their self-isolation, and 43 (41.3%) did not violate the self-isolation during the 14 days after PCR positivity for COVID-19. Demographic characteristics and past medical history of study participants are shown in Table 1. As indicated in Table 1, healthcare providers diagnosed with COVID-19 with higher education degrees were more committed to self-isolation.

Table 1. Demographic characteristics and history of pre-existing diseases of study participants (N=104)

Variables		Not adhering to self-isolation	Adhered to Self-isolation	Total	P-value
Age (mean ± SD)		34.56±7.49	34.42±7.89	34.5±7.6	0.09*
Sex, N (%)	Men	29 (%47.5)	22 (%51.2)	51(%49)	0.07**
	Women	32 (%52.5)	21 (%48.8)	53 (%51)	
Education, N (%)	Diploma	19 (%31.1)	9 (%20.9)	28 (%26.9)	0.04**
	Bachelor	27 (%44.3)	13 (%30.2)	40 (%38.5)	
	Master and higher	15 (%24.6)	21 (%48.8)	36 (%34.6)	
Pre-existing Disease, N (%)	Diabetes	2 (%3.3)	1 (%2.3)	3 (%2.9)	0.08***
	Cardiac disease and Hypertension	4 (%6.6)	4 (%9.3)	8 (%7.7)	
	No pre-existing diseases	55 (%90.2)	38 (%88.4)	93 (%89.4)	

* Independent T-test, **Chi-squared test, *** Fisher's exact test

As detailed in Table 2, the results of univariate analyses (logistic regression) revealed that the odds of adherence to self-isolation in healthcare providers diagnosed with COVID-19 who have education degrees of Master and above was significantly (OR=2.95, 95%CI:1.05–8.30) higher than those with diploma degrees (P<0.001). Results indicated that four of the five big personality traits, including conscientiousness (OR=1.29; 95%CI: 1.15–1.44), neuroticism (OR=0.85; 95%CI: 0.80 -.91), extraversion (OR=1.15; 95%CI: 1.04 - 1.26), agreeableness (OR=1.07; 95%CI: 1.01–1.14) were significantly associated with adherence to self-isolation in the univariates analysis. After adjustment to potential confounders using a multiple logistic regression model, results showed that only two of the five big personality traits including conscientiousness (AOR=1.37; 95%CI: 1.15–1.63) and neuroticism (AOR=0.85; 95%CI: 0.74–0.98) were significantly related to the self-isolation adherence. It is worth noting that openness to experience was marginally significantly associated with self-isolation adherence (AOR=1.13, 95%CI: 0.94–1.35) with P-value=0.07. Based on the multiple logistic regression model, resilience was one of the most important predictors of self-isolation adherence. This means with an increase of one score in

resilience, the odds of adherence to self-isolation increased significantly by 18% (AOR=1.18, 95%CI: 1.07–1.30) (P-value<0.001). It is worth mentioning that our multiple logistic regression model was significant according to the Chi-square omnibus test and the model fits the data well according to the Hosmer-Lemeshow test for goodness-of-fit. Furthermore, this model produced an area under the Receiver Operating Characteristic Curve of 0.78 indicating good discriminating capability.

Table 2. Results of the multiple logistic regression model to assess the association between the outcome (Adhered/not adhered to self-isolation) and several independent variables (N=104)

Variable		Crude OR* (95% CI**)	P-value	Adjusted OR (95%CI)	P-value
Age		0.99 (.94–1.05)	92	.90 (.82–1.00)	0.6
Sex	Male	1		1	0.90
	Female	0.86 (.39–1.88)	.71	1.10 (0.227–5.36)	
Education	Diploma	1	-	1	-
	Bachelor	1.01 (.36–2.85)	.97	.57 (.09–3.55)	0.55
	Master and higher	2.95 (1.05–8.30)	.04	1.50 (0.24–9.24)	0.65
Pre-existing disease		1.20 (0.33–4.16)	0.76	1.23 (0.34–4.28)	0.49
Resilience		1.16 (1.08–1.24)	<0.001	1.18 (1.07–1.30)	<0.001
Personality	Conscientiousness	1.29 (1.15–1.44)	<0.001	1.37 (1.15–1.63)	<0.001
	Neuroticism	0.85 (0.80 -.91)	<0.001	0.85 (0.74–0.98)	0.02
	Openness	1.06 (0.99-1.14)	0.07	1.13 (0.94–1.35)	0.07
	Extraversion	1.15 (1.04 - 1.26)	0.003	1.13 (0.94 - 1.35)	0.16
	Agreeableness	1.07 (1.01–1.14)	0.024	0.96 (0.82–1.11)	0.60

*OR: Odds Ratio, **CI: Confidence interval

Discussion

This study examined whether personality traits and resilience are associated with adherence to self-isolation during the COVID-19 pandemic. According to the univariate analysis results, among the studied demographic factors, only the level of education has a significant relationship to compliance with national guidelines regarding self-isolation. Increasing individuals' education increased their adherence to self-isolation. However, multiple logistic regression modeling demonstrated that only postgraduate and higher education were significantly associated with increased adhesion to self-isolation. Among the other independent variables, resilience, conscientiousness, and neuroticism were significant predictors of adherence to self-isolation. Some personality traits, such as agreement, and extraversion had no significant relationship with adherence to self-isolation, while openness to experience had a marginal significant association. The pandemic influenced individuals' personality traits. For instance, heightened stress and uncertainty may have exacerbated neurotic tendencies, while social isolation could impact extraversion and openness (23).

The results showed that conscientiousness is strongly associated with self-isolation among the five big personality traits. This finding is consistent with the concept that conscientiousness is entirely related to each person's responsibilities, and people who display conscientious qualities have healthy habits and effective decision-making (24). Our findings show that people with higher consciences were usually better and more efficient in performing their duties and following care instructions to limit disease transmission and spread (25).

Findings showed that as individuals' neuroticism decreased, their commitment to staying at home and adhering to self-isolation increased. Similar to our findings, peek et al., and Aronson et al. indicated that people with neurotic fears and anxieties have a strong tendency to use the defense mechanism of denial and use this mechanism to overcome their inner anxiety and fear and do more risky actions (26, 27). In addition, high neuroticism leads to undesirable coping behaviors (28). Additionally, other studies have shown that the reason for the negative effect of neuroticism on disease care and prevention behaviors is the depressive aspect of the concept of neuroticism (29).

The results of multiple regression analysis revealed that resilience is the main predictor of self-isolation behavior. Based on the available scientific evidence, resilience can help improve mental health, and ultimately, the commitment of individuals when faced with anxious and critical situations and play an effective role in positive confrontation and effective adaptation to these situations (30). In addition, in line

with our finding, in Santangelo's study, resilience had a significant relationship with the duration of separation in patients, so people with higher resilience scores showed a greater ability to tolerate the duration of separation (31).

The data modeling results did not show a significant relationship between agreeableness and commitment to maintaining self-isolation. In some other studies, contrary to the findings of this study, agreeableness has been cited as a predictor factor for social distance as well as adherence to disease prevention guidelines due to the individual's desire for social acceptance and empathy (10, 32). Studies by Abdelrahman (33) and Tim Bogg (25) have shown that the relationship between adherence to health guidelines and social distance has been insignificant. A possible justification of the present study results, it can be said that using a precise instrument (electronic monitoring by GPS) to measure the outcome/ behavior and not using self-reported data has caused patients not to worry about social acceptance, and their behavior is probably based on their real personality.

According to the results, extraversion did not significantly correlate with the adherence to self-isolation, while openness showed marginal significance. In several studies, contrary to our findings, extraversion (25) and openness to experience (34) showed a positive and significant relationship with social distancing and commitment to the national guidelines. Hence, people with higher extroversion are less likely to adhere to social distancing and self-isolation (9). In Asselmann's study, consistent with our results, extraversion, and openness to experience could not show a significant relationship with social distancing (10). Probably, the desire of extroverts to communicate extensively and not to leave their place of isolation can be justified by their creativity in inventing alternative methods of communication.

Strength and limitation

The main advantage of the present study is the higher precision of the instrument we used to measure the outcome variable. In this study, Adhered/ not adhered to self-isolation was measured by tracking study subjects via GPS, and participants' self-expression regarding staying at home was not considered. Although researchers tried to enter more COVID-19 participants into the present study, only 104 health providers participated in our cohort. Accordingly, it can be said that the first limitation of the present study is the generalizability of the results to the entire population providing health services and that such a sample size may not have had enough power to detect effects when it exists. The second limitation of this study is that this project was conducted on healthcare providers who are naturally more aware of the coronavirus transmissibility and the importance of self-isolation as an important way to prevent infection spreading so that the results of this study could not be generalized to the general population. Indeed, non-adherence to self-isolation in the general population may be higher than in health care providers.

Conclusion

The results of this study suggest that increasing conscientiousness in individuals can increase the level of commitment and adherence of individuals to self-isolation and not leave the place of isolation during the transmissibility of disease. In addition, people who were more resilient in the face of stressful situations were more committed to preventing the transfer of infection to others. It is also possible to increase the commitment to stay in isolation by reducing people's neuroticism level, which includes feelings of fear, depression, perfectionist irrational beliefs, and negative attitudes. Although agreeableness, extraversion, and openness to experience did not significantly predict the commitment to isolation in our study, there is scientific evidence about the impact of these traits on the formation of health-oriented behaviors. Further studies are needed to clarify the role of these personality traits. To enhance resilience, health professionals should receive training in stress management, coping mechanisms, and emotional well-being. Additionally, they should be encouraged to establish social connections, even in virtual settings, to combat loneliness and bolster resilience.

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Conflict of interests

The author(s) declared no potential conflicts of interest concerning this article's research, authorship, and publication.

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