

Age, COVID-19-related fear, insomnia symptoms and cyberchondria: a mediation model

Wiek, strach przed zachorowaniem na COVID-19, objawy bezsenności i cyberchondria: model mediacyjny

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Abstract

Introduction: The subject of our study was the role of age, fear of COVID-19 infection and insomnia as predictors of cyberchondria in a Polish sample. We were also interested in whether insomnia mediated the relationship between fear of COVID-19 infection and cyberchondria in the entire sample.

Material and methods: The study sample consisted of 504 people, including 420 women and 84 men, aged 18 to 76 years ($M \pm SD$ 30.49 \pm 10.28), who were recruited through an online platform. Cyberchondria was assessed using the Polish version of the Cyberchondria Severity Scale. An 11-point numerical rating scale was used to measure the intensity of fear of COVID-19 infection for oneself. Insomnia symptoms were measured using the Polish version of the Athenian Insomnia Scale.

Results: The correlation coefficients indicated positive relationships between the fear of COVID-19 infection and insomnia and cyberchondria, while age correlated negatively with cyberchondria. The hierarchical multivariate linear regression analysis revealed that COVID-19-related fear was the best predictor of cyberchondria. Insomnia and age were also cyberchondria predictors, but to a lesser extent. The mediation analysis revealed a significant indirect relationship between COVID-19-related fear and cyberchondria through insomnia symptoms.

Conclusions: We observed that COVID-19-related fear and, to a lesser extent, age and insomnia were cyberchondria predictors. We also found both direct and indirect relationships between COVID-19-related fear and cyberchondria through insomnia.

Key words: adults, insomnia, age, cyberchondria, COVID-19-related fear.

Streszczenie

Wstęp: Przedmiotem badania była rola wieku, strachu przed zachorowaniem na COVID-19 oraz bezsenności jako predyktorów cyberchondrii w polskiej próbie. Autorów interesowało również, czy bezsenność pośredniczy w związku między strachem przed zachorowaniem na COVID-19 a cyberchondrią w całej próbie.

Materiał i metody: Próba badawcza obejmowała 504 osoby, w tym 420 kobiet i 84 mężczyzn, w wieku od 18 do 76 lat ($M \pm SD$ 30,49 \pm 10,28), zrekrutowanych za pośrednictwem platformy internetowej. Cyberchondria została oceniona za pomocą polskiej wersji skali *Cyberchondria Severity Scale*. Do pomiaru nasilenia strachu przed zachorowaniem na COVID-19 zastosowano 11-punktową skalę liczbową. Objawy bezsenności mierzono za pomocą polskiej wersji *Ateńskiej skali bezsenności*.

Wyniki: Współczynniki korelacji wskazywały na pozytywny związek między strachem przed zachorowaniem na COVID-19 i bezsennością a cyberchondrią oraz ujemny związek między wiekiem a cyberchondrią. Analiza hierarchicznej wielowymiarowej regresji liniowej wykazała, że strach związany z COVID-19 był najlepszym predyktorem cyberchondrii. Bezsenność i wiek także były predyktorami cyberchondrii, ale w mniejszym stopniu. Analiza mediacji wykazała istotny pośredni związek między strachem przed zachorowaniem na COVID-19 a cyberchondrią, w którym pośredniczyły objawy bezsenności.

Wnioski: Wykazano, że strach związany z COVID-19 oraz w mniejszym stopniu wiek i bezsenność są predyktorami cyberchondrii. Stwierdzono również bezpośrednie oraz pośrednie związki między strachem przed zachorowaniem na COVID-19 a cyberchondrią, w których pośredniczyły objawy bezsenności.

Słowa kluczowe: dorośli, bezsenność, wiek, cyberchondria, strach przed zachorowaniem na COVID-19.

Introduction

The subject of our study was the relationship between cyberchondria and age, fear of COVID-19 infection and symptoms of insomnia. We have used the term ‘fear’ rather than ‘anxiety’ related to COVID-19 because, according to the DSM-5 classification, ‘fear’ is an emotional response to an actual or perceived threat, whereas ‘anxiety’ is the result of anticipating a future threat (American Psychiatric Association 2013).

Infection with the SARS-CoV-2 virus causes development of the infectious respiratory disease COVID-19, which, depending on its severity, may lead to pneumonia, respiratory failure and possibly even death (Adhikari *et al.* 2020). The potential COVID-19 mortality rate, fear of infection, and social limitations and changes leading to lockdowns and social isolation have resulted in numerous psychological and psychiatric consequences. Research on global responses to COVID-19 demonstrates that the pandemic has caused depression and anxiety symptoms, especially in women and younger people (COVID-19 Mental Disorders Collaborators 2021). For the Polish population in particular, Gambin *et al.* (2021) found that the highest levels of depression and anxiety related to the COVID-19 pandemic were observed in younger age groups (individuals 18–44 years old), and the lowest levels of depression and anxiety were seen in the 45–85-year-old age group. Those researchers also found that important predictors of depression and anxiety symptoms included difficulties in home relationships, fear, uncertainty about the spread of the virus, and external constraints.

Researchers have highlighted the need for closer examination of the lower levels of depression and anxiety symptoms – as well as post-traumatic stress disorder symptoms – in response to COVID-19 that have been found among the elderly, especially in developed countries. It is well known that older people have fewer coping resources for COVID-19; those resources include biological and cognitive resources as well as material resources (limited access to advanced information technology) and social resources (a small number of close people and friends) to help maintain their mental health (e.g., Farhang *et al.* 2022). On the other hand, older people can compensate for these gaps with closer and more meaningful social relationships, even with a small number of people, and they can benefit from the available professional medical and psychological care. Therefore, the level of

anxiety and depression in response to the threat of the COVID-19 pandemic in this age group may not increase significantly (Vahia *et al.* 2020).

Chinese studies have shown that age and male gender, coexisting with somatic diseases, are significant factors in the development of severe forms of COVID-19 (Geng *et al.* 2021). Other studies, conducted at the epicentre of the COVID-19 pandemic in Wuhan, China, found that the risk factors for death in patients in local hospitals as a result of COVID-19 infection were age (more than 80 years old) and male gender, although these people had risk factors such as somatic diseases (cancerous, cardiological and neurological disorders) that are common to other age groups (Zhang *et al.* 2022). The importance of advanced age and male gender – and the presence of somatic diseases as risk factors for death due to COVID-19 infection – was also demonstrated in French studies (Kaeuffer *et al.* 2020) and a subsequent meta-analysis (Dessie and Zewotir 2021). A meta-analysis by Romero Starke *et al.* (2021) suggested that the risk of infection severity increases with age, but that it is not justified to introduce age thresholds in the COVID-19 severity analysis, as increases in infection severity can be observed in each age group.

Fear of COVID-19 infection can have two additional consequences. One is symptoms of insomnia, and the other is searching the Internet for information about the infection, its symptoms and treatments – a condition known as ‘cyberchondria’.

Some authors (e.g., Cheshmehzangi *et al.* 2022) point out that the health, social and economic challenges associated with the COVID-19 pandemic may disrupt sleep-regulating processes, such as circadian rhythms and brain activation processes, which in turn cause symptoms of insomnia. Bhat and Chokroverty (2022) demonstrated that the stress accompanying the fear of COVID-19 infection and the psychosocial factors associated with a pandemic (e.g., lockdown, quarantine and risk of economic problems) can lead to a range of sleep disorders, such as insomnia, interrupted sleep, a sense of non-regenerative sleep, daytime sleepiness and nightmares. To define the sleep disorder symptoms resulting from the COVID-19 pandemic, Bhat and Chokroverty (2022) proposed the colloquial term ‘coronasomnia’, and Gupta and Pandi-Perumal (2020) proposed the term ‘COVID-somnia’. A study by Goncalves *et al.* (2022) showed that younger women who fear COVID-19 infection and have relatively low incomes are particularly at risk of developing

insomnia. However, a meta-analysis (Li *et al.* 2022) showed that insomnia primarily affects people prone to this type of disorder, such as healthcare workers, COVID-19 patients, patients with chronic somatic diseases and patients with mental disorders. In one of the studies, the researchers showed that alarmist media messages regarding the pandemic were also important factors in coronasomnia (Otlea *et al.* 2022).

Stress and fear about their own health and lives prompt people to search for information about disturbing symptoms, their significance and the treatment options. Internet resources become the source of easily available information. Starčević and Berle (2013) have described this phenomenon as 'cyberchondria'. It is defined as a tendency to over-worry about one's health and to increase Internet research for medical information about symptoms, which may be accompanied by general anxiety about health, doubts and the need to explain the symptoms. Indeed, excessive use of the Internet to search for information on health status may itself lead to an increase in anxiety (which resulted in the initial search) (Hashemi *et al.* 2020). The main predictors of cyberchondria are anxiety sensitivity, intolerance to uncertainty and obsessive-compulsive symptoms. According to Starčević *et al.* (2021), the development of cyberchondria during the pandemic resulted from high uncertainty about the medical and psychosocial consequences of the pandemic. As indicated by Laato *et al.* (2020), the excess of hard-to-distinguish information about the pandemic increased the feeling of anxiety and intensified cyberchondria. Research by Jungmann and Wirthöft (2020) has shown that cyberchondria is positively correlated with fear of the SARS-CoV-2 virus, and this relationship is moderated by fear for one's own health. Notably, the perceived susceptibility to COVID-19 infection has also been associated with cyberchondria, poor sleep quality, health anxiety and obsessive-compulsive symptoms (Yalçın *et al.* 2022). As indicated by Vismara *et al.* (2021), cyberchondria during the pandemic has increased, especially in women, young people, and people suffering from somatic diseases, depression and obsessive-compulsive symptoms, as well as problematic Internet users. The same study also showed that quality of life and self-esteem are inversely correlated with cyberchondria (Vismara *et al.* 2021). In turn, Maftai and Holman (2020) showed that in a group of older people, optimism – as opposed to neuroticism – reduces the likelihood of cyberchondria and the fear for one's health. However, the lower frequency of cyberchondria in older age groups

may result instead from the lower availability of IT techniques in this group or the lower skills of older people in using these techniques.

The aim of the current study was to determine the role of age, fear of COVID-19 infection and insomnia as predictors of cyberchondria in a Polish sample. We were also interested in whether insomnia mediates the relationship between fear of COVID-19 infection and cyberchondria in the entire sample. We hypothesised that age, fear of COVID-19 infection and insomnia would predict cyberchondria and that insomnia would serve as a moderator between COVID-19-related fear and cyberchondria.

Material and methods

Participants

The study sample consisted of 504 people aged 18-76 ($M \pm SD$ 30.49 \pm 10.28) comprising 420 women and 84 men. A detailed description of the study sample is presented in Table 1. Participants were recruited through an online platform. They were informed of the study's purpose, that their participation was voluntary and that they could withdraw from participation at any time without needing to give a reason. Participants were not remunerated for their participation. Participants gave their informed consent to participate by proceeding to fill in the questionnaires.

Measures

Cyberchondria was assessed using the Polish version of the Cyberchondria Severity Scale (CSS) (McElroy and Shevlin 2014; Polish adaptation by Beata Bajcar, Jolanta Babiak and Agnieszka Olchowska-Kotala). The CSS comprises 33 items and uses a 5-point Likert scale (1 – *never*, 2 – *rarely*, 3 – *sometimes*, 4 – *often*, 5 – *always*). In this study, we considered the overall score for cyberchondria (Cronbach's $\alpha = 0.93$).

An 11-point numerical rating scale was used to measure the intensity of fear of COVID-19 infection for oneself. Each participant assessed the severity of fear they were experiencing at the time of testing by pointing to a number on a scale from 0 (*I feel absolutely no fear*) to 10 (*I feel unimaginable fear*).

Insomnia symptoms were measured using the Polish version of the Athenian Insomnia Scale (AIS) (Soldatos *et al.* 2000; Polish adaptation by Małgorzata Fornal-Pawłowska, Dorota Wołyńczyk-Gmaj and Waldemar Szelenberger). The AIS contains eight items that are scored from 0 to 3. The Cronbach's α coefficient for this scale in the studied sample was 0.83.

Ethics

The research procedure strictly followed ethical principles for human research and was approved by the Research Ethics Committee at the University of Warsaw Faculty of Psychology (ref: 27-10-2020). All procedures followed were also in accordance with the Helsinki Declaration of 1975, as revised in 2000.

Statistics

All calculations were made using the IBM SPSS 27 software. To analyse cyberchondria predictors, multivariate hierarchical linear regression analyses were performed. Mediation analysis was performed via Hayes' PROCESS macro version 4.1 (2018). Mediation analysis was carried out using the bootstrap method with 5000 sample draws (95% confidence intervals).

Results

As reflected in the data presented in Table 1, the proportion of women and men in this study was unequal. Women accounted for 83.7%, while men accounted for 16.3%. Most of the study participants were people with higher levels of education (63.5%), single (46.2%) or in marriage or partnerships (47.4%) and living in large cities (49.2%).

Table 2 contains data on descriptive statistics and Pearson's correlations for the variables studied. The results of the descriptive statistical analysis presented in Table 2 confirmed the normality of the distribution of the results of COVID-19 fear, insomnia symptoms and cyberchondria. The age distribution was different from the normal one. As seen in Table 2, COVID-19-related fear and insomnia symptoms positively correlated with cyberchondria, while the correlation between age and cyberchondria was negative. Age positively correlated with COVID-19-related fear, while there was no significant correlation between age and insomnia symptoms. COVID-19-related fear positively correlated with insomnia symptoms.

In the hierarchical multivariate linear regression analysis, age (included in Step 1) was a non-

significant predictor of cyberchondria. Age and fear of COVID-19 infection (included in the regression analysis in Step 2) explained 8% of the variance in cyberchondria. When a new predictor such as insomnia symptoms was added in Step 3, this predictor increased the explained cyberchondria variance by 1%. Overall, hierarchical multivariate linear regression analysis explained 9% of cyberchondria variability. The model was not burdened with the problem of collinearity (VIF, variance inflation factor values were between 1.0 and 1.3). The semipartial correlation coefficients indicated rather weak relationships between the predictors and cyberchondria (the highest correlation value was confirmed for the fear of COVID-19 infection) (Table 3).

To test the indirect relationship between COVID-19-related fear and the level of cyberchondria through insomnia symptoms, a mediation analysis was performed using the PROCESS macro version 4.1 (Model 4). The analysis indicated a significant indirect relationship between COVID-19-related fear and cyberchondria through insomnia symptoms [effect = 0.10, SE = 0.06, 95% CI = (0.00,

Table 1. Sociodemographic variables in the studied sample (N = 504)

Variables	n (%)
Sex	
Men	84 (16.7)
Women	420 (83.3)
Education	
Higher	320 (63.5)
Secondary	172 (34.1)
Primary	12 (2.4)
Marital status	
Single	233 (46.2)
Married/partnered	239 (47.4)
Divorced	32 (6.3)
Place of residence	
Rural areas	96 (19.0)
Small towns	160 (31.8)
Large cities	248 (49.2)

Table 2. Descriptive statistics and Pearson *r* correlations for the studied variables in the whole sample (N = 504)

Variable	M ±SD	S	K	1	2	3	4
1. Age	30.49 ±10.28	1.33	2.02	–			
2. COVID-19-related fear	3.89 ±2.36	0.53	–0.76	0.11*	–		
3. Insomnia symptoms	7.45 ±4.53	0.88	0.48	–0.05	0.10*	–	
4. Cyberchondria	60.78 ±20.37	0.88	0.76	–0.08*	0.26***	0.15***	–

S – skewness, K – kurtosis, **p* < 0.05, ****p* < 0.001

Table 3. Multivariate hierarchical linear regression analyses predicting cyberchondria in the whole sample ($N = 504$)

Variable	B	SE	β	R^2	ΔR^2	VIF	Tolerance
Step 1				0.005			
Age	-0.17	0.09	-0.08			1.000	1.000
Step 2				0.08	0.08		
Age	-0.23	0.08	-0.12**			1.013	0.987
COVID-19 fear	2.40	0.37	0.28***			1.013	0.987
Step 3				0.09	0.01		
Age	-0.21	0.08	-0.11*			1.017	0.983
COVID-19 fear	2.30	0.37	0.27***			1.024	0.977
Insomnia symptoms	0.51	0.19	0.11**			1.014	0.987

SE (standard error), R^2 adjusted, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

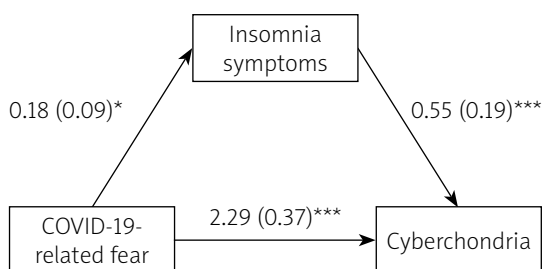


Fig. 1. The mediating role of insomnia symptoms in the relationship between fear of COVID-19 infection and cyberchondria. Unstandardized coefficients are reported, with standard errors in parentheses. * $p < 0.05$, *** $p < 0.001$

0.24)]. The individual pathways in the mediation analysis are displayed in Figure 1.

Discussion

Our hypothesis anticipated that age, fear of COVID-19 infection and insomnia would predict cyberchondria. We also hypothesised that insomnia would serve as a mediator between COVID-19-related fear and cyberchondria.

Results for the relationship between age and cyberchondria were inconsistent. In previous studies, Barke *et al.* (2016) and Fergus and Spada (2017) found no relationship between cyberchondria and age, whereas Laato *et al.* (2020) suggested that older people experienced less cyberchondria and were less likely to exchange unverified information regarding the pandemic.

Our results indicate that age, by itself, is not a predictor of cyberchondria. This result is not surprising. The risk of infection with SARS-CoV-2 applies to people of all ages and genders (Chen *et al.* 2022). Searching for information about one’s own health on the Internet does not result from advanced age, but rather from their health-anxiety level (Menon *et al.* 2020).

When the fear of COVID-19 infection was included in the regression analysis, age did materialise as a significant predictor of cyberchondria.

It is likely that the fear of COVID-19 infection operates as a suppressor variable (i.e., a variable that increases the age-predictive value when introduced in the regression analysis) (MacKinnon *et al.* 2000). As illustrated in Table 3, the age effect is weak. The Pearson’s r correlation coefficient indicates that the relationship between age and cyberchondria is negative. The older a person is, the less they are involved in searching for information about their own health on the Internet. These observations are in line with the results of Maftei and Holman (2020), who also found a weak negative correlation between age and cyberchondria.

Fear of COVID-19 infection made the biggest contribution to the cyberchondria variability. While age and insomnia were weakly associated with cyberchondria, fear of COVID-19 infection made the greatest unique contribution to cyberchondria variability. Indeed, the fear of infection alone accounted for 8% of the variability in cyberchondria. The relationship between fear of COVID-19 and cyberchondria has also been demonstrated in several other studies (e.g., Wu *et al.* 2021; Uysal Toraman *et al.* 2022).

The various factors influencing the level of fear of COVID-19 infection include the current state of physical health, mental health problems and the fear of stigmatisation in the event of COVID-19 infection, as well as concern regarding COVID-19 information that is derived from the Internet (Vrublevska *et al.* 2022). It is worth emphasising that overly intensive searching for information on the Internet in response to the anxiety related to COVID-19 infection may intensify this fear. The Internet provides a great deal of incomplete, unverified and even false information (Hashemi *et al.* 2020). Individuals with greater IT competencies (mostly younger people) can cope better with information overload and pandemic anxiety (Robinson *et al.* 2021).

We believe that the increased fear of COVID-19 infection may play an important role in the development of insomnia. Cheshmehzangi *et al.* (2022) noted that the COVID-19 pandemic has caused numerous changes, such as changes in mental health (including those that induce fear and anxiety), changes in the social environment and important economic changes. All of these factors contribute to changes in circadian rhythms during a pandemic and can affect sleep regulation processes. Consequently, COVID-19 may become a source of qualitative and quantitative reduction in sleep quality. The increase in fear of COVID-19 infection is usually associated with changes in arousal levels and may contribute to sleep disturbances. Although our study showed that the link between insomnia and cyberchondria is rather weak, a mediation analysis confirmed that insomnia serves as a mediator in the relationship between fear of COVID-19 infection and cyberchondria.

Our multivariate hierarchical regression analysis also showed that insomnia was a weak but significant predictor of cyberchondria. High levels of insomnia symptoms have been associated with high levels of cyberchondria. Insomnia is a common health problem and is widespread among people of all ages, especially the elderly. Many researchers have pointed to various factors associated with insomnia, such as somatic diseases or psychotic disorders, but a special role in its development has been played by mood disorders and anxiety disorders (Aernout *et al.* 2021). We expect that during a pandemic, the symptoms of insomnia, when they are particularly severe and frequent, may prompt people to search the Internet for information about the relationship between insomnia and the pandemic and how to cope with it.

Our study had some limitations. First, the studied sample was not balanced in terms of gender. Women predominated among the participants, which limits the generalisability of the study results. Second, we did not control for the presence of physical and mental health disorders among study participants, which could have influenced scores on COVID-19-related fear as well as symptoms of insomnia. Third, a significant portion of the participants were well-educated people living in large cities, which could have influenced their assessment of the pandemic. Fourth, mediation analysis also requires verification to assess whether the results reflect mediating or confounding factors (MacKinnon *et al.* 2000). Considering these

limitations, we suggest future qualitative and quantitative research for a stronger assessment of the studied relationships.

Conclusions

Despite these limitations, we observed that COVID-19-related fear and, to a lesser extent, age and insomnia are cyberchondria predictors. We also found both direct and indirect relationships between COVID-19-related fear and cyberchondria through insomnia.

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Disclosure

The author declares no conflict of interest.

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