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# Body Mass Index, Big Five personality traits and cyberchondria in a sample of Polish men and women: A mediation model

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**Summary**

**Aim.** The aim of this cross-sectional study was to assess the relationship between Body Mass Index (BMI) and cyberchondria in a sample of men and women. The study also examined the significance of Big Five personality traits as mediators of this relationship.

**Material and methods.** Participants were 329 women and men aged 18 to 65 recruited online. BMI was estimated based on the height and current weight data provided by the participants. The *Ten-Item Personality Inventory* was used to assess the Big Five personality traits. Cyberchondria was diagnosed using the *Cyberchondria Severity Scale* (CSS-PL).

**Results.** BMI correlated positively with emotional stability (opposite of neuroticism) and extraversion but negatively with cyberchondria. Emotional stability and extraversion correlated negatively with cyberchondria. Only BMI and emotional stability were good predictors of cyberchondria. Women scored lower on BMI and emotional stability scale but higher on the cyberchondria scale than men. The mediation analysis revealed a direct and indirect effects of BMI on cyberchondria through emotional stability as a mediator between BMI and cyberchondria.

**Conclusions.** This study highlights the possible importance of BMI for cyberchondria depending on individuals' emotional stability. These results may be useful for professionals dealing with a therapy for overweight/obese people as well as for problematic Internet users.

**Key words:** BMI, Big Five, cyberchondria

## Introduction

Being overweight or obese is a serious social, psychological, and medical problem affecting approximately 61% of men and 31% of women who are professionally active in Poland [1]. Being overweight or obese and having a high level of BMI stems from biological factors, including genetic ones. Other culprits include diet and insufficient

physical activity, but also a high level of stress affecting one's way of eating [2]. However, the impact of stress can be differentiated due to individual variations in human personality, which modify individual susceptibility to stress. McCrae and Costa's Five-Factor Model of Personality (the so-called Big Five) is often treated as the theoretical basis for research on health-related behaviour and plays a unique role in predicting physical and mental health disorders. This model can help to explain neuroticism and its components (facets), such as anxiety, angry hostility, depression, self-consciousness, impulsiveness, and vulnerability to stress as risk factors in health-related behaviours [3]. Many studies showed an association between high level of neuroticism and high BMI level as risk factor for overweight [4] and obesity [5].

The most convincing data on the relationship between neuroticism and BMI comes from genetic studies. Torgersen et al. [6] showed genetic correlations between neuroticism and BMI as risk factors for cardiovascular and ischemic heart disease. Increasing anxiety regarding body image resulting from being overweight/obese may cause hypochondria related to a possible undiagnosed disease, and thus intensify the process of searching for information about one's health on the Internet, referred to as cyberchondria [7]. It is also worth noting that depression and anxiety associated with BMI may exacerbate cyberchondria [8, 9]. Starčević and Berle [10] described cyberchondria as a tendency to worry excessively about one's health and to search the Internet for medical information or symptoms due to anxiety about one's health. Neuroticism is also a significant risk factor in the development of cyberchondria [11, 12], while intolerance of uncertainty and defensive pessimism may mediate the relationship between neuroticism and cyberchondria [13], especially among women [14]. Bagarić and Jokić-Begić [15] presented an interesting hypothesis regarding the relationship between BMI and cyberchondria. The authors suggested that the Internet is a meaningful source of disseminating and promoting strategies for taking care of one's health through self-observation, including body weight. At the same time, the Internet is a source of important suggestions regarding specific lifestyle. Therefore, in people who are more susceptible to this type of social influence, it may intensify the psychological tendency towards cyberchondria. It is also worth noting that Liu et al. [16] showed no correlation between BMI and cyberchondria.

The purpose of the present cross-sectional investigation was to determine the possible correlation between BMI level and cyberchondria and whether Big Five personality traits may mediate between BMI and cyberchondria. We assumed a positive correlation between BMI and cyberchondria. We also hypothesised that low emotional stability level (i.e., neuroticism) may serve as a mediator between BMI and cyberchondria. Since the examined variables may differentiate women and men, we performed an appropriate comparative analysis of the results between women and men [17].

## Material and methods

### Participants

The study sample consisted of 329 people, including 252 women and 77 men. They were aged 18 to 65 years ($M$ = 30.27; $SD$ = 10.02) and recruited via an online platform. The minimum sample size adequate for the study aims was 227 ($\alpha = 0.05$; power = 0.95). The online study was completely anonymous, and participants were not remunerated for their participation. Sociodemographic details of participants are presented in Table 1.

### Measures

1. The BMI for each person was calculated based on the self-reported assessment of participants' height and current weight according to the formula: weight (kg) / height $(cm)^2$.
2. The Polish adaptation of the *Ten-Item Personality Inventory* (TIPI-PL) [18, 19] was used to assess the Big Five personality traits (Cronbach's alpha coefficients for the current sample are in parentheses): emotional stability (opposite of neuroticism; $\alpha = 0.73$), extraversion ($\alpha = 0.63$), openness to experience ($\alpha = 0.30$), agreeableness ($\alpha = 0.59$), and conscientiousness ($\alpha = 0.70$). Participants rated each item on a scale from 1 ("strongly disagree") to 7 ("strongly agree").
3. Cyberchondria was assessed using the Polish adaptation of the *Cyberchondria Severity Scale* (CSS) [20, 21]. CSS is a self-reported instrument comprising 33 items using a 5-point Likert-scale (1 = "never"; 2 = "rarely", 3 = "sometimes", 4 = "often", 5 = "always"). Cronbach's alpha for the study sample was ($\alpha = 0.95$). In this study, we only considered the overall score for cyberchondria.

### Ethical approval

The research procedure strictly followed ethical principles for human research and was approved by the Research Ethics Committee at the Faculty of Psychology, University of Warsaw (No 13-04-2020). All procedures followed were also in accordance with the Helsinki Declaration of 1975, as revised in 2000.

### Statistical analysis

We performed all statistical computations using IBM's SPSS 27 Statistics software. We performed correlation analysis using Pearson's $r$ correlation coefficients. Since the compared groups were not equinumerous, the Mann-Whitney $U$ test was used to verify the significance of differences between women and men. Multivariate linear regression analysis (stepwise method) was used to estimate BMI and personality traits as predictors of cyberchondria. The PROCESS macro for SPSS version 3.5 was ap-

plied for the mediation analysis (Model 4) with bootstrapping procedure to estimate the direct and indirect effects [22].

## Results

Table 1 presents the sociodemographic data of the study participants. As shown in Table 1, most of the survey participants are people with higher education, single people, and inhabitants of large cities.

Table 1. **Sociodemographic variables in the studied sample (N = 329)**

| Variables | N (%) |
|---|---|
| Education | |
| Higher | 213 (64.7) |
| Secondary | 113 (34.3) |
| Primary | 3 (0.9) |
| Marital status | |
| Single | 152 (46.2) |
| Married/partnered | 80 (24.3) |
| Divorced | 94 (28.6) |
| Widow | 3 (0.9) |
| Place of residence | |
| Rural areas | 56 (17.0) |
| Small towns | 80 (24.3) |
| Large towns | 193 (58.7) |

Descriptive statistics, Cronbach's alphas, and Pearson's *r* correlations between the studied variables in the whole sample are displayed in Table 2.

Table 2. **Descriptive statistics and Pearson's *r* correlations (*N* = 329)**

| Variable | Range | M ± SD | 1 | 2 | 3 | 4 | 5 | 6 |
|---|---|---|---|---|---|---|---|---|
| 1. BMI | 16.7–38.1 | 23.56±4.37 | - | | | | | |
| 2. Emotional stability | 2–14 | 8.10±3.52 | 0.21*** | - | | | | |
| 3. Extraversion | 2–14 | 10.27±3.03 | 0.14** | 0.41*** | - | | | |
| 4. Openness to experience | 2–14 | 9.53±2.32 | 0.01 | 0.06 | 0.28*** | - | | |
| 5. Agreeableness | 4–14 | 10.56±2.48 | 0.08 | 0.27*** | 0.20*** | 0.06 | - | |
| 6. Conscientiousness | 2–14 | 10.47±2.96 | -0.02 | 0.09 | 0.08 | -0.07 | 0.03 | - |
| 7. Cyberchondria | 30–136 | 61.11±21.92 | -0.14** | -0.24*** | -0.14* | -0.05 | -0.02 | -0.03 |

*M* – mean; *SD* – standard deviation; * $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$

As we can see in Table 2, BMI coefficient correlated positively with emotional stability and extraversion, but negatively with cyberchondria. Emotional stability and extraversion correlated negatively with cyberchondria. All coefficients were small, but statistically significant.

The basic descriptive statistics of the studied variables for women and men are displayed in Table 3.

Table 3. **Gender differences in BMI, personality traits and cyberchondria**

| | Women (N = 252) M ± SD | Men (N = 77) M ± SD | Z | Cohen's d |
|---|---|---|---|---|
| BMI | 22.90 ± 4.17 | 25.72 ± 4.33 | -5.27*** | 0.66 |
| Emotional stability | 7.62 ± 3.50 | 9.68 ± 3.15 | -4.53*** | 0.62 |
| Extraversion | 10.36 ± 2.99 | 9.99 ± 3.19 | -0.79 | 0.12 |
| Openness to experience | 9.59 ± 2.30 | 9.32 ± 2.38 | -0.55 | 0.11 |
| Agreeableness | 10.58 ± 2.49 | 10.48 ± 2.47 | -0.41 | 0.04 |
| Conscientiousness | 10.44 ± 2.94 | 10.55 ± 3.04 | -0.49 | 0.04 |
| Cyberchondria | 62.75 ± 21.59 | 55.74 ± 22.27 | -3.13** | 0.32 |

*M* – mean; *SD* – standard deviation; Z – value for the Mann-Whitney U test; Cohen's *d* – effect size. ** $p < 0.01$; *** $p < 0.001$

As the data in Table 3 shows, women demonstrated a lower BMI coefficient and lower emotional stability level, but a higher level of cyberchondria compared to men. No significant differences were found between the two groups regarding extraversion, openness to experience, agreeableness, or conscientiousness.

Table 4 provides the results of the multivariate linear regression analysis (stepwise method) with BMI, emotional stability and extraversion as predictors of cyberchondria in the whole sample. The results showed that only BMI and emotional stability were predictors of cyberchondria. The VIF and tolerance coefficients indicated no problem with predictor collinearity (VIF values between 1.0 and 1.3).

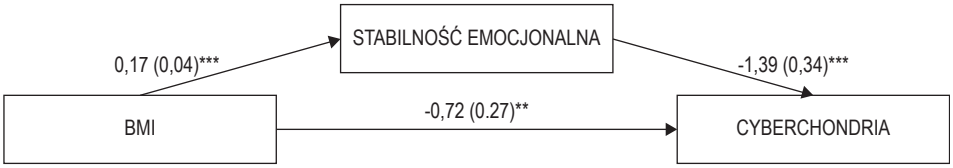
Table 4. **Multivariate linear regression analysis (stepwise method) predicting cyberchondria in the whole sample (*N* = 329)**

| Predictors | B | SE | ß | $R^2$ adjusted | VIF | Tolerance |
|---|---|---|---|---|---|---|
| BMI | -0.72 | 0.27 | -0.14** | 0.02 | 1.000 | 1.000 |
| Emotional stability | -1.39 | 0.34 | -0.22*** | 0.06 | 1.049 | 0.954 |
| Extraversion | -0.30 | 0.24 | -0.04 | 0.06 | 1.204 | 0.830 |

B – unstandardized regression coefficient; SE – standard error; ß – standardized regression coefficient; $R^2$ – adjusted determination coefficient; VIF – variance inflation factor; ** p <0.01; *** p <0.001

The mediation analysis was performed using emotional stability as a mediator between BMI and cyberchondria. The analysis showed a significant indirect relationship

between BMI and cyberchondria through emotional stability (effect = – 0.24; *SE* = 0.08; 95% CI (-0.42, – 0.11)). Figure 1 shows individual pathways in the mediation analysis.




** p < 0,01; *** p < 0,001

Figure 1. **The mediating effect of emotional stability in relationship between BMI and cyberchondria (unstandardized coefficients with standard errors in parentheses)**

## Discussion

The results of our study partially confirmed the hypotheses. Contrary to the hypothesis, BMI proved to be negatively correlated with cyberchondria. Emotional stability and extraversion were also negatively correlated with cyberchondria. We have also shown that women have significantly lower BMI and emotional stability levels and higher levels of cyberchondria compared to men. The positive correlation between BMI and extraversion revealed in our study were also confirmed in other studies [23]. However, the multivariate linear regression analysis showed that only BMI and emotional stability were good predictors of cyberchondria. To understand the relationship between BMI and cyberchondria revealed in our study, it is necessary to refer to the potential role of emotional stability.

The high emotional stability level associated with cyberchondria may suggest a different mechanism associated with excessive searching for information on the Internet compared to health-related anxiety. As Bagarić and Jokić-Begić [15] suggested, immoderate searching for information on the Internet may be motivated by psychological factors resulting from social pressures on a certain lifestyle and individual's appearance, including maintaining a low body weight (low BMI). Thus, for some people, searching for information on the Internet may rather serve to maintain an optimal weight and appearance than seeking information about potential risk to one's own health. On the other hand, it is possible that cyberchondria serves both purposes at the same time.

Although the overall result in the whole sample indicated that a high level of emotional stability was associated with a lower level of cyberchondria, it is worth noting that women who dominated among the study participants had a higher level of cyberchondria and a higher level of neuroticism (lower emotional stability level) as well as lower BMI compared with men (cf. Table 3). Thus, women had a higher neuroticism profile than men, which may increase cyberchondria. The overall score across the sample may mask these differences as suggested by Anderson et al. [17]. Considering the lower level of BMI in women as compared to men, we suppose that

high levels of cyberchondria may be related to women's body image rather than to anxiety about their own health. For example, Quittkat et al. [24] showed that body dissatisfaction as well as importance of appearance was higher in women than in men. These authors also showed that body dissatisfaction was unaffected by age in women, who invested more time to achieve their ideal appearance as compared to men. This is due to the social influence associated with the presence of women in social networks.

As Bidmon and Terlutter [25] suggested, women, compared to men, showed greater unwillingness to seek direct medical advice, but at the same time they wanted to be well informed about health topics and enjoyed searching websites such as Web 2.0. Our results are also in line with Cuzzolaro's [7] suggestion that increasing body image anxiety can cause hypochondriac anxiety and exacerbate cyberchondria. We agree that higher neuroticism levels may lead women to seek information about health problems rather than appearance problems. Our hypothesis applies to mostly normal-weight women who participated in our study. When women and men search for body-related information on the Internet, it helps them to find current patterns of body appearance or suggestions for its maintenance. It is worth noting that the study participants were young people (mean age 30 years old) who were well-educated and lived in large cities. Excessive use of the Internet in these people may be related to concern for their own image rather than fear for health.

Our study suggested a mediating role of neuroticism (low emotional stability) between BMI and cyberchondria. We showed that BMI correlated positively with emotional stability (i.e., low level of neuroticism) in the whole study sample. The relationship between high BMI level and high emotional stability (low neuroticism) are in line with the results of other studies [4]. It should be remembered that these studies do not consider differences between women and men hidden behind the overall results. The mediation analysis confirmed that neuroticism may serve as mediator in the relationship between BMI and cyberchondria.

### Study limitations

The sample included mostly women and too few men, which was an unrepresentative sample. More than 70% of the study participants were under the age of 35, and only small subgroup was older. Probably, in older people, mainly health-related motivation may increase cyberchondria. We did not control for potential health disorders in study participants. The general anxiety level and depressive symptoms that often accompany a high BMI level should be also verified.

## Conclusions

This study highlights the possible importance of the BMI for cyberchondria depending on the level of emotional stability of individuals. These results may be useful

for professionals dealing with a therapy for overweight/obese people as well as for problematic Internet users.

## Possible clinical implications

Healthcare for overweight or obese people should incorporate knowledge about the personality of these people to improve communication and cooperation between them and therapists and to optimise therapy. A patient-centred approach can also help in reducing overweight or obese people's anxiety about their health and prevent them from conducting excessive Internet searches for often unreliable knowledge about overweight or obesity and how to deal with this problem.

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## References

1. Rulkiewicz A, Pilchowska I, Lisik W, Pruszczyk P, Ciurzyński M, Domienik-Karłowicz J. *Prevalence of obesity and severe obesity among professionally active adult population in Poland and its strong relationship with cardiovascular co-morbidities-POL-O-CARIA 2016–2020 study*. J. Clin. Med. 2022; 11(13): 3720. https://doi.org/10.3390/jcm11133720.
2. Araiza AM, Lobel M. *Stress and eating: Definitions, findings, explanations, and implications*. Soc. Personal. Psychol. Compass. 2018; 12(4): 12378. https://doi.org/10.1111/spc3.12378.
3. Hudek-Knezević J, Kardum I. *Five-factor personality dimensions and 3 health-related personality constructs as predictors of health*. Croat. Med. J. 2009; 50(4): 394–402. https://doi.org/10.3325/cmj.2009.50.394.
4. Olivo G, Gour S, Schiöth HB. *Low neuroticism and cognitive performance are differently associated to overweight and obesity: A cross-sectional and longitudinal UK Biobank study*. Psychoneuroendocrinology 2019; 101: 167–174. https://doi.org/10.1016/j.psyneuen.2018.11.014.
5. Gerlach G, Herpertz S, Loeber S. *Personality traits and obesity: a systematic review*. Obes. Rev. 2015; 16(1): 32–63. https://doi.org/10.1111/obr.12235.
6. Torgersen K, Bahrami S, Frei O, Shadrin A, O'Connell KS, Smeland OB et al. *Shared genetic architecture between neuroticism, coronary artery disease and cardiovascular risk factors*. Transl. Psychiatry. 2021; 11: 368. https://doi.org/10.1038/s41398-021-01466-9.
7. Cuzzolaro M. *Body schema and body image: History and controversies*. In: Cuzzolaro M, Fassino S, editors. *Body image, eating, and weight. A guide to assessment, treatment, and prevention*. Cham, CH: Springer; 2018. P. 1–24.

8. Blasco BV, García-Jiménez J, Bodoano I, Gutiérrez-Rojas L. *Obesity and depression: Its prevalence and influence as a prognostic factor: A systematic review*. Psychiatry Investig. 2020; 17(8): 715–724. https://doi.org/10.30773/pi.2020.0099.
9. Schenkel SK, Jungmann SM, Gropalis M, Witthöft M. *Conceptualizations of cyberchondria and relations to the anxiety spectrum: Systematic review and meta-analysis*. J. Med. Internet. Res. 2021; 23(11): 27835. https://doi.org/10.2196/27835.
10. Starčević V, Berle D. *Cyberchondria: Towards a better understanding of excessive health-related Internet use*. Expert Rev. Neurother. 2013; 13(2): 205–213. https://doi.org/10.1586/ern.12.162.
11. Lagoe C, Atkin D. *Health anxiety in the digital age: An exploration of psychological determinants of online health information seeking*. Comput. Human. Behav. 2015; 52: 484–491. https://doi.org/10.1016/j.chb.2015.06.003.
12. Nasiri M, Mohammadkhani S, Akbari M, Alilou MM. *The structural model of cyberchondria based on personality traits, health-related metacognition, cognitive bias, and emotion dysregulation*. Front. Psychiatry 2023; 13: 960055. https://doi.org/10.3389/fpsyt.2022.960055.
13. Bajcar B, Babiak J. *Neuroticism and cyberchondria: The mediating role of intolerance of uncertainty and defensive pessimism*. Pers. Individ. Differ. 2020; 162: 110006. https://doi.org/10.1016/j.paid.2020.110006.
14. Maftei A, Holman AC. *Cyberchondria during the coronavirus pandemic: The effects of neuroticism and optimism*. Front. Psychol. 2020; 11: 567345. https://doi.org/10.3389/fpsyg.2020.567345.
15. Bagarić B, Jokić-Begić N. *Cyberchondria – health anxiety related to Internet searching*. Soc. Psihijat. 2019; 47(1): 28–50.
16. Liu S, Yang H, Cheng M, Miao T. *Family dysfunction and cyberchondria among Chinese adolescents: A moderated mediation model*. Int. J. Environ. Res. Public Health 2022; 19(15): 9716. https://doi.org/10.3390/ijerph19159716.
17. Anderson JR, Bloom MJ, Broshous WT, Chen GYX, Jost SR, Lang A et al. *HEXACO personality factors as predictors of physical activity, resting heart rate, body mass index, and healthy lifestyle behaviors*. Curr. Issues Pers. Psychol. 2023; 12(1): 11–19.
18. Gosling SD, Rentfrow PJ, Swann WB Jr. *A very brief measure of the Big-Five personality domains*. J. Res. Pers. 2003; 37(6): 504–528. https://doi.org/10.1016/S0092-6566(03)00046-1.
19. Sorokowska A, Słowińska A, Zbieg A, Sorokowski P. *Polska adaptacja testu Ten Item Personality Inventory (TIPI) – TIPI-PL – wersja standardowa i internetowa*. Wroclaw: WrocLab; 2014. Polish.
20. McElroy E, Shevlin M. *The development and initial validation of the cyberchondria severity scale (CSS)*. J. Anxiety Disord. 2014; 28(2): 259–265. https://doi.org/10.1016/j.janxdis.2013.12.007.
21. Bajcar B, Babiak J, Olchowska-Kotala A. *Cyberchondria and its measurement. The Polish adaptation and psychometric properties of the Cyberchondria Severity Scale CSS-PL*. Psychiatr. Pol. 2019; 53(1): 49–60. https://doi.org/10.12740/PP/81799.
22. Hayes AF. *Introduction to mediation, moderation, and conditional process analysis: A regression-based approach*, 2nd ed. New York, NY: Guilford Press; 2018.
23. Sutin AR, Ferrucci L, Zonderman AB, Terracciano A. *Personality and obesity across the adult life span*. J. Pers. Soc. Psychol. 2011; 101(3): 579–592. https://doi.org/10.1037/a0024286.
24. Quittkat HL, Hartmann AS, Düsing R, Buhlmann U, Vocks S. *Body dissatisfaction, importance of appearance, and body appreciation in men and women over the lifespan*. Front. Psychiatry 2019; 10: 864. https://doi.org/10.3389/fpsyt.2019.00864.

25. Bidmon S, Terlutter R. *Gender differences in searching for health information on the Internet and the virtual patient-physician relationship in Germany: Exploratory results on how men and women differ and why*. J. Med. Internet Res. 2015; 17(6): e156. https://doi.org/10.2196/jmir.4127.

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