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Who Believes in Fake News: A Study on the Relationship between Affective Temperament, Cyberchondria and Problematic Use of the Internet during the COVID-19 Pandemic

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Abstract

The COVID-19 outbreak has been associated with various psychological problems, such as Cyberchondria, constant research for information online, to obtain health-related information. This was associated with problematic social media use and various psychological problems. This study aimed to measure the characteristics of fear and anxiety of COVID-19, the generalized approach to online searching and the use of the Internet about the perception of

health, during a pandemic. The online survey was disseminated from April to June 2021 on available social media channels. We found that the pandemic was associated with depression, anxiety, cyberchondria, and cognitive preoccupation. We reported an increase in cyberchondria, depression, stress, low mood, and anxiety during the Covid outbreak. The Internet plays a vital role in everyday life in this period, because it has become a popular source of accessing health-related information.

Keywords
Cyberchondria; COVID-19; affective temperament; problematic internet use; fake news

1. Introduction

COVID-19 outbreak had a variety of psychosocial impacts, such us excessive use of social media among people. This condition has been associated with various psychological consequences; for example, Cyberchondria, social media fatigue, and propagation of fake news [1]. People through misinformed on social media, exacerbated fears of COVID-19 [2]. This misinformation regarding the pandemic period has had disastrous effects on people; this misinformation produced an excess of information and an epidemic (infodemic). According to the World Health Organization (WHO), the global effect of a pandemic is infodemic information, a term that is used to indicate the abundance of information, is not always accurate, and people have open access to information due internet connectivity ad mass media [2, 3]. This overload of information, many fake, can increased anxiety and stress. The term cyberchondria regards excessive and repetitive online research of medical information that causes distress, severe anxiety and internet addiction; the patient tends to constantly look up information on the web to obtain reassurance for their state of health. Cyberchondria means constant research of information online in order to obtain health-related information [4]. Uncertainty and anxiety can trigger a compulsive search of internet information, intensify anxiety and stress [5]. An example disseminated of fake news during the COVID-19 pandemic suggested 5G cellular network towers contribute to the spread of the Corona Virus disease; previous studies suggested that fake news can fuel anxiety [6-8]. Moreover, a previous research study shows that women seem to be more afraid of covid. It Is possible to identify various factors that can take a protective or risky role in the tendency to believe fake news, such as young age and a lower level of culture [9, 10]. Previous studies showed that fear of Corona Virus disease had been associated with problematic social media use and cyberchondria, higher levels of health anxiety, obsessive-compulsive symptoms, and somatic symptoms [2]. In light of this, this study aimed to measure the characteristics of fear and anxiety of COVID-19, the generalized approach to online searching and the use of the Internet about the perception of health, during a pandemic.

2. Methods

2.1 Study Design and Population

Data were collected between April and June 2021 through an online survey sent to institutional or other professional mailing lists, posted on social network sites, and via web advertising. The

research method avoided receiving incomplete protocols since the online answer inserting did not allow to proceed if one response was left unanswered.

The study included healthy subjects from the Italian population 18 years of age and older. All respondents were provided with written information about the research purposes, methods, and expected benefits; the survey submission was considered informed voluntary consent.

The study design is in accordance with the Helsinki Declaration. Since the study was conducted with healthy subjects, data were properly anonymized, and informed consent has been obtained at the time of the original data collection, ethical approval was not required. A priori statistical power analysis for sample size estimation, with an alpha = 0.05 (two-tailed tests), a medium effect size value (0.50) and power = 0.95, revealed that the sample size needed using Cohen's criteria was approximately *N* = 210 (GPower 3.1 software). Thus, the sample size of *N* = 1037 was more than adequate for the main objective of this study.

3. Measures

The following psychological tests were administered:

3.1 Fear of COVID-19 Scale (FCV-19S) Italian Version

The Italian version of the Fear of COVID-19 Scale (FCV-19S) was investigated for its psychometric characteristics and validated [11]. The scale measures fear related to COVID-19 and consists of 7 items. Each item is rated on a 5-point Likert scale, ranging from 1 (completely disagree) to 5 (completely agree). The score can vary from a minimum of 7 points to a maximum of 35 points; a higher index expresses a higher degree of fear of COVID-19. The validation of the Italian version identified high internal consistency and reliability. The Italian version of the FCV-19S is useful for identifying possible psychological criticalities related to COVID-19 for any age group. The validation of the Italian version identified high internal consistency and reliability (Cronbach's coefficient = 0.8670; Mean = 2.36; Standard Deviation = 0.85).

3.2 Cyberchondria Severity Scale (CSS)- Italian Version

The Italian version of the Cyberchondria Severity Scale (CSS) was validated [5, 12]. The instrument consists of 33 items and refers to a five-factor structure. The items can be grouped into five subscales: "compulsion" (8 items), "distress" (8 items), "excessiveness" (8 items), "reassurance" (6 items), "distrust in medical professionals" (3 items to be reversed). Each item is measurable on a 5-point Likert scale, from 1 ("never") to 5 ("always"). A high level of cyberchondria corresponds to a high score on the CSS. The analysis of the Italian version of the scale demonstrated good internal consistency and test-retest reliability at five weeks. The analysis of the Italian version of the scale demonstrated good internal consistency and test-retest reliability at five weeks (Cronbach's coefficient = 0.93; Mean = 2.18; Standard Deviation = 0.65).

3.3 General Problematic Internet use Scale 2 (GPIUS-2) Italian Version

The Italian version of the General Problematic Internet Use Scale 2 (GPIUS 2) was tested [13]. The GPIUS 2 is the updated version of the GPIUS, which consists of 29 items. The GPIUS 2 is a 15-item scale that assesses four dimensions: preference for online versus face-to-face interactions;

tendency to use the internet for mood regulation; deficits in self-regulation skills for online behavior (compulsive aspect) and frequency of obsessive thoughts about the online world (obsessive aspect); and negative consequences, i.e., social, personal, and professional problems resulting from internet use. Preference for online over face-to-face interactions and self-regulation skills were dimensions absent from the original GPIUS. Each item is rated on an 8-point Likert scale, from 1 ("completely disagree") to 8 ("completely agree"). The validation of the Italian version of the scale revealed good psychometric properties, so the instrument can be used to measure the cognitive and behavioral components of generalized problematic internet use and its outcomes. The validation of the Italian version of the scale revealed good psychometric properties, so the instrument can be used to measure the cognitive and behavioral components of generalized problematic internet use and its outcomes (Cronbach's coefficient = 0.91; Mean = 3.24; Standard Deviation = 1.40).

3.4 Temperament Evaluation of the Memphis, Pisa, Paris, and San Diego-Autoquestionnaire (TEMPS-A) Short Version

The short version of the Temperament Evaluation of The Memphis, Pisa, Paris, and San Diego – Auto questionnaire (TEMPS-A) was examined and validated [14]. The TEMPS-A is a self-administered questionnaire that in its short form consists of 39 items, compared to 110 items in the original extended version. All items are dichotomously answered "yes"/"no." The scale is aimed at detecting affective temperament and consists of five subscales: depressive, cyclothymic, hyperthymic, irritable and anxious. The analysis of the Italian version confirmed the good psychometric properties of the TEMPS-A short version, which is a valid instrument for measuring affective temperament. The analysis of the Italian version confirmed the good psychometric properties of the TEMPS-A short version, which is a valid instrument for measuring affective temperament (Cronbach's coefficient = 0.86; Mean = 16.34; Standard Deviation = 6.72).

As the score or scale means increases, perceptions of Fear, Cyberchondria, GPIUS-2 and TEMPS-A also increase. However, if the scale score or average decreases, perceptions of Fear, Cyberchondria, GPIUS-2 and TEMPS-A also decrease.

4. Statistical Analysis

As requested, descriptive statistics (mean ± standard deviation; frequency and percentages) were used to summarize continuous and non-continuous demographic and psychometric data. Correlation analysis (Pearson correlation) was performed to assess the association between problematic internet use, cyberchondria, fear of COVID-19 and affective temperaments. P value <0.05 was considered statistically significant. In addition, differences (T student) between gender were tested against the variables examined. To fully understand the importance of our findings, we include the "Cohen's d" index of the effect size or strength of the relationship [15]. Statistical analyses were performed with STATA 14.

5. Results

The sample comprises 1,037 subjects (F: 79.65%; M:20,35%) aged 18 and over.

Table 1 and Table 2 show the sociodemographic features of the sample. 40.89% were single, most had a level of education ≥13 (48.31%, 41.08%, 3.95%) and were students (47.54%). 19.98%

underwent the COVID-19 vaccine and many participants were on call (84.46%). 89.18% reported that they had not received COVID-19.

Table 1 Sociodemographic features of the sample.

Age	**Freq**	**Percent**	**Cum.**
18-22	313	30.18	30.18
23-30	412	39.73	69.91
31-40	132	12.73	82.64
41 e-50	80	7.71	90.35
51-60	72	6.94	97.29
>60	28	2.7	100
Marital Status			
Other	59	5.69	5.69
Single	424	40.89	46.58
Cohabiting	60	5.79	52.36
Divorced	38	3.66	56.03
Engaged	309	29.80	85.82
Married	147	14.18	100.00
Education Level			
Other	19	1.83	1.83
8 years	50	4.82	6.65
13 years	501	48.31	54.96
17 years	426	41.08	96.04
>17 years	41	3.95	100.00
Employment status			
Other	53	5.11	5.11
Unemployed	97	9.35	14.46
Retired	16	1.54	16.00
Employee	282	27.10	43.10
Self-employment	96	9.26	52.36
Student	493	47.54	100.00

Table 2 Sociodemographic features of the sample.

Vaccine	**Freq.**	**Percent**	**Cum.**
No	829	80.02	80.02
Yes	207	19.98	100.00
Why not?			
Other (allergies, contraindications)	70	8.63	8.63
Out of fear	56	6.91	15.54
Waiting for a call	685	84.46	100.00
Contagious			

No	923	89.18	89.18
Yes	112	10.82	100.00

The Pearson correlations between Problematic Internet Use, Cyberchondria Severity Scale, Fear of COVID-19 and Affective Temperaments are shown in Table 3.

Table 3 The Pearson correlations beetween Problematic Internet Use, Cyberchondria Severity Scale, Fear of COVID-19 and Affective Temperaments.

		GPIUS 2						TEMPS A				FCV	CYBERCHONDRIA					
		Posi	Mood	Cogni	Comp.	Negat	Gpiuss-2	Cycl.	Hyper.	Irrit.	Depre.	Anxious	Compulsion	Distress	Excessiveness	Reassurance	Mistrust	Css
GPIUS 2	Posi	1																
	Mood regulation	0.44*	1															
	Cognitive Preoccupation	0.47*	0.56*	1														
	Compulsive Use Internet	0.43*	0.56*	0.75*	1													
	Negative Outcomes	0.44*	0.35*	0.49*	0.53*	1												
	Composite	0.69*	0.79*	0.84*	0.86*	0.63*	1											
TEMPS A	Cyclothymic	0.27*	0.43*	0.34*	0.40*	0.32*	0.45*	1										
	Hyperthymic	-0.30*	-0.15*	-0.14*	-0.14*	-0.14*	-0.21*	-0.10*	1									
	Irritable	0.16*	0.24*	0.22*	0.25*	0.19*	0.27*	0.38*	0.03	1								
	Depressive	0.34*	0.38*	0.36*	0.38*	0.31*	0.46*	0.58*	-0.23*	0.37*	1							
	Anxious	0.19*	0.23*	0.18*	0.23*	0.16*	0.25*	0.42*	-0.09*	0.22*	0.37*	1						

FCV	**FCV**	0.18*	0.24*	0.19*	0.21*	0.18*	0.26*	0.31*	-0.05	0.12*	0.31*	0.44*	1					
CYBERCHONDRIA	**Compulsion**	0.24*	0.27*	0.25*	0.28*	0.28*	0.33*	0.35*	-0.01	0.17*	0.32*	0.35*	0.47*	1				
	Distress	0.26*	0.34*	0.30*	0.34*	0.29*	0.40*	0.41*	-0.07*	0.18*	0.40*	0.41*	0.59*	0.68*	1			
	Excessiveness	0.21*	0.37*	0.30*	0.33*	0.24*	0.39*	0.31*	-0.06*	0.12*	0.34*	0.29*	0.37*	0.59*	0.68*	1		
	Reassurance	0.09*	0.14*	0.11*	0.12*	0.17*	0.16*	0.11*	0.04	0.07*	0.13*	0.16*	0.22*	0.27*	0.36*	0.44*	1	
	Distrust in medical professionals	-0.20*	0.02	-0.12*	-0.05	-0.18*	-0.10*	-0.05	0.00	-0.05	-0.10*	-0.10*	-0.05	-0.16*	-0.11*	-0.06	0.08*	1
	Css	0.22*	0.37*	0.29*	0.33*	0.29*	0.39*	0.37*	-0.04	0.16*	0.37*	0.37*	0.52*	0.77*	0.86*	0.86*	0.61*	0.04	1

Note: *Significant at the 0.05 level.

In general, women present higher average values than men, in the four factors POSI, Mood Regulation, Cognitive preoccupation, compulsive use and the total score (Composite score). There is no statistically significant difference in the Negative Outcome factor (Table 4). The medium effect sizes of gender differences exist for all subscales except the "Negative outcome" subscale.

Table 4 Student's t-test results on the difference in means between Male and Female – GPIUS-2.

GPIUS-2	Mean								
	Male	Female	Difference	S.E.	*t*-statistic	p value	Cohen's *d*[a]	95% Conf. Interval	
POSI	2.48	2.82	-0.34	0.13	-2.54	*	-0.20	-0.35	-0.05
MOOD REGULATION	4.10	5.07	-0.98	0.16	-6.03	***	-0.47	-0.62	-0.31
COGNITIVE_PREOCCUPATION	2.91	3.19	-0.29	0.13	-2.18	*	-0.17	-0.32	-0.02
COMPULSIVE USE	3.11	3.66	-0.55	0.16	-3.49	**	-0.27	-0.42	-0.12
NEGATIVE OUTCOME	1.86	1.86	0.00	0.10	-0.01		-0.00	-0.15	-0.15
COMPOSITE_SCORE	2.89	3.32	-0.43	0.11	-4.02	***	-0.31	-0.46	-0.16

Note: * p value < 0.05; ** p value < 0.01; *** p value < 0.001.

[a] effect size: d = 0.20—small effect; d = 0.50—medium size effect; d = 0.80—large effect.

There are higher values for women in the cyclothymic, depressive and anxious subscales with statistically significant differences (p-value <0.001). In the hyperthymic subscale, men have a higher mean score and the difference is statistically significant (p-value <0.001). Irritable temperament was not significant (Table 5). The effect sizes of gender differences range from small (Irritable), to medium size (hyperthymic and depressive), to large (cyclothymic and anxious).

Table 5 Student's t-test results on the difference in means between Male and Female – TEMPS-A.

TEMPS-A	Mean								
	Male	Female	Difference	S.E.	*t*-statistic	p value	Cohen's *d*[a]	95% Conf. Interval	
cyclothymic	**4.33**	**6.23**	**-1.89**	**0.27**	**-7.13**	***	-0.55	-0.70	-0.40
hyperthymic	**4.74**	**4.05**	**0.70**	**0.16**	**4.24**	***	-0.33	-0.18	-0.48
irritable	1.67	1.57	0.10	0.13	0.77		-0.06	-0.09	-0.21
depressive	**2.45**	**3.20**	**-0.75**	**0.18**	**-4.25**	***	-0.33	-0.48	-0.18
anxious	**1.11**	**1.82**	**-0.70**	**0.08**	**-8.54**	***	-0.66	-0.81	-0.51

Note: * p value < 0.05; ** p value < 0.01; *** p value < 0.001.

[a] effect size: d = 0.20—small effect; d = 0.50—medium size effect; d = 0.80—large effect.

Women have a higher score on average (Table 6). The result is highly significant (p value < 0.001 ***). The effect sizes of gender differences is medium in FCV.

Table 6 Student's t-test results on the difference in means between Male and Female – FVC.

FVC									
	Mean								
	Male	Female	Difference	S.E.	*t*-statistic	p value	Cohen's *d*[a]	95% Conf. Interval	
FCV	1.95	2.47	-0.52	0.06	-8.19	***	-0.63	-0.79	-0.48

Note: * p value < 0.05; ** p value < 0.01; *** p value < 0.001;

[a] effect size: d = 0.20—small effect; d = 0.50—medium size effect; d = 0.80—large effect.

Considering the 5 factors and the total score (css), women present higher mean values than men. The differences between the averages are highly significant (p-value <0.001 ***), except for the Reassurance factor which is not statistically significant (Table 7). The effect sizes of gender differences range from small (Reassurance), to medium size for all other subscales.

Table 7 Student's t-test results on the difference in means between Male and Female – CSS.

CSS	Mean								
	Male	Female	Difference	S.E.	*t*-statistic	p value	Cohen's *d*[a]	95% Conf. Interval	
COMPULSION	1.45	1.70	-0.25	0.06	-3.90	***	-0.30	-0.45	-0.15
DISTRESS	1.61	2.09	-0.48	0.08	-6.36	***	-0.49	-0.64	-0.34
EXCESSIVENESS	2.07	2.44	-0.37	0.06	-5.76	***	-0.44	-0.60	-0.29
REASSURANCE	1.86	1.94	-0.08	0.07	-1.16		-0.09	-0.24	-0.06
DISTRUTS[b]	3.89	4.18	-0.29	0.08	-3.67	***	-0.28	-0.43	-0.13
CSS	1.94	2.25	-0.31	0.05	-6.24	***	-0.48	-0.63	-0.33

Note: * p value < 0.05; ** p value < 0.01; *** p value < 0.001.

[a] effect size: d = 0.20—small effect; d = 0.50—medium size effect; d = 0.80—large effect;

[b] distrust in medical professionals.

6. Discussion

In this study, we found that the pandemic period was associated with depression, anxiety, cyberchondria, and cognitive preoccupation and this is in line with a study [16]; in fact, according to this study individuals who perceive greater severity from COVID-19 and therefore are afraid of Covid, have a higher degree of anxiety, cyberchondria, but also high levels of depression above in the female gender. This correlates with an excessive search for information on one's health status through excessive and repetitive internet searches. About cognitive preoccupation, this finding is in line with the theory [17], the authors proposed that cognitive overload is one of the causes of increased distrust and that confidence can be increased by reducing cognitive load. Cognitive load also has obvious effects on the perception of information, including health information and information overload.

According to scientific literature [2], we found that affective temperaments directly correlate with the problematic use of the Internet and fear of Covid correlates with the problematic use of the Internet and cyclothymic, anxious, irritable, depressive temperaments. Cyberchondria correlates with problematic use of the internet and cyclothymic, anxious, depressive, and irritable temperaments. This is in line with the study [18], which emphasized that misinformation, spreading rapidly through social media, poses a serious threat to the COVID-19 response. The findings showed that the hyperthymic correlates inversely with distress and the excess of information on the net (this can be linked to the hedonistic and less obsessive character of a temperament that tends to action and extroversion, which instead in a more introverted way, happens in remaining temperaments). We observed that gender had significant differences; females experienced higher levels of cyberchondria than males. Therefore, some research shows that the female sex is positively associated with cyberchondria, while others state that gender has no effect [19, 20].

Consistent with the findings of previous studies [2, 16] we reported an increase in cyberchondria, depression, stress, low mood, anxious mood, during the Covid outbreak, and internet plays a vital role in everyday life in this period, because it has become refers to the existence of a popular source of accessing health related information. According to studies women seem to be more afraid of Covid but few are vaccinated in our sample; this can correlate with the distrust in the medical staff subscale CSS (mistrust) [9].

In a similar way [21] in our's study emerged another important finding that, were the higher values for women in the cyclothymic, depressive and anxious subscales, suggesting In fact according to this study, anxious/insecure temperament, is associated with increased perceptions of stress, and internet supported this conditions.

We observed that gender had significant differences; females experienced higher levels of cyberchondria than males. This finding contrasted previous research that found gender does not affect cyberchondria [19].

7. Conclusion

Affective temperaments, in particular cyclothymic, anxious, irritable and depressive, have a direct relationship with the fear of contagion from Covid and the problematic Internet use. Temperament also has a direct direction with Cyberchondria health anxiety. The paper highlights how an extroverted and hyperthymic tendency does not present the tendency to close itself to withdrawal and connection to the network. In this study we found gender differences concern women who are more prone to cyberchondria, compulsion, distress and excess of information concern women who are not reassured by reading information and this is related to anxiety and cyberchondria that is not reassured by reading rather increases anxiety and goes looking elsewhere (compulsive aspect), we found that women present higher average values than men, in POSI, Mood Regulation, Cognitive preoccupation, compulsive use and in the total score. Women have less emotional regulation and more compulsion related to cyclothymic, anxious, and depressive temperament; hyperthymic temperament seems more associated with the observed male sample. The lack of reassurance with just reading the information on the net can make these subjects more vulnerable and prone to fake news beliefs and probably more prone to brooding. Further studies could investigate the obsessive component of brooding associated with affective temperaments,

which predispose a subject to information vulnerability from fake news, especially in the face of potentially anxious events, such as the extraordinary one of the Covid pandemic.

8. Limitation

The results of this study must be interpreted considering limitations. The data collected presented all self-report in nature, and can be subject to social desirability regarding a high-stakes phenomenon widely covered by the media. We were collected by people with university education and a diploma in Italy who used social media average. As such, the results may be representative of the female gender. Indeed, the level of education could be an important factor that can reduce and/or increase the research and sharing of fake news. However, this study is conceived as an exploratory analysis based on a very simple design. Finally, in the present study we used only correlation coefficients to assess the relationship between variables. Correlation coefficients only detect linear correlations between variables. We can't exclude that other kinds of a nonlinear relationships between our variables may be present even when correlation coefficients are very low.

Author Contributions

CM and FP designed the study and supervised the method procedures, the various drafts and the final version of the manuscript. LGN and MCS organized recruitment, collected data and managed the literature searches. MGC and CL contributed to the statistical analysis. All Authors contributed to write paper and approved the final manuscript.

Competing Interests

The authors have declared that no competing interests exist.

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