Since January 2020 Elsevier has created a COVID-19 resource centre with free information in English and Mandarin on the novel coronavirus COVID-19. The COVID-19 resource centre is hosted on Elsevier Connect, the company's public news and information website.

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Who falls for fake news? Psychological and clinical profiling evidence of fake news consumers

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ABSTRACT

Awareness of the potential psychological significance of false news increased during the coronavirus pandemic, however, its impact on psychopathology and individual differences remains unclear. Acknowledging this, the authors investigated the psychological and psychopathological profiles that characterize fake news consumption. A total of 1452 volunteers from the general population with no previous psychiatric history participated. They responded to clinical psychopathology assessment tests. Respondents solved a fake news screening test, which allowed them to be allocated to a quasi-experimental condition: group 1 (non-fake news consumers) or group 2 (fake news consumers). Mean comparison, Bayesian inference, and multiple regression analyses were applied. Participants with a schizotypal, paranoid, and histrionic personality were ineffective at detecting fake news. They were also more vulnerable to suffer its negative effects. Specifically, they displayed higher levels of anxiety and committed more cognitive biases based on suggestibility and the Barnum Effect. No significant effects on psychotic symptomatology or affective mood states were observed. Corresponding to these outcomes, two clinical and therapeutic recommendations related to the reduction of the Barnum Effect and the reinterpretation of digital media sensationalism were made. The impact of fake news and possible ways of prevention are discussed.

1. Introduction

Pseudoscientific beliefs have many definitions (e.g., Fasce et al., 2020; Lilienfeld et al., 2005; Matute et al., 2011). Current research posits, pseudoscientific beliefs arise if certain content or information is accepted as scientific when in fact it lacks insufficient objective evidence (Fasce & Picó, 2019). Several studies have found significant increases in pseudoscientific beliefs and psychopathological risks during the coronavirus pandemic (Escolà-Gascón et al., 2020). Pseudoscientific beliefs are frequently irrational (e.g., believing in the existence of the Loch Ness monster), but they do not necessarily have to be magical (e.g., believing in the existence of intelligent extra-terrestrial life) (see Dagnall, Munley, et al., 2010; Dagnall, Parker, et al., 2010; Dagnall et al., 2011; Vickers, 2020; Escolà-Gascón, O'Neill, & Gallifa, 2021). In this latter example, the content is not magical because astrophysicists are looking for and finding a multitude of exoplanets (see the publication of Samland et al., 2021). However, at present there is no scientific evidence of intelligent life outside the Earth (for this reason the statement "there is extra-terrestrial intelligent life" can be considered pseudoscientific). In this paper, the authors focus on pseudoscientific beliefs related to medicine.

Pseudoscientific beliefs related to health put people's safety and well-being at risk (Lazarević et al., 2021; Lilienfeld, 2007). Illustratively, studies report that denial of the existence of the AIDS virus encouraged sex without the use of protection (Bogart et al., 2010; Ojikutu et al., 2020). Similarly, other research outlines the repercussions of anti-vaccination movements (Kata, 2010; Pullan & Dey, 2021). Believing

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that vaccines are detrimental to health represents a medical pseudoscientific belief (Jolley & Douglas, 2014; Stein et al., 2021). Such messages often feature prominently within conspiracy theories (Lobato et al., 2014; Drinkwater, Dagnall, Denovan, & Walsh, 2021).

Conspiracy ideation consists of advocating and believing that alternative explanations (unofficial) are real (Denovan et al., 2020). A conspiracy theory is an implausible argument that offers an unsubstantiated elucidation for certain events or circumstances (see Dagnall et al., 2017a; Drinkwater et al., 2020). For example, believing that governments have inserted a micro-chip in vaccines to control the population (e.g., Kanozia & Arya, 2021). In clinical terms, conspiracy theories and beliefs are characterized by delusional and counterfactual thought. In more extreme cases this can manifest as paranoid responses (Dagnall et al., 2015; Darwin et al., 2011; Imhoff & Lamberty, 2018). However, it is unclear what the psychopathological impact of these negative, non-adaptive responses are (e.g., Kuhn et al., 2021). As with the perceptual alternations that characterize magical ideation, it is possible that in conspiracy ideation factors such as mistrust of authority and perceived lack of control express both pathologically and nonpathologically (Kowalski et al., 2020). Thus, pseudoscientific beliefs may extend to conspiracy theories because both constructs are predicated on acceptance of information as valid without scientific evidence; endorsement correspondingly lacks the certainty afforded by objective evidence and is typically implausible (Escolà-Gascón, Marín, et al., 2021).

The concept of "fake news" is defined as content that is disseminated or released as "real" information when it is not (Lazer et al., 2018; van der Linden et al., 2020). In this sense, fake news is fabricated (see Escolà-Gascón, Dagnall, & Gallifa, 2021). This definition is similar to the delineations of pseudoscientific beliefs and conspiracy theories outlined earlier. A key commonality being the acceptance of fake news as authentic, despite lack of impartial verification (Lindeman & Aarnio, 2007; Bronstein et al., 2019). Moreover, a conspiratorial idea can express itself in the form of fake news if it becomes a publicly disseminated piece of information (e.g., denial of climate change) (e.g., van der Linden, 2015). Fake news is problematic because it can socially and psychologically influence populations (Zimmermann & Kohring, 2020). Effects though, are difficult to predict because the most frequent media in which fake news are spread is the Internet (see Guess et al., 2019). The veracity of internet data is difficult to discern due to the volume of information and the vastness of available sources (e.g., Pennycook & Rand, 2019).

Researchers have undertaken extensive research examining the influence of fake news literature (see Pennycook & Rand, 2021 for a review). One effect of fake news is radicalization of political ideologies (Salvi et al., 2021; Vegetti & Mancosu, 2020). Polarization of thinking generates increased aggression and fosters ideological tribalism (see Clark & Winegard, 2020). Another psychological consequence is emotional deregulation (e.g., Preston et al., 2021). Martel et al. (2020) observed that people who tended to believe more in fake news also had high levels of emotional dependence. Similarly, Pennycook et al. (2020) reported that fake news was related to thinking styles; levels of analytical style were lower in those who endorsed fake news (see also Swami et al., 2014). However, there is very little evidence on the psychiatric consequences or mental disorders fostered by fake news (see Pennycook & Rand, 2021 "Outstanding Questions").

In the medical field, studying the impact of online fake news on mental health is essential in order to develop prevention programs that protect the psychological well-being of the population. It is true that there are several preventive initiatives based on computational methods, warning signals, and mathematical algorithms that restrict problematic online content (e.g., Apuke & Omar, 2021). However, although these partially protect the population from access to fake news, they do not address the question of how to safeguard the psychological health of mass Internet consumers (van der Linden et al., 2021). To protect the mental health of populations that accidentally consume fake news, it is important to know in which categories of psychopathology symptoms increase (see De Coninck et al., 2021; So et al., 2022).

In this paper the authors analyzed the symptomatic differences observed between two groups: (1) people who effectively discriminated online fake news, and (2) people who ineffectively discriminated online fake news. The symptomatic differences were based on four personality disorders, symptoms that characterize *psychotic spectrum disorders* (PSD), anxiety, and addiction disorders. The main objective of the study was to find out whether symptom levels of the disorders analyzed increased or decreased as a function of the individual's ability to detect fake news online.

In accordance with the evidence initially cited and related to the impact of pseudoscientific beliefs on the mental well-being of the population during the coronavirus pandemic, the following hypothesis was put forward: individuals who are better at detecting online fake news obtain lower levels of symptoms of the disorders evaluated with respect to subjects who do not know how to correctly detect fake news.

2. Methods

2.1. Participants

A total of 1452 volunteers (49 % female and 51 % male) over 21 years of age (mean age = 29.15; standard deviation = 6.128) participated. Volunteers were asked how many hours per day they used digital devices to be connected to the Internet (computers, smartphones, tablets, and TVs were included). The number of hours of Internet use per day ranged from 6 to 14 (mean = 10.06; standard deviation = 2.573). This question was asked because the number of online fake news a person can receive varies according to the number of hours of Internet connection. Therefore, this was a control question. Similarly, the participants declared that they had no diagnosed psychiatric history and that they did not have any health impairment to answer the surveys.

All volunteers participated freely and did not receive any compensation for partaking in the study. Participation was voluntary and all had to sign a written informed consent before answering the questionnaires. This consent explained all the information about the study and its objectives.

2.2. Materials

2.2.1. State-Trait Anxiety Inventory (STAI)

This scale was initially developed by Spielberger et al. (1970) to evaluate clinical symptoms of anxiety and stress. The STAI consists of 40 items distributed in two dimensions: (1) State-type anxiety (refers to anxiety motivated by the circumstances experienced by the person) and (2) Trait-type anxiety (refers to anxiety motivated by the individual's way of being or personality). To answer the items, the perceived frequency of symptoms must be indicated on a scale ranging from 0 ("none") to 3 ("very much"). The reliability and validity of this scale is excellent and has been replicated in numerous investigations (e.g., Wiglusz et al., 2019). In this research, the Spanish version published by TEA Ediciones, S.A.U. was used (Spielberger et al., 2015). The reliability

indices applied to this sample were acceptable (alpha > 0.7 and Omega > 0.7).

2.2.2. Positive and Negative Affect Schedule (PANAS)

This instrument was originally developed by Watson et al. (1988) to measuring affective symptoms. The PANAS has 20 items that are classified into two dimensions: (1) Positive affect (assesses positive emotions and feelings such as enthusiasm, satisfaction, and vitality) and (2) Negative affect (examines negative emotions such as guilt, hostility, sadness, pessimism, and dissatisfaction). For each item, the participant indicates the degree to which he/she experiences each of the contents on a Likert-type scale from 1 ("very little or not at all") to 5 ("extremely"). The PANAS has satisfactory validity and reliability, both in its original version and in subsequent revisions (see Díaz-García et al., 2020). In this research, the Spanish adaptation of Ortuño-Sierra et al. (2015) was used. The reliability indices used in this sample were good for both dimensions (alpha > 0.8 and omega > 0.8).

2.2.3. Multivariable Multiaxial Suggestibility Inventory (MMSI-2)

The MMSI-2 was developed and published by Escolà-Gascón (2020a) after 8 years of psychometric analysis. This test is broad-spectrum, has 174 items and measures 16 primary clinical variables and 4–5 secondary variables. These scales collect several clinical symptoms based on The *Diagnostic and Statistical Manual of Mental Disorders* (DSM-5) (see American Psychiatric Association, 2013). The clinical dimensions of the MMSI-2 used in this research were as follows: Inconsistencies (K), Lies (L), Fraud (F), Simulation (Si), Neurasthenia (Nt), Substance Use (Cs), Suggestibility (Su), Thrill-Seeking (Be), Histrionism (Hi), Schizotypy (Ez), Paranoia (Pa), Narcissism (Na), Anomalous Visual/Auditory Phenomena (Pva), Anomalous Tactile Phenomena (Pt), Anomalous Olfactory Phenomena (Po) and Anomalous Cenesthetic Phenomena (Pc). Participants must indicate the degree of agreement on each of the items following the Likert model of 5 response alternatives (1 = "strongly disagree" and 5 = "strongly disagree"). The MMSI-2 has excellent construct validity (see Escolà-Gascón, 2020b) and reliability indices > 0.9 (using Cronbach's alpha and McDonald's Omega coefficients) (Escolà-Gascón, 2020a). In this sample, the reliability indices were also excellent for all dimensions (alpha > 0.8 and omega > 0.8).

2.2.4. The COVID-19 fake news test

The COVID-19 fake news test consists of 18 statements about coronavirus; 6 false (fake news), 6 true, and 6 indeterminate (i.e., due to lack of evidence, it was not possible to establish content veracity). To ensure validity, statements were worded according to the World Health Organization (2020) guidelines for identifying true and false news. After reading each statement, participants indicated whether content was true ("YES"), false ("NO"), or whether they were uncertain ("?"). For each correct response a point was awarded, other answers received no points (errors were not penalised). Correspondingly, total scores ranged from 0 to 18 points.

This test has previously been used in published peer reviewed research (see Escolà-Gascón, 2021; Escolà-Gascón, Dagnall, & Gallifa, 2021; Escolà-Gascón, Marín, et al., 2021), where it has demonstrated good validity and reliability. The mean obtained ranged from 8.13 to 10.32 (9.51 in the sample of Escolà-Gascón, 2021). These values support the use of a cut-off point close to nine points (0.5) to discriminate participants with high abilities to detect fake news (vs. those cannot). In this study acceptable reliability indices were obtained (omega coefficient > 0.8 and ordinal alpha coefficient > 0.8). Test items were previously published using an open access license in Escolà-Gascón (2021).

2.3. Procedures

The design of this research was correlational and based on group comparison. The recruitment process of the participants was carried out online using social networks: Facebook, Twitter, LinkedIn, and WhatsApp groups. The duration of the sample collection was 7 months (from March to September 2021). Prior to the survey, each volunteer was presented with an informed consent form that they had to sign (by clicking on the acceptance box on the online form). All materials were administered in Spanish and all subjects stated that they resided in Spain. There were no setbacks or unforeseen events during data collection.

As responses were obtained, data were automatically recorded in a downloadable Microsoft Excel matrix. During the 7 months, the variables sex, age, and number of hours of Internet connection were monitored. When the number of men and women was similar and the summer vacation was over, data was no longer collected.

No missing values were obtained because no question could be left unanswered. When all the responses were collected, the scores for each of the scales and variables of this research were calculated and the results were analyzed.

2.4. Statistical analysis

Statistical analyses were performed using the R programming language, *RStudio* and *JASP* (The Jamovi Project, 2022). Multiple regression analysis was applied (with the *residual least squares* method) and Student's *t*-test was used. Mann-Whitney *U* tests were also employed, and Bayes Factors (hereafter BF_{10}) were estimated. The a priori probabilities were adjusted to 50 % (i.e., they were *equiprobable*). Using simple transformations, the posteriori distribution or $P(H_1|D)$ was estimated from the BF_{10}. These transformations were as follows:

$$BF_{10} = \frac{\int_{\Theta H_1} P(D|\theta_{H_1}, H_1)\cdot\pi(\theta_{H_1}|H_1)d\theta_{H_1}}{\int_{\Theta H_0} P(D|\theta_{H_0}, H_0)\cdot\pi(\theta_{H_0}|H_0)d\theta_{H_0}} \propto \frac{BF_{10}}{BF_{10}+1} = P(D|H_1)$$

The parameters of the above equation that allows estimation of the BF_{10} are obtained by integration procedures and the result can be interpreted in the odds metric. For this reason, this transformation could be used. $BF_{10} \geq 10$ points indicates evidence in favour of the alternative hypothesis of the study.

3. Results

3.1. Mean comparison analysis

The variables were statistically described according to two groups: (1) participants who effectively detected fake news about coronavirus and (2) participants who ineffectively detected fake news. Participants were classified into these groups according to the number of hits obtained in the COVID-19 fake news test (hits ranged from 0 to 18). When the participant obtained a value equal to or higher than 9 points, he/she was classified in group 1 ($n = 699$). When the score was below 9, the participant was classified in group 2 ($n = 753$). This cut-off point was defined according to the median observed in the fake news test (total mean = 9.81; total standard deviation = 4.308; total median = 9). Descriptive statistics are summarized in Table 1.

Table 1
Descriptive statistics for the scales differentiated according to the effectiveness in the detection of fake news.

Clinical variables	Ineffective fake news detection (hits < 9) N = 753		Effective fake news detection (hits ≥ 9) N = 699	
	Direct means	Standard deviation	Direct means	Standard deviation
Number of hits in the detection fake news exam	6.07	2.064	13.82	1.671
Trait anxiety (STAI-T)	22.12 (3.69)	3.875 (0.646)	16.69 (2.78)	3.709 (0.618)
State anxiety (STAI-S)	20.21 (3.37)	3.844 (0.641)	13.71 (2.28)	2.935 (0.489)
Positive affect	31.48 (6.62)	5.164 (1.291)	32.22 (6.81)	5.983 (1.496)
Negative affect	17.67 (3.17)	3.373 (0.843)	15.56 (2.64)	3.418 (0.855)
Histrionism (Hi)	36.22 (6)	2.923 (0.562)	31.43 (5.08)	3.194 (0.614)
Schizotypy (Ez)	38.39 (7.59)	3.821 (0.868)	30.5 (5.80)	3.81 (0.866)
Paranoia (Pa)	35.94 (7.73)	3.328 (0.832)	32.17 (6.79)	2.617 (0.654)
Narcissism (Na)	35.16 (6.28)	3.699 (0.771)	33.44 (5.93)	6.036 (1.257)
Visual and auditory Disturbances (Pva)	17.66 (2.88)	2.565 (0.583)	17.73 (2.89)	2.66 (0.605)
Touch disturbances (Pt)	12.93 (2.83)	1.622 (0.579)	12.72 (2.76)	1.692 (0.604)
Olfactory disturbances (Po)	14.78 (3.49)	2.093 (0.747)	14.68 (3.46)	2.041 (0.729)
Cenesthetic disturbances (Pc)	16.09 (3.08)	2 (0.556)	16.41 (3.17)	1.892 (0.525)
Cognitive biases based on the Barnum Effect (Si).	22.53 (7.30)	2.146 (0.894)	15.75 (4.48)	4.267 (1.778)
Suggestibility (Su)	22.19 (6.14)	4.474 (1.598)	18.43 (4.80)	2.864 (1.023)
Search for emotions (Be)	14.07 (5.67)	2.127 (1.329)	12.73 (4.83)	2.3 (1.438)
Substance use and addiction risks (Cs)	13.54 (3.05)	2.174 (0.777)	13.52 (3.04)	2.061 (0.736)

Note: Means and standard deviations on a scale of 0 to 10 are given in parentheses.

Direct scores enable the comparison between the means of group 1 and 2. However, if it is desired to check which clinical variables scored higher than others, the direct scores should be transformed so that all the scales are on the same metric. In this case, given that not all the scales had Spanish normative groups, it was decided to apply a transformation of the scores into a range from 0 to 10.

The following equation was used to modify the direct scores:

$$TS_{10} = \frac{DS_{ij}}{K_{max_j} \cdot N_j} \cdot 10$$

where:

TS_{10} = transformed scores over 10;
DS_{ij} = direct scores of the "i" participant and "j" scale;
$K_{\max_j}$ = maximum response alternative in scale "j";
N_j = number of items in scale "j".

When the minimum response alternative on a scale "j" $K_{\min_j}$ is not equal to 0, the following equation should be used:

$$TS\left(K_{min_j} \neq 0\right)_{10} = \frac{DS_{ij} - K_{max_j}}{\left(K_{max_j} - 1\right) \cdot N_j} \cdot 10$$

The latter transformation was used for the PANAS and MMSI-2 scales. From these formulas, all the scores were within a range of values between 0 and 10. By having the same metric, the mean graph could be made to compare the scores between the clinical scales and to know which of them scored higher. Comparisons between group 1 and group 2 means were made with direct scores. Table 2 shows the results of these comparisons.

Mean transformed scores out of 10 were graphically depicted in Fig. 1 for each type of group.

Results in Table 2 indicated that subjects with difficulties in detecting fake news score higher on the subclinical variables Trait Anxiety, State Anxiety, Negative Affect, Histrionism, Schizotypy, Paranoia, Narcissism, Simulations (Barnum Effect), Suggestibility and Search for emotions. The Bayes Factor exceeded the 10-point threshold and reinforced the observations obtained in the frequentist contrasts. The contrast power was excellent for all the statistical tests applied to these variables. This is important because it prevents type I and type II errors.

The graphical trends in Fig. 1 can be interpreted as a group clinical profile. The clinical variables that scored highest in group 1 subjects were Positive Affect and Paranoia. In contrast, the variables that scored highest in group 2 were Schizotypy, Simulations and Paranoia. These clinical trends reinforce what was observed in Table 2 and allow us to conclude that not knowing how to detect fake news effectively is related to increases in some clinical variables such as Anxiety, Negative Affect, Simulations (Barnum Effect bias) and personality tendencies.

3.2. Multiple regression analysis

To re-examine the observed statistical effects and trends, a multiple regression analysis was applied using fake news detection hits as the criterion variable and subclinical variables as predictors. Table 3 shows the correlations between fake news test scores and subclinical personality variables, perceptual disturbances and cognitive biases. Based on Table 3, predictors that best correlated with the criterion variable were chosen to fit the regression models. Table 4 provides the results of the forward stepwise regression.

Results in Table 4 indicate that the variables Simulations (Si), Schizotypy (Ez), Paranoia (Pa), State anxiety and Histrionism (Hi) explain 78.1 % of the variance of the fake news test scores. However, the increases in R^2 and Fisher's F-statistic indicate that the most important increase can be observed with the inclusion of the variable Schizotypy (Ez) (see model 2). This has several clinical implications that will be analyzed in the discussion.

4. Discussion

This paper investigated the effects of fake news on subclinical personality profiles and other psychopathological variables. Results supported the conclusion that failure to correctly detect fake news is related to increased psychopathological risks in: Trait Anxiety, State Anxiety, Negative Effect, Histrionism, Schizotypy, Paranoia, Narcissism, Simulations (Barnum Effect), Suggestibility and Search for Emotions. The implications of these findings for the clinical practice of psychology and psychiatry are discussed and interpreted below.

4.1. Connection between fake news and personality disorders

The observed relationship between fake news and levels of schizotypy was consistent with previous scientific evidence on pseudoscientific beliefs and magical ideation (see Bronstein et al., 2019; Escolà-Gascón, Marín, et al., 2021). Following the dual process theory model (e.

Table 2
Means comparisons between participants who effectively detect fake news (>9) and those who do not (<9).

Clinical variables	Welch's *t*-test	Mann-Whitney U test	Cohen's d[a]	BF_{10} $P(H1\|D)$	% Error associated to the BF_{10}	Measurement of contrast power (1-β)[b]
Trait anxiety (STAI-T)	27.305*	442,951*	|1.432|	135.483 ~1	1.827e − 131	φ = 27.264 (1-β) = 0.99
State anxiety (STAI-S)	36.412*	479,475.5*	|1.902|	208.402 ~1	4.725e − 203	φ = 36.213 (1-β) = 0.99
Positive affect	−2.504	246,348.5	|0.132|	1.350 0.574	0.008	–
Negative affect	11.826*	350,005.5*	|0.621|	37.025 ~1	3.069e − 30	φ = 11.823 (1-β) = 0.99
Histrionism (Hi)	29.747*	454,763*	|1.564|	169.237 ~1	4.572e − 152	φ = 29.778 (1-β) = 0.99
Schizotypy (Ez)	39.379*	486,687*	|2.067|	248.281 ~1	6.482e − 230	φ = 39.354 (1-β) = 0.99
Paranoia (Pa)	24.074*	432,044*	|1.258|	111.275 ~1	2.066e − 105	φ = 23.952 (1-β) = 0.99
Narcissism (Na)	6.468*	326,555*	|0.342|	30.877 ~1	1.268e − 10	φ = 6.511 (1-β) = 0.99
Visual-auditory Disturbances (Pva)	−0.548	260,369.5	|0.029|	0.068	0.152	–
Touch disturbances (Pt)	2.412	285,896	|0.127|	1.054	0.010	–
Olfactory disturbances (Po)	0.947	270,202	|0.050|	0.092	0.114	–
Cenesthetic disturbances (Pc)	−3.189	243,770.5	|0.167|	8.709	0.001	–
Cognitive biases based on the Barnum Effect (Si).	37.761*	476,957*	|2.004|	230.433 ~1	2.296e − 223	φ = 38.155 (1-β) = 0.99
Suggestibility (Su)	19.193*	401,409*	|1.000|	79.534 ~1	2.083e − 70	φ = 19.039 (1-β) = 0.99
Search for emotions (Be)	11.469*	360,308.5*	|0.603|	29.047 ~1	1.012e − 28	φ = 11.481 (1-β) = 0.99
Substance use and addiction risks (Cs)	0.130	264,024	|0.007|	0.059	0.175	–

Note:
* $p < 0.001$.
[a] Cohen's d test was corrected by applying Hedges' g.
[b] Since the sample size of the two groups was different, the harmonic mean was used as a parameter to estimate the contrast power of each test. The harmonic mean was 724.996.
The harmonic mean equation is as follows:
$\overline{n} = \frac{(2n_1 n_2)}{(n_1 n_2)}$.

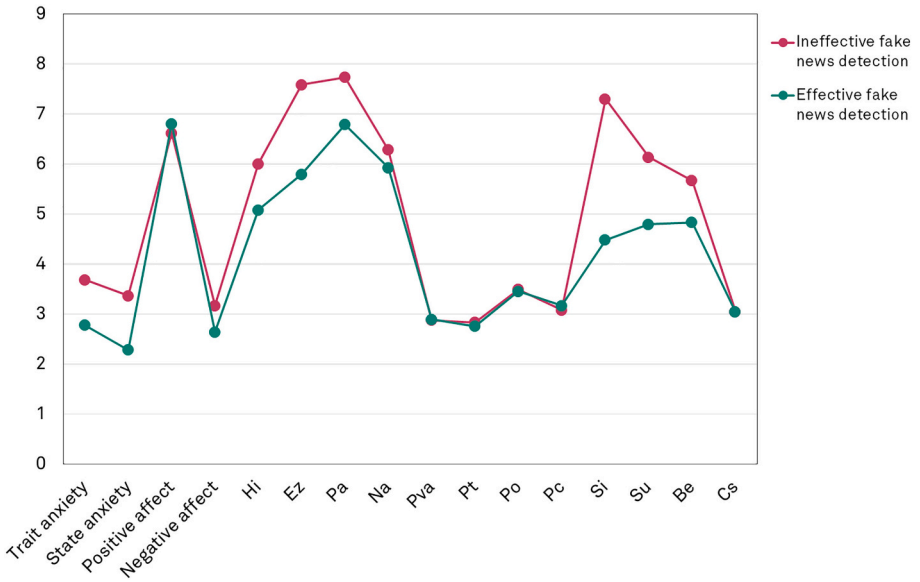

Fig. 1. Individual/group differences from means out of 10 for clinical personality tendencies, differentiating between participants who effectively detect fake news and those who do not.

Table 3
Correlations between subclinical (predictor) variables and the fake news detection test score. ($N = 1452$).

Clinical variables	Pearson correlation	95 % Pearson confidence intervals		Spearman correlation
		Lower	Upper	
Trait anxiety (STAI-T)	−0.578*	−0.611	−0.542	−0.603*
State anxiety (STAI-S)	−0.671*	−0.699	−0.642	−0.710*
Positive affect	0.157	0.107	0.207	0.191
Negative affect	−0.377*	−0.420	−0.332	−0.410*
Histrionism (Hi)	−0.650*	−0.679	−0.619	−0.695*
Schizotypy (Ez)	−0.748*	−0.770	−0.724	−0.763*
Paranoia (Pa)	−0.711*	−0.736	−0.685	−0.738*
Narcissism (Na)	−0.300*	−0.346	−0.252	−0.335*
Visual-auditory Disturbances (Pva)	0.011	−0.040	0.062	−0.023
Touch disturbances (Pt)	−0.103	−0.154	−0.052	−0.134
Olfactory disturbances (Po)	−0.044	−0.095	0.008	−0.058
Cenesthetic disturbances (Pc)	0.054	0.002	0.105	0.012
Cognitive biases based on the Barnum Effect (Si).	−0.757*	−0.778	−0.734	−0.787*
Suggestibility (Su)	−0.486*	−0.524	−0.446	−0.522*
Search for emotions (Be)	−0.457*	−0.496	−0.415	−0.464*
Substance use and addiction risks (Cs)	−0.071	−0.122	−0.020	−0.127

Note:
* $p < 0.001$.

g., Pennycook & Rand, 2019), when a person does not correctly distinguish between information with scientific arguments and information without scientific grounds it is because they predominantly use cognitive reasoning characterized by intuition (e.g., Dagnall, Drinkwater, et al., 2010; Swami et al., 2014; Dagnall et al., 2017b; Williams et al., 2021).

Concomitantly, intuitive thinking correlates positively with magical beliefs (see Šrol, 2021). Psychopathological classifications include magical beliefs as a dimension of schizotypal personality (e.g., Escolà-Gascón, 2020a). Therefore, it is possible that the high schizotypy scores in this study can be explained from the perspective of dual process theory (Denovan et al., 2018; Denovan et al., 2020; Drinkwater, Dagnall, Denovan, & Williams, 2021). Intuitive thinking could be the moderating variable that explains why participants who scored higher in schizotypy did not effectively detect fake news.

Something similar happened with the subclinical trait of paranoia. This variable scored the highest in both group 1 and group 2 (see Fig. 1). Intuition is also positively related to conspiratorial ideation (see Drinkwater et al., 2020; Gligorić et al., 2021). Similarly, psychopathology tends to classify conspiracy ideation as a frequent belief system in paranoid personality (see Escolà-Gascón, 2022). This is because conspiracy beliefs are based on systematic distrust of the systems that structure society (political system), knowledge (science) and economy (capitalism) (Dagnall et al., 2015; Swami et al., 2014). Likewise, it is known that distrust is the transversal characteristic of paranoid personality (So et al., 2022). Then, in this case the use of intuitive thinking and dual process theory could also justify the obtained paranoia scores. The same is not true for the histrionic personality.

One of the characteristic features of histrionicity is lying (see Escolà-Gascón, 2020a). Specifically, within the histrionic personality, lying should be understood as an automatic deception that is used for seduction purposes (Posavac et al., 2021). In this context, psychological theories that justify the functionality of unconscious lying could serve us to understand why histrionic scores were higher in the group that ineffectively detected fake news (see Semrad et al., 2019). One such

Table 4
Multiple linear regression models using the forward stepwise method. The inclusion of predictor variables was based on linear correlations. Criterion variable = fake news detection test hits; predictor variables: State anxiety, Histrionics, Schizotypy, Paranoia and Simulations (Barnum Effect).

Clinical variables	Unstandardized regression parameters			β_z	Adjusted R^2 (error of the estimate)	ΔR^2	Fisher's test change
	β_0	β	Errors				
Model 1							
Cognitive biases based on the Barnum Effect (Si).	23.017	−0.686*	0.016	−0.757*	0.573	–	1944.374*
Model 2							
Cognitive biases based on the Barnum Effect (Si).	31.136	−0.445*	0.015	−0.491*	0.723	0.150	785.084*
Schizotypy (Ez)		−0.369*	0.013	−0.470*			
Model 3							
Cognitive biases based on the Barnum Effect (Si).	37.396	−0.358*	0.015	−0.395*	0.758	0.036	216.074*
Schizotypy (Ez)		−0.292*	0.013	−0.371*			
Paranoia (Pa)		−0.311*	0.021	−0.256*			
Model 4							
Cognitive biases based on the Barnum Effect (Si).	36.141	−0.324*	0.015	−0.357*	0.775	0.017	107.262*
Schizotypy (Ez)		−0.252*	0.013	−0.321*			
Paranoia (Pa)		−0.255*	0.021	−0.210*			
State anxiety (STAI-S)		−0.157*	0.015	−0.172*			
Model 5							
Cognitive biases based on the Barnum Effect (Si).	37.737	−0.318*	0.015	−0.351*	0.781	0.006	40.597*
Schizotypy (Ez)		−0.218*	0.014	−0.278*			
Paranoia (Pa)		−0.227*	0.021	−0.187*			
State anxiety (STAI-S)		−0.142*	0.015	−0.156*			
Histrionism (Hi)		−0.121*	0.019	−0.109*			

Note: β_0 = constant; β = unstandardized regression coefficient; β_z = standardized regression coefficient; R^2 = explained variance.
* $p < 0.001$.

theory is social desirability (Edwards, 1957; Danioni et al., 2020). It is possible that participants who did not effectively detect fake news believed that this research supported conspiratorial beliefs. With this prior instruction, this type of participant might wish to please and correspond with the expectations of the research team. This kind of behavior is very common in histrionic profiles (see Furnham & Grover, 2021). For this reason, histrionic scores were elevated in those participants who did not correctly detect fake news.

STAI scales also showed differences between group 1 and group 2. Participants who did not effectively detect fake news (vs. effectively detected fake news) had higher levels of anxiety than participants. In this relationship, anxiety can be understood as a response to the information and misinformation overload during the coronavirus pandemic (e.g., Gupta et al., 2022), or as an independent variable that could distort the individual's reasoning for identifying fake news (see Escolà-Gascón et al., 2020). In this research, anxiety was measured both as a stable personality trait and as a state. The following speculation could be made, it is possible that state-type anxiety levels reflect a circumstantial response to the coronavirus pandemic and that trait-type anxiety assumes the role of an independent variable.

However, this point is only a speculation; it is crucial to note that the above speculation could not be experimentally tested in the present study. For this reason, in the regression models it was accepted that state-type anxiety acted as a predictor variable; it would also be possible that the circumstances of confrontation with fake news (we refer to the fact of having to answer a fake news screening test) increased the levels of situational anxiety and caused an increase in the responses of some participants. Therefore, the interpretation of the value of the anxiety scores should be made with caution.

Narcissistic personality and scales measuring perceptual disturbances did not yield relevant effect sizes. The fact that perceptual disturbances were not significant subclinical variables implies that positive psychotic symptomatology (i.e., those symptoms related to hallucinations and delusions) are not affected by fake news. This would only be applicable for positive symptoms, as negative symptomatology (included in schizotypy) should have been assessed independently (see the Limitations section). The same is true for the positive and negative affect scales, which showed no significant differences.

4.2. Clinical recommendations for the prevention and detection of fake news

Based on these findings, prevention of fake news should be carried out both externally (for example, using mathematical algorithms to detect and eliminate fake news) and from an individual or internal approach. The latter refers to the intra psychological resources used by users of social networks to detect fake news and avoid the discomfort they generate. Encouraging the use and learning of these internal resources is also a way of combating fake news. Correspondingly, the results obtained in this study allow us to make several contributions.

First, the Simulations (Si) scale of the MMSI-2 was one of the variables that showed the greatest differences. This scale is related to the Barnum Effect, which is a type of cognitive bias. The Barnum Effect consists of accepting as exclusive a verbal description of an individual's personality, when, the description employs contents applicable or generalizable to any profile or personality that one wishes to describe (see Boyce & Geller, 2002; O'Keeffe & Wiseman, 2005). The error of this bias is to assume as exclusive or unique information that is not. This error can occur in other contexts not limited to personality descriptions. Originally, this bias was studied in the field of horoscopes and pseudoscience's (see Matute et al., 2011). Research results suggest that people who do not effectively detect fake news regularly commit the Barnum Effect. So, one way to prevent fake news may be to educate about what the Barnum Effect is and how to avoid it. The question we ask is this, by reducing the Barnum effect, could the negative impact of fake news be avoided?

According to scores on the Suggestibility and Thrill-Seeking scales, it seems that people who score high are those who engage with higher levels of fake news. This could indicate and describe the vulnerable profile of those who are more susceptible to the negative effects of fake news. Therefore, this proposes two possible recommendations: (1) consistent with Pennycook et al. (2018), educate the interpretation of sensationalism associated with fake news to interfere as little as possible in those users with high Suggestibility, and (2) as suggested by Bronstein et al. (2019), foster critical thinking as an internal psychological resource that questions and allows dismantling fake news. This coincides with the evidence obtained by Bago et al. (2020), which makes our results consistent with the findings of other studies (see also Roozenbeek & van der Linden, 2019). Moreover, an adaptive use of critical thinking could help suggestible individuals to better regulate their emotional lability (Escolà-Gascón et al., 2021).

The promotion of critical thinking involves enhancing analytical cognitive reasoning, which is complementary to the intuitive style (see Pennycook et al., 2020). This idea based on dual process theory supports the interpretations in Subsection 4.1. At this point, it is important to remember that the activation of the analytical style does not imply annulling the use of the intuitive style. Similarly, when intuition is used, it is also possible to active the analytical-critical style simultaneously. In this way, dual processing models suggest that both styles function in parallel (Pennycook & Rand, 2021). Therefore, the promotion of critical thinking should be based on analytical cognitive reasoning, but without forgetting that intuitive reasoning can intervene at specific moments. This is frequent in individuals who believe in the existence of the paranormal. These profiles tend to use intuition as a decision-making mechanism (see Drinkwater, Dagnall, Denovan, & Williams, 2021; Williams et al., 2021), but they can also think critically and activate analytical reasoning. Thus, the use of critical thinking based exclusively on the analytical style should be taken with caution.

These suggestions can be applied at several levels. One of these levels may be the psychotherapeutic and clinical level. Caution should be exercised; accordingly, the above suggestions are presented only as hypothetical ideas that should be tested again in the future to know and verify their efficacy.

4.3. On the consumption pattern before and after the COVID-19 crisis

Although consumption of fake news has been influenced by the coronavirus crisis (see Escolà-Gascón, 2021) the problem pre-dates the current pandemic (Pennycook & Rand, 2021). The influence of the spread of COVID-19 between 2020 and 2021 was increased digitization of human activities to facilitate telematic work (Innerarity & Colomina, 2020a). This revealed two important features disintermediation and infodemia. The former is where direct access to information was promoted, dispensing with intermediary media that would act as filters and secure channels of communication (Innerarity & Colomina, 2020b). The latter refers to the overabundance of information available. This includes false or misleading information. This excess can confuse individuals and blur sources credibility (see Pulido et al., 2020). The problem of infodemia was formally acknowledged by the *World Health Organization* (see Escolà-Gascón et al., 2020).

Identifying these contextual factors is crucial because the psychological mechanisms involved in the consumption of fake news likely persist beyond the pandemic. Thus, preceding research suggests that fake news consumption after COVID-19 will continue to be influenced by the core drivers present during the pandemic (i.e., digital acceleration, disintermediation, and infodemia). A potential factor that accentuates consumption of novel fake news is stimulus saturation. This is a psychological mechanism where the capacity to evaluate and manage data is exceeded, making it difficult to discriminate between true and false information. This suggests that the pre and post COVID-19 there has been a movement from accidental to saturation consumption. Accordingly, future research should assess the effects of saturation

effects across subclinical behaviors.

4.4. Limitations

One limitation has already been discussed in Section 4.1. However, two more can be highlighted. The first is related to the effective and ineffective detection of fake news. It should be considered that the cut-off point chosen to organize groups 1 and 2 was empiricist because it was based on the median. However, there is no previous research indicating the sensitivity and specificity of the chosen threshold. As these statistical properties are unknown, the results should be considered with caution and replicated in future research. In addition, another sub-limitation should also be highlighted: the fact that a person does not effectively detect fake news does not mean that he/she has magical or conspiratorial ideation. This possibility was not tested in this research and should be analyzed in future studies. We hypothesize that failure to detect pseudoscientific fake news will be related to magical ideation and intuitive thinking. However, the ideal would be to contrast this possibility from the logic of experimental designs.

The second limitation is related to the generalization of the results and the sample. Although the sample size was excellent for this type of research, all subjects were Spanish. It is likely that cultural and/or linguistic differences may interfere with the results and moderate the effects of the relationship between fake news detection and subclinical attributes.

5. Conclusions

The conclusions of this research can be summarized as follows:

(1) The evidence obtained proposes that profiles with high scores in schizotypy, paranoia and histrionism are more vulnerable to the negative effects of fake news. In clinical practice, special caution is recommended for patients who meet the symptomatic characteristics of these personality traits.
(2) In psychiatry and clinical psychology, it is proposed to combat fake news by reducing or recoding the Barnum effect, reinterpreting sensationalism in the media and promoting critical thinking in social network users. These suggestions can be applied from intervention programs but can also be implemented as psychoeducational programs for massive users of social networks.
(3) Individuals who do not effectively detect fake news tend to have higher levels of anxiety, both state and trait anxiety. These individuals are also highly suggestible and tend to seek strong emotions. Profiles of this type may inappropriately employ intuitive thinking, which could be the psychological mechanism that.
(4) Positive psychotic symptomatology, affective mood states and substance use (addiction risks) were not affected by fake news. In the field of psychosis, it should be analyzed whether fake news influences negative psychotic symptomatology.

The results of this research are not experimental, but they contribute to the generation of new hypotheses and offer practical recommendations for the psychiatric and/or psychological clinic.

Ethics approval

The Committee of Ethical Guarantees of the *Sociedad Universitaria para la Investigación Científica*, (as an official Spanish institution with public I.D. 58210-J/1) reviewed, favorably evaluated and approved this research.

Data availability statement

The raw data supporting the conclusions of this article will be made available by the authors, without undue reservation. The data file is ".sav" and can be run free of charge with the Jamovi software (see The Jamovi Project, 2022).

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CRediT authorship contribution statement

Álex Escolà-Gascón: Methodology, Data curation, Formal analysis, Investigation, Writing – original draft. **Neil Dagnall:** Conceptualization, Resources, Writing – review & editing. **Andrew Denovan:** Methodology, Validation, Visualization. **Kenneth Drinkwater:** Validation, Project administration. **Miriam Diez-Bosch:** Supervision.

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Preregistration

This study was not preregistered.
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Declaration of competing interest

The authors confirm that there are no known conflicts of interest associated with this publication.

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