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Article

What Lies Beyond Personality Traits? The Role of Intolerance of Uncertainty, Anxiety Sensitivity, and Metacognition

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ABSTRACT

Background: Although personality trait models have become consolidated as the hegemonic taxonomical models for describing personality and provide excellent capacity for predicting variables of psychological interest (i.e., mental disorders), there are still important gaps in our knowledge about *why* personality traits predict those variables. We hypothesised that intolerance of uncertainty, anxiety sensitivity and metacognition may partially give an answer to that *why*. **Method:** We analysed: (1) the relationship between those three variables and the five dimensions of the Big Five model (n = 914; 51.7% women) in Study 1, and (2) the relationship between those variables and neuroticism facets (n = 656; 55.7% women) in Study 2. **Results:** Intolerance of uncertainty was statistically related to the dimensions of neuroticism, extraversion, and agreeableness, while anxiety sensitivity also proved to be related to neuroticism. Both variables were related to the six facets of the neuroticism dimension (with the exception of the impulsivity facet for intolerance of uncertainty). Metacognition showed no significant relationship with any of the personality dimensions. **Conclusions:** The current work sheds some light on the *why* underlying the potential relationships between personality traits and relevant behaviours, with intolerance of uncertainty and anxiety sensitivity being particularly important, especially concerning the neuroticism dimension.

¿Qué Hay más Allá de los Rasgos de la Personalidad? El Papel de la Intolerancia a la Incertidumbre, Sensibilidad a la Ansiedad y Metacognición

Palabras clave:
Personalidad
Big Five
Intolerancia a la incertidumbre
Sensibilidad a la ansiedad
Metacognición

RESUMEN

Antecedentes: Aunque los modelos de personalidad de rasgos se han consolidado como los modelos hegemónicos para describir la personalidad y tienen capacidad para predecir variables de interés psicológico (p. ej., trastornos mentales), existen lagunas acerca del *por qué* los rasgos de personalidad predicen esas variables. Hipotetizamos que intolerancia a la incertidumbre, sensibilidad a la ansiedad y metacognición podrían responder parcialmente a dicho *por qué*. **Método:** Se analizó: (1) la relación entre estas tres variables y las cinco dimensiones del modelo *Big Five* (n = 914; 51,7% mujeres) y (2) la relación entre estas variables y las facetas del neuroticismo (n = 656; 55,7% mujeres). **Resultados:** La intolerancia a la incertidumbre se relacionó con neuroticismo, extraversión y amabilidad, mientras que la sensibilidad a la ansiedad mostró estar relacionada con neuroticismo. Ambas se relacionaron también con las seis facetas del neuroticismo (salvo impulsividad para la intolerancia a la incertidumbre). La metacognición no mostró relaciones significativas con ninguna de las dimensiones. **Conclusiones:** El presente trabajo arroja luz sobre el *por qué* subyacente a las relaciones potenciales entre los rasgos de personalidad y conductas relevantes, siendo la intolerancia a la incertidumbre y la sensibilidad a la ansiedad de gran importancia, especialmente para el neuroticismo.

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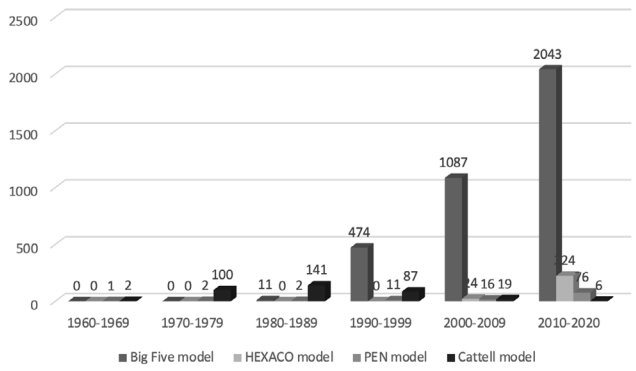
One of the oldest and most fruitful perspectives in the scientific study of personality is the view that considers the personality trait construct as the unit of analysis (Matthews et al., 2009). Throughout history, different personality models based on the trait construct have been proposed, which in turn have suggested various taxonomies of broader personality traits or dimensions and more specific personality traits or facets (Sanz, 2008; Sanz et al., 1999). Among these taxonomies, it is worth mentioning Cattell's model (Cattell, 1950), Eysenck's model or PEN model (Eysenck & Eysenck, 1985), the Five Factor model or Big Five model (Costa & McCrae, 1985), and more recently, the HEXACO model (Ashton et al., 2004).

The empirical support that each of these models had (and still receives) is diverse, with the Big Five model having the highest level of endorsement and consolidation after hundreds of independent and cross-cultural studies (Sanz, 2008). To determine the current levels of support for those taxonomies of personality traits, we conducted a search in PsycInfo with the following key words—including key words related to the main instruments that operationalize the different taxonomies of personality traits: (1) for the Big Five model: "*Big Five*", "*five factor model*", "*5 factor model*", "*NEO-PI*" OR "*NEO-FFI*"; (2) for the HEXACO model: "*HEXACO*" OR "*HEXACO-PI-R*"; (3) for the PEN model "*EPI*", "*EPQ*", "*EPQR*", "*PEN*" OR "*PEN model*"; and (4) for Cattell model: "*16PF*" OR "*Cattell model*". The date range for this search was 1960-2020. Figure 1 shows how the Big Five model clearly has the most results, with a significant difference compared to the other three models.

Of course, a greater number of publications does not guarantee the validity of a personality trait taxonomy. However, in the case of the Five Factor Model, the results of most of these studies have demonstrated its validity in, for example, predicting people's behaviour in a wide range of areas. Therefore, it is not surprising that more than 80 meta-analyses can be found in scientific literature on the significant relationship of the Big Five with various relevant behaviours, including mental health and well-being, academic performance, coping, humour styles, physical activity, human values, job satisfaction, performance motivation, work performance, counterproductive work behaviours, academic dishonesty, sexuality and sexual health, sedentary behaviour, antisocial behaviour and aggression, parenting, workplace, and school harassment, etc. (Sanz, 2018). In the area of health and well-being alone, it is possible to find at least 36 meta-analyses on their relationships with the Big Five (Strickhouser et al., 2017).

Figure 1

Search Results in PsycInfo for Publications Related to "Big Five", "HEXACO", "PEN" and Cattell Personality Models



Thus, considering the substantial support for the Big Five, it makes sense to view it as the most adequate available taxonomy for describing personality traits today.

However, regardless of the taxonomy of personality traits we use to explain a person's personality, we inevitably face the same question: why do personality traits affect the aforementioned relevant behaviours? In other words, what are the processes or mechanisms that produce the effects of personality traits? For example, why are personality traits related to or influential on a variety of psychological disorders? What are the processes or mechanisms that produce the effects of personality traits on psychological disorders?

The challenge was to choose possible candidates to answer those questions, given the many probable psychological variables that could explain those processes or mechanisms. In the present research, the decision was to select the following psychological constructs: intolerance of uncertainty, anxiety sensitivity, and metacognition. The reason behind that decision was that those psychological variables have consistently shown their relationship with various psychological disorders, for which personality traits have also been proven to be risk or protective factors (Boelen & Reijntjes, 2009; Carleton, 2016; Cox et al., 1999; Double & Birney, 2016; Jenkins et al., 2021; Telch et al., 1989).

Intolerance of uncertainty is defined as the "tendency to consider the possibility of a negative event as threatening and unacceptable, regardless of its probability of happening" (Carleton et al., 2007, p. 2308) or as the "incapacity for tolerating the aversive responses caused by the perception of lacking information in a situation and maintained by the perception associated with uncertainty" (Carleton, 2016, p. 31). The vast majority of scientific evidence regarding the relationship between personality and intolerance of uncertainty comes from research that, in very few cases, directly analyses the relationship between them (Berenbaum et al., 2008; Hirsh & Inzlicht, 2008). More commonly, studies include intolerance of uncertainty or personality traits as mediator or predictive variables in broader research (Boelen & Reijntjes, 2009; Carleton, 2016; Ferry & Nelson, 2021). It is in this second context that we find more scientific literature, especially in relation to psychopathology. In these studies, personality traits are conceived as predictive variables for a number of psychological disorders, with intolerance of uncertainty being studied as a possible mediator variable in that process (i.e., Bajcar & Babiak, 2020; Clarke & Kiropoulos, 2021; McEvoy & Mahoney, 2012; 2013). Table 1 presents a review of the scientific literature on the relationship between personality (based on the Big Five model) and intolerance of uncertainty.

Anxiety sensitivity can be understood as the "fear of physiological sensations related to anxiety, based on the belief that these sensations are threatening on a physical, psychological, or social level" (Reiss, 1987; Reiss et al., 1986). As with intolerance of uncertainty, there are very few studies that directly examine the relationship between anxiety sensitivity and personality. The main study was conducted by Cox et al. (1999), who found a positive relationship between anxiety sensitivity and the Big Five dimensions of neuroticism, openness, conscientiousness, and extraversion. Despite these intriguing results, it is surprising that there has been a lack of further studies replicating these findings. One exception is the research conducted by Erfani et al. (2022), which indicated that the dimensions of neuroticism, agreeableness and conscientiousness predicted levels of anxiety sensitivity. The remaining evidence of the relationship

Table 1
Summary of Scientific Literature on Relationships Between Intolerance of Uncertainty and Personality Traits

Personality trait	Reference	Relation with IU*
Neuroticism	Bajcar & Babiak (2020)	β = .65; $p < .001$
	Berenbaum et al. (2008)	$r = .61$; $p < .01$
	Bongelli et al. (2021)	$r = .51$; $p < .001$ (inhibitory IU) $r = .36$; $p < .001$ (prospective IU)
	Clarke & Kiropoulos (2021)	$r = .48$; $p < .001$
	Fergus & Rowatt (2014)	$r = .61$; $p < .01$
	Hirsh e Inzlicht (2008)	Positive-direct relation (correlation coefficients are not indicated)
	Hong & Lee (2015)	$r = .16$; $p < .01$ (1st sample) $r = .45$; $p < .01$ (2nd sample)
	McEvoy & Mahoney (2012)	$r = .40$; $p < .001$
	McEvoy & Mahoney (2013)	$r = .49$; $p < .001$
	Yang et al. (2015)	$r = .51$; $p < .001$
Extraversion	Berenbaum et al. (2008)	$r = -.19$; $p < .01$
	Fergus & Rowatt (2014)	$r = -.38$; $p < .05$
	Hong & Lee (2015)	$r = -.24$; $p < .01$
	Sternheim et al. (2017)	$r = -.47$; $p < .001$
	Yang et al. (2015)	$r = -.10$; $p < .001$
Openness	Berenbaum et al. (2008)	$r = -.17$; $p < .01$
	Bongelli et al. (2021)	$r = -.17$; $p < .01$ (inhibitory IU)
	Fergus & Rowatt (2014)	$r = -.12$; $p < .05$
Agreeableness	Bongelli et al. (2021)	$r = -.13$; $p < .05$ (inhibitory IU)
Conscientiousness	Bongelli et al. (2021)	$r = -.16$; $p < .05$ (prospective IU)

Note. β = beta coefficient (regression model); IU = intolerance of uncertainty; r = Pearson correlation coefficient.
*All the indicated relations are referred to the intolerance of uncertainty global factor if there is no further clarification.

between personality and anxiety sensitivity is again found in studies on psychopathology, where anxiety sensitivity was considered a mediator variable in the relationship between personality traits and psychological disorders (Hong, 2010; Longley et al., 2006; Ranney et al., 2022; Ren et al., 2019; Naragon-Gainey et al., 2014).

Lastly, metacognition can be defined as "thoughts and knowledge regarding cognitive processes" (Flavell, 1979, p. 906) or, more recently, as the "conscience and management of one´s thoughts" (Kuhn & Dean, 2004, p. 270) and as "monitoring and control of thoughts" (Martinez, 2006, p. 696). In the case of metacognition, the scientific literature that examines its relationship with personality is mainly limited to the educational context, where metacognition is studied as a mediating variable in the relationship between personality traits and educational variables such as academic performance, attention, or learning processes. Despite this limitation, there is evidence of the relationship between metacognition and personality traits (Double & Birney, 2016; Kelly & Donaldson, 2016; McEvoy & Mahoney, 2013; Ozturk, 2020; Sepahvand et al., 2018).

As described, there is evidence supporting the relationship between several Big Five personality dimensions and variables such as intolerance of uncertainty, anxiety sensitivity, and metacognition. However, it is not clear with which Big Five dimension in particular these variables are most closely related to, and given that these variables correlate with each other, the nature and magnitude of those relationships after controlling for the effect of these intercorrelations remain uncertain. Moreover, most previous studies have focused on the dimensions of the Big Five but not on their facets. Therefore, the primary goal of the present study was to clarify the nature and strength of the associations of intolerance of uncertainty, anxiety sensitivity, and metacognition not only with the Big Five dimensions but also with the Big Five facets.

Study 1

Method

Participants

This study included 914 participants from the Spanish general population (M_{age} = 40.29 years; 51.7% women, range: 18-85 years). Of these participants, 37.7% were single, 50.9% had basic or secondary education, and 57.5% were employed at the time of the study. Table 2 presents all the sociodemographic details of the sample.

Table 2
Sociodemographic Characteristics of Study 1 Participants

Variables		Values*
N		914
Mean age (*SD*)		40.29 (15.95)
Gender (% women)		51.7
Civil status	Single	37.7
	Living with partner	4.5
	Married	21.6
	Divorced/Separated	31.1
	Widow/er	5.1
Studies	None	10.4
	Primary or secondary	35.7
	Professional formation	15.2
	Bachelor Degree	35.9
	Master or PhD	2.7
Working status	Salaried	49.3
	Self-employed	8.2
	Unemployed	7.7
	Student	29.0
	Retired	5.7

Note. * All values are percentages if there is no further indication.

Instruments

The following assessment instruments were used in Study 1:

a. An *Ad hoc* questionnaire for assessing the following sociodemographic variables: age, gender, marital status, education level and employment status.
b. The *NEO Five Factor Inventory* (NEO-FFI; Costa & McCrae, 1992; Spanish adaptation by Aluja, García et al., 2005). This self-report instrument was used to assess the Big Five personality traits. It consists of 60 items with a five-point Likert response scale, ranging from 0 (*"completely disagree"*) to 4 (*"completely agree"*). The NEO-FFI is comprised by 5 scales (Neuroticism, Extraversion, Openness, Agreeableness and Conscientiousness). The internal consistency index (Cronbach's α) in the current study for each scale was .85, .71, .74, .71, and .86, respectively.
c. *The Intolerance of Uncertainty Scale* (IUS-27; Freeston et al., 1994; Spanish adaptation by Rodríguez et al., 2006). This questionnaire, which assesses levels of intolerance of uncertainty, consists of 27 self-report items answered using a 5-point Likert scale. Individuals with high scores tend to experience significant discomfort and emotional distress when facing uncertain situations. Cronbach's α for the global scale in the current study was excellent (.94).
d. The *Anxiety Sensitivity Index-3* (ASI-3; Taylor et al., 2007; Spanish adaptation by Sandín et al., 2007). This questionnaire, which assesses levels of anxiety sensitivity, consists of 18 self-report items that measure the three components of this construct (fear of somatic experiences, fear of cognitive dyscontrol, and fear of external anxiety symptoms). Responses are given on a 5-point Likert scale. Cronbach's α for the global scale in the current study was excellent (.92), consistent with the latest review of the Spanish version of this instrument (Altungy et al., 2023).
e. The *Metacognitions Questionnaire* (MCQ-30; Wells & Cartwright-Hatton, 2004; Spanish version by Ramos-Cejudo et al., 2013). This questionnaire, which assesses metacognition - based on Wells' (2009) Metacognitive Model -, consists of 30 self-report items that are answered using a 4-point Likert scale. Cronbach's α for the global scale in the current study was excellent (.90).

Procedure

Participants were recruited using the snowball method by 3rd and 4th year Psychology students who were previously instructed by the study researchers. These students were required to contact 6 people following the guidelines below to ensure the desired heterogeneity: (1) 3 participants should be women and 3 men; (2) 0-1 participants aged 18 to 30 years; 1-2 participants aged 31 to 51 years; and 1-2 participants over 51 years.

Students provided participants with a link to complete the battery of questionnaires. On the first page of the questionnaire, informed consent was requested, and information was provided about confidentiality. Participants were informed that the data they provided would be used exclusively for research purposes. Participants' responses were anonymous, and they received no incentive for their participation. All data were treated in accordance with the Declaration of Helsinki, and the study was approved by the Ethics Committee of the Universidad Complutense de Madrid.

Data Analysis

All analyses were performed using the Statistical Package for the Social Sciences (SPSS-22®). Initially, frequency and descriptive analyses were conducted to study the sociodemographic characteristics of the sample and to check the normality assumption of all data.

The next step involved performing an exploratory factor analysis following Naragon-Gainey & Watson's (2018) methodological proposal. The rationale was to determine with which personality dimension(s) intolerance of uncertainty, anxiety sensitivity, and metacognition were most closely related. For the factor analysis, NEO-FFI items for each trait were randomly clustered in three "packages" of 4 items each (the decision to create three packages was based on the fact that three constructs were being examined, thus ensuring that an unequal number of variables would not disproportionately saturate a specific factor). The composition of each "package" was randomly decided, using *Research Randomizer* (Urbaniak & Plous, s.f.). In addition to these three "packages", the global score of the IUS-27, ASI-3 and MCQ-30 questionnaires were included into the exploratory factor analysis, with the following specifications: (1) extraction method: maximum likelihood; (2) promax oblique rotation; (3) initial extraction of 5 factors (corresponding to the five dimensions of the Big Five model).

Lastly, multiple linear regression analyses were conducted to confirm the results obtained in the factor analysis and to control for the multiple relationships between the different variables, as well as between them and variables that may be related to personality (control variables). In these analyses, the criterion variable was the total score of the personality trait in which intolerance of uncertainty, anxiety sensitivity, and metacognition showed the highest factor loadings, while the predictive variables were the total scores of the IUS-27, ASI-3, and MCQ-30, respectively. Age and gender were included as control variables.

Results

The results of the exploratory factor analysis showed that the three predictive variables were significantly more strongly related to the neuroticism dimension compared to the other four dimensions, with their effects controlled in the analysis. As observed in table 3, the personality dimensions "packages" corresponding to the five personality dimensions of the Big Five model loaded perfectly into the corresponding factor, as expected according to the existing scientific literature (Costa & McCrae, 2008), and it was also a prerequisite for the rationale of this analysis, following the suggestion made by Naragon-Gainey & Watson (2018). Following the procedure of these authors, the first step was to check the Kaiser-Meyer-Olkin (KMO) index (used to determine how suited data is for such analysis), which was .804. KMO values over .800 indicate that data sample is adequate, as the variance proportion in the variables that may be caused by underlying factors is satisfactory (Dziuban & Shirkey, 1974). In addition, Bartlett´s sphericity test was statistically significant ($p < .001$), indicating that the correlation matrix is not an

Table 3
Factor Analysis Pattern Matrix of the Big Five Model Factors and the IUS-27, ASI-3 and MCQ-30 Measures

Measures	Factor				
	Neuroticism	Extraversion	Openness	Agreeableness	Conscientiousness
Neuroticism A	**.738**	.042	-.023	.043	-.209
Neuroticism B	**.756**	-.118	.006	.046	-.074
Neuroticism C	**.825**	-.071	.007	.063	.008
Extraversion A	-.101	**.521**	-.052	-.033	.038
Extraversion B	-.038	**.764**	.030	-.004	-.044
Extraversion C	.038	**.807**	-.002	.025	.001
Openness A	.133	.202	**.594**	.046	.005
Openness B	-.043	-.026	**.796**	-.051	.001
Openness C	-.059	-.121	**.849**	.009	-.010
Agreeableness A	.088	.110	.001	**.692**	.030
Agreeableness B	-.086	.039	-.042	**.624**	.017
Agreeableness C	-.085	-.154	.027	**.735**	.013
Conscientiousness A	-.023	-.096	-.056	.033	**.768**
Conscientiousness B	-.008	-.008	.015	-.073	**.946**
Conscientiousness C	.100	.115	.039	.114	**.712**
IUS-27 total	.760	-.055	-.027	-.075	.099
ASI-3 total	**.657**	.048	-.032	-.066	.084
MCQ-30 total	**.656**	.059	.056	-.063	.099

Note. Factor extraction method: maximum likelihood; factor rotation method: promax with Kaiser normalisation; fixed factor extraction: 5. Factor loads > .30 are indicated in bold.

identity matrix. Both tests confirm the adequacy of the conducted factor analysis. The five-factor solution explained 68.8% of the data variance. Furthermore, intolerance of uncertainty, anxiety sensitivity, and metacognition all loaded on the factor corresponding to the neuroticism dimension (with the highest factor loading for intolerance of uncertainty - .760 – followed by anxiety sensitivity – .657 – and metacognition - .656). It is important to highlight that none of these three variables showed a factor loading > .30 in any of the other factors.

Although the factor analysis provides useful information regarding which personality dimension the variables of intolerance of uncertainty, anxiety sensitivity, and metacognition are the most closely related to, it does not indicate whether these relationships are statistically significant once the effects of other variables are controlled for. This is why a linear regression analysis was conducted. Since the three variables loaded together along the neuroticism dimension in the factor analysis, this personality trait was included in the analysis as the criterion, with intolerance of uncertainty, anxiety sensitivity, and metacognition as the predictors (gender and age were also included as control variables in the regression analysis). Before this, it was confirmed that all these variables showed significant correlations with each other (a prerequisite for these analyses). The results of the linear regression analysis ($R^2_{adjusted}$ = .499; F = 139.161; p < .001) indicated that only intolerance of uncertainty (β = 0.506; partial r = .47) and anxiety sensitivity (β = 0.197; partial r = .20) were directly related with the neuroticism dimension (with the relationship being stronger for intolerance of uncertainty). The Durbin-Watson index was 1.965 (close to 2), indicating the absence of autocorrelation between the variables included in the model.

In addition, it was decided to study the possible relationship of intolerance of uncertainty, anxiety sensitivity, and metacognition with the remaining four personality dimensions. The results of these complementary linear regression analyses indicated that only the intolerance of uncertainty was also related with other Big Five dimensions, specifically extraversion (β = -0.275; partial r = -.21; $R^2_{adjusted}$ = .089; F = 14.930; p < .001) and agreeableness (β = -0.224; partial r = -.17; ($R^2_{adjusted}$ = .100; F = 18.199; p < .001) (with an inverse relationship in both cases and of quantitatively smaller magnitude compared to the neuroticism dimension). In light of these results, the second study aimed to explore more deeply the relationship that intolerance of uncertainty and anxiety sensitivity might have with each of the six neuroticism facets (excluding metacognition, as it was not included in the regression model for neuroticism).

Study 2

Method

Participants

For this second study, the sample consisted of 656 participants from the general Spanish population (M_{age} = 39.95 years; 55.7% women; range = 18-85 years). Of these, 41.7% were married, 42.7% had basic or secondary education, and 56.9% were employed at the time of the study. Table 4 present all the sociodemographic details of the sample.

As with the first study, the sample was characterized by its heterogeneity. Another important aspect to note is the similarity in the sociodemographic composition in both studies.

Instruments

The following assessment instruments were used for study 2 (only those differing from study 1 will be described):

Table 4
Sociodemographic Characteristics of Study 2 Participants

Variables		Values*
N		656
Mean age (*SD*)		39.95 (16.07)
Gender (% women)		55.7
	Single	39.6
	Living with partner	7.8
Civil status	Married	41.7
	Divorced/Separated	7.5
	Widow/er	3.3
	None	1.1
	Primary or secondary	41.6
Studies	Professional formation	18.7
	Bachelor Degree	29.0
	Master or PhD	9.7
	Salaried	49.1
	Self-employed	7.8
Working status	Unemployed	7.5
	Student	28.4
	Retired	5.8

Note. * All values are percentages if there is no further indication.

a. An *Ad hoc* questionnaire.
b. The *Personality Inventory NEO Revised* (NEO-PI-R; Costa & McCrae, 1992; Spanish adaptation by Aluja, Rossier et al., 2005). This self-report instrument was used to assess the six facets of the neuroticism trait. It is composed of 240 items with a five-point Likert response scale, from 0 ("completely disagree") to 4 ("completely agree"), that measure the five personality traits and their 30 facets. In the current study, only the items for the neuroticism dimension and its six facets - anxiety, depression, social anxiety, hostility, vulnerability, and impulsivity – were administered, with their internal consistency indices (Cronbach´s α) being: .77, .88, .70, .72, .80 and .59, respectively. Since the Cronbach´s α for the impulsivity facet was below .70 (the cut off point for being considered adequate according to Hernández et al. (2014) standards), the results obtained in this facet should be interpreted with caution.
c. The *Intolerance of Uncertainty Scale* (IUS-27; Freeston et al., 1994).
d. The *Anxiety Sensitivity Index-3* (ASI-3; Taylor et al., 2007).

Procedure

The procedure followed in this second study was the same as in the first one. To keep things simple, we refer the reader to the corresponding section in Study 1. Note that participants in this study were different from those in Study 1 and were collected at a different time.

Data Analysis

In this second study, all analyses were also carried out using the Statistical Package for the Social Sciences (SPSS-22®). Initially, frequency and descriptive analyses were conducted to study the sociodemographic characteristics of the sample, and to check the normality assumption of all data. As in Study 1, an exploratory factor analysis following Naragon-Gainey & Watson (2018) proposal was conducted. In this case, NEO-PI-R items corresponding to each of the six facets of the neuroticism dimensions were clustered into two "packages" of four items each. The decision to create two packages per facet instead of three, as in Study 1, was due to the fact that Study two included two variables for analysis (intolerance of uncertainty and anxiety sensitivity) instead of three. Items of each facet were randomly assigned to one of its two packages using *Research Randomizer* (Urbaniak & Plous, s.f.). In addition to these 12 packages of items, the factor analysis included the total scores of the IUS-27 and ASI-3 scales. The specifications for the factor analysis were: (1) extraction method: maximum likelihood; (2) promax oblique rotation; (3) initial extraction of 6 factors (corresponding to the six facets of the neuroticism dimension).

Lastly, multiple linear regression analyses were conducted to confirm the results obtained in the factor analysis and to control the multiple relationships between the different variables, as well as between them and variables that may be related to personality (control variables). In these analyses, the criterion variable was the total score of the neuroticism facet on which intolerance of uncertainty and anxiety sensitivity showed the highest factor loadings, with the predictive variables being the total scores of the IUS-27 and ASI-3, respectively. Control variables were age and gender.

Thanks to the use of an on-line platform for registering participants´ responses, there were few missing values. Regarding the sociodemographic questions (which did not have "forced" responses), the percentage of missing values was as follows (out of the total sample of 656 participants): 6.7% for age ($n = 44$); 0.6% for gender ($n = 4$); 0.3% for marital status ($n = 2$); 0.3% for education level ($n = 2$); and 0.3% for employment status ($n = 2$). These missing values were recorded as such in the database. Regarding the criterion and predictive variables, there were no missing values, as responses were "forced" by the platform software.

Lastly, metacognition was not considered as a predictive variable in this second study, as it was not included in the neuroticism regression model in Study 1.

Results

As indicated, the first analysis was an exploratory factor analysis following Naragon-Gainey & Watson´s (2018) proposal. Results of this analysis are presented in Table 5. Kaiser-Meyer-Olkin (KMO) sample adequacy index was .926 (KMO > .800 indicates that sample values are adequate; Dziuban & Shirkey, 1974, and Bartlett´s sphericity test was statistically significant ($p < .001$), indicating the validity of the analysis. The six-factor solution explained 48.45% of the data variance. Both the intolerance of uncertainty and anxiety sensitivity variables loaded on the factor corresponding to the anxiety facet (with the highest factor loading for intolerance of uncertainty – .737 – followed by anxiety sensitivity – .592 –). It is important to highlight that neither of these two variables showed a factor loading > .30 in any of the other facets. Lastly, regarding this analysis, it is important to remember that one of the advantages of this procedure is that the strongest relationship found with the anxiety facet for both variables was determined after controlling the possible influence of the remaining facets, thanks to the characteristics of the factor analysis.

Table 5
Factor Analysis Pattern Matrix of the Neuroticism Facets and the IUS-27 and ASI-3 Measures

Measures	Factor					
	Anxiety	Depression	Social Anxiety	Hostility	Vulnerab.	Impulsiv.
Anxiety A	**.879**	.045	-.053	-.059	-.074	.047
Anxiety B	**.793**	-.219	.041	.031	.121	.011
Depression A	.091	**.908**	.013	-.073	-.052	.014
Depression B	.219	**.555**	.003	-.007	.203	-.042
Social Anxiety A	.192	.086	**.337**	-.005	.111	-.024
Social Anxiety B	-.002	-.021	**1.043**	.002	-.058	.007
Hostility A	.128	**.332**	-.010	**.366**	-.139	.048
Hostility B	-.023	-.069	.002	**.936**	.064	.003
Vulnerability A	.050	-.042	-.039	.036	**.939**	.022
Vulnerability B	.214	.233	.137	-.005	**.336**	.015
Impulsivity A	-.013	-.002	-.042	-.025	.175	**.538**
Impulsivity B	.019	.016	.037	.028	-.098	**.677**
IUS Total	**.737**	.097	-.007	.069	-.048	-.100
ASI Total	**.592**	.069	.013	-.049	-.036	.052

Note. Factor extraction method: maximum likelihood; factor rotation method: promax with Kaiser normalisation. fixed factor extraction: 6. Factor loads > .30 are indicated in bold.

As in Study 1, a linear regression analysis was carried out to determine the existence of relationships between Study 2 variables. In this case, the first regression analysis used the anxiety facet as the criterion, with intolerance of uncertainty and anxiety sensitivity as the predictors (gender and age were also included as control variables in the regression analysis). Before this, it was confirmed that all these variables showed significant correlations with each other (a prerequisite for these analyses). The results of the linear regression analysis ($R^2_{adjusted}$ = .476; F = 152.86; p < .001) indicated that both intolerance of uncertainty (β = 0.516; partial r = .50) and anxiety sensitivity (β = 0.189; partial r = .21) were directly related to the anxiety facet (with the relationship being stronger for the intolerance of uncertainty). Gender (β = -0.177; partial r = -.24) and age (β = -0.075; partial r = -.10) were also included in the model. Durbin-Watson index was 1.944 (close to 2), indicating absence of autocorrelation between the variables included in the model.

In addition, it was decided to study the possible relationship of intolerance of uncertainty, anxiety sensitivity, and metacognition with the remaining five neuroticism facets. The results of these complementary linear regression analyses indicated that intolerance of uncertainty showed significant relationships with four facets: depression (β = 0.519; partial r = .51), social anxiety (β = 0.384; partial r = .36), hostility (β = 0.415; partial r = .37), and vulnerability (β = 0.509; partial r = .50). Anxiety sensitivity was related to all five facets: depression (β = 0.220; partial r = .25), social anxiety (β = 0.212; partial r = .21), hostility (β = 0.137; partial r = .13), vulnerability (β = 0.174; partial r = .20), and impulsivity (β = -0.194; partial r = -.20). However, its influence was smaller than that observed for intolerance of uncertainty in all facets except impulsivity – in which only the latter was included in the regression model, along age.

Discussion

This work has sought to provide evidence on a critical question: what lies beyond personality traits, whether general (dimensions) or specific (facets)? As discussed in the introduction, there is abundant literature on the various relationships between personality traits with a wide range of behaviours, but a significant gap exists regarding the mechanisms that produce the effects of personality traits on those behaviours. In this empirical work, we have attempted to shed light on the deeper aspects of personality through mechanisms or processes based on psychological constructs such as intolerance of uncertainty, anxiety sensitivity, and metacognition.

From the two studies that comprise this work, there are several relevant conclusions that can be drawn concerning the initial objective of clarifying the nature and strength of the associations between the Big Five dimensions and facets and three potential psychological mechanisms or processes through which these dimensions and facets affect relevant psychopathological behaviours. These psychological mechanisms or processes were captured in the constructs of intolerance of uncertainty, anxiety sensitivity, and metacognition.

Firstly, intolerance of uncertainty has proved to be a key variable in this regard, particularly in relation to neuroticism (explaining 49.6% of its score variance, along with anxiety sensitivity, gender, and age), as well as the dimensions of extraversion and agreeableness. These results align with previous research (Bajcar & Babiak, 2020; Clarke & Kiropoulos, 2021; McEvoy & Mahoney, 2012; 2013) on the relationship between this construct and the neuroticism dimension. More specifically, evidence was found of a relationship between intolerance of uncertainty and five of the six neuroticism facets (anxiety, depression, social anxiety, hostility, and vulnerability), explaining 27-49% of the variance of their scores (along with anxiety sensitivity, gender, and age). These results are of the utmost importance from a scientific point of view in the field of personality, as they provide empirical evidence in a historically neglected area of personality research. Naragon-Gainey & Watson (2018) are among the few that have also studied the relationship between intolerance of uncertainty and neuroticism facets, and our results are consistent with theirs.

Secondly, anxiety sensitivity has also emerged as a relevant variable in the field of personality, though in a more specific manner, as it only showed a relationship with the neuroticism dimension—results that are similar to those reported by Hong (2010), Ranney et

al. (2022) and Ren et al. (2019). Moreover, this relationship is an important one, not only because of its partial correlation with the neuroticism dimension (.21), but also because results from Study 2 indicated that this psychological variable was related to all six facets of neuroticism (with partial *r* ranging from .21 to .25). These findings add empirical validity to the earlier (and until now, non-replicated) results of Cox et al. (1999).

This research has some limitations. First, we worked with a convenience sample. Therefore, future research should include other cultural and/or diverse types of samples. Secondly, the design was cross-sectional, which does not allow for predictive conclusions to be drawn from the results. Thus, it would be ideal to replicate these studies with a longitudinal design. Despite these limitations, there are some important strengths to highlight from these two studies. The first is that Study 1 is the first, to our knowledge, to explore the possible relationship between intolerance of uncertainty, anxiety sensitivity, and metacognition (considering all three together) with the five dimensions of the Big Five model. The second is that Study 2 is, to our knowledge, the first research to analyse the relationship between intolerance of uncertainty and neuroticism facets, and the second one (after Cox et al. (1999)) to explore the relationship between anxiety sensitivity and neuroticism facets.

In conclusion, the results reported in this work may serve as a relevant and necessary starting point for future research to determine whether these variables could act as mediators between neuroticism-related personality traits (or other personality traits) and the development and maintenance of various mental disorders. They may even be partially responsible for personality being a risk (or protective) factor for the development of these disorders. Thus, the findings of this work provide an empirical framework with implications for applied psychology, especially in the field of psychotherapy. It would be interesting to develop and validate prevention and intervention programs for psychological disorders that address these variables. While it may be challenging to change a personality trait, it might be easier to change specific aspects such as intolerance of uncertainty or anxiety sensitivity—in other words, it might be easier to change how uncertainty or anxiety are managed.

Author Contributions

Pedro Altungy: Conceptualization, Resources, Data Curation, Formal Analysis, Methodology, Writing -Original draft. **Sara Liébana:** Resources, Data Curation, Writing - Original Draft. **Andrea García de Marina:** Resources. **Ahsley Navarro:** Resources. **José Manuel Sánchez-Marqueses:** Resources. **Ana Sanz-García:** Resources. **María Paz García-Vera:** Conceptualization, Project Administration, Writing – Review & Editing. **Jesús Sanz:** Conceptualization, Project Administration, Writing – Review & Editing, Funding Acquisition.

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Declaration of Interests

The authors declare that there is no conflict of interest.

Data Availability Statement

Currently, the raw data are not publicly available in an institutional repository. Nonetheless, the authors are open to share the data with researchers interested in replicating the results found in this paper.

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