08, 09, 10 e 11 de novembro de 2022
ISSN 2177-3866

DEPRESSION, ANXIETY AND STRESS AND THEIR RELATIONSHIP TO PERSONALITY TRAITS AND SEXUAL ORIENTATION

DENISE ADRIANA JOHANN
UNIVERSIDADE FEDERAL DE SANTA MARIA (UFSM)

PAULO SERGIO CERETTA
UNIVERSIDADE FEDERAL DE SANTA MARIA (UFSM)

FRANCIANE COUGO DA CRUZ CERETTA
INSTITUTO FEDERAL DE EDUCAÇÃO, CIÊNCIA E TECNOLOGIA FARROUPILHA (IFFARROUPILHA)

BRUNO MILANI
INSTITUTO FEDERAL DE EDUCAÇÃO, CIÊNCIA E TECNOLOGIA FARROUPILHA (IFFARROUPILHA)

DEPRESSION, ANXIETY AND STRESS AND THEIR RELATIONSHIP TO PERSONALITY TRAITS AND SEXUAL ORIENTATION

Abstract
The main objective of this research is to examine the influence of personality traits on the Depression, Anxiety and Stress scale. The difference of the average levels of mental health regarding sexual orientations is also verified. The research was conducted on a sample of 39755 cases, with participants from several countries. After applying a data cleaning procedure, the sample was reduced to 14233 cases. The mean age was 26.26 years with a standard deviation of 8.92. The following instruments were used in the research: Depression, Anxiety and Stress Scales (DASS-42), the Ten Item Personality Inventory (TIPI) which is a summary measure of the five personality traits (extroversion, Agreeableness, conscientiousness, emotional stability, and openness to experiences). The results showed that the regression model built by personality traits and sexual orientation explains 35.6% of depression, 40.6% of anxiety and 46.4% of stress. It is noteworthy that self-declared bisexual individuals are the ones who suffer the most from mental degradation.
Keywords: Depression; Anxiety; Stress; Personality traits; Sexual Orientation, Psychometry.

1. Introduction

Depression, anxiety, and stress are negative emotional states that, if pathological, can cause physical, behavioral, or psychological harm. Therefore, knowledge of these conditions is important for prevention, treatment and the consequent promotion of the population's health and well-being. According to Krikorian et al. (2014) suffering can be defined as something subjective and individual, complex, and difficult to express, especially through words. Several researches have been carried out through the application of instruments capable of measuring the dimensions of suffering. In this sense, the DASS-42 questionnaire (Depression Anxiety and Stress Scale) developed by Lovibond & Lovibond (1995) is widely used to assess the mental health status encompassing depression, anxiety, and stress.

As highlighted by Paleczek, Bergner & Rybnicek (2018), the Big Five model has been widely used in research in the corporate world in search of leadership with excellence, in addition to being used as a predictor in the performance of leaders and managers. The five major factors that measure an individual's personality characteristics include: i) emotional stability, which lists impulse control, mood and resistance to emotional stress; ii) extraversion, measures the level at which an individual feels comfortable with direct social interactions with other individuals; iii) conscientiousness, evaluates the organization, self-discipline, zeal and effort in pursuit of achievements; iv) openness to experiences, denotes preferences for certain thoughts and understanding of problems, in addition to listing the search for new experiences and, v) agreeableness, which refers to the level of kindness and trust.

Several studies point out the challenges faced by individuals due to their sexual orientation, whether in schools, universities, jobs or in the community to which they belong. Among these studies, the works of Meyer (2003), Chan, Operario & Mak (2020) and Mendes & Pereira (2021) can be highlighted, and more specifically the study presented by Kirby et al. (2021). Likewise, the structural model advocated here contributes to the correct determination and understanding of the relationship between aspects of psychological distress and sexual orientation.

2. The personality from a quantitative point of view

Galton (1822-1911) was passionate about measurement and is considered one of the first experimental psychologists. During his various trips around the world, he recorded data about people, weather and various other events that surrounded him. Galton soon discovered that his real passion was studying the variations of human ability. His work Hereditary Genius published in 1869 was the first systematic approach aimed at investigating the effect of heredity on intellectual abilities. Galton (1869) states that an individual's natural abilities are genetically inherited. In this way he emphasizes that human mental abilities as well as personality traits are due to heredity. In many ways, Galton's studies are influenced by his cousin Charles Darwin's Origin of Species. The influence of Charles Darwin on psychology is widely discussed by Dewsbury (2009).

Galton (1869) pointed out that he was not the first to study the heredity of mental abilities, but the first to address the issue in statistical terms by presenting numerical results. Galton's studies ended up influencing and relating the field of psychology and statistics. In his efforts to quantify, understand, and explain the transmission of characteristics, traits, and abilities from one generation to another, Galton formulated the notion of what is now known as regression analysis, a method used to predict the value of a variable from several other predictor variables based on the least squares method previously proposed by Gauss (1809). Thus, height, weight and intelligence characteristics should present regression to the mean, that is, the inherited results tended to move towards the mean results of the next generation.

McDougall (1929) was the first to suggest that to avoid confusion in measurement and understanding, personality must be analyzed from the point of view of at least five distinguishable but inseparable factors. Thus, it is understood that each individual has a combination of these five factors, regardless of which is the predominant factor. These five factors were named i) intellect, related to intelligence, knowledge, memory, among others, ii) character, it is an integrated hierarchical system of feelings, iii) temper, something controllable related to the way of thinking or reacting, for example, stay calm, be nervous, among others, iv) temperament, something that cannot be controlled, related to the biological way of thinking or reacting, for example, tendency to be calm or tendency to be nervous, exhibiting introverted or extroverted behavior and, v) disposition, set of emotional and affective tendencies.

From a lexical point of view, personality starts to be measured by the Big Five through words that describe human behavior. Norman (1963) presents an effort looking for a convergence of factors based on several previous studies. Their results produced clear and consistent evidence of the existence of 5 personality factors labeled by: i) Emergence, ii) agreeableness, iii) Conscientiousness, iv) Emotional Stability, and v) Culture. After 1980, studies on personality gained notoriety with works from the lexical point of view leveraged by Goldberg (1981) and Goldberg (1992).

Costa & McCrae (1980) developed studies on another perspective of personality measuring. Initially, this approach was called NEO–PI (Three-factor Personality Inventory, Neuroticism, Extraversion and Openness to Experiences). Later, McCrae & Costa (1985), McCrae & Costa (1987), Costa & McCrae (1992) expanded the scope of personality by incorporating the factors Conscientiousness and Agreeableness into NEO – PI. With these new factors, the three-dimensional approach came to be called the Five Factor Model (FFM), initially called NEO–PI–R (NEO–PI Revised).

Digman (1997) analyzed the correlation pattern of studies involving the Big Five and found the emergence of two consistent factors of a higher order, naming them Alpha and Beta, the Big Two. The Alpha factor incorporates emotional stability, Agreeableness, and conscientiousness, and can be considered a socialization factor. The Beta factor, encompassing extraversion and openness, can be considered a personal growth factor. DeYoung, Peterson &

Higgins (2002) believe that Alpha can be better labeled as stability, corresponding to emotional stability, agreeableness and conscientiousness, and Beta as plasticity, related to extraversion and openness.

A quick and simple instrument to assess the personality dimensions of the Big Five (or Five Factor Model) is the Ten Item Personality Inventory (TIPI), where 10 descriptors are assessed on a 7-point interval scale. As highlighted by Gosling, Rentfrow & Swann (2003), the TIPI is a short inventory that uses two questions to measure each of the personality traits. This inventory is suggested when personality traits are not the only (main) topics of analysis. Several additional versions of the Big Five lexicon and the Five Factor Model have emerged over the years. One of the best known is Hexaco of Ashton et al. (2004) which seeks a convergence of the studies of Costa & McCrae (1992) and Goldberg (1992), adding a sixth dimension called Honesty-Humility.

Hampson & Goldberg (2020) highlight that the five personality traits (extroversion, agreeableness, conscientiousness, emotional stability, and openness to experiences) are understood as patterns of thoughts, feelings and behaviors that last over time, but in a similar way of our physical development, the personality changes throughout life. The authors emphasize that along with aging, personality traits tend to change in a more socially desirable direction and that this change is due to two factors: i) a result of intrinsic maturational changes caused by genetics and, ii) a result of the encounter and adaptation to life experiences. The joint action of the two factors, leading to personality stability, is a process that is still far from being fully understood.

3. Depression, Anxiety and Stress

Depression, anxiety, and stress represent negative emotional states and can be classified as non-psychotic mental disorders. Initially, Lovibond & Lovibond (1995) developed the depression and anxiety inventory, but they ended up discovering a third factor they called stress and the inventory came to be known as the Depression Anxiety and Stress Scale (DASS). Therefore, it is to be expected that the correlation between depression-anxiety is smaller than the correlation between depression-stress and the correlation between anxiety-stress, as stress permeates both depression and anxiety.

Depression is defined as an emotional state characterized by low positive affectivity. Lovibond & Lovibond (1995) include inertia, anhedonia, dysphoria, discouragement, devaluation of life, self-depreciation, and lack of interest. One of the main features of depression is ruminative thinking. Nolen-Hoeksema (2000) emphasizes that ruminative thinking (repetitive and negative in character) can interfere with the proper resolution of problems with family or friends, and this can evolve into a depressive disorder. Although most people can experience symptoms of depression throughout their lifetime, not everyone achieves the quality of pathological depression. Beck & Alford (2014) highlight that depression is a psychological disorder and the main symptoms are associated with emotional (reduced satisfaction), cognitive (pessimism), motivational (dismay) and physical (loss of appetite and sleep disturbance) aspects.

Anxiety refers to behavioral or physiological responses to some stimulus which the brain recognizes as danger or threat, regardless of whether it is real or imagined. It often triggers hyperactivation, generating disproportionate reactions to the situation that triggered it. Lovibond & Lovibond (1995) considered the following items: arousal of the autonomous system, musculoskeletal effects, situational anxiety, and subjective experiences of anxiety.

Strawn et al., (2021) highlight that anxiety is an emotional state that, from a behavioral point of view, manifests itself through an unpleasant state of fear, impulsiveness, excessive worry, accelerated speech, etc. From a physiological point of view, anxiety can manifest itself

through rapid heart rate, muscle tension, stomach problems, shortness of breath, etc. Anxiety is not always pathological, as it is a response that seeks to protect the individual against the presence of a real or imagined threat or danger. Beesdo, Knappe & Pine (2011) highlight that pathological anxiety arises from the excessive and persistent frequency of exaggerated reactions leading to emotional suffering and physical harm to the individual.

Stress is generally defined as a natural reaction of the body that occurs when it experiences situations of pressure, danger or threat. Lovibond & Lovibond (1995) include items such as: difficulty relaxing, nervous excitement, agitation, irritability, overreaction, impatience. Stress has its good side, as it is a biological attitude necessary to adapt to new situations. In a more advanced stage, stress can trigger failures in the defense mechanism, leading the body to exhaustion due to overload in physiological reactions, causing psychological suffering. Cohen, Edmondson & Kronish (2015) emphasize that stress can also lead to cardiovascular problems.

4. Sexual orientation and psychological impacts

Meyer (1995) and Meyer (2003) proposed the minority stress model as a solid conceptual framework to explain mental health disparities between sexual minorities and heterosexual populations. As sexual minorities we can understand the acronym LGBTQIA+ (L = lesbians, G = gays, B = bisexuals, T = transsexuals, Q = Queer, I = intersex, A = asexual and, + = other groups and variations of sexual orientation). However, Meyer (2003) singled out only Lesbian, Gay and Bisexual (acronym LGBs) in her study using meta-analysis. The study presents a detailed discussion explaining that perceived stigma (experiences of persecution, discrimination, and prejudice), internalized homonegativity (shame and avoidance), sexual identity concealment (hiding your sexual identity for fear of rejection) create a hostile social environment and stressful that translates into mental health problems.

Chan, Operario & Mak (2020) studied the mental health disparity among gay, lesbian, and bisexual individuals in Hong Kong. Bisexual individuals in Hong Kong reported higher levels of vulnerability to depressive and anxiety symptoms compared to lesbians and gays. A possible explanation is associated with the intrapersonal, interpersonal and community character of concealment. Bisexual individuals are more likely to hide their sexual orientation (identity uncertainty) from themselves, others and to withdraw from the community that fights for rights. This conflict, denial and alienation would imply greater vulnerability of mental health.

The study by Kirby et al., (2020) highlights the need to understand the relationship between the implicit and explicit bisexual identity of individuals, as bisexuality attracts more external doubts compared to gay and heterosexual identities. The authors describe that individual with bisexual sexual orientation usually go through a temporary experimentation and start to deal with their identity in a complex way, sometimes not considering their identity as something central to their self-concept, and thus, not developing their bisexuality.

More recently, Mendes & Pereira (2021) investigated the impact of COVID-19 on quality of life at work from the perspective of sexual orientation in individuals from Brazil and Portugal. The study included 1,396 individuals who declared themselves to be heterosexual, 95 as gay or lesbian and 87 as bisexual. Differences were found between sexual orientations for all dimensions of work-related quality of life: heterosexual participants scored higher on general well-being, home-work interface, job satisfaction, working conditions and lower on job stress, compared to with bisexual, gay or lesbian participants. More precisely, this study will examine the influence of personality traits on the depression, anxiety, and stress scale from the perspective of sexual orientations through the verification of three hypotheses:

Hypothesis 1: Personality traits are significantly related to depression, anxiety, and stress. McCrae & Costa (1991) demonstrated that neuroticism, extraversion, and openness to experience have systematic effects on psychological well-being. They also emphasized that Agreebleness and conscientiousness may be associated with increased satisfaction with life and happiness. Openness to experiences, agreeableness, and conscientiousness have been reported to have significant associations with affectivity indicators (Watson & Clark, 1992). Thus, the structural model advocated here suggests a significant relationship between the five personality traits and depression, anxiety, and stress.

Hypothesis 2: The emotional stability personality trait is the trait that most impacts depression, anxiety, and stress. People with marked features of neuroticism tend to use ineffective coping strategies (Bolger, 1990). Furthermore, as highlighted by Heck (1997), neuroticism is characterized by strong emotional reactions in stressful situations. In the school environment, universities, jobs or in the community where individuals are inserted, teams are usually formed, which demand a relationship between the individual and other people to carry out difficult tasks, in situations that put the participants in front of stressful agents. Therefore, a stronger relationship between emotional stability and the depression, anxiety and stress inventory is expected.

Hypothesis 3: Bisexuality is the sexual orientation that presents the highest average levels of depression, anxiety and stress when compared to heterosexuals. Chan, Operario & Mak (2020) analyzed the disparity in mental health according to sexual orientation and reported that bisexuals are the most vulnerable due to psychological degradation. Also, from the perspective of sexual orientation, Mendes & Pereira (2021) reported that heterosexual individuals scored higher in general well-being compared to gay or lesbian bisexuals. They also highlighted that heterosexual have a lower degree of stress at work. Following this reasoning, and assuming that bisexuals are more likely to hide their sexual orientation, it is expected that they present a higher average level of depression, anxiety and stress when compared to individuals who declare themselves in other genders.

There is a need to understand the mental health behavior in relation to the participants' personality traits and sexual orientation, as the equal rights of individuals is a concern and agenda in many countries. The study is supported by the ideas of Igawa, Higa & Takamiya (2020) that highlight the importance of personality traits, from the Big Five model, as predictors of performance effectiveness, as in research focused on various occupations including online games, as emphasized by Jeng & Teng (2008). Within this context, several milestones have leveraged considerable progress in the area of sexual orientation as a specific field of equality. Hadden, O'Riordan & Jackson (2020) share the thought of relevance in understanding the impact of individuals' sexual orientation in their daily occupations, knowing, and seeking to understand, and explain, the daily activities of these individuals in their social and cultural worlds within the complex scenario that this reality currently represents.

5. Methodological aspects

Survey data were obtained from the Open-Source Psychometrics Project. These data were collected through an online version of the Depression Anxiety Stress Scales (DASS-42) inventory. All data obtained is anonymous and respondents were informed at the start of the test that their responses would be used for research. After data collection, respondents were asked to confirm that their responses were accurate and adequate. Each item was presented one at a time in a random order for each new participant, along with a 4-point rating scale (1 = Does

not apply to me at all, 2 = Applies to me to some degree, or sometimes, 3 = Applied to me to a considerable degree, or most of the time, 4 = Applied to me to a large degree, or most of the time).

The Ten Item Personality Inventory - TIPI dataset consists of 10 personality items (see Gosling et al., 2003). The TIPI is a 10-item measure designed to measure the five major personality traits (Agreeableness, conscientiousness, emotional stability, extraversion, openness to experience). All items are on a 7-point Likert scale (1 = strongly disagree, 2 = moderately disagree, 3 = somewhat disagree, 4 = neither agree nor disagree, 5 = somewhat agree, 6 = moderately agree, 7 = totally agree). Each of the personality traits contains 2 opposing correlation items. Educational level was measured in intensity from 1 to 4 (1 = Less than high school, 2 = High school, 3 = Higher education, 4 = Graduate). Sexual orientation was measured from 1 to 5 (1 = Heterosexual, 2 = Bisexual, 3 = Homosexual, 4 = Asexual, 5 = Other).

Data were collected between 2017 and 2019 through an online version of the DASS-42 inventory. The web dataset has 39755 cases, with participants from multiple countries. Data cleaning procedure was applied, eliminating all cases in which any answer was zero (0), avoiding imputation. Cases in which there was inconsistency in the data (negative correlation between variables in the same depression, anxiety, and stress factor) were also excluded. The age of the participants was limited to the range between 19 and 70 years, with a mean of 26.26 years and a standard deviation of 8.92. Applying this data cleaning procedure, the sample was reduced to 14233 cases.

The search for results will be done through a multiple regression model with a constant, as in Equation [1], and without constant with binary and covariate variables, as in Equation [2]. The first equation (without constant) will provide the conditional mean of depression, anxiety, and stress for each of the subgroups (sexual orientation) as well as the influence of covariates (personality traits, age, and gender). The second equation (with constant) will be used to verify the difference in the averages of depression, anxiety, and stress, if there is a significant difference between the sexual orientation with the highest average and the other orientations, considering the effect of the covariates.

$$DASS_i = \sum_{k=1}^{5} \beta_k DO_{k,i} + \sum_{g=1}^{G} \beta_g Covariables_{g,i} + u_i \quad [1]$$

In equation [1], DASS assumes the values for its three constructs (depression, anxiety, and stress) for individuals i (i=1, 2, ... 14233); $D_{k,i}$ are dummy variables that will assume values of zero (0) or one (1) and identify the sexual orientation k (k = Heterosexual, Bisexual, Homosexual, Asexual and Other) for individual i. For example, for individuals who self-declare heterosexual orientation, , $DO_1 = 1$, and $DO_2 = DO_3 = DO_4 = DO_5 = 0$; for individuals who declare themselves to be bisexual, $DO_2 = 1$, and $DO_1 = DO_3 = DO_4 = DO_5 = 0$.

$$DASS_i = \beta_0 + \sum_{k=1}^{4} \varphi_k DO_{k,i} + \sum_{g=1}^{G} \beta_g Covariables_{g,i} + u_i \quad [2]$$

In equation [2] we suppress the sexual orientation identified as the highest average DASS and add an intercept β_0. In this case, β_0 identifies the average DASS of the suppressed sexual orientation and φ_k is the difference in relation to the average DASS of the other sexual orientations. β_g identifies on DASS the impact of covariates g (g = personality traits, age, and gender).

6. Results

The findings of this study may provide insights into the relationship between individuals' mental health, personality, and sexual orientation. Table 1 shows the composition of the sample segmented by level of formal education, personality traits and sexual orientation. It is important to emphasize that the analysis of the different results plays an essential role in the formulation of attitudes and attributions of public health managers.

Table 1. Sample composition segmented by educational level, personality traits and sexual orientation

Segment	Sample	Percentage
Educational Level		
Less than high school	138	0.97%
High School	4637	32.60%
College Education	7038	49.48%
Post-graduation	2410	16.94%
Total	**14233**	**100.00%**
Personality Traits		
Agreeableness	5504	29.64%
Conscientiousness	4277	23.03%
Emotional Stability	1643	8.85%
Extroversion	2029	10.93%
Openness to experiences	5118	27.56%
Total [(a)]	**18571**	**100.00%**
Sexual Orientation[(b)]		
Heterosexual	10157	71.41%
Bisexual	1593	11.20%
Homosexual	678	4.77%
Asexual	681	4.79%
Others	1114	7.83%
Total	14223	100.00%

(a) The sample total exceeds 14223 because many scored identically on more than one personality trait.
(b) The total number of survey participants who do not consider themselves fully heterosexual is 28.59%.
Source: research data.

Regarding the education level, most individuals are in higher education, corresponding to 49.48% of the sample (7038 individuals). Second are high school students, with 32.60% (4637 respondents). Individuals with a postgraduate degree are in third place, with 16.94% (2410 individuals) and, finally, individuals with less than high school education, only 0.97% (138 individuals).

As for personality traits, many individuals scored equally in more than one personality trait, so the number of total responses in this factor was 1871. This occurs due to the characteristic of inseparability of personality traits when individuals are constituted by a composition of each of the traits. Agreeableness and Openness to experiences were the most identified traits in the participants, equivalent, respectively, to 29.64% (5504) and 27.53% (5118). Next comes conscientiousness with 23.03% (4277), extroversion, 10.93% (2029) and emotional stability with 8.85% (1643).

In terms of sexual orientation, people who declared themselves to be heterosexual predominated, accounting for 71.41% (10157). In second place are bisexuals, 11.20% (1593),

then asexual, 4.79% (681) and homosexual, 4.77% (678). Also, 7.83% (1114) of respondents declared themselves to have other sexual orientations.

The perception that each of the five personality traits (Agreeableness, conscientiousness, emotional stability, extraversion and openness to experiences) included only two items (Ten Item Personality Inventory) to investigate the reliability of the TIPI scale, we followed the recommendation of Clark and Watson (1995) who propose the calculation of the mean inter-item correlation – Miic: extraversion (Miic = 0.55), Agreeableness (Miic = 0.36), conscientiousness (Miic = 0.52), emotional stability (Miic = 0.61) and openness to experiences (Miic = 0.38).

The ideal range of mean correlation between items is 0.15 to 0.50. If it is less than that, the items would not be sufficiently correlated and would not measure very well the construct or idea. Over 0.50, the items are so close that they are almost repetitive (Clark and Watson, 1995). The Miic of the entire TIPI was 0.48. The Miic values of all factors ranged from 0.36 to 0.61.

Flake & Fried (2020) carry out an extensive discussion on the identification, definition, and measurement of constructs. In this context, measurement is an important aspect of the replication crisis faced by psychology. It is known that measurement error can produce biased estimates of the associations between the constructs that the observed variables represent. We evaluated the fit of the DASS-42 through confirmatory factor analysis with several indices: Comparative Fit Index (CFI = 0.927), McDonald Fit Index (MFI = 0.926); Incremental Fit Index (IFI = 0.928); Tucker-Lewis Index (TLI = 0.922) and Root Mean Square Error of Approximation (RMSEA = 0.056). The CFI is a "good fit" index little influenced by the sample size ranging from 0 to 1, which quantifies the proportional improvement in the model's fit over a null model. In contrasts, the RMSEA is a measure of "lack of fit" indicated for large samples (compensating for the degrees of freedom that penalizes the chi-square test) its values range from 0 to 1, high values identify lack of fit. All indices suggest an adequate fit of the model.

Additionally, we sought to increase the robustness of the model by calculating reliability scores (Alpha and Omega). Alpha is an estimate of the total score reliability for measuring a single construct common to all items in a test under certain conditions (one-dimensionality, equivalent loads, and independence from errors). As all these conditions are unlikely to hold in any real situation, we also present the Omega score as an alternative measure of reliability. The values obtained for Alpha are: Depression = 0.957; Anxiety = 0.908 and Stress = 0.925. Alternatively, checking how the constructs explain the correlations between items, the Omega values are: Depression = 0.958 (95% CI = 0.957, 0.959]); Anxiety = 0.909 (95% CI = 0.907, 0.912]) and Stress = 0.925 (95% CI = 0.923, 0.927]). These values suggest reliability and unidimensionality in each of the constructs.

Table 2 presents the results of Equation [1] estimation, using depression, ten-item personality traits, and sexual orientation. In this table, the coefficients identify the impacts of personality traits on depression. However, the coefficients related to sexual orientation are the averages of depression for each orientation and between parentheses are the lower and upper limits of the confidence interval of the coefficients. In the second part of Table 2, the coefficients that identify the differences in mean depression between the sexual orientation with the highest mean and the other sexual orientations are presented. These coefficients are obtained by applying Equation [2].

The association of depression with personality traits is significant, when considered the five traits (Model 1). It is observed that emotional stability has a negative coefficient of -0.221 with a very narrow confidence interval (-0.228, -0.215), thus, neuroticism is the only personality trait that is associated with increased depression (remembering that neuroticism is the opposite of emotional stability). The other personality traits act to reduce the level of depression.

Table 2. Estimated results using depression, ten-item personality inventory, and sexual orientation

	Model 1(b)	Model 2(c)
Equation [1]		
Agreeableness	-0.020*** (-0.027, -0.014)	
Conscientiousness	-0.062*** (-0.068, -0.056)	
Emotional Stability	-0.221*** (-0.228, -0.215)	
Extroversion	-0.089*** (-0.095, -0.084)	
Openness to experiences	-0.030*** (-0.037, -0.023)	
Alpha		-0.325*** (-0.334, -0.315)
Beta		-0.151*** (-0.160, -0.143)
Age	0.0001 (-0.001, 0.001)	0.001** (0.0003, 0.002)
D_g_Feminine	-0.057*** (-0.077, -0.036)	0.017 (-0.003, 0.038)
D_Heterosexual	1.585*** (1.533, 1.636)	1.878*** (1.827, 1.929)
D_Asexual	1.615*** (1.553, 1.677)	1.892*** (1.829, 1.955)
D_Homosexual	1.642*** (1.579, 1.706)	1.965*** (1.902, 2.029)
D_Bisexual	1.695*** (1.640, 1.751)	2.031*** (1.976, 2.086)
D_Others	1.629*** (1.571, 1.687)	1.916*** (1.857, 1.974)
Equation [2](a)		
D_Heterosexual	-0.111*** (-0.139, -0.083)	-0.153*** (-0.182, -0.124)
D_Asexual	-0.080*** (-0.127, -0.033)	-0.139*** (-0.188, -0.090)
D_Homosexual	-0.053* (-0.100, -0.006)	-0.065** (-0.114, -0.016)
D_Others	-0.067*** (-0.107, -0.026)	-0.115*** (-0.157, -0.073)
Observations	14223	14223
R2	0.357	0.297
R2 Adjusted	0.356	0.296
Residual Standard Error	0.623 (df = 14211)	0.652 (df = 14214)
F Value	657379*** (df = 12; 14211)	665980*** (df = 9; 14214)

(a) Difference between the average level of depression for bisexual orientation compared to the average level of depression for other sexual orientations. Results obtained by applying Equation [2]. Significance codes * = 0.05; ** = 0.01 and *** = 0.001.
(b) Personality is measured according to the five major factors proposed by Gosling et al. (2003);
(c) Personality is measured according to higher order factors of the Big Five (Alpha and Beta) discussed in Digman (1997) and DeYoung, Peterson, and Higgins, (2002).

Considering the higher order factors (Model 2), the alpha factor presented a coefficient of -0.325 acting as a depression reducer, although the beta factor is also a depression reducing factor, but to a lesser extent. The variation in age does not seem to have a direct effect on the variation in depression, as its significant effect (Model 1) is not maintained in the model with higher order factors. A similar interpretation can be applied to the female gender.

Heterosexual individuals have the lowest mean levels of depression (1.585), and bisexual individuals have the highest mean levels of depression (1.695). These results are robust as they are confirmed using higher order personality factors (Model 2). Although the average levels of depression have changed slightly, heterosexual individuals continue to have the lowest levels and bisexuals continue to have the highest levels of depression.

The second part of Table 2 shows that the greatest difference in mean levels of depression occurs between heterosexuals and bisexuals, which is -0.111 (1.585 – 1.695) and this difference is statistically significant. The values of the differences between bisexuals with the other orientations are all significant, confirming that the bisexual orientation is the one that is exposed to a greater level of depression. These results are maintained when considering the higher order factors of personality (Model 2), thus giving greater robustness to the results.

Table 3 presents the results using anxiety as the dependent variable. Personality trait coefficients identify significant impacts on anxiety, but now, in addition to the neuroticism personality trait, the agreeableness trait also tends to influence the increase in anxiety.

Considering the higher order factors, the alpha factor has a coefficient -0.256 acting as a more expressive reducer of anxiety than the beta factor.

Table 3. Estimated results using anxiety, ten-item personality inventory, and sexual orientation

	Model 1(b)	Model 2(c)
Equation [1]		
Agreeableness	0.008*** (0.003, 0.014)	
Conscientiousness	-0.024*** (-0.028, -0.019)	
Emotional Stability	-0.213*** (-0.217, -0.208)	
Extroversion	-0.031*** (-0.035, -0.027)	
Openness to experiences	-0.019*** (-0.025, -0.014)	
Alpha		-0.256*** (-0.263, -0.248)
Beta		-0.076*** (-0.083, -0.070)
Age	-0.008*** (-0.009, -0.007)	-0.007*** (-0.008, -0.006)
D_g_Feminine	0.057*** (0.042, 0.072)	0.155*** (0.139, 0.171)
D_Heterosexual	1.129*** (1.091, 1.168)	1.403*** (1.363, 1.443)
D_Asexual	1.179*** (1.133, 1.226)	1.432*** (1.382, 1.481)
D_Homosexual	1.166*** (1.118, 1.213)	1.471*** (1.421, 1.521)
D_Bisexual	1.192*** (1.150, 1.233)	1.499*** (1.456, 1.542)
D_Otthers	1.212*** (1.168, 1.255)	1.482*** (1.436, 1.528)
Equation [2](a)		
D_Heterosexual	-0.062*** (-0.083, -0.042)	-0.096*** (-0.118, -0.073)
D_Asexual	-0.012 (-0.048, 0.023)	-0.067*** (-0.105, -0.029)
D_Homosexual	-0.026 (-0.061, 0.009)	-0.027 (-0.066, 0.011)
D_Others	0.020 (-0.010, 0.050)	-0.017 (-0.050, 0.016)
Observations	14223	14223
R2	0.407	0.294
R2 Adjusted	0.406	0.293
Residual Standard Error	0.467 (df = 14211)	0.510 (df = 14214)
F Value	811537*** (df = 12; 14211)	656435*** (df = 9; 14214)

(a) Difference between the average level of depression for bisexual orientation compared to the average level of depression for other sexual orientations. Results obtained by applying equation [2]. Significance codes * = 0.05; ** = 0.01 and *** = 0.001.

(b) Personality is measured according to the five major factors proposed by Gosling et al. (2003);

(c) Personality is measured according to higher order factors of the Big Five (Alpha and Beta) discussed in Dignan (1997) and DeYoung, Peterson, and Higgins, (2002).

The variation in age and being female seems to have a direct effect on the variation in anxiety, as its significant effect (Model 1) is maintained when considering higher order factors. Thus, increasing age tends to reduce the level of anxiety and females tend to have a higher average level of anxiety.

Individuals who self-reported as heterosexual presented with the lowest average levels of anxiety (1.129) and bisexual and other individuals, with the highest average levels of anxiety (1.192 and 1.212) respectively. These results (Model 1) are confirmed using higher order personality factors. Although the average levels of anxiety changed slightly, heterosexual individuals continued to have the lowest levels and the bisexual and other groups had the highest levels of anxiety.

The second part of Table 3 demonstrates the difference in mean levels of anxiety that occurs between heterosexuals and bisexuals is -0.062 (1.129 – 1.192) and this difference is statistically significant. However, the differences values between bisexuals and the other

orientations are not all significant. These results are maintained when considering the higher order factors of personality.

Table 4 shows the coefficients obtained when stress is used as a dependent variable. Personality trait coefficients identify significant impacts on stress levels. The emotional stability trait has a negative coefficient of -0.287 with a very narrow confidence interval (-0.292, -0.281), thus, neuroticism is the only personality trait that is associated with increased levels of stress. The other personality traits act to reduce the level of stress. Considering the higher order factors, the alpha factor has a coefficient -0.360 acting as a more expressive stress reducer than the beta factor.

The variation in age is presented as a stress-reducing factor, that is, older individuals tend to have lower levels of stress. On the other hand, the coefficient of the binary variable that identifies the female sex is positive and statistically significant. This result recognizes that female individuals have a higher average level of stress than males. These results hold when considering higher order factors.

Table 4. Estimated results using stress, ten-item personality inventory, and sexual orientation.

	Model 1(b)	Model 2(c)
Equation [1]		
Agreeableness	-0.022*** (-0.028, -0.016)	
Conscientiousness	-0.021*** (-0.027, -0.016)	
Emotional Stability	-0.287*** (-0.292, -0.281)	
Extroversion	-0.038*** (-0.043, -0.033)	
Openness to experiences	-0.012*** (-0.018, -0.006)	
Alpha		-0.360*** (-0.369, -0.351)
Beta		-0.083*** (-0.090, -0.075)
Age	-0.004*** (-0.005, -0.003)	-0.002*** (-0.003, -0.001)
D_g_Feminine	0.049*** (0.032, 0.067)	0.171*** (0.152, 0.190)
D_Heterosexual	1.407*** (1.363, 1.451)	1.730*** (1.684, 1.777)
D_Asexual	1.418*** (1.365, 1.471)	1.716*** (1.658, 1.774)
D_Homosexual	1.420*** (1.366, 1.474)	1.788*** (1.729, 1.846)
D_Bisexual	1.474*** (1.427, 1.522)	1.841*** (1.791, 1.891)
D_Otthers	1.451*** (1.401, 1.501)	1.769*** (1.715, 1.822)
Equation [2](a)		
D_Heterosexual	-0.067*** (-0.091, -0.043)	-0.111*** (-0.137, -0.084)
D_Asexual	-0.056** (-0.096, -0.016)	-0.125*** (-0.170, -0.080)
D_Homosexual	-0.054** (-0.095, -0.014)	-0.053* (-0.098, -0.008)
D_Others	-0.023 (-0.058, 0.011)	-0.072*** (-0.111, -0.034)
Observations	14223	14223
R2	0.464	0.332
R2 Adjusted	0.464	0.332
Residual Standard Error	0.533 (df = 14211)	0.595 (df = 14214)
F Value	1025832*** (df = 12; 14211)	786339*** (df = 9; 14214)

(a) Difference between the average level of depression for bisexual orientation compared to the average level of depression for other sexual orientations. Results obtained by applying equation [2]. Significance codes * = 0.05; ** = 0.01 and *** = 0.001.

(b) Personality is measured according to the five major factors proposed by Gosling et al. (2003);

(c) Personality is measured according to higher order factors of the Big Five (Alpha and Beta) discussed in Digman (1997) and DeYoung, Peterson, and Higgins, (2002).

Individuals who self-reported as heterosexual presented with the lowest average levels of stress (1.407) and bisexual individuals, with the highest average levels of stress (1.474).

These results (Model 1) are confirmed using higher order personality factors. Although the average levels of stress have changed slightly, heterosexual individuals continue to have one of the lowest levels and the bisexual group has the highest levels of stress.

In the second part of Table 4, it can be seen that the difference in mean levels of stress that occurs between heterosexuals and bisexuals is -0,067 (1.407 – 1.474) and this difference is statistically significant. The values of differences between bisexuals with the other orientations are all significant. These results are maintained when considering the higher order factors of personality.

Final Considerations

This study aimed to investigate the relationship between aspects of mental health depression, anxiety and stress with personality traits and self-declaration of sexual orientation of individuals in different countries. The central idea is to identify and analyze the relationship between the DASS-42, TIPI and sexual orientation constructs using the structural equation model and regression analysis with dummy variables.

The results found allow us to conclude that the five major personality traits measured by the Ten Item Personality Inventory have a significant relationship with the evaluated aspects of mental health, namely: depression, anxiety and stress, and this result is in accordance with hypothesis 1. It is fundamental to emphasize that, regarding personality, the analysis of the different results offers a good opportunity to confirm that the emotional stability trait is always associated with high levels of depression, anxiety, and stress. This result agrees with hypothesis 2.

Also, it can be concluded that individuals segregated by self-reported sexual orientation tend to present different average levels of depression, anxiety and stress and this difference is significant, at least for one of the orientations. Individuals self-declared as bisexual always tend to be more vulnerable to their mental health when compared to heterosexual individuals and in some situations when compared to individuals of other orientations. This vulnerability manifests itself through higher average levels of symptoms of depression, anxiety, and stress. This result agrees with hypothesis 3.

These results stand for both the analysis using the five grid factors and the higher order personality factors, alpha and beta. Therefore, bisexual individuals experience an identity uncertainty (double orientation) that is translated by an internal and external confrontation to have an identity that is still, nowadays, socially marginalized.

Implications

This research confirmed the assumptions about the role of personality traits and their expressiveness in negative affectivity, allowing us to partially explain depression, anxiety and stress. In this way, the development of efficient forms of professional performance assumes an important position, so there is a necessity of knowledge about personality traits. To Perceive thoughts, values, emotions, and behaviors are key to diagnosing and treating emotional and personality disorders. Experience shows that the model advocated here plays a fundamental role in showing phenomena of human behavior to qualify professional performance in the face of issues of negative affectivity. This should reflect professionally in the formulation of preventive options, analysis, and studies of human behavior.

Therefore, knowledge of these conditions is important for the prevention, treatment and consequent promotion of health and well-being of the population. Likewise, the analysis of the different results contributes to the perception of the desires and attitudes of sexual minorities. Bisexual individuals operate in different educational, professional, and social areas under the stronger action of agents harmful to mental health. Therefore, mental health interventions for bisexuals should address these aspects of their experience and should address depression,

anxiety, and bisexual identity-specific stress through relevant prevention practices. For example, therapies working with bisexual clients should seek to validate their bisexual identity and communicate a sense of acceptance and respect for the diverse nature of sexuality.

Following the idea of Mohr & Kendra (2011), it is never too much to insist on adaptive strategies on the factors of acceptance, concealment motivation, identity uncertainty, internalized homo negativity, difficulty with the identity development process, identity affirmation and identity centrality. In the interpersonal context, Balsam & Mohr (2007) highlight the need to identify sources of support and affirmation to resolve the emotional stress that arises from the identity disclosure process, as bisexuals tend, in addition to presenting higher levels of confusion, identity, have lower levels of self-disclosure and community connection when compared to their peers (lesbians/gays).

Limitations and suggestions

Despite the theoretical and empirical nature of this research, some limitations should be highlighted: i) the study uses non-probabilistic sampling within a broad geographic context (several countries) and this implies concepts and attitudes with distinct cultural characteristics. This may limit the stability of the results presented here; ii) the nature of the cross-section approach and the characteristic of the methodology used greatly limit the interpretation of the relationships found as causal relationships. To this end, a longitudinal study is likely to be necessary and, iii) the study uses secondary data from self-reports of depression, anxiety, stress, and personality traits. Certainly, structured interviews in greater depth can provide important information to improve the interpretation of the results found.

As a result of these limitations some suggestions can be highlighted: i) to perform an analysis segmenting the sample by countries, thus seeking to isolate a specific geographic or cultural component, ii) apply a methodology that would consider a broader analysis throughout the entire distribution of the data (eg quantile regression analysis) and not just an analysis through the average behavior and, iii) apply a causality test that includes cross-section data in order to test the causal relationship between the constructs.

References

Balsam, K. F., & Mohr, J. J. (2007). Adaptation to sexual orientation stigma: A comparison of bisexual and lesbian/gay adults. Journal of Counseling Psychology, 54(3), 306–319. doi.org/10.1037/0022-0167.54.3.306

Beck, A. T., & Alford, B. A. (2014). Depression: Causes and Treatment. University of Pennsylvania Press; 2nd edition.

Chan R. C. H, Operario, D, & Mak, W. W. S. (2020) Bisexual individuals are at greater risk of poor mental health than lesbians and gay men: The mediating role of sexual identity stress at multiple levels. Journal of Affective Disorders. 260:292-301. doi: 10.1016/j.jad.2019.09.020

Cohen, B. E., Edmondson, D., & Kronish, I. M. (2015). State of the art review: depression, stress, anxiety, and cardiovascular disease. American Journal of Hypertension, 28(11), 1295-1302. doi.org/10.1093/ajh/hpv04

DeYoung C. G., Peterson J. B., Higgins D. M. (2002). Higher-order factors of the Big Five predict conformity: Are there neuroses of health? Personality and Individual Differences. 33 (4): 533–552. doi:10.1016/s0191-8869(01)00171-4

Digman J. M. (1997). Higher-order factors of the Big Five. Journal of Personality and Social Psychology. 73 (6): 1246–1256. doi:10.1037/0022-3514.73.6.1246

Flake, J. K., & Fried, E. I. (2020). Measurement Schmeasurement: Questionable Measurement Practices and How to Avoid Them. Advances in Methods and Practices in Psychological Science. Vol. 3 (4), 456-465. doi:10.1177/2515245920952393

Gosling, S. D., Rentfrow, P. J., & Swann, W. B., Jr. (2003). A Very Brief Measure of the Big Five Personality Domains. Journal of Research in Personality, 37, 504-528. doi.org/10.1016/S0092-6566(03)00046-1

Hadden, L., O'Riordan, A. & Jackson, J. (2020). Shining a light on the daily occupational experiences of lesbian and gay adults' in Ireland: applying an occupational justice lens. Irish Journal of Occupational Therapy, Vol. 48 No. 2, pp. 117-132. doi.org/10.1108/IJOT-12-2019-0017

Igawa, K., Higa, K. & Takamiya, T. (2020). Utilizing short version Big Five traits on crowdsouring. International Journal of Crowd Science. Vol. 4, No. 2, pp. 117-132. doi.org/10.1108/IJCS-11-2019-0031

Jeng, S.-P., & Teng, C.-I. (2008). Personality and motivations for playing online games. Social Behavior and Personality: An international journal, 36(8), 1053-1060. doi.org/10.2224/sbp.2008.36.8.1053

Kirby, T. A., Merritt, S. K., Baillie, S., Malahy, L. W., & Kaiser, C. R. (2021). Combating Bisexual Erasure: The Correspondence of Implicit and Explicit Sexual Identity. Social Psychological and Personality Science, 12(8), 1415–1424. doi.org/10.1177/1948550620980916

Krikorian, A., Limonero, J. T., Román, J. P., Vargas, J. J., & Palacio, C. (2014). Predictors of suffering in advanced cancer. The American Journal of Hospice & Palliative Care, 31(5), 534-542. doi: 10.1177/1049909113494092

Leong, L., Jaafar, N.I., & Sulaiman, A. (2017). Understanding impulse purchase in Facebook commerce: does Big Five matter? Internet Research., 27, 786-818.

Lovibond, S. H., & Lovibond, P. F. (1995). Manual for the Depression Anxiety Stress Scales. (2nd. Ed.) Sydney: Psychology Foundation

McCrae, R. R., & Costa, P. T. (1991). Adding Liebe und Arbeit: The full five-factor model and well-being. Personality and Social Psychology Bulletin, 17(2), 227–232. doi.org/10.1177/014616729101700217

McDougall, W. (1929). The chemical theory of temperament applied to introversion and extroversion. The Journal of Abnormal and Social Psychology, 24(3), 293–309. doi.org/10.1037/h0075883

Mendes, C., & Pereira, H. (2021). Assessing the Impact of COVID-19 on Work-Related Quality of Life through the Lens of Sexual Orientation. Behavioral sciences (Basel, Switzerland), 11(5), 58. doi.org/10.3390/bs11050058

Meyer I. H. (2003). Prejudice, social stress, and mental health in lesbian, gay, and bisexual populations: conceptual issues and research evidence. Psychological bulletin, 129(5), 674–697. doi.org/10.1037/0033-2909.129.5.674

Meyer, I. H. (1995). Minority stress and mental health in gay men. Journal of Health and Social Behavior, 36(1), 38–56. doi.org/10.2307/2137286

Mohr, J. J., & Kendra, M. S. (2011). Revision and extension of a multidimensional measure of sexual minority identity: the Lesbian, Gay, and Bisexual Identity Scale. Journal of counseling psychology, 58(2), 234–245. doi.org/10.1037/a0022858

Paleczek, D., Bergner, S., & Rybnicek, R. (2018). Predicting career success: is the dark side of Personality worth considerating? Journal of Managerial Psychology, Vol. 33 No. 6, pp. 437-456. doi.org/10.1108/JMP-11-2017-0402

Watson, D., & Clark, L. A. (1992). On traits and temperament: general and specific factors of emotional experience and their relation to the five-factor model. Journal of personality, 60(2), 441–476. doi.org/10.1111/j.1467-6494.1992.tb00980.x