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Personality traits, sex, and sexual orientation predict academic choices

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Personality traits, sex, and sexual orientation predict academic choices

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ABSTRACT

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Human personality is associated with vocational interests and the choice of an undergraduate major. Personality traits means can also differ among majors, sex, and sexual orientations. The main aim of the study is to predict academic choices, based on personality traits, dichotomous thinking, sex, and sexual orientation. A total of 687 undergraduate Brazilian students were recruited through online media and answered a battery of questionnaires in the online Qualtrics platform and divided into three main scientific areas (Social: N = 299, Biological: N = 248, Exact Sciences: N = 132). Six personality traits were measured by the HEXACO-60 scale, dichotomous thinking by the Dichotomous Thinking Inventory (DTI), and the 7-point Kinsey scale was used to assess sexual orientation. Two models were run, one with a calculated DTI general (*g*) factor and a regular total sum score. Results show a positive marginal effect of Openness on Social Sciences and negative effect on Biological Sciences ($\delta y/ \delta x$ = 0.15 and -0.16, respectively). In Social Sciences, we found an interaction between Conscientiousness and heterosexuality ($\delta y/ \delta x$ = 0.21), and Extraversion and being male ($\delta y/ \delta x$ = 0.34) while in Biological Sciences, interactions between being a homosexual male and Agreeableness had a negative effect ($\delta y/ \delta x$ = -0.60) and an interaction with Extraversion ($\delta y/ \delta x$ = 0.83). The DTI *g* factor score showed to be a negative predictor for the Biological Sciences ($\delta y/ \delta x$ = -0.04). The DTI sum score was a positive predictor for the Social Sciences ($\delta y/ \delta x$ = 0.004) and negative for the Biological Sciences ($\delta y/ \delta x$ = -0.005). No significant effects were found in the Exact Sciences. Personality traits have an adaptive value and in modern times when combined with an individual's sex and sexual orientation, could serve as predictors for academic major choice, in addition to traits alone, as previous studies have shown.

Key words: Personality; Dichotomous thinking; Academic choices; Evolutionary psychology

RESUMO

Ollhoff, C. K. (2023). *Traços de personalidade, sexo e orientação sexual predizem escolhas acadêmicas* (Dissertação de Mestrado). Instituto de Psicologia, Universidade de São Paulo, São Paulo.

A personalidade humana está associada a interesses vocacionais e à escolha de um curso de graduação. Os traços de personalidade também podem diferir entre os cursos de graduação, sexo e as orientações sexuais. O principal objetivo do estudo é prever escolhas acadêmicas, com base em traços de personalidade, pensamento dicotômico, sexo e orientação sexual. Um total de 687 estudantes brasileiros de graduação superior foram recrutados por meio de mídia on-line e responderam a uma bateria de questionários na plataforma on-line Qualtrics e foram divididos em três áreas científicas (Ciências Sociais: N = 299, Biológicas: N = 248, Exatas: N = 132). Seis traços de personalidade foram aferidos pela escala HEXACO-60, o pensamento dicotômico pelo Dichotomous Thinking Inventory (DTI), e a escala de Kinsey de 7 pontos foi utilizada para avaliar a orientação sexual. Foram executados dois modelos, um com fator geral (*g*) do DTI calculado e um escore regular de soma total. Os resultados mostram um efeito marginal positivo da Abertura à Experiência nas Ciências Sociais e um efeito negativo nas Ciências Biológicas ($\delta y/\delta x$ = 0,15 e -0,16, respectivamente). Nas Ciências Sociais, encontramos uma interação entre Conscienciosidade e heterossexualidade ($\delta y/\delta x$ = 0,21), e Extroversão e ser do sexo masculino ($\delta y/\delta x$ = 0,34), enquanto nas Ciências Biológicas, as interações entre ser homossexual, do sexo masculino e Agradabilidade tiveram um efeito negativo ($\delta y/\delta x$ = -0,60) e uma interação com Extroversão ($\delta y/\delta x$ = 0,83). O escore do fator *g* do DTI mostrou-se um preditor negativo para as Ciências Biológicas ($\delta y/\delta x$ = -0,04). O escore de soma do DTI foi um preditor positivo para as Ciências Sociais ($\delta y/\delta x$ = 0,004) e negativo para as Ciências Biológicas ($\delta y/\delta x$ = -0,005). Não foram encontrados efeitos significativos nas ciências exatas. Os traços de personalidade têm um valor adaptativo e, nos tempos modernos, quando combinados com o sexo e a orientação sexual de um indivíduo, podem servir como preditores para escolhas acadêmicas, além de traços sozinhos, como estudos anteriores mostraram.

Palavras-chave: Personalidade; Pensamento dicotômico; Escolhas acadêmicas; Psicologia evolucionista.

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1. GENERAL INTRODUCTION

The dissertation will be divided into three main chapters. The first chapter consists of a theoretical introduction to personality traits, variation and selection, genetic and development course, and evolutionary explanations of personality traits; followed by an entry published in the Encyclopedia of Sexual Psychology and Behavior, edited by Todd K. Shackelford, with the title “Big Five Personality Traits: Female Sexual Orientation”. Other important topics to this project, dichotomous thinking, and vocational interests, will be discussed in the last part of this chapter.

The second chapter refers to the measurement of invariance of the Dichotomous Thinking Inventory (DTI), calculation of a general (*g*) factor and discussion about factor measurement. The third and last chapter will use the DTI *g* factor and the standard sum score method and apply it to two Multinomial Logistic models that calculate marginal effect sizes. The models have as independent variables, sex, sexual orientation, personality traits and the DTI scores, and as dependent variables, three scientific areas (Social, Biological, and Exact Sciences). Differences between personality traits and three semester segments were also calculated. Afterwards, results are discussed, and a general discussion is presented.

2. CHAPTER ONE

2.1. Individual differences and personality traits

This section aims to introduce the reader to the concept of individual differences, and personality traits (being a kind of individual differences). Those differences seem to be present in many distinct populations and have an evolutionary background.

Although genes and environment interact together, and behaviors are a result of both, genes are sometimes given less emphasis when explaining behavior. Genes should not be disregarded as heritability of traits can reach an average of 49%, as Polderman et al. (2015) show in a meta-analysis of twin correlations and reported variance components for 17,804 traits, from 2,748 publications including 14,558,903 partly dependent twin pairs. Since heritability can play a great part in shaping traits, the study of variation can still be approached from the standpoint of the universal psychological architecture present in all humans (Chabris et al., 2015; Lukaszewski et al., 2020; Polderman et al., 2015; Turkheimer, 2000).

Humans share a primate nature and many of our behavioral traits are related to this nature (van Schaik, 2016). Personality is supposed to have conferred benefits and was selected in non-human primates and humans alike, who share an evolutionary background with these primates. For instance, consistent and stable differences in temperament, impulsivity patterns, social tendencies, and social roles within groups are observed among non-human primates as well as humans (Sapolsky, 2007).

While terminology concerning personality can be ambiguous, with terms such as "personality" and "temperament" used interchangeably, personality traits generally refer to consistent behavior patterns exhibited over time or in specific contexts (e.g., aggressiveness) (Blaszczyk, 2020). Non-human primates also exhibit personality traits that align with the Big Five traits model (except for Conscientiousness), demonstrating the existence of personality traits in both human and non-human primates (Blaszczyk, 2020).

Personality traits are traits that demonstrate individual differences, and individual differences play a crucial role in solving various social adaptive problems, such as mate selection (Buss, 2009). It amplifies

individual differences in traits that potential mates can easily judge (Miller, 2000) as the offspring have a chance of inheriting the genetic structure that codes for the development of psychological mechanisms that produce the same selection patterns in response to trait cues (Michalski & Shackelford, 2010). For example, facial cues can signal intelligence, and women select for these cues regardless of their menstrual cycle, following the pattern of assortative mating (i.e., correlations between phenotypes or genotypes across mated pairs) (Moore et al., 2014). However, intelligence may operate through stabilizing selection, where the average is preferable, meaning that it may not always be amplified using a "more is better" approach (Miller & Penke, 2007).

Personality traits, alike other traits that demonstrate individual differences seem to have evolved, they are present in other species and are widespread across different cultures. Personality traits may not follow a "more is better" approach, as there are costs and benefits associated with every trait level. The next section will explain how personality traits vary and were selected.

2.2. Variation and selection of personality traits

There are several approaches to explaining the variation and selection of personality traits, including life-history theory, mutational load, and costly signaling theory (as summarized by Buss, 2009). However, in this section we will mainly focus on an ecological approach, mainly by environmental heterogeneity and niche diversity.

Penke et al. (2007) suggest that personality trait variation can be explained by balancing selection due to environmental heterogeneity. This means that the same traits are affected by selective pressures in different directions at different times or in different places, and no genetic variant underlying personality traits is consistently favored over others. Negative frequency dependent selection is a special case of this perspective, which proposes that spatiotemporal fluctuations in selection pressures occur primarily in the social environment of the species (e.g., the ratio of cooperative partners to cheaters, sex ratio, and distribution of competitors), rather than the external physical environment. This type of selection is

"negative" because it favors rare traits, for example, if most individuals are friendly and cooperative, there will be a lower percentage of individuals who would benefit from being deceitful.

If the conditions of balancing selection by environmental heterogeneity and negative frequency dependent selection are met, then there will be two or more phenotypes, or even a range of phenotypes, with equal average fitness across different environments. For instance, population sex ratios can naturally fluctuate over time, which greatly affects the adaptive benefits of reproductive strategies in humans. This fluctuation in sex ratios can put balancing selection pressure on personality traits linked to reproductive strategies, such as sociosexuality, Extraversion, and Neuroticism (Alvergne et al., 2010; Buss & Penke, 2015; Schmitt, 2005). Since most personality traits affect mating and parenting behavior, variations in sex ratios can result in variable selection on personality (Del Giudice, 2012).

Moreover, while humans share a common nature and exhibit similar average fitness across various environments, there can be variations specific to certain domains due to the presence of specialized minds, adapted to particular social niches and group dynamics. Therefore, a greater diversity of niches may lead to greater variation as specialized minds are recruited to fill specific niches. Even certain psychopathologies, such as ADHD and autism (when not significantly impairing), might have been selected for as they could provide benefits such as exploratory behavior that enhances collective foraging and risk-taking in the case of ADHD, and high intelligence and visuo-spatial abilities in the case of autism (Hunt & Jaeggi, 2022).

Penke and Jokela (2016) suggest that humans possess a unique ability to actively seek and construct environments that align with their individual preferences, needs, and abilities. There are many related concepts that may play a part in aligning individual preferences with predisposition, and perhaps shaping personality traits, such as active gene-environment correlation, experience-producing drives, or niche picking and construction (see, Laland et al., 2016; Odling-Smee et al., 2013; Smaldino et al., 2019). While active gene-environment correlation, experience-producing drives, niche picking, and niche construction all describe ways in which individuals interact with their environment, they differ in terms of

the driving forces and mechanisms involved. Active gene-environment correlation and niche picking are driven by genetic differences and individual preferences, while experience-producing drives and niche construction are driven by the individual's actions and the modification of the environment. Nonetheless, individuals can strategically position themselves in environments that maximize the fitness benefits associated with their specific personality profiles (Penke & Jokela, 2016).

According to Martin et al. (2022), there may be mechanisms of adaptive social plasticity in personality that reflect the changing costs and benefits of social behavior in different contexts. Because social niche specializations involve various social roles and tactics that individuals use to deal with social challenges, the evolution of these roles is likely driven by processes at both the individual and group levels that optimize social interactions with partners.

Focusing on tasks that align with their initial traits and preferences allows individuals to benefit from enhanced learning or task-specific proficiency while reducing the costs of conflict with group members who are competing for common niches. It can also enhance synergies and marginal benefits between group members who specialize, which promotes emergence and maintenance of individual differences in behavior. This creates a feedback loop that establishes frequency-dependent selection as a form of interaction between social and non-social selection in dyads like mated pairs or larger groups, such as neighborhoods, coalitions, and herds (Martin et al., 2022).

Building on these ideas, the niche diversity hypothesis posits that micro-populations or niches within a larger population can vary significantly, and in highly complex societies, individuals can occupy multiple niches, each with different optimal levels of personality traits (Durkee et al., 2022). Consequently, the niche diversity hypothesis predicts three things: (a) less covariance among traits, resulting in more distinct combinations of traits (Lukaszewski et al., 2017), (b) wider distributions of trait levels, resulting in more individual variation in each trait (Smaldino et al., 2019), and (c) greater personality dimensionality (Smaldino et al., 2019).

Durkee et al. (2022) recently conducted an analysis of personality traits and niche diversity in 115 nations. Niche diversity is estimated as a nation's score on the first principal component of three variables: sectoral diversity (variety of a nation's exports weighted by volume), urbanization (percentage of the population living in cities), and the HDI (nation's average levels of education, gross domestic product, and life expectancy). While these three variables are conceptually appropriate indicators of niche diversity due to their relationships with economic specialization and division of labor, Durkee et al. (2022) acknowledge that they are not perfect measures.

Durkee and colleagues (2022) discovered that there was a strong association between niche diversity and lower intertrait covariance, as well as greater personality dimensionality across nations, but not with trait variances. The authors suggest that if many niches within and between populations tend to incentivize similar levels of traits when they are incentivized at all, niche diversity may not result in greater trait variance. However, the variety of trait combinations incentivized by different niches may still differ across populations, resulting in higher personality dimensionality and less overall covariance among traits.

These ecological ideas seem to best explain how traits might vary and are selected, distinctively, environmental heterogeneity, niche diversity, and niche specialization. Next, the Big Five and HEXACO personality model are explained. Although the study uses the HEXACO model, it was based in the Big Five model and traits are similar, so explanations can be taken from the Big Five.

2.3. The Big Five personality model

The lexical hypothesis proposes that personality traits can be found in natural language but does not specify where in speech they may be encoded. This hypothesis led to the use of factor analysis with a variety of personality descriptors to identify the existence of five factors, which are collectively known as the Big Five. The factors are Extraversion, Agreeableness, Conscientiousness, Neuroticism, and Openness to Experience. They are general tendencies that vary along a continuum and have different levels of expression, which may confer benefits or costs depending on the environment. The Big Five Model was

originally proposed Tupes and Christal in 1961 (see, Tupes & Christal, 1992), but further developed by Digman (1990), Goldberg (1992) and McCrae and Costa (see, McCrae & John, 1992), and is widely used in personality research.

2.4. Genetic and developmental course of the personality traits

McCrae and Costa (1994) argued that personality did not change after age 30, and this was due to developmental mechanisms rather than social pressures, which at the time caused some controversy. Briley and Tucker-Drob (2014) conducted a meta-analysis of longitudinal twin and sibling studies and found that the environment did not significantly contribute to phenotypic stability in very early childhood ($b_0 = 0.034$, $p = 0.09$). However, they also found that the environmental contribution increased until age 30 ($b_{0\_30} = .008$, $p < 0.001$), and then plateaued afterward ($b_{30\_90} = 0.001$, $p = 0.21$).

In essence, Briley and Tucker-Drob (2014) found that genetic stability increases from moderate in infancy to near-perfect by age 30 and remains consistent throughout adulthood. The contribution of genetics to the stability coefficient for older adults over a 5-year period is estimated to be 0.38 out of 0.71. The remaining 0.33 stability could be attributed to the environment, measurement error, or method bias, see P. T. Costa et al. (2019) for a critique. Overall, the evidence suggests that personality traits are indeed relatively stable and do not tend to change significantly after the age of 30.

Although personality traits exhibit relative stability across time, cross-cultural research suggests that Neuroticism and Extraversion decline, while Agreeableness and Conscientiousness increase throughout the lifespan. However, the normative developmental trajectory of trait levels (i.e., normative mean change) is generally smooth, and not significantly influenced by life events. Trait changes are not entirely idiosyncratic, as there are common developmental patterns in which the set point of everyone gradually shifts. While the environment may influence the expression of basic tendencies (e.g., cultural norms for what is polite) and the biological underpinnings of personality traits (e.g., brain damage), events such as occupational or romantic roles cannot directly impact personality (P. T. Costa et al., 2019).

Accordingly, Del Giudice (2009) explains that development is often viewed as a cumulative process where earlier characteristics and behaviors tend to persist unless actively modified. However, from the perspective of natural selection, continuity is not always useful or necessary. Humans can develop "disposable" traits or ontogenetic adaptations that are only beneficial during specific life stages and are replaced or modified when no longer needed. This modularization of development allows for selection to act independently on different stages of life. For instance, traits that were advantageous in infancy for receiving parental care may become maladaptive when an individual becomes independent. Selection is expected to render such traits transient, causing them to be lost or replaced during development. However, continuity is still a significant aspect of development. It should be noted that the stability of phenotypic traits cannot be taken for granted, as there may be developmental tradeoffs between present and future contributions to reproductive success or survival.

Therefore, intrinsic development better aligns with the universality of personality development, as personality traits exhibit continuity from childhood to old age, with high test-retest correlations over long periods, starting from young adulthood (up to 40 years) (P. T. Costa et al., 2019). From an evolutionary perspective, social benefits arise from the development of resilience, cooperation, and responsibility, which also enhance individual fitness. Cross-cultural studies indicate broad agreement that Neuroticism and Extraversion decrease while Agreeableness and Conscientiousness increase over the lifespan. Openness generally increases during adolescence and declines in later adulthood (P. T. Costa et al., 2019).

Furthermore, in general, approximately 40% of the variance in personality traits can be attributed to heritability (Bergeman et al., 1993; Bouchard & McGue, 2003; Jang et al., 1996; Power & Pluess, 2015). However, one study found that the Openness to Experience trait has the highest heritability (21% of variance between individuals explained by genotyped common variants), followed by Neuroticism (15% of variance), but not the other traits (Power & Pluess, 2015).

In sum, the Big Five personality traits seem to be influenced by evolutionary biological factors, with a cross-cultural structure that is consistent across studies (P. T. Costa et al., 2001; Lippa, 2010; McCrae &

John, 1992; Schmitt et al., 2008). Personality has a strong heritable component, but this does not imply that personality absolutely cannot change. While normative changes in mean levels of personality can occur during development and can be adaptive, personality becomes relatively stable and plateaus after the age of 30.

2.5. Evolutionary explanations for the Big Five traits

The Neuroticism and Agreeableness are usually more sexually dimorphic, differences between sexes are more consistently reported, and they seem somewhat linked, evolutionary explanations will start with those traits.

According to previous research, compared to men, women tend to score on average higher on the trait of Neuroticism, followed by Agreeableness (Archer, 2019; P. T. Costa et al., 2001; Schmitt et al., 2008). Generally, the level of Neuroticism in an individual is probably influenced by environmental factors, in dangerous environments or for individuals who cannot detect subtle threats, natural selection may favor higher levels of Neuroticism, while in less dangerous environments, selection tends to reduce it (Nettle, 2010). One evolutionary hypothesis is that women tend to be more neurotic on average because the costs inflicted on them by unpredictable environments are more detrimental compared to men (Nettle, 2010). In terms of offspring survival, women face greater risks to their reproductive success due to factors such as infant survival being more dependent on maternal care and defense, making risk-taking and other dangers more costly to women's reproductive success than men's (Campbell, 1999).

Sex differences in Neuroticism may also be influenced by the levels of individualism/collectivism in a population. Western societies with more individualistic values tend to exhibit greater sex differences in personality, including Neuroticism (P. T. Costa et al., 2001; Schmitt et al., 2008), which may be related to the greater success of men in competitive individualistic societies (Murphy et al., 2021). However, the "tend and befriend" approach observed in women, instead of a more competitive approach done by men, may also play a role in explaining sex differences in Neuroticism (and in Agreeableness, see next). It should be noted that men can also be prosocial towards women, and intrasexual competition in men may

mediate mate retention (Arnocky et al., 2018; Buunk & Massar, 2012). In sum, overall, while avoiding risks can be beneficial for survival, taking risks may also have advantages, particularly for men in certain environments.

Regarding Agreeableness, it has been suggested that throughout evolution, women may have gained a higher fitness advantage on average than men by fostering positive social relationships (Nettle & Liddle, 2008). In contrast, due to the high variance in male reproductive success and its dependency on status (Pérusse, 1993; Pollet & Nettle, 2008), men may benefit more from increasing their status than women do, even if it has negative effects on social harmony (Nettle, 2010).

In addition, since females invest more time and effort in their offspring than males (Bjorklund & Shackelford, 1999; Janicke et al., 2016; Trivers, 1972), they often rely on social networks for successful child-rearing (Hrdy, 2009; Nettle & Liddle, 2008). Maintaining good relationships within their local social network is generally more important for women than for men (Campbell, 1999). Women exhibit a tendency towards "tend and befriend" in matrilocal societies, where relationships are typically peaceful and caretaking responsibilities are shared (Taylor et al., 2000). These differences in costs and benefits may have led women to evolve as the more cooperative, empathetic, and agreeable sex (Nettle & Liddle, 2008; Seyfarth & Cheney, 2013; Varella et al., 2016).

As for the other traits, Extraversion is associated with increased social attention (Ashton et al., 2002), more mating opportunities, as well as greater likelihood of engaging in risky sexual behavior (Schmitt, 2004; Schmitt & Buss, 2000). Highly extraverted individuals are often characterized as being ambitious, assertive, and competitive, while also being sociable and physically active (Nettle, 2010). However, there are potential drawbacks such as accidents, health issues, interpersonal conflicts, and depletion of resources (Nettle, 2010).

Conscientiousness can vary depending on the predictability of events in ancestral times. Higher conscientiousness would have been advantageous when events were predictable, as individuals could gain more resources and lower risks by being more rigid in decision-making (Ashton, 2017; Nettle, 2010).

However, when environments and situations change rapidly, lower Conscientiousness is favored (Ashton, 2017; Nettle, 2010). Studies have shown that lower Conscientiousness is associated with taking immediate opportunities, having more mating episodes, greater sociosexuality, and faster life history strategies (Davis et al., 2019; Del Río et al., 2019; Nettle, 2006; Schmitt, 2004). Being more conscientious can bring more resources, but it can be a waste of effort and time if the task does not pay off. Conversely, lower conscientiousness is related to sexual activity and consequently more sexual risks.

Finally, Openness to Experience is associated with potential benefits in mating success, despite the potential costs (Nettle, 2006; Nettle & Clegg, 2006). Individuals with high openness may receive social recognition and attention due to their higher intelligence and creativity (Nettle, 2010). However, higher openness is also associated with certain costs, such as a positive correlation with drug use, nightmares, depression, and even disorganized and psychotic thinking (Burch et al., 2006; McCrae, 2004; Nettle, 2010).

2.6. The HEXACO personality model

The HEXACO traits were used in this study, and they can be explained in a similar evolutionary context to the Big Five traits for most of the traits. The Big Five model has been widely accepted as the predominant personality model in academia (McCrae & Costa, 2008). However, a possible addition to the Big Five model is the "Honesty-Humility" factor. This sixth factor was derived from lexical studies conducted by Ashton and Lee in the early 2000s and was added to the existing five traits. Words such as "integrity", "trustworthiness", "truthfulness", and "values" were found to suggest a factor that could provide better explanatory power, leading to the identification of the Honesty-Humility factor (Ashton et al., 2000).

Ashton et al. (2000) conducted a study to investigate the relationship between markers of the Big Five personality traits and the honesty factor. The study included several relevant questionnaire variables to assess the exploitation of others and early measures of the Dark Triad traits. The Dark Triad traits are considered the “dark side” of personality, divided in three main traits: Machiavellianism, subclinical

narcissism, and subclinical psychopathy (Paulhus & Williams, 2002). Narcissism entails grandiosity, entitlement, and superiority, Machiavellianism is characterized by manipulation, self-service, and deceit, and psychopathy describes impulsiveness, lack of empathy and being erratic (Paulhus & Williams, 2002). Just like the other traits (Big Five or HEXACO), everyone has them, and since they are subclinical traits, they should not be considered as diagnostic criteria for pathologies, the behaviors associated are not necessarily damaging to the individual or others, as for example the Narcissistic personality disorder is.

The results indicated that the measures of Dark Triad traits were strongly associated with the honesty factor, more so than any of the Big Five personality traits. The correlations between the early Dark Triad measures and the honesty factor ranged from -0.40 to -0.45. An additional article also supported the notion that honesty, along with rotated versions of Agreeableness and Neuroticism, are dimensions that underlie individual differences in prosocial versus antisocial tendencies (Ashton & Lee, 2001).

A new personality inventory was developed and named HEXACO after further research and changes to the nomenclature. The HEXACO model consists of six factors, with Emotionality replacing Neuroticism, and half of the traits are like the Big Five, including Extraversion, Conscientiousness, and Openness to Experience (Ashton & Lee, 2001, 2007; Lee & Ashton, 2004). However, the traits of Honesty-Humility, Agreeableness, and Emotionality do not have a one-to-one correspondence with any of the classic Big Five factors. These three traits encompass the variability associated with the Big Five's Agreeableness and Neuroticism factors, as well as additional variability not captured by the classic Big Five (Ashton et al., 2014).

Thus, the acronym HEXACO stands for Honesty-Humility, Emotionality, eXtraversion, Agreeableness versus Anger (used simply as Agreeableness), Conscientiousness, Openness to Experience (Ashton & Lee, 2001, 2007; Lee & Ashton, 2004). The traits in the HEXACO model also have associated facets, which are as follows: H - sincerity, fairness, greed-avoidance, and modesty; E - fearfulness, anxiety, dependence, and sentimentality; X - social self-esteem, social boldness, sociability, and

liveliness; A - forgivingness, gentleness, flexibility, and patience; C - organization, diligence, perfectionism, and prudence; and O - aesthetic appreciation, inquisitiveness, creativity, and unconventionality (Ashton & Lee, 2007; Lee & Ashton, 2004).

The use of HEXACO has seen a significant increase in recent years, with studies supporting a nomological network for the HEXACO traits (Zettler et al., 2020). Each HEXACO trait primarily maps onto a specific outcome domain, indicating that each HEXACO dimension captures a unique set of personality traits related to specific criteria (Zettler et al., 2020). However, it is important to mention that more ecological approaches should utilize the HEXACO model directly.

2.7. Evolutionary explanations for the HEXACO traits

As per Ashton (2017), the theoretical evolutionary distal causes for the traits are presented but see also Ashton and Lee (2007) and Lee and Ashton (2004).

The evolutionary origins of half of the HEXACO traits are like the Big Five traits explanations. For the evolutionary explanations of Extraversion, Conscientiousness, and Openness, please refer to the previous Big Five traits section. However, the Honesty-Humility trait, as well as to some extent the Agreeableness and Emotionality (Neuroticism in the Big Five), have unique origins, and therefore will be discussed.

Beginning with the Honesty-Humility trait, individuals with higher levels tend to avoid exploiting others, even when they could do so without getting caught. Conversely, those with lower levels of Honesty-Humility are more likely to cheat or exploit others, potentially leading to retaliation and lack of cooperation. Notably, men tend to be lower on Honesty-Humility compared to women, likely due to higher levels of intrasexual competition where outcompeting rivals can lead to acquiring resources and mates (Ashton, 2017).

Agreeableness, like Honesty-Humility, reflects the inclination to sustain or restore cooperation, even after experiencing exploitation (Ashton, 2017). Both traits capture individual differences in responses to the perception of the possibility of exploiting others or being exploited by others (Ashton &

Lee, 2007). An agreeable individual tends to be forgiving, gentle, and not hold grudges. Sometimes, forgiveness and continued cooperation, even after experiencing exploitation, can be advantageous. In contrast, a disagreeable individual becomes angry and may refuse to cooperate at the first sign of exploitation. This behavior may also be beneficial when the person is attempting to exploit others (Ashton, 2017).

Emotionality refers to the tendency to prioritize the protection of oneself and kin. An individual high in Emotionality would avoid potential harm and danger and provide care for their family members. This trait can also lead to gaining help for oneself and kin. Conversely, an individual low in Emotionality may engage in more risky or harmful activities with potentially greater gains, but at the cost of exposing themselves or their kin to danger. In terms of sex differences, women tend to be higher in Emotionality than men, possibly due to the influence of kin altruism. Women have a greater investment in reproduction due to pregnancy and lactation, thus they bear more of the burden of raising children. On the other hand, fatherhood is often less certain for men, as their female partner may have mated with someone else, whereas a woman can be certain of the biological relationship with her child (Ashton, 2017).

2.8. Genetic factors of the HEXACO traits

Lewis and Bates (2014) conducted a study to determine the genetic architecture of the HEXACO traits and found that a unitary underlying genetic factor was sufficient to explain the genetic covariation between domain facets. This suggests that each domain is primarily influenced by a specific genetic factor rather than complex gene-environment interactions or multiple genes. However, the inclusion of the sixth factor of Honesty-Humility altered the structure of Agreeableness and Neuroticism, as aspects of these constructs moved to define Honesty-Humility.

Recently, a twin study using samples from four different countries (N = 7,026), found a decrease in genetic variance in old age compared to young and middle adulthood, for five out of six HEXACO dimensions. Shared environmental effects between twin siblings were considered insignificant, while individual differences due to environmental influences not shared by twins showed a linear decrease for

Emotionality, a decline for Openness in the second half of life, and a linear or no increase for all other trait dimensions. As the identical and fraternal twins grew older, the discrepancies in Honesty-Humility, Extraversion, Agreeableness, and Conscientiousness became greater probably due to life experiences contributing to personality differences across the life span. (Kandler et al., 2021).

The authors conclude that the results indicate that the differences in heritability estimates of personality traits throughout the life span can be attributed to various factors, which differ to some extent for different traits, revealing unique patterns for each trait. Generally, genetic variance for most traits showed a downward trend with age, whereas environmental differences displayed an opposite pattern. These observations support the notion that life experiences increasingly contribute to individual differences in personality across the life span. The distinct trait patterns of varying genetic and environmental influences imply various types of Gene x Environment interactions that have diverse implications for different traits and at different life stages (Kandler et al., 2021). More studies using the sixth trait should be conducted, as well as longitudinal studies, to ascertain how much of the variability of traits can be explained by genes and environment and explore the Gene X Environment interaction.

So far, little has been discussed about the intersection of personality and sexuality, which is among the main aims of the current study. Thus, we present the next chapter which was published as an entry of the Encyclopedia of Sexual Psychology and Behavior (Springer), edited by Todd K. Shackelford, entitled “Big Five Personality Traits: Female Sexual Orientation”. In this chapter, the reader may give the attention to the “Sexual Orientation” and “Personality Traits and Female Sexual Orientation” sections since other personality topics were already covered.

2.9. Encyclopedia Chapter - Big Five personality traits: female sexual orientation

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Reference:

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Definitions

Personality has several possible definitions. In this chapter, the personality model used is the one called *Big-Five* personality traits or *Five-Factor Model* (FFM), which divides human personality in five distinct personality factors or traits. A personality trait can be defined as "a relatively stable, consistent, and enduring internal characteristic that is inferred from a pattern of behaviors, attitudes, feelings, and habits in the individual" (American Psychological Association [APA] 2022). Throughout the text the term Big-Five will be used as a standard term for the personality model.

The five traits, and some trait descriptive adjectives, are: 1 – Extraversion (active, assertive, talkative), 2 – Agreeableness (kind, generous, sympathetic), 3 – Conscientiousness (organized, responsible, planful), 4 – Neuroticism (anxious, worrying, unstable), 5 – Openness to Experience (curious, imaginative, insightful) (Goldberg 1992; McCrae and John 1992). Additionally, traits can be differentiated in facets, see Costa Jr. and McCrae (1995), and DeYoung et al. (2007) for examples. The traits vary on a continuum, from lower to higher levels. Having a lower or higher level does not mean that it is good or bad, it depends on the situation.

As for sexual orientation, it can be commonly defined as the attraction to men, women or both (J. M. Bailey et al. 2016). It refers to the sexual desire, attraction, and preferences instead of overt sexual behavior, identity or affective feelings (J. M. Bailey 2009; Valentova and Varella 2016). If no such desires, attraction or preferences are manifested, a person can be considered asexual (e.g., Storms 1980).

Sexual orientation is a continuum between polars of exclusive heterosexuality, i.e., exclusive orientation towards individuals of the opposite sex, and exclusive homosexuality i.e., exclusive sexual orientation towards the same sex (Petterson et al. 2015; Valentova and Varella 2016). The "midpoint" is a bisexual orientation, individuals can vary in their attraction to both sexes, ranging from predominantly heterosexual with some potential same-sex attraction, to predominantly homosexual with some potential opposite sex attraction (Valentova and Varella 2016).

Introduction

Although the focus of the chapter is on females, differences between females and males is discussed. Male behavior can be useful to explain female behavior, as they may affect each other, or be presented inversely (i.e., females showing typical male behavior). The behaviors and traits are general tendencies, averages, and should not be taken as absolutes. Some consideration for developmental and environmental reasons for the trait variance is given, followed by variation between the sexes. Variation in sexual orientation is also shown, and lastly, the conjunction of both personality traits and sexual orientation is elucidated. Evolutionary reasoning is applied to the explanation of personality traits and sexual orientation, since individual differences in both Big-Five and sexual orientations seem to have evolved, and probably conferred benefits to humans during the evolutionary past.

Personality traits

In an initial meta-analysis, done by Feingold (1994), utilizing different measures of personality, one of them being the NEO-PI/NEO-PI-R, which measures the Big-Five traits and facets, women were found to be less assertive (Cohen's d = .24) (positive d = greater in women, negative d = greater in men), and more anxious (ds = -.41 to -.59) than men. Later on, Costa et al. (2001), in a cross-cultural study investigating 26 cultures, found differences between men and women, among U.S. adults, there are strong effects (ds = .51 and .59, respectively) for Neuroticism and Agreeableness, and a moderate effect (d = -.29) for Extraversion. The effects for Neuroticism, Agreeableness, and Extraversion were replicated in

culture-level analyses (*d*s = .28 to .50). There were smaller (*d*s = .11 to .16) but significant effects showing women higher than men in Openness to Experience and Conscientiousness (Costa et al. 2001).

Another cross-cultural study, this time investigating 55 cultures, found that females report more Neuroticism (*d* = .40), Agreeableness (*d* = .15), Conscientiousness (*d* = .12), and Extraversion (*d* = .10) (Schmitt et al. 2008). As can be seen, the most consistent difference between females and males lies in the Neuroticism trait (Schmitt et al. 2008). These sex differences are also greater in more egalitarian countries, notably Neuroticism and Agreeableness, perhaps because of a greater trend to sexual dimorphism in resource rich environment (Schmitt et al. 2008).

According to Penke et al. (2007), variation in personality traits can be a result of mainly balancing selection by environmental heterogeneity. That is, the spatial or temporal fluctuations in selection pressures must occur in a way that the trait's net fitness effects are almost neutral when averaged across all relevant spatiotemporal environments. Negative frequency dependent selection is also a possible reason for variation in traits. Namely, the spatiotemporal fluctuations in selection pressures usually occur in the social environment (e.g., ratio of cooperative partners to cheaters, sex ratio and distribution of intra and interspecific competitors) of the species, instead of the external physical environment. It is negative because it favors traits rare in frequency. If these conditions are met (environmental heterogeneity and negative frequency dependent selection), there are two or more different phenotypes (or a continuum of phenotypes) with identical average fitness across environments.

Similarly, the niche-diversity hypothesis proposes that niches (i.e., micro populations within a larger population) varies widely across human populations, and in large complex societies, individuals can occupy an assortment of different niches, each incentivizing different optimum levels of personality traits (Durkee et al. 2022). The niche-diversity hypothesis predicts: (a) more distinct combinations of traits (i.e., less covariance among traits; Lukaszewski et al. 2017), (b) wider distributions of trait levels (i.e., more individual variation in each trait; Smaldino et al. 2019), and (c) greater personality dimensionality (Smaldino et al. 2019).

Durkee et al. (2022), found that niche diversity was robustly associated with lower intertrait covariance and greater personality dimensionality across nations, but not with trait variances (Durkee et al. 2022). Nonetheless, personality trait levels and combinations might be dependent on socioecological contexts (Durkee et al. 2022), alike to the Penke et al.'s (2007) idea of environmental heterogeneity.

Indeed, the Big-Five personality traits seem to have adaptive value, due to situational variety which individuals encounter themselves in, personality traits have been selected accordingly (Buss 1996; Nettle 2006, 2010). One trait may have benefits in one situation, but also impose costs in another (Ashton 2017; Nettle 2010). There is also evidence for personality traits in nonhuman animals such as different primates, dogs, cats, cows, and horses, to cite a few (Fernández-Bolaños et al. 2020; Gosling 2001; Kaiser and Müller 2021; Smith and Weiss 2017), and some evidence for environmental heterogeneity favoring selection of personality polymorphism in nonhuman animals (Dingemanse and Réale 2005).

Thus, personality traits seem to have evolutionary biological factors and are basically intercultural (Costa et al. 2001; Lippa 2010; McCrae and John 1992; Schmitt et al. 2008). About 40% of variance of personality traits can be attributed do heritability (Bergeman et al. 1993; Bouchard and McGue 2003; Jang et al. 1996; Power and Pluess 2015). There is also evidence pointing out that most heritability lies in the Neuroticism ($p = 0.04$), 15% of the variance between individuals is explained by the genotyped common variants, and Openness to Experience traits (21%, $p = 0.005$), but not the other traits (Power and Pluess 2015).

Although traits are relatively stable (see Caspi et al. 2005, for six generalizations of rank-order stability), cross-cultural studies show broad agreement that Neuroticism and Extraversion decline while Agreeableness and Conscientiousness increase over the life span, but the normative developmental course of trait levels is smooth, with no jags at particular ages or in relation to normative life events (Costa et al. 2019). There is possible greater account for environmental influences, since levels of personality traits might vary between cultures (McCrae et al. 2005, 2010).

According to Costa et al. (2019), it is possible that Neuroticism decreases from adolescence to early adulthood, and Agreeableness and Conscientiousness increase, due to environmental demands, or to intrinsic maturation. The second is more consistent with the universality of personality maturation, since personality differences show continuity from middle childhood to old age, with large retest coefficients over long intervals of time (up to 40 years) beginning in young adulthood. Evolutionarily, there are societal benefits of becoming more resilient, cooperative, and responsible, promoting individual fitness.

Environmental and developmental influences in traits might reflect the Life History Theory, which proposes that depending on the environment, there is a strategic allocation of bioenergetic and material resources toward competing survival and reproductive goals (Black et al. 2018). One of the ways in which the variation of traits is preserved is favoring the reproductive success of those individuals in which the genetic inclination for the development of traits is more flexible, because ideal levels of traits vary across places and time (Ashton 2017). That is, depending on the initial experiences, it is possible to develop higher or lower levels of traits (Ashton 2017). This is consistent with the ideas of balancing selection by environmental heterogeneity, and negative frequency dependent selection. See Camperio Ciani et al. (2007) for a natural experiment indirectly supporting these ideas. It should be noted that studies in early age (up to ten years) show mixed results and there are methodological issues are involved (see Costa et al. 2019). These ideas are yet to be consistently tested.

Evolutionary reasons for Neuroticism and Agreeableness differences between men and women

Neuroticism is the trait that is consistently reported to be higher in women, followed by Agreeableness. As put by Budaev (1999), these traits represent the dimension of dominance-oriented aggressive behavior, maintained by frequency-dependent selection. Starting with Neuroticism, it is plausible that in environments where the level of actual threat is high, or in individuals poorly able to deal with undetected threats, selection favors increased Neuroticism, whilst in more benign situations selection tends to reduce it (Nettle 2010). Women are more neurotic because the costs inflicted on them are different from men (Nettle 2010). Aggression and other forms of risk taking are more costly to women's

reproductive success than men's, considering offspring survival (Campbell 1999). In women, Neuroticism positively predicts the number of children, between and within polygynous (i.e., males mate with more than one female) families with high fertility (Alvergne et al. 2010). Within the low social class, offspring quality (i.e., child nutritional status) decreases with a woman's Neuroticism, indicating a reproductive trade-off between offspring quantity and quality, an intermediate level of Neuroticism might be generally favorable (Alvergne et al. 2010).

Another possible reason is individualism. Western societies with individualistic values exhibit greater sex differences in personality (Costa et al. 2001; Schmitt et al. 2008), and it has recently been seen that it seems to be a variable that best predicts differences in Neuroticism (Murphy et al. 2021). Men tend to thrive more than women in more individualistic societies (i.e., competitive environments), and have less Neuroticism (Murphy et al. 2021). Perhaps the competitiveness factor also partly explains Agreeableness differences. In women, when there is greater intrasexual competitiveness, they tend to have lower Agreeableness and greater Neuroticism, while in men competitiveness is more recurrent and related to lower Neuroticism (Buunk et al. 2017; Campbell 2013; Murphy et al. 2021).

As for Agreeableness, over evolutionary time women have, on average, gained more in fitness terms from harmonious social relationships relative to personal status than men have (Nettle and Liddle 2008). One reason might be that males have high variance in reproductive success, and their reproductive success, at least potentially, depends strongly on their status (Pérusse 1993; Pollet and Nettle 2008). Men likely gained more by increasing status than women do, even at the expense of social harmony (Nettle 2010).

A second possibility entails parental investment, females invest more and for longer in their offspring as opposed to males (Bjorklund and Shackelford 1999; Trivers 1972), and they often draw on networks of social support to do so successfully (Nettle and Liddle 2008). Avoiding risks and remain well-integrated into their local social network is more important to women than it is for men (Campbell 1999). Under stress females tend to affiliate, engaging more in their social network, characterizing a

pattern of “tend and befriend”, in matrilocal societies, female relations are usually peaceful, and they tend to exchange caretaking responsibilities (Taylor et al. 2000).

Men consider intrasexual competition a normal fact of life, they tend to be more dominant, while for women competition does not seem to favor reproductive status and impairs collaborative relationships (Campbell 2013). Because of these differing balances of costs and benefits, women may have evolved to be the more agreeable and the more empathetic of the two sexes (Nettle and Liddle 2008; Seyfarth and Cheney 2013; Varella et al. 2016).

Evolutionary reasons for differences in Openness to Experience

Differences in Openness to Experience, Extraversion and Conscientiousness are not consistently reported, the latter two will be explained in the context of female sexual orientation when appropriate. Openness to Experience seems to have a greater importance on sexual orientation, thus an early general explanation is valid. Openness is related to creativity, love to art and beauty, having open interest and values, divergent thinking, curiosity, expressing a more liberal political leaning, and analyzing feelings with intimate partners (DeYoung et al. 2005, 2007; McCrae 2004; McCrae and Greenberg 2014). Closed people are usually more “down to earth”, difficulty to adapt to change, narrow interests and conservatism (McCrae 2004; McCrae and Greenberg 2014).

Openness to Experience can be related to mating success, an important benefit in spite of the potential costs (Nettle 2006, 2010; Nettle and Clegg, 2006). A highly open person might gather social esteem and attention due to its higher intellect and imagination (Nettle 2010). Higher Openness also has its costs, as indicated by its positive correlation with drug use, nightmares, depression, and even disorganized and psychotic thinking (Burch et al. 2006; McCrae 2004; Nettle 2010).

This section mainly sought to explain how the Big-Five traits that best explain female differences (Neuroticism, Agreeableness, and possibly Openness considering sexual orientation) vary and were selected, what are their ecological and evolutionary bases. As the literature indicates, sexual variation occurs mainly in the traits of Neuroticism and Agreeableness, in general the other traits have a greater

influence of environmental factors. But all of them are partly inherited and partly influenced by the environment.

2.10. Sexual orientation

Multiple theories have been proposed for the appearance of a non-heterosexual sexual orientation (e.g., kin selection, by product of sex atypicality, or sneaking strategy). Some theories are adaptationist, such as the kin selection hypothesis, and sneaking and conditional strategy (for a review, see Valentova and Varella 2016). Other hypotheses consider it as a byproduct, of sex atypicality, for example (Valentova and Varella 2016). There is also extensive evidence for same-sex behavior in nonhuman animals (N. W. Bailey and Zuk, 2009; Poiani 2010). As emphasized by Valentova and Varella (2016), these theories are not mutually exclusive, and together they can explain a bigger proportion of the sexual orientation continuum.

Sexual orientation also has a heritable component. Specifically with females, a study investigating (sample size) twins (homosexual, monozygotic, dizygotic, and adopted sisters), found that 48% of the monozygotic twins, 16% of the dizygotic twins and 6% of the adopted sisters reported being homosexual (J. M. Bailey et al. 1993). Heritability was significant, ranging from .27 to .76, and phenotypic variance attributed to the shared environment ranged from 0 to .23, and nonshared environmental variance ranged from .15 to .73 (J. M. Bailey et al. 1993). But generally, heritability explains at least one third of the variation in sexual orientation (J. M. Bailey et al. 2016).

Genetically, there is not a single dimension from opposite-sex to same-sex preference, in the sense that the more you are attracted to one sex, the less you are attracted to the other (Ganna et al. 2019). Genetic factors explain partially sexual behavior, attraction, and fantasies (Ganna et al. 2019). There are also environmental factors that should not be excluded (e.g., Luoto et al. 2019a; Wang et al. 2019).

Further, women appear to have a greater flexibility or fluidity (i.e., changes over time) of sexual orientation (in this case measured by three dimensions) than men (Kinnish et al. 2005), that means, they move from heterosexual to homosexual or vice-versa more often. For example, sex differences between

heterosexual individuals in total change for the dimensions of sexual fantasy, $F(1,270) = 8.68$, $p = .003$, and romantic attraction, $F(1,270) = 4.85$, $p = .028$, with women reporting greater change than men over the lifespan on all dimensions (Kinnish et al. 2005). Although, using the Kinsey Scale, women's sexual orientation variability is typically not large, about 1 Kinsey Scale point to adjacent categories, for example from predominantly heterosexual, but more than incidentally homosexual, to bisexual, in a span of two years (J. M. Bailey et al. 2016; Diamond 2009).

On the other hand, men who reported changes in sexual orientation, usually already identified themselves with a non-heterosexual sexual orientation, moving from a bisexual to homosexual (Kinnish et al. 2005). Men may adopt transitional bisexual identities in the process of trying to make sense of divergent parts of their current and previous attractions (J. M. Bailey et al. 2016). These men likely had emotionally satisfying romantic relationships with women in spite of feeling sexual attraction only towards men, or their previous heterosexual encounters may have been unsatisfying but not distasteful (J. M. Bailey et al. 2016).

Women tend to have a pattern of bisexual orientation more often than men, and this pattern is more stable, in the sense that women come out as bisexual, usually maintain that assessment longitudinally (J. M. Bailey et al. 2016; Diamond 2008). Women show substantially less category-specificity in their self-reported patterns of sexual arousal (i.e., arousal to males and females) (J. M. Bailey et al. 2016; Baumeister et al. 2001; Diamond 2009). But bisexuality does not mean necessarily sexual fluidity. Bisexuality refers to sexual attraction occurring regardless of sex-specific body type (male/female), sexual fluidity refers to situation-dependent flexibility in sexual responsiveness to different sex-specific body types (male/female/non-binary) (Luoto and Rantala 2021). A possibility for this sexual fluidity is that it evolved in concert with or is an artifact of female's capacity for non-reproductive arousability during non-fertile periods of the menstrual cycle, promoting formation of alliances within the sex (J. M. Bailey et al. 2016).

Another possibility is a sexually antagonistic selection underlying male and females same-sex behavior (Berger et al. 2016). Selection can be inconsistent if one allele at a locus is favored when the carrier is a male, and another allele at the locus is favored when the carrier is a female (Cox and Calsbeek 2009). Sexually antagonistic selection for fast life history strategies (e.g., faster sexual maturity), with greater sociosexuality (i.e., tendency to engage in casual sex) may underlie variation in female sexual orientation (Luoto 2020; Luoto et al. 2019a, 2019b). This is congruent with the gender shift hypothesis, which states that homosexual men and women will be more similar to their opposite sex heterosexual counterparts in certain neurobehavioral and psychological traits than to their same-sex heterosexual counterparts (J. M. Bailey et al. 2016; Luoto 2020; Luoto et al. 2019a).

Another point of note is the differentiation between lesbian women into two main categories: butch and femme. Butches are considered masculine lesbians, as opposed to femmes, that are more feminine (Brown et al. 2002). That does not mean there are only two categories, but it is a common self-assessed classification (Brown et al. 2002). A reason for this difference in lesbians is pre-natal androgen exposure, measured by finger length ratio (J. M. Bailey et al. 2016; Breedlove 2017; Brown et al. 2002). Pre-natal correlates seem to be more strongly associated with sexual orientation in women than in men (Bogaert and Skorska 2020; Breedlove 2017). Femmes report a greater fluidity than butches (Diamond 2009), perhaps because of lesser androgen exposure, meaning that despite the fluidity of sexual orientation in women, there is compelling evidence that prenatal influences matter, supporting the notion that straight women and lesbians do represent different groups of women (Breedlove 2017). Most butches identify themselves as exclusively homosexual, whereas about half the femmes identify themselves as bisexual, and bisexual women can show characteristics of both butches and femmes, and anything in between (Luoto et al. 2019a; Luoto and Rantala 2021).

In sum, women's sexual orientation is more fluid, and they show a more bisexual orientation. Sexual orientation is also strongly dependent on genetic influences, but also environmental influences. One of the main environmental influences is the exposure of pre-natal androgens, which can cause,

depending on the exposure, a more masculinized homosexual orientation (butch) or a more feminine one (femme). Relations due to probable environmental heterogeneity, sexual orientation, the gender shift hypothesis, and personality traits, will be discussed next.

2.11. Personality traits and female sexual orientation

This section will focus on personality differences between women with distinct sexual orientations. Comparisons to men will be largely omitted, due to space limitations, and for better clarity on the focus of the chapter. Initially, the studies are cited in a chronological order, presenting summarized knowledge (i.e., reviews and meta-analysis) and different cultures. Results are discussed next, mainly focusing on the most recent meta-analysis, but not disregarding the older studies.

Lippa (2005), expressed that Big-Five personality traits differ between heterosexual and homosexual women. Lesbian women differed from heterosexual women in that they were higher on Openness to Experience (d = .47), but lower on Neuroticism (d = .30). Later on, Lippa (2008), showed that bisexual women stood out from lesbian and heterosexual women in Neuroticism (ds = .21, .30), highest of all three groups, and Agreeableness (ds = .09, .24), lowest of the three group. It seems that cross-culturally, bisexual women tend to be more neurotic than other women, and lesbians are less neurotic (Lippa 2008). Similarly, another study with a Chinese sample, found that heterosexual women also report more Neuroticism than nonheterosexual women (d =.36) (Zheng et al. 2011). The three studies mentioned above support in part the gender shift hypothesis of homosexuality, specifically, homosexual men show the similar Neuroticism levels of heterosexual women and homosexual women show similar levels of heterosexual men.

In a meta-analysis study, Openness to Experience was positively related to homosexuality in men and women, and women tended to report lower Neuroticism than heterosexual women (Allen and Walter 2018). But the study did not differentiate bisexual. Recently, Allen and Robson (2020), this time differentiating bisexuals, made two different studies, first exploring whether the Big-Five trait dimensions relate to sexual orientation in a nationally representative sample of Australian adults (N = 13,351).

Second, they conducted an updated systematic review and meta-analysis (N = 21) of personality and sexual orientation. Since the meta-analysis also included data from the first study, it will be discussed instead of both studies.

In the meta-analysis[1], homosexual women scored lower than heterosexual women on Agreeableness, *k* = 5, SMD = – .20 (95% CI: –.33, – .07), and Conscientiousness, *k* = 5, SMD = – .29 (95% CI: –.45, – .14), and they scored higher in Openness to Experience, *k* = 20, SMD = .30 (95% CI: .14, .46), and Extraversion, *k* = 10, SMD = – .15 (95% CI: – .23, – .07), but no differences in Neuroticism were found, *k* = 9, SMD= –.11 (95% CI: – .23, .02) (Allen and Robson, 2020).

Bisexual women reported lower Conscientiousness *k* = 6, SMD = – .45 (95% CI: – .62, – .29), Agreeableness *k* = 6, SMD = –.21 (95% CI: –.29, –.13), and Extraversion, *k* = 7, SMD = – .10 (95% CI: – .18, –.01), than heterosexual women. Bisexuals were the more open of the groups, *k* = 11, SMD = .16 (95% CI:.05, .27), and more neurotic, *k* = 15, SMD = .29(95% CI: .12, .44) than heterosexuals (Allen and Robson 2020).

Concerning Extraversion, Gangestad and Simpson (1990), found that unrestricted women (i.e, greater sociosexuality) tend to be more extroverted, socially dominant and less harm avoidant, perhaps helping them to acquire their own resources. Sociosexuality is also related to negative frequency dependent selection and life history (see the personality traits and sexual orientation section) (Gangestad and Simpson 1990; Penke et al. 2007), possibly explaining more Extraversion in homosexual women, and in concordance with the gender shift hypothesis, as men tend to be more sexually unrestricted (Schmitt 2005). Although bisexual women showed lower Extraversion, and they also have greater sociosexuality when compared to heterosexual women (Semenyna et al. 2018).

Regarding Agreeableness, heterosexual women seem to have the greatest levels between the sexual orientations (Allen and Robson 2020). As explained in the personality section, higher

[1] *k* = number of pooled effect sizes, SMD = standardized mean difference, CI = confidence interval (computed using inverse-variance weighted random effects meta-analysis).

Agreeableness might have benefited women in their reproductive success and offspring survival, by staying integrated socially, taking a "tend-and-befriend" approach. For nonheterosexual women (i.e., lesbians and bisexuals), higher Agreeableness might have not been as important and is congruent with the gender shift hypothesis, since they show a "male-like" trait pattern (i.e., less Agreeableness). Perhaps a differentiation between types of lesbian women (butch and femme) is needed to clarify possible differences in the Neuroticism and Agreeableness traits, together with a socioenvironmental approach, environmental heterogeneity could influence traits expression in women.

Since Neuroticism did not differ between homosexual and heterosexuals in women, in the meta-analysis done by Allen and Robson (2020), contrary to other findings (Lippa 2005; Zheng et al. 2011), it may be that threat detection and avoidance, as well as kin survival, might have represented benefits for women in general (Ashton 2017; Nettle 2010), in this case not supporting the gender shift hypothesis. But cross-culturally and in the meta-analysis, bisexual women seem to be more neurotic, perhaps related to greater identity confusion, explained next (Allen and Robson 2020; Lippa 2008).

Allen and Robson (2020), note that the differences in Openness to Experience might be one of the most important findings, since bisexuals seem to have higher levels of this trait, and the curvilinearity of Openness and possibly the sexual orientation continuum. When we consider that bisexuals also tend to experience more Neuroticism and identity confusion (Allen and Robson 2020; Balsam and Mohr 2007), the Openness trait might be important for identity formation in these individuals, avoiding that they make a commitment to one identity or another before exploring possibilities (Zoeterman and Wright 2014). Lippa (2005), mentions that conceivably life experiences of lesbian (and gay) individuals are norm-breaking and marginalized, leading them to be more iconoclastic, liberal, cognitively flexible, and self-aware than heterosexual individuals.

There can be benefits of social bond and alliances formation, by being more tolerant, sharing feelings, reducing intrasexual competition and increasing intrasexual cooperation, while maintaining access to partners of the opposite sex ensures potential reproductive success (McCrae and Greenberg

2014; Metin-Orta and Metin-Camgöz 2020; Valentova and Varella 2016). Additionally, the same genetic factors (i.e., single nucleotide polymorphisms) that help explain sexual behavior, attraction, and fantasies, also help explain the Openness to Experience trait (Ganna et al. 2019).

Another important finding was that bisexual individuals tend to score lower on Conscientiousness than heterosexual and homosexual individuals (Allen and Robson 2020). Generally, variation in Conscientiousness can be explained by the fact that in ancestral times, when outcomes and schedules could be predicted, higher Conscientiousness might have been advantageous, individuals would gain more resources and have lower risks by being more rigid in their decision making (Ashton 2017; Nettle 2010). When environments and situations change quickly, lower Conscientiousness is favored (Ashton 2017; Nettle 2010). Lower Conscientiousness is related to taking immediate opportunities and more mating episodes, greater sociosexuality and faster life history strategies (Davis et al. 2019; Del Río et al. 2019; Nettle 2006; Schmitt 2004). This pattern of results is indicative of a curvilinear effect for Conscientiousness, like Openness for women (Allen and Robson, 2020). For men, this pattern of results is indicative of a linear association (Allen and Robson, 2020), corroborating with the fact that sexual orientation for men is less fluid (Bailey et al. 2016).

One final point should be made, that socioecological factors might influence the consistency or universality of the Big-Five personality traits. Some evidence for this possibly lies in indigenous populations, for example in Bolivia (Gurven et al. 2013), and recently in southern Africa (Thalmayer et al. 2021). Personality traits should be investigated considering different niches for larger scale societies and smaller-scale societies, even if the niches are more delimited and thus incentivizing similar trait levels, combinations of traits could vary (Durkee et al. 2022; Gurven et al. 2013). Additionally, environmental heterogeneity can act on personality and sexual behavior, such as promiscuity and intrasexual competition (Gangestad and Simpson 2000; Schmitt 2005), perhaps affecting sexual orientation as well.

Together with the evidence presented for the possible selection of personality traits, and the gender shift hypothesis in part, differences in personality and sexual orientation, its fluidity, in women

can be partially explained. Evidence is still needed to assess this idea with more clarity, since different ecologies, niches, and life experiences could influence the development of the traits in women with different sexual orientations.

Conclusion

This chapter sought mainly to present and explain differences in personality and sexual orientation, and specifically differences in personality between sexual orientations in women. Given the differences in personality traits, notably Openness to Experience, it is possible to state that the sexual orientation continuum is more fluid in women. Recently, greater evidence of the genetic influence has been shown, with more robustness to the Openness trait, but a better socioecological/evolutionary understanding of this trait might be needed considering different sexual orientations.

Research focusing on identifying possible developmental and cultural variables present in the sexual orientation and personality is called for. Moreover, little attention has been given to personality of asexual individuals, although there is more recent evidence using a personality model other than the Big-Five (see, Bogaert et al. 2018). Differentiating types of women, for example, in categories of butches and femmes could be potentially useful and including facets of the traits. Although there are new studies considering personality differences and sexual orientations, reasons as to why they appear are still not clear.

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2.12. Dichotomous thinking

Next, dichotomous thinking and its relation to personality traits and sexual orientation is explained, followed by vocational interests and personality traits.

Dichotomous thinking is a cognitive style characterized by seeing the world as binary oppositions, all or nothing, right or wrong, good and evil. Dichotomous thinking is useful for quick comprehension and decision making, dichotomous outcomes are commonly used in everyday life, as they bring clear results, showing immediate closure to debates or problems and expedite arriving at conclusions (Oshio, 2009). But it can also bring gross misunderstandings between people with different opinions, prejudice, and potentially violence (Mieda & Oshio, 2021; Oshio, 2009).

As shown by Oshio (2009), in his Dichotomous Thinking Inventory (DTI), dichotomous thinking can be separated into three main factors: (1) Preference for Dichotomy - refers to a thinking style that leads to preferring distinctness, clarity, and conciseness as opposed to ambiguity, obscurity, and vagueness; (2) Dichotomous Belief - refers to thinking that anything in the world can be divided into two categories such as “black or white”, “good or bad”, or “winner or loser”; (3) Profit-and-Loss Thinking - refers to thinking of how to get access to the benefits in a situation for oneself and how to avoid the disadvantages.

Dichotomous thinking is also related to HEXACO personality traits and Dark Triad traits (Jonason et al., 2018; Oshio, 2009), characterized by narcissism (being self-centered), Machiavellianism (being manipulative and cynical) and subclinical psychopathy (lack of empathy and impulsivity).

On the other hand, the Honesty-Humility trait of HEXACO personality traits can be interpreted as the opposite of the traits of the Dark Triad, since Honesty-Humility represents an inclination to cooperate with others, even when exploring others might be advantageous, and the common element of the Dark Triad can be seen as a willingness to exploit others when it is advantageous (Lee & Ashton, 2014). Men and non-heterosexual people may also show greater levels of the Dark Triad traits (Jonason & Luoto, 2021).

Correlations between HEXACO traits (mainly Honesty-Humility) and dichotomous thinking have also been shown. Dichotomous thinking is characterized by low levels of Honesty-Humility and Agreeableness (Mieda & Oshio, 2021). Mieda and Oshio (2021), compared the Big Five and HEXACO traits, and associated them to the DTI. Total scores of DTI and all DTI factors were associated negatively with Honesty–Humility (ranging from r = -0.21 to r = -0.34) and Agreeableness (ranging from r = -0.27 to r = -0.34) of the HEXACO personality model. The DTI total and Dichotomous Belief scores were related negatively to the HEXACO's Openness to Experience (r = -0.17 and r = -0.21, respectively).

To examine the extent to which variance in dichotomous thinking is captured by the Big Five and HEXACO personality traits, Mieda and Oshio (2021), conducted multiple regression analyses using the total and dimensional scores as dependent variables and the personality traits as independent variables and calculated the multiple correlation coefficients. The statistical significance of the differences between the multiple correlation coefficients was tested by using Steiger's Z test, a method used to determine if two independent correlation coefficients are significantly different from each other. The coefficients were lower for the Big Five traits than the HEXACO traits, except for Preference for Dichotomy (DTI total: $z = 7.21$, $p < .001$; Preference for Dichotomy: $z = 1.02$, $p = .304$; Dichotomous Belief: $z = 9.08$, $p < .001$; Profit-and-Loss Thinking: $z = 7.51$, $p < .001$).

In summary, mainly HEXACO's Honesty-Humility and Agreeableness, and to some extent Openness to Experience, seem to be related to dichotomous thinking. Moreover, the HEXACO personality model best represents the feature of dichotomous thinking.

2.13. Personality and vocational interests

Vocational interest is an all-encompassing term, including work occupations, different undergraduate majors, and general interests. Some measures can include simply academic major choice, other can include vocational interest scales. In the current dissertation, the chosen undergraduate majors are divided into three scientific areas (Social, Biological, and Exact Sciences).

Vocational interests (see Ashton (2018) for a review) were investigated using the Big-Five model. Kline and Lapham (1992), found that Science students have higher levels of Conscientiousness, followed by engineers. The science students were significantly higher on Conscientiousness than Arts, Mixed Faculty, and Social Sciences students. De Fruyt & Mervielde (1996), claim that Behavioral/Social science and Humanities students are more neurotic, more open to experience and less conscientious than students of Economic-oriented courses, who were also more extroverted. Another article found that individuals that are more open to experience tend to have Artistic and Investigative vocational interests, extroverted individuals tend to have business interests, and agreeable people tend to have social interests (Larson et al., 2002).

In a more recent study, investigating preferences of undergraduate courses choice, with a sample of high school students, Balsamo et al. (2012), state that students who intend to go to the Humanities area are introverted and conscientious, students who prefer Economics and Law are more extroverted and less conscientious. Students who opted for the Health Sciences showed similar Conscientiousness levels to those who chose the Humanities, but they were more extroverted than Humanities students.

Compared to the Big-Five, the HEXACO model has proven to be a better way to predict vocational interests (McKay & Tokar, 2012; Šverko & Babarović, 2016). One article, with community and college students samples, using the Oregon Vocational Interest Scales (ORVIS), which assesses the vocational interest in eight dimensions, Leadership, Organization, Altruism, Creativity, Analysis, Production, Adventure and Erudition, found a positive correlation between Openness and Experience, and Creativity and Erudition (*r's* > 0.45 in both samples); between Extraversion, and Leadership and Altruism (*r*'s ranging from 0.20 to 0.40 in both samples), and a negative correlation between Emotionality and Adventure (community sample r = -0.36, student sample r = -0.46) (Pozzebon et al., 2010).

Another study by McKay and Tokar (2012), focused on RIASEC vocational interests dimensions, for a review of RIASEC, see Nauta, (2010), who propose the division of vocational interests into six dimensions, 1 – Realistic, 2 - Investigative, 3 - Artistic, 4 - Social, 5 - Enterprising and 6 – Conventional.

In men, Realistic interests negatively correlated with Extraversion (r = -0.16) and Emotionality (r = -0.28). In women, Realistic interests were negatively correlated with Emotionality (r = -0.22) and Conscientiousness (r = -0.19). For both sexes, the strongest positive correlation was between Artistic interests and Openness (r*'s* > 0.60) (McKay & Tokar, 2012).

Also using the RIASEC dimensions and the HEXACO model, Šverko & Babarović (2016), showed that Investigative and Artistic interests are positively correlated with Openness to Experience (r = 0.30 and r = 0.48, respectively), Social interests with Honesty-Humility and Emotionality (r's = 0.27), and Enterprising interests are negatively correlated with Honesty-Humility (r = -0.31).

Moreover, women apply more for undergraduate majors in the Humanities and Biological Sciences, which is related to greater empathizing (understanding of other people), when compared to men, who in turn, have greater systematization (understanding of the inanimate world) and major in the Exact Sciences (Varella et al., 2016).

In conclusion, there is enough evidence to affirm that personality traits, and more recently HEXACO traits, are related to vocational interests, and that trait mean levels might differ among majors. Understanding HEXACO traits can be important for vocational counseling as is understanding the demography of the major, why do the students behave the way they do? Why are students interested in different topics? Based on the individual's personality, is it possible to predict which major is best fitted for them? Moreover, relations between academic interests and sexual orientation do not seem to be deeply explored. Personality differences between sexes and academic choices, and personality differences between sex/sexual orientations have been shown but combining sex and sexual orientation could bring a new understanding to academic choices.

3. CHAPTER TWO

This chapter depicts the first study, a measure of invariance of the Dichotomous Thinking Inventory (DTI). Subsequently, the second study is explained. The same data was used in both chapters. Although data collection was the same, some variables and instruments will be discussed in each study.

The research was registered and approved by the Institutional ethical board under the number: 51519321.1.0000.5561; available in the Appendix A.

First, we briefly introduce psychometrics and construct measurement to show their importance to the present study and experimental psychology.

Introduction

Psychometrics is a field that studies measurement of psychological constructs, like cognitive abilities, different behaviors, and personality traits. It involves the design, development, and validation of measurement tools, such as questionnaires, tests, and assessments, to assess and quantify these constructs.

As such, proper measurement of a theoretical construct is crucial. To find out if it really exists, a factor analysis might be conducted on a questionnaire designed to measure the theoretical construct. Factor analysis is a statistical technique employed to elucidate the underlying factors or latent variables that account for the observed correlations among multiple variables. It aims to reduce the complexity of the data by representing the shared variance among the variables using a smaller set of unobserved factors. As Thompson (2004) puts, factor analysis can have many uses, but there are three main uses:

1. Inform evaluations of score validity - whether scores measure the theoretical construct.
2. Develop theory regarding the nature of constructs – numerous different measures are administered to various samples, and the results of factor analysis are then used to specify construct dimensions.
3. Summarize relationships in a lower set of factor scores that can then be used in subsequent analyses - using fewer variables in substantive analysis tends to conserve degrees of freedom and improve power against Type II error.

Thompson (2004) explains that there are two main classes of factor analysis, the first called "Exploratory Factor Analysis" (EFA), in which the researchers do not have expectations on the number or nature of constructs or factors. Even if they have expectations, they do not have to declare it as analysis is not influenced by expectations. Second, there is the "Confirmatory Factor Analysis" (CFA). The CFA requires that the researcher has specific expectations regarding the number of factors, which variables reflect given factors, and whether the factors are correlated. CFA will test the fit of factor models.

The project will make use of all three EFA uses and the CFA, as we first test scale fit, then conduct a EFA to assess if the scale measures what it proposes, measure dimensionality, and in the third chapter of the project use the results in the statistical analysis of the second study.

3.1. Aim – Study One

Main Aim:

The main aim is to measure the invariance of the DTI Brazilian-Portuguese version.

Secondary Aim:

The secondary aim is to measure dimensionality and apply the regression scoring results (as opposed to usual sum scoring) in the second study.

3.2. Method

Data was collected in an online survey that was distributed through e-mail lists and social media, which led to a convenience sample.

3.3. Participants

The participants are Brazilian undergraduate students that completed the survey. One could only respond to the survey after accepting the consent form (*Termo de Consentimento Livre e Esclarecido* – TCLE). Those who referred as asexual (N = 7) and selected the "Other option" when asked about their sex (N = 3) were excluded, because the N of those individuals is too small to be analyzed. The total number of participants is 707.

3.4. Instruments

Social Demographic data

The sociodemographic questionnaire contains closed and open questions, including age, ethnicity, sex, gender, major and semester (Appendix B).

Dichotomous Thinking Inventory (DTI)

Developed by Oshio (2009), the DTI has 15 items on a 6-point scale (ranging from 1 – strongly disagree to 6 – strongly agree). The 6-point scale was considered adequate to measure dichotomy, as there is no midpoint, i.e., participants should present an opinion.

Following Oshio (2009), the internal consistency of the total DTI score is 0.84, and the internal consistency for each factor is: (1) preference for dichotomy ($\alpha = 0.81$), dichotomous belief ($\alpha = 0.74$) and profit and loss thinking ($\alpha = 0.75$). Each factor (and total score) is computed by summing the responses of the 6-point scale. The Brazilian-Portuguese version can be seen in Appendix C.

3.5. Data analysis

Data was filtered using Python 3.11 language and analyzed with both Python 3.11 and R 4.2.2 languages.

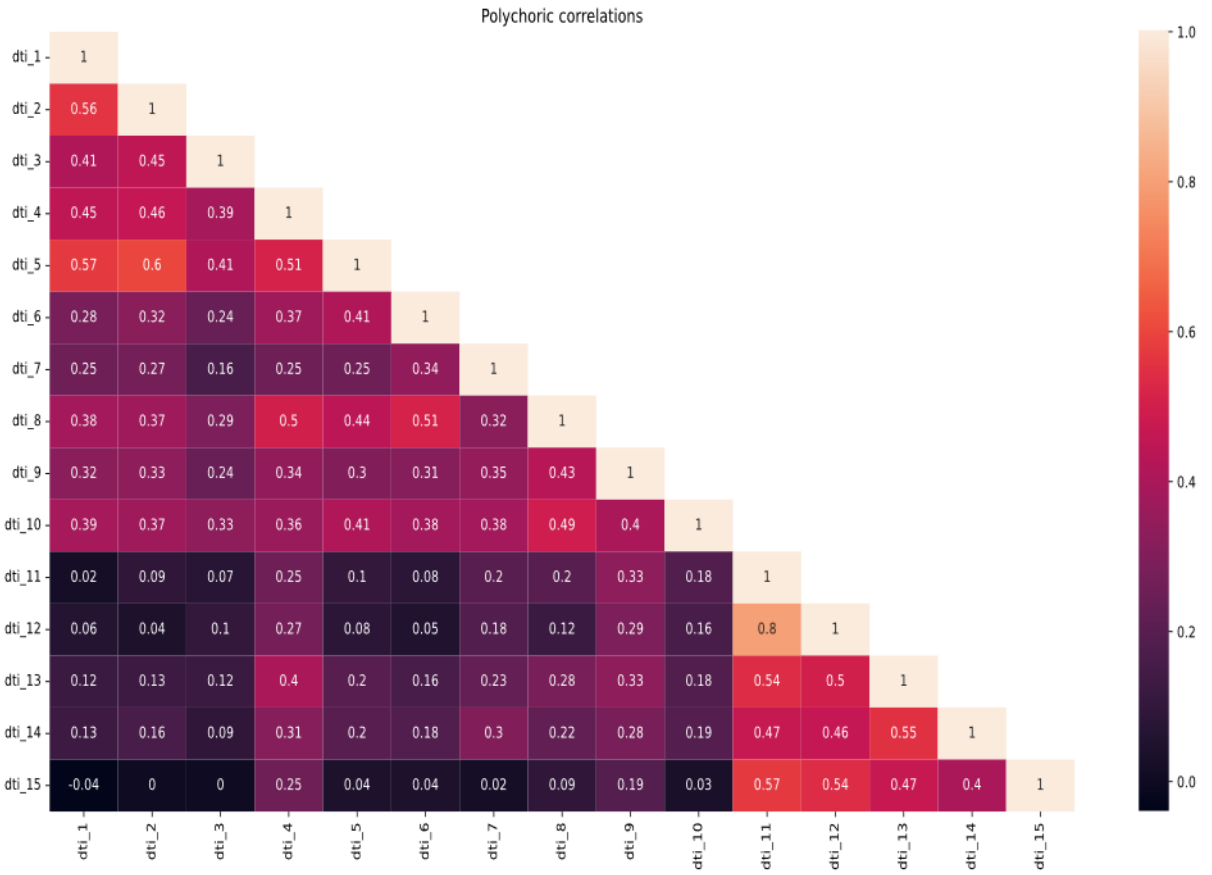
3.6. Results

A total of 707 individuals were analyzed. Of those, 421 are females (59.5%) and 286 are males (40.4%). Mean age is 24.39 years old (min = 18, max = 65).

A confirmatory factor analysis (CFA) was conducted to verify the measurement invariance of the DTI Brazilian-Portuguese version, which pointed a low fit of the model: CFI = 0.605, RMSEA = 0.138 (90% CI = 0.131 – 0.145), SRMR = 0.114. Given the low fit, this suggests that the model implied structures different from the structures obtained from the data. In other words, the relationships between the observed variables and the latent factors specified in the model are not consistent with the data. An EFA was conducted to assess number of factors and dimensionality. The polychoric correlations of the DTI items can be seen below in Figure 1.

Figure 1

Polychoric correlations matrix of DTI items

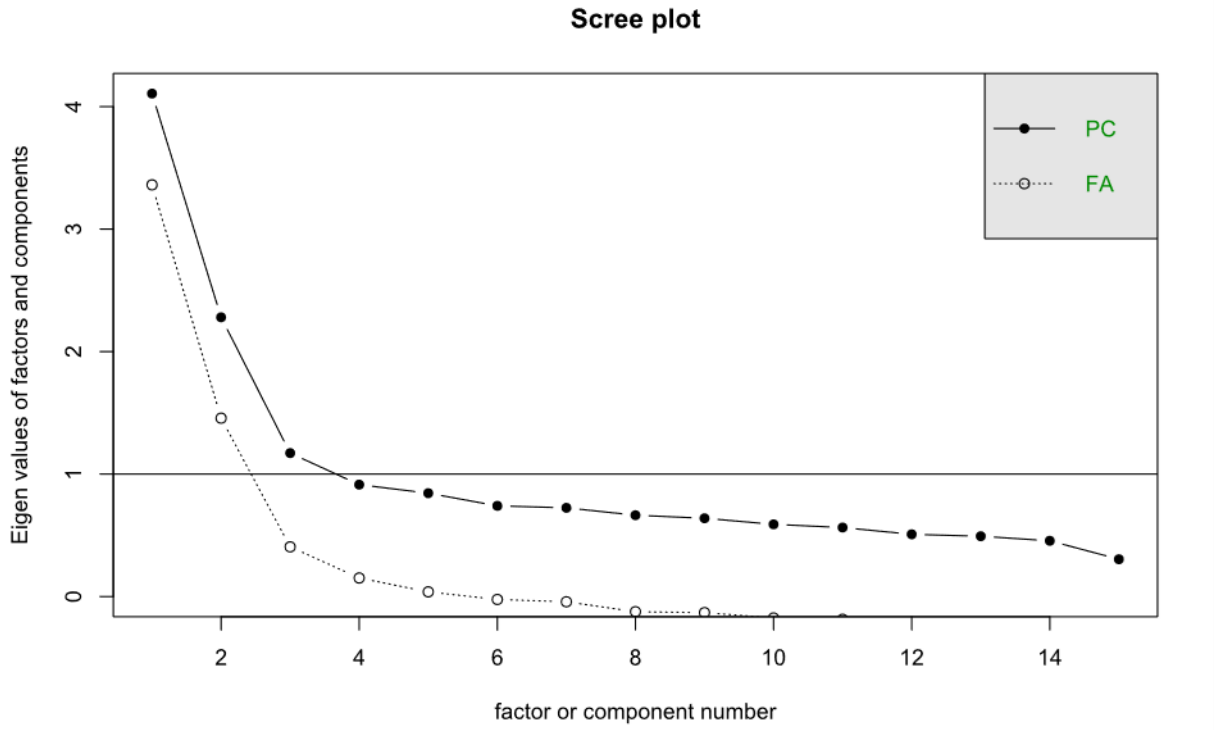


Bartlett's test of sphericity was conducted to ensure that the polychoric correlation matrix was not random: $\chi^2 = 3043.132$, $p < 0.001$. The Kaiser-Meyer-Olkin (KMO) test of sample adequacy was above the minimum of 0.5 (KMO = 0.85). The correlation matrix was appropriate and submitted to the EFA.

Scree plot of the EFA suggested four factors, while the Kaiser Criterion (eigenvalue above 1.0) would indicate two factors (Figure 2). However, Horn's parallel analysis, very simple structure (VSS), and Velicer's minimum average partial (MAP) tests were conducted to better estimate the number of factors to retain. Oblimin rotation was used to control interfactor correlations, adopting a maximum likelihood method. All tests, parallel analysis, VSS, and MAP suggested two factors.

Figure 2

Scree plot of the EFA

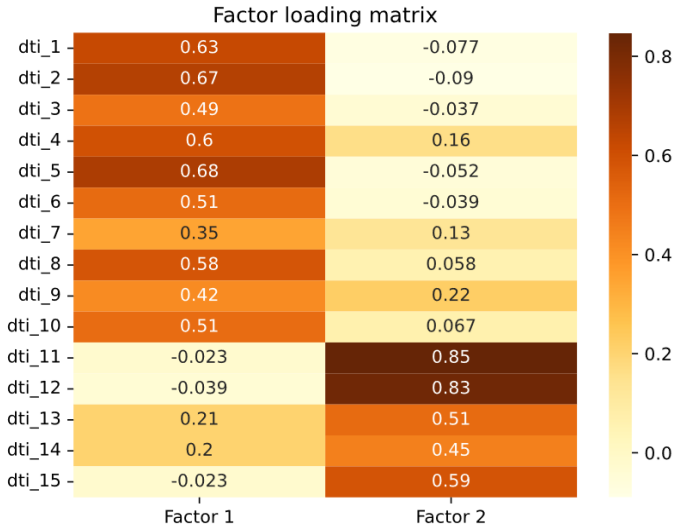


Note: PC = Principal Components, FA = Factor Analysis.

An EFA was conducted with two factors, using oblimin rotation to produce orthogonal results, being an appropriate and recommended rotation, while controlling interfactor correlations (Watkins, 2018) and using a maximum likelihood method. Factor loadings of the FA can be seen in Figure 3.

Figure 3

Factor loading matrix



Note: DTI items are represented on the left side.

Following the critical value (CV) formula (see below) proposed by Norman and Streiner (2014), a method to retain loadings that are statistically significant, at a 1% significance level, we arrive at CV = 0.19. All items above this cutoff are considered significant. On a 5% significance level, we change the 5.152 numerator to 3.920 and receive CV = 0.14. However, items "dti_9", "dti_13" and "dti_14" would have to be removed if the aim were to achieve simplicity, since they load on both factors. In our case, we decided to keep all items.

$$\text{CV} = \frac{5.152}{\sqrt{N} - 2}$$

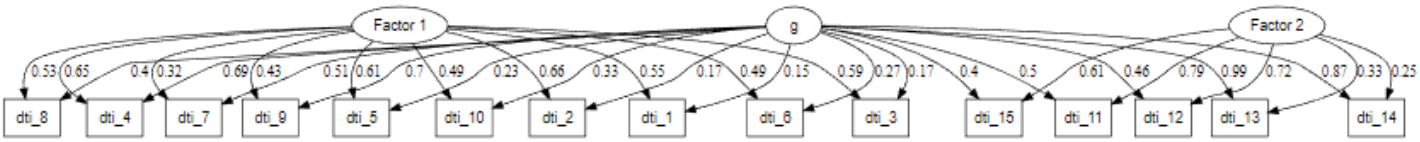
A CFA with the two factors model was performed, standardizing the latent variables in a way that the open factor is set by fixing its variance to 1, leaving all factor loadings as free parameters, using a robust weighted least squares estimation (WLSMV) for the polychoric correlations, as recommended by Finney and DiStefano (2013). While keeping all items, CFA confirmed that the model with two factors had a better fit: Robust CFI = 0.948, Robust RMSEA = 0.060 (90% CI = 0.054 – 0.067), SRMR = 0.071. Cronbach's alphas for the first factor (α = 0.80) and the second factor (α = 0.79) were satisfactory but considering the multidimensionality of the scale, and since Cronbach's alpha tends to be quite rigid and does not demonstrate dimensionality of the scale (Flora, 2020; Knekta et al., 2019), McDonald's Omega coefficients should be calculated.

A new model was made since the data seem to fit well a multidimensional two factors scale, now assessing a general construct (*g*) influencing all items, while forcing factor correlations to be 0. A bifactor model was setup, using as reliability measure Omega Hierarquical (or ω_h), which represents the proportion of total variance due to a single general construct that influences all items, despite multidimensionality of the scale (Flora, 2020). Model fit was much improved: Robust CFI = 0.995, Robust RMSEA = 0.034 (90% CI = 0.027 – 0.040), SRMR = 0.039. The proportion of total-score

variance due to *g* is 0.48 (ω_h = 0.48), for the first factor (ω_h = 0.55) and the second factor (ω_h = 0.33). Figure 4 shows the loadings of each factor in a path diagram.

Figure 4

Loadings path diagram of the general factor (g) and Factors 1 and 2



Finally, a regression score method was applied to obtain factor scores, when using factor scores as predictors, they seem to be better than simple sum or mean scores (McNeish & Wolf, 2020; Skrondal & Laake, 2001). It should be noted that factor scores are sensitive to factor extraction methods and rotation, and indeterminacy, meaning that there is not a single solution for factor analysis results (DiStefano et al., 2009). The regression type of scoring for the DTI general factor (*g*) was applied in the second study (Chapter Three) and compared to the standard sum score.

3.7. Discussion

Initial CFA of the Brazilian-Portuguese DTI version did not show good fit, suggesting measurement invariance. After an initial EFA and subsequent CFA's, model fit was improved with a

bifactor model. All 15 items converged on a general factor (*g*), with 0.48 total-score variance due to *g* (ω_h = 0.48). Frequently, sum scores and alphas of a scale are described, but without testing for dimensionality. Additionally, reliability can sometimes be mistakenly used as a validation metric, but reliability is the consistency of the instrument's measurements (Knekta et al., 2019). In the DTI (as in other scales), items are unit-weighted, implying that each item contributes an equal amount to the construct being measured. However, an optimally weighted scale does not assume that each item contributes an equal amount, that is, each item corresponds more strongly or weakly to the construct (McNeish & Wolf, 2020).

Sometimes factor scores can be used as subscales, although in the bifactor model, specific factors do not represent subscales per se but instead represent the shared aspects of a subset of items that are independent from the general factor (Flora, 2020). As shown in Figure 4, the *g* factor influences all items, and each specific factor influences only a subset of items. However, we obtained a ω_h = 0.55 for the first factor, that is greater than ω_h = 0.48 for *g*. This means that the majority of reliable variance is still explained by the first factor.

Since the initial CFA of the DTI had low fit, it could also mean that items should be optimally weighted. Future analysis could be done using optimally weighted items. Sum scores can be applied for broad purposes as in a rough approximation (e.g., using sum scores to outline depression severity), but advanced applications of psychometrics (e.g., investigate the ontology of depression) require more precision (McNeish & Wolf, 2020). As McNeish and Wolf (2020) put, sum scoring might not be an ideal method, statistical models can be complex, so results from multilevel models, growth models, or multiple regression based on sum scores can be more adversely affected by imprecision when scoring of multiple scales is necessary. Sum scores can be used as only as a rough approximation.

3.8. Conclusion

Oshio's (2009) original article did find a multidimensional scale but used a common "alpha and sum" approach to calculating scores and used a total sum score, instead of testing if all items correspond to a single underlying construct. In this study, the Brazilian Portuguese DTI showed measurement

invariance. After modeling, two factors were found and a general factor (*g*), future analysis could improve the DTI asserting for dimensionality, McDonald's Omega, and factor scores. Additionally, different factor analysis methods, and consequently factor scores might yield different results. Sum scores can be useful in clinical settings when time is of the essence, to give a sufficient, but rough approximation. In research, sum scores are generally not appreciated.

4. CHAPTER THREE

This is the final chapter that depicts the second study. It includes the HEXACO inventory, DTI scores calculated in the second chapter, sex, sexual orientation, and scientific areas. A short introduction for this chapter presents mainly the secondary aims and theoretical findings that will substantiate the discussion regarding personality traits and academic choices/interests.

Introduction Chapter Three

Honesty-Humility

McKay and Tokar (2012), relating HEXACO to RIASEC vocational interests, found that in men Artistic interests relate positively to Honesty-Humility (r = 0.20) and Social interests for both men and women (r = 0.27 and r = 0.13, respectively). For both sexes, Enterprising interest related negatively to Honesty-Humility (r = -0.21). Also, men's Conventional interests related negatively with Honesty-Humility (r = -0.17). Recently, Lee et al. (2022), with a sample of 73,385 individuals and using the HEXACO traits, used a cutoff of the effect size of 0.20 and did not rely on significance testing, because of the large sample, found that individuals from Business/Commerce majors tended to score lower on Honesty-Humility ($\bar{z}$ = -0.22).

Using the Big Five Model, Vedel (2016) found that Arts and Humanities consistently demonstrated higher scores on Neuroticism compared to other academic groups, with moderate effect sizes often observed in comparisons with Engineering, Law, and Sciences. Psychology also exhibited higher scores and moderate effect sizes were found in comparison to Economics. On the other hand, Economics and Business consistently scored lower than other groups.

Emotionality

For emotionality, it was negatively associated with women's Investigative interests (r = -0.23) and men's Conventional interests (r = -0.16) (McKay & Tokar, 2012). According to Lee et al. (2022), Engineering and in Physical Sciences/Math students scored lower in Emotionality relative to the grand mean ($\bar{z}$ = -0.34 and -0.27, respectively).

Extraversion

Vedel (2016) affirms that Economics, Law, Political Sciences, and Medicine scored higher in Extraversion than Arts, Humanities, and Sciences majors, and the differences often represented medium effect sizes. Lee et al. (2022) shows that people in the Physical Sciences/Math majors scored lower in Extraversion than people in other fields ($\bar{z}$ = -0.19), and people in Business/Commerce scored higher ($\bar{z}$ = 0.20). Moreover, specifically for men, Realistic interest seems to be associated negatively with Extraversion (r = -0.16) (McKay & Tokar, 2012).

Agreeableness

McKay and Tokar (2012), show that Social interests are related positively to Agreeableness (r = 0.22, for men, and r = 0.19, for women). Vedel (2016) explains that Law, Business, and Economics consistently obtained lower scores compared to other academic groups, with some moderate effect sizes found in comparisons to Medicine, Psychology, Sciences, Arts, and Humanities. Lee et al. (2022) did not find any differences among majors.

Conscientiousness

Ludwikowski et al. (2019) state that Conscientiousness differentiated between Biological Sciences/Medicine and Business majors with higher Conscientiousness emerging for Biological Sciences/Medicine majors. Vedel (2016) also found Conscientiousness differences, as Arts and Humanities scored consistently lower than other academic majors, such as Sciences, Medicine, Psychology, Engineering, Law, and Economics.

Analyzing HEXACO traits, Lee et al. (2022) found that no academic group had greater than means than their cutoff of 0.20. However, at the facet level individuals in Visual/Performing Arts showed lower-than-average level for Prudence ($\bar{z}$= -0.30) and to a lesser extent for Organization ($\bar{z}$ = -0.18), but also averaged non-trivially higher score in Perfectionism ($\bar{z}$ = 0.16). In our study, the Business major was included in the Social Sciences and there were no Conscientiousness differences in the Biological Sciences.

Openness to experience

Ludwikowski et al. (2019), tried to establish the extent to which personality traits, alongside with interests, self-efficacy (and in a second model, ability), differentiate between majors. Overall, personality predicts 28.4% of the majors, and specifically Openness distinguished between Social Sciences and Biological Sciences/Medicine majors. Additionally, McKay and Tokar (2012), relating HEXACO to RIASEC vocational interests, found that Openness positively relates to Social interests (r = 0.36, for men and r = 0.31, for women), and Investigative interests (r = 0.48, for men and r = 0.43, for women). Artistic interests had the highest positive correlation with Openness (r = 0.65, for men and r = 0.63, for women).

Vedel (2016), in a systematic review of Big Five personality traits and academic majors, points out that the Openness trait yielded the largest effect size among majors and no clear difference between sexes. Lee et al. (2022), found that Visual/Performing Arts major showed a very high mean of Openness ($\bar{z}$ = 0.53), when compared to the grand mean for all majors, followed by the Humanities ($\bar{z}$ = 0.30). Health Sciences and Business/Commerce were below the mean ($\bar{z}$ = -0.21 and $\bar{z}$ = -0.26, respectively). Overall, Openness to Experience seems to be one of the best personality traits predictors of major choice.

Changes in personality traits by semester segments

According to the National Center for Education Statistics ([NCES], 2022), in the U.S. in 2020, the overall 6-year graduation rate for first-time, full-time undergraduate students who began seeking a

bachelor's degree at 4-year degree-granting institutions in fall 2014 was 64 percent. In Brazil, according to the *Instituto Nacional de Estudos e Pesquisas Educacionais Anísio Teixeira* ([INEP], 2022), between 2012 and 2021, the dropout rate was about 59%. By the second year of college, the dropout rate for the U.S. corresponds to 6.2% and 10.6% for Brazil (Aina et al., 2022). Although the reasons can be many (e.g., Aina et al. 2022), a mismatch between personality traits and the chosen major can explain at least part of it.

Furthermore, as mentioned previously, personality tends to be rather stable, not changing after the age of 30. Changes might not occur between semester segments due to changes in personality. However, this would be better tested in a longitudinal study. If no changes are seen, it could be that individuals accordingly allocate themselves to areas that match better their personality traits.

4.1. Study Two

Aim:

The main aim is to predict academic choices, based on personality traits, dichotomous thinking, sex, and sexual orientation.

Hypotheses:

H1 – Personality traits predict academic choices for all areas.

H2 – Dichotomous Thinking (total score) predicts academic choices for all areas.

H3 – Sex and sexual orientation predict academic choices for all areas.

Secondary aim:

The secondary aim is to compare personality traits between semester segments, for each scientific area.

Hypothesis:

H1.2 – Personality traits do not change between semester in the scientific areas.

4.2. Method

The same data collection method was applied in both studies. Analysis was done in Python 3.11 language and R 4.2.2 language. Undergraduate majors were divided into three main scientific areas, Social, Biological, and Exact Sciences. This division was made based on the suggestion by the College Entry Foundation (*Fundação Universitária para o Vestibular* - FUVEST), an autonomous institution connected to the University of Sao Paulo (USP), that runs the entrance examinations to USP.

The three areas and some majors are: (1) Social Sciences - administration, arts, music, law, economics, journalism, pedagogy, languages, tourism, philosophy, and geography; (2) Biological Sciences - physical education, psychology, pharmacy, medicine, veterinary medicine, dentistry, biology, nursing, physiotherapy, and nutrition; (3) Exact Sciences - civil, mechanical, electrical, and production engineering, statistics, computing, geology, mathematics, physics, and chemistry.

Only scores of the general factor (*g*) of the DTI and the total sum score were included for better comparisons, instead of factors scores, since otherwise discussion based on previous literature would be limited.

4.3. Participants

Only individuals that responded to the survey in its entirety were analyzed, all are over 18 years of age an accepted the consent form. Because of their low numbers, those who selected sex other than “male” or “female” were excluded (N = 3), asexuals as well (N = 7). To ensure better model fit and normality, HEXACO outliers were removed (N = 20).

A total of 687 respondents were analyzed, 59.5% are females (N = 409) and about 40.5% are males (N = 278). Mean age is 24.45 years (min = 18, max = 65), 86.1% are from public universities (N = 592) and about 44% are from the northeastern region of Brazil (N = 302). Regarding sexual orientation, 57.2% are heterosexuals (N = 393), 29.7% are bisexuals (N = 202) and 13.2% are homosexuals (N = 90).

As to the areas, 44% are from the Social Sciences (N = 299), 36.5% are from Biological Sciences (N =248), and 19.4% are from Exact Sciences (N = 132). Frequencies of sex and sexual orientations divided by scientific areas can be seen in Table 1.

Table 1

Frequency of sexual orientation, given sex, by scientific areas

Sexual Orientation	Heterosexual		
Area	**Bio**	**Exact**	**Social**
sex			
Female	11.8%	6.1%	15.1%
Male	8.2%	7.4%	8.6%
Total	19.9%	13.5%	23.7%
Sexual Orientation	**Bisexual**		
Area	**Bio**	**Exact**	**Social**
sex			
Female	9.6%	2.5%	11.4%
Male	1.9%	1.3%	2.9%
Total	11.5%	3.8%	14.3%
Sexual Orientation	**Homosexual**		
Area	**Bio**	**Exact**	**Social**
sex			
Female	1.3%	0.6%	1.2%
Male	3.9%	1.7%	4.5%
Total	5.2%	2.3%	5.7%

Note: Bio = Biological Sciences, Social = Social Sciences, Exact = Exact Sciences.

4.4. Instruments

In addition to the DTI, described in the first study, the HEXACO-60 personality inventory and Kinsey scale were used.

HEXACO-60

HEXACO-60: The inventory, developed by Ashton and Lee (2009), is constituted of 60 questions (10 for each trait), responded on a Likert type scale ranging from 1 – strongly disagree to 5 – strongly agree. The internal consistency reliabilities ranged from 0.77 to 0.80 in the college sample and from 0.73 to 0.80 in the community sample.

The 100 item HEXACO-PI-R, which includes the 60 questions of the HEXACO-60 used in our study (Appendix D), was validated for a Brazilian sample by A. R. L. Costa et al. (2019). In A. R. L. Costa et al.'s (2019) study, all six traits were above the Cronbach's alpha of 0.70 and Guttman's Lambda 6, except for the Emotionality trait ($\alpha = 0.64$, G6 = 0.57). According to the authors, the results suggest that the Brazilian version of 100-HEXACO-PI-R is a valid and useful measure of personality traits. Its psychometric properties show good adequacy and consistency.

Kinsey Scale: To assess sexual orientation, a seven-point Kinsey scale (Appendix E) was presented, were "0" represents an exclusively heterosexual sexual orientation, "3" represents bisexual orientation, and "6" represents exclusively homosexual orientation (Kinsey et al., 1948, 1953). The respondents could also select if they were asexual. Those who selected the options 0 and 1 were classified as heterosexual, 2 to 4 as bisexual, 5 and 6 as homosexual.

4.5. Data analysis

A mulitnomial logistic regression was done with the three scientific areas as dependent variables and personality traits, DTI *g* factor, sex, sexual orientation, and interactions between sex, sexual orientation, and personality traits as predictors. A separate analysis was done using the DTI total sum score method instead of the *g* factor. Two separate models were done instead of one with both DTI scores, as to not interfere with results, since both correlate strongly with each other. The results from the other variables (HEXACO, sex , and sexual orientation) were reported using the DTI *g* factor model. However, results for these variables are similar in both models.

Multiple MANOVA's were conducted to assess changes in personality traits between semester segments, for each scientific branch.

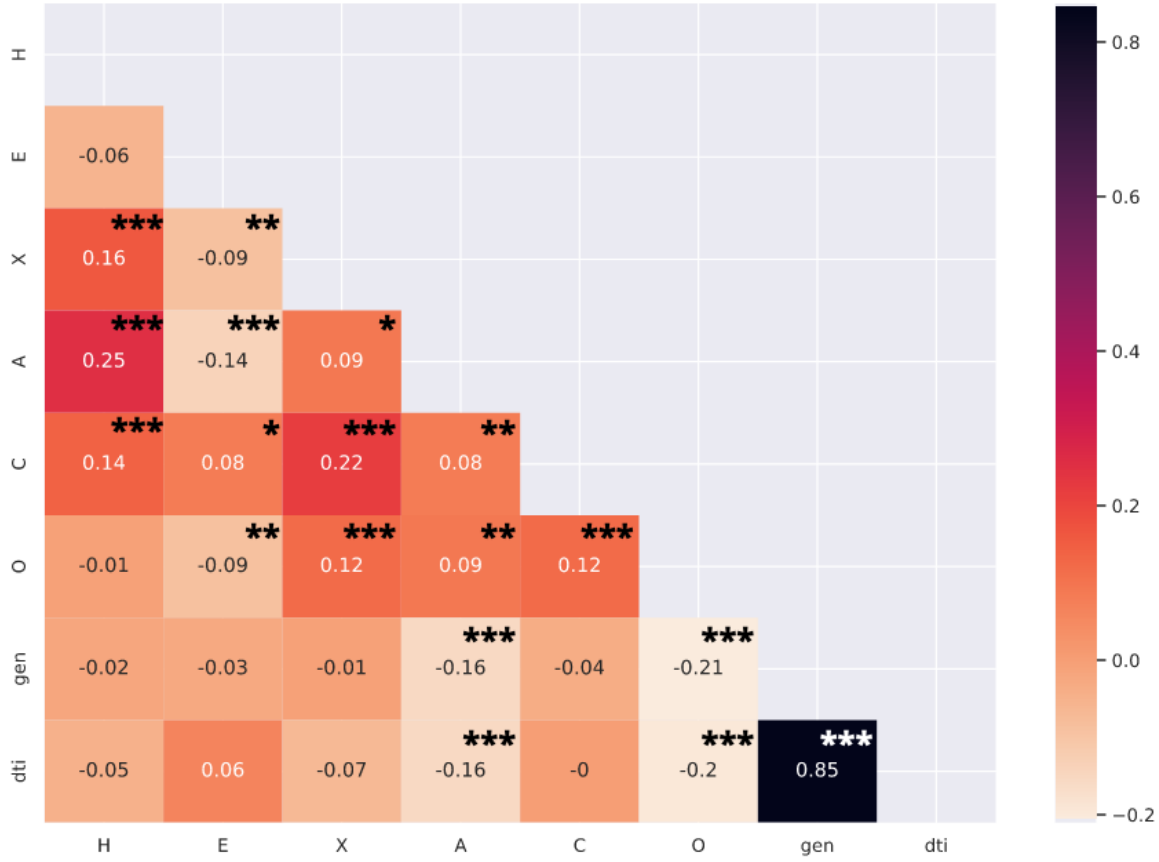
4.6. Results

Regarding the HEXACO personality traits, Cronbach's alphas for all traits ranged from 0.74 to 0.81, except for the Openness trait ($\alpha = 0.67$). Unidimensional Omegas ranged from 0.73 to 0.81, except again for Openness ($\omega_u = 0.67$). This version of omega considers each trait as a unitary personality scale

(see Flora, 2020), where each trait is composed of multiple facets, since there might not be an underlying general factor of all traits (see, Ashton et al., 2020). Inter-trait Pearson correlations can be seen in Figure 5.

Figure 5

Pearson correlations between HEXACO traits and DTI scores



Note: gen = DTI general factor (*g*). dti = DTI sum score. Significant correlations between traits: *** = $p \leq 0.001$, ** = $p \leq 0.01$ and * = $p < 0.05$.

HEXACO mean scores, divided by scientific areas, can be seen in Table 2. The Exact Sciences had the greatest Honesty-Humility (mean = 3.59 std = 0.67) and Agreeableness scores (mean = 3.13, std = 0.57). Social Sciences had the greatest Emotionality (mean = 3.37, std = 0.65) and Openness to Experience scores (mean = 3.81, std = 0.57). Finally, Biological Sciences had the greatest Extraversion (mean = 3.01, std = 0.74) and Conscientiousness scores (mean = 3.73, std = 0.57).

Table 2

Mean and standard deviations of traits by scientific areas

Trait	H		E		X		A		C		O	
	mean	SD	mean	SD	mean	SD	mean	SD	mean	SD	mean	SD
Area												
Bio	3.48	0.65	3.36	0.68	3.01	0.74	3.07	0.68	3.73	0.57	3.74	0.55
Exact	3.59	0.67	3.26	0.58	2.87	0.79	3.13	0.57	3.68	0.61	3.69	0.58
Social	3.42	0.69	3.37	0.65	2.96	0.75	3.04	0.65	3.67	0.6	3.81	0.57

Note: Bio = Biological Sciences, Social = Social Sciences, Exact = Exact Sciences.

Table 3 depicts the mean values of the DTI total sum score and the general factor (*g*), calculated using a regression method, for each scientific area. Although results vary given method of score calculation, Exact sciences have the largest means.

Table 3

Mean and standard deviations of DTI scores by scientific areas

DTI	Total sum score		g factor	
	mean	SD	mean	SD
Branch				
Bio	55.22	9.83	-0.09	0.78
Exact	57.36	9.88	0.07	0.83
Social	57.06	9.29	0.01	0.82

Note: Bio = Biological Sciences, Social = Social Sciences, Exact = Exact Sciences.

4.7. Personality characteristics and scientific area choice

A multinomial logistic regression was run to predict where the individuals will place themselves, in the scientific areas, according to sex, sexual orientation, personality traits, and the DTI general (*g*) factor. A second model was run using the DTI total sum score instead of the *g* score to compare both DTI scores, showing how interpretations might differ. The model tested for *marginal effects* (δy/ δx), the change in the predicted value of a dependent variable when there is a unit change in one of the independent variables, while holding all other independent variables constant. When variables are continuous a 1-unit change in the variable is called *marginal effect*, for discrete variables, this change would be called *incremental effect* (Norton et al., 2019). However, since in this study there are both types of variables and interactions, the term *marginal effect* will be used as a standard.

Marginal effects depend on values from other explanatory variables and are not the same for the whole group, it calculates the average of the marginal effects (AME) for each observation (Norton et al., 2019). If we look at the main effect in isolation, it could be imprecise if the moderator has values that distort the relationship, the marginal effects approach incorporates multiple values of the moderator (Busenbark et al., 2022). This method controls for differences in baseline odds, as they might differ between groups (e.g., between men and women; Buis, (2010)). Basically, by calculating the marginal effect of each independent variable, researchers can estimate how changes in the values of the independent variables will affect the predicted value of the dependent variable. They are also more easily interpretable than odds ratio or estimated coefficients.

The model used the three scientific areas as the dependent variable, while for the discrete independent variables, the model automatically selects a reference category. In this case, the female sex and the bisexual sexual orientation were chosen as reference categories. Comparisons of the variables and interactions are made with these categories. Table 4 depicts all the significant findings.

Table 4

Significant marginal effects

Scientific Area	Male/X	Male/ Homo/ X	A	Het/C	O	DTI total sum score	DTI g factor
Social Sciences	**δy/δx = 0.34**	NA	NA	**δy/δx = 0.21**	**δy/δx = 0.15**	**δy/δx = 0.004**	NA
Biological Sciences	NA	**δy/δx = 0.83**	**δy/δx = -0.60**	NA	**δy/δx = -0.16**	**δy/δx = -0.005**	**δy/δx = -0.04**

Note: Variables with interactions are divided by "/". Homo = Homosexual, Het = Heterosexual. X = Extraversion, A = Agreeableness, C = Conscientiousness, O = Openness to Experience.

In the Social Sciences, the Openness trait was significant: $\delta y/\delta x = 0.15$, SE = 0.07, p = 0.03, (95% CI = 0.01 – 0.30). Meaning that there more open an individual is, for every 1-unit change in Openness, while holding all other variables constant, the marginal effect increases by 0.15. The second significant result was male's Extraversion: $\delta y/\delta x = 0.34$, SE = 0.16, p = 0.04, (95% CI = 0.01 – 0.67). That is, there is a moderation effect on Extraversion depending on the individual's sex, in this case if the person is a male, as opposed to a female, for every 1-unit change in Extraversion, the marginal increases by 0.34. A

male individual is 0.34 more likely to be in the social Sciences. The last significant result was Conscientiousness related to heterosexuals: $\delta y/\delta x = 0.21$, SE = 0.09, p = 0.01, (95% CI = 0.03 – 0.40). Again, for every 1-unit increase in Conscientiousness while being heterosexual, marginal effects increase by 0.21, when compared to bisexuals.

In the Biological Sciences the Openness trait was also significant: $\delta y/\delta x = -0.16$, SE = 0.07, p = 0.02, (95% CI = -0.30 – -0.02), but in a negative direction. This means that the as Openness increases, the likelihood is 0.16 less of being in the Biological Sciences. There was also a significant interaction between male's homosexuality and Extraversion: $\delta y/\delta x = 0.83$, SE = 0.29, $p < 0.01$, (95% CI = 0.26 – 1.40), meaning that as Extraversion increases, while being male and homosexual, it is 0.83 more likely to be in the Biological Sciences, when compared to bisexual females. The same holds true for homosexual men and Agreeableness, but in a negative direction: $\delta y/\delta x = -0.60$, SE = 0.29, p = 0.04, (95% CI = -1.18 – -0.02). In the Exact Sciences, there were no significant results.

Finally, regarding the DTI sum scores and *g* factor scores, although two models were run, it did not significantly alter the previous results, thus only the *g* factor model results were reported. As for the *g* score, it was significant in the Biological Sciences: $\delta y/\delta x = -0.04$, SE = 0.02, p = 0.04, (95% CI = -0.09 – -0.00). As the DTI *g* factor increases, it is 0.04 less likely to be in the Biological Sciences. For the DTI total sum score method, we get a significant result for the Social Sciences: $\delta y/\delta x = 0.004$, SE = 0.002, p = 0.03, (95% CI = 0.000 – 0.008), an increase likelihood of 0.004 in being in the Social Sciences, and a significant negative result in the Biological Sciences: $\delta y/\delta x = -0.005$, SE = 0.002, $p < 0.01$, (95% CI = -0.009 – -0.001), a 0.005 decrease likelihood of being in the Biological Sciences. Although the results for DTI *g* score and sum score are significant, they have all small marginal effects. It should also be considered that the magnitude of the effect depends on how the independent variable was measured. For example, if we take an increase of 0.80 in the case of personality traits, measured in a Likert type scale and computed means, this could indicate a meaningful difference in the outcome variable. In the *g* factor, results were calculated using a regression method, and the DTI total sum, simply summing all items.

4.8. Trait differences by semester segments

Multiple MANOVAs were applied to compare personality traits, divided by scientific areas, and using the semester segments as the independent variable. Twelve semesters were divided into three parts, the first segment is composed of the semesters 1 to 4, second segment, semesters 5 to 8, and third segment, semesters 9 to 12. There was no significance in any of the branches. This means that personality traits are not significantly different across the segments. Lowest p-value achieved was in the Biological Sciences, for the Honesty-Humility trait (Pillai's trace $V = 0.0217$, $F = 2.7095$, $p = 0.06$).

4.9. Discussion

The present work aimed to predict academic choices, based on personality traits, dichotomous thinking, sex, and sexual orientation. The secondary aim was to compare personality traits between semester segments, for each scientific area.

The multinomial logistic regression showed that as Openness to Experience was a significant positive predictor for the Social Sciences, as Openness increases, there is an increase of 0.15 in the likelihood of and individual finding themselves on the social Sciences and likelihood decrease by 0.16 for the Biological Sciences. As Openness increases, it is less likely for an individual to be in the Biological Sciences as opposed to the Social Sciences.

The present findings are corroborated with previous literature (Lee et al., 2022; Ludwikowski et al., 2019; Vedel, 2016), Social Sciences are the most open branch, although Openness negatively predicts being in the Biological Sciences, and there were no effects for the Exact Sciences. Although sex plays a part in major choice (Dickson, 2010; Varella et al., 2016), since we did not see any sex (and sexual orientation) interacting effects with Openness, in agreement with Vedel (2016), this could indicate that personality group differences across majors are not just sex effects, and that Openness plays an important role in academic choice.

For the Conscientiousness result, as Conscientiousness increases while being heterosexual, there is on average a 0.21 greater likelihood of being in the Social Sciences, when compared to bisexuals. In the

evolutionary past, higher Conscientiousness might have been advantageous, when events could have been predicted as individuals would gain more resources and have lower risks by being more rigid in their decision making (Ashton, 2017; Nettle, 2010). Lower Conscientiousness is related to taking immediate opportunities and more mating episodes, greater sociosexuality and faster life history strategies (Davis et al., 2019; Del Río et al., 2019; Nettle, 2006; Schmitt, 2004).

Additionally, females can score higher than males in Conscientiousness (P. T. Costa et al., 2001; Schmitt et al., 2008), and McKay and Tokar (2012) show that for women, Realistic interests can be inversely related to Conscientiousness (r = -0.19). In a recent metanalysis done by Allen and Robson (2020), exploring Big Five differences between sexual orientations, they found that between bisexuals and heterosexuals, there is a difference in Conscientiousness as bisexual men and women were lower in Conscientiousness than their heterosexual counterparts. However, the effect was greater for women[2] (k = 6, SMD = -.45 (95% CI, -.62, -.29)), than for men (k = 6, SMD = -.19 (95% CI, -.24, -.15)).

Interestingly, in our case, heterosexual individuals, independent of sex, with higher Conscientiousness tend to be in the social Sciences. In contrast to previous results, there was not a particular sex mediation, although, corroborating with previous results, bisexuals appear to be less conscientious than heterosexuals. Perhaps in some areas like economics, management, business and perhaps law, being more conscientious can be useful. For example, when working for an enterprise, in the economics/business related areas, you cannot be disorganized when managing products, people, organizing schedules or managing profits and loss. Being disorganized and lacking diligence can be a large problem for the enterprise, disrupting schedules, product deliveries and the hierarchy. Being disorganized in law can also be problematic, as the individual needs to form arguments, write reports, read, and sign documents. Those areas might also have a larger proportion of males and consequently heterosexuals, but in our case, it was related to heterosexuality only.

[2] k = number of pooled effect sizes, SMD = standardized mean difference, CI = confidence interval (computed using inverse-variance weighted random effects meta-analysis).

Extraversion also had an effect in the Social Sciences. For males, compared to females, as Extraversion increases, likelihood of being in the Social Sciences increases on average by 0.34. In the biological Sciences, specifically for homosexual males, likelihood increase by 0.83.

Regarding sexual orientation, Lippa (2008), using data of a BBC survey of 206,818 participants found that heterosexual men, when compared to bisexual men, are more extroverted (d = 0.12), homosexual men as well, when comparing to bisexual men (d = 0.13). Heterosexual women were more extraverted than bisexual women (d = 0.25), and bisexuals show more Extraversion than lesbians (d = 0.12). There were also sex differences, as women show less Extraversion than men (d = -0.17). Allen and Robson (2020) found that homosexual women had higher levels of Extraversion than heterosexual women, (k = 10, SMD = – .15 (95% CI: – .23, – .07)), but homosexual and heterosexual men did not differ in levels of Extraversion, (k = 12, SMD = .02 (95% CI: – .04, .09)).

Using the HEXACO traits, Boagert et al. (2018), did not find differences in Extraversion between heterosexual men and women, but they found differences between gays and lesbians (d = 0.15), bisexual and heterosexual men (d = -0.16), between lesbian and heterosexual women (d = -0.18), and between bisexual and heterosexual women (d = -0.26).

In this study, while being male, likelihood of being in the social Sciences increases, and the same holds true for homosexual males in the biological Sciences. Bisexual women also seem to be the group with lesser levels of Extraversion. Lesser levels of Extraversion can be seen in Exact Sciences related majors/interests, but there was not a significant result here. It could be that generally men show more Extraversion than women, and it is reflected in the Social Sciences and specifically for homosexual men in the Biological Sciences. Moreover, Social and Bio Sciences involves more contact with others than perhaps Exact Sciences. Professions like Medicine or Law, involve a lot of interactions, talking and discussing, whilst an extraverted person might deal better with that, introverts will tend to shy away or feel overwhelmed.

Lastly, a significant result was found for Agreeableness and homosexual men in the Biological Sciences. For every increase in Agreeableness, likelihood of being in the biological Sciences decrease by 0.60, when compared to bisexual females. Lippa (2008) shows that heterosexual men, when compared to gay men, are less agreeable (d = -0.34), also when compared to bisexual men (d = -0.17). For women, heterosexual women are more agreeable than lesbians and bisexual women (d = 0.14 and d = 0.24, respectively), and bisexual women are less agreeable than lesbians (d = -0.09). Sex differences were also shown, as men are less agreeable than women (d = -0.60).

Allen and Robson (2020) found that homosexual women had lower levels of Agreeableness than heterosexual women, (k = 5, SMD = – .20 (95% CI: –.33, – .07)), but that homosexual and heterosexual men did not differ in levels of Agreeableness, (k = 5, SMD = .22 (95% CI: –.06, .50)). Using HEXACO traits, Bogaert et al. (2018), showed that gays are less agreeable than lesbians (d = -0.13), and less agreeable than heterosexual men (d = -0.12). Bisexual men were also less agreeable than heterosexual men (d = -0.10) and bisexual women were less agreeable than heterosexual women (d = -0.11).

It can be that homosexual men are the least agreeable group, in the Biological Sciences the majors demand more Agreeableness, as they involve dealing with people and being empathic (see Varella et al., 2016). For example, a psychologist needs to be calm and have empathy towards the patient to understand the patient's issue and not be too combative or rude. The psychologist needs to be receptive of the patients complains. Since Agreeableness involves trust, not believing that one would be exploited, in the Bio Sciences, were human contact is involved, it makes sense to take the presupposition that the person you are dealing with is someone to trust and be empathic towards, to be agreeable.

Lastly, regarding the DTI sum scores and DTI g factor scores, the g score was significant in the Biological Sciences. As the DTI g factor increases, it is less likely to be in the Biological Sciences by on average 0.04. For the DTI total sum score method, we get a significant result for the Social Sciences, it is more likely to be on the Social Sciences as DTI total scores increases by 0.004, and a significant negative result in the Biological Sciences, it is less likely to be in the Biological Sciences as DTI scores increases

by 0.005. While the results for both DTI g score and sum score are statistically significant, the effects they have are relatively small, for the DTI sum scores method. It should be noted that interpretations might differ because of the way scores were calculated for *g* (regression method) and for the standard sum method, or if a Likert type scale was used or not.

Dark Triad traits were previously related to dichotomous thinking (Jonason et al., 2018). Dark Triad traits are Narcissism, Machiavellianism, and Psychopathy. Narcissism entails grandiosity, entitlement, and superiority, Machiavellianism is characterized by manipulation, self-service, and deceit, and Psychopathy describes an impulsiveness, lack of empathy and being erratic (Paulhus & Williams, 2002).

In a study done by Jonason et al. (2018), in the full sample, constituted by four countries (N = 1489), there were significant positive correlations between latent variance between the Dark Triad traits and dichotomous thinking traits, correlations ranged from 0.12 to 0.30 in the full sample. As Jonason et al. (2018) outs, dichotomous thinking might be a necessary bias for immediate satisfaction, creating an immediate survival focus, acquiring mates and status (Richardson & Hardesty, 2012).

Vedel and Thomsen (2017), investigating Dark Triad personality traits, also found that Economics/Business major students, when compared to Psychology students, were more Machiavellian (*d* = 0.89), narcissistic (*d* = 0.52) and psychotic (*d* = 0.75). When comparing Psychology and Law, Law students score higher on the three traits, Machiavellian (*d* = 0.44), narcissistic (*d* = 0.22) and psychotic (*d* = 0.48). Lastly, Economics/Business when compared to Law students, score higher on the three traits, Machiavellian (*d* = 0.37), narcissistic (*d* = 0.30) and psychotic (*d* = 0.28).

In a recent study by Gruda et al. (2023), investigating Machiavellianism and college majors, the results indicated that sex differences were most apparent in “person-oriented” majors (e.g., Education, female: *t* = -0.63, male: t = 0.02; Nursing, female: t = -0.59, male: t = 0.06) and “thing-oriented” majors (e.g., Law, female: t = 0.49, male: t = 0.01; Politics, female: t = -0.05, male: t = 0.49). In all majors male participants score higher than female participants on Machiavellianism. In the full sample of Jonason’s et

al. (2018) study, Machiavellianism correlated with DTI Preference for Dichotomy (r = 0.18), Dichotomous Belief (r = 0.27), and Profit-and-loss Thinking (r = 0.30).

The DTI *g* factor was a negative predictor for being in the Biological Sciences, as was the DTI total sum score method. This is congruent with the Dark Triad results of other studies, as the "person-oriented" majors show lower levels of Dark Triad traits. Using total sum score, it was a positive predictor for being in the social Sciences. Again, this is congruent with previous results using the Dark Triad, as Economics/Business and Law students score higher on these traits. These majors might reinforce an immediate survival focus for status acquisition, for example. However, Dichotomous Thinking is negatively related to Openness to Experience. Mieda and Oshio (2021), correlated HEXACO traits and the DTI, total sum scores correlated at -0.17. In our study, correlations between the *g* factor and DTI total sum score correlated at about -0.2 with Openness and Openness was a predictor for being in the social Sciences. If we take the DTI total sum score, it could be that there were enough individuals that scored highly on the DTI to show a small, but significant result, and yet, show Openness as a significant predictor.

Overall, it could mean that individuals choose scientific areas/majors according to their personality traits, as these areas/majors serve as niches in which both the individual and group optimize social interactions with partners. As Martin et al. (2022) put, personality may exhibit adaptive social plasticity mechanisms that reflect the varying costs and benefits of social behavior in different contexts.

By concentrating on tasks that correspond with their initial traits and inclinations, individuals can gain advantages from improved learning or specific-task expertise while minimizing the potential conflict with group members who are vying for similar roles. Additionally, this can encourage synergies and marginal advantages between group members who specialize in different areas (Martin et al., 2022).

4.9.1. Changes in personality by semester segments

In the present study, no significant differences between semester segments (i.e., 1 to 4, 5 to 9, and 10 to 12 semesters) were found for any of the scientific areas. This means that significant changes in

personality do not occur between segments, from beginning to end of the majors inside of the three scientific areas. Stoll et al. (2021), measuring differentiation in RIASEC interests in a span of 10 years, from the last year of high school at age 19 (T1) to 10 years after graduating (T6). The authors made measurements every 2 years and used the intraclass correlation coefficient across the six RIASEC scales (interests nested within persons) as an indicator of interest profile differentiation and change in intraclass correlation coefficients (ICCs) as an indicator of changes in interest profile differentiation. Results show that the ICCs ranged from .87 to .90, meaning that interests mostly vary within persons and not between persons.

Stoll et al. (2021) also show that considering change in profile variation (interest profile differentiation) across time, the ICCs were relatively stable. But two significant changes were found, as ICCs increased between T1 and T2 ($\ln(\Delta_t)ICC = 0.02$, $p = 0.037$) and significantly decreased from T3 to T4 ($\ln(\Delta_t)ICC = -0.04$, $p = 0.003$). Additionally, rank order stabilities ranged from .68 to .89 across the six intervals (T1 to T6), and stability coefficients increasing with age. The authors explain that their findings might indicate that the postulated increases in profile differentiation are restricted to certain life phases (i.e., a certain age span), usually in younger age groups.

The present study compared HEXACO personality traits and not RIASEC interests (although correlated), and did not compare individuals to themselves, as in a longitudinal study, but individuals in different semester groups. As Stoll et al. (2021) put, by age 19 interests are usually already well developed. Personality traits by the age twenty are also relatively well developed, and do not change after age 30, and changes are usually consistent to intrinsic development (see, P. T. Costa et al., 2019). Participants of this study have the mean age of about 24 years, if we were to see any differences, it would probably be in the first segment, but since no differences were found, it is possible that personality and vocational interest are already developed in such a manner, that individuals choose a major (inside scientific areas) based on their personalities and stick to it. The majors can be niches for individuals with similar personalities and individuals select these majors according to their personality.

4.10. General conclusion

Considering the first study, the main aim was to measure the invariance of the Dichotomous Thinking Inventory (DTI) Brazilian-Portuguese version. Because measurement invariance was found, caution is needed when interpreting the DTI findings and making conclusions. There are issues relating to scale assessment mentioned in the first study. If we were to take the *g* factor approach, using a regression score method, interpretation changes drastically than a simple sum score approach. Scales should have dimensionality assessed and see if there is an underlying construct, and that there are not multiple scales assessing different constructs.

The main aim of the study was to predict academic choices, based on personality traits, dichotomous thinking, sex, and sexual orientation. Results show that overall, Openness to Experience seems to be one of the best predictors of academic choice, since it was a predictor for both Social Sciences and Biological Sciences. However, interpretations should also be careful because of the lower than ideal Cronbach alpha for the trait (0.67). Sex, sexual orientation, and interactions with personality traits can also serve as predictors of academic choice. This could mean that these academic areas, or undergraduate majors, are kinds of niches which individuals choose according to their preferences, their personalities. Also, personality does not seem to change between semester segments in all scientific areas. This possibly means that personality and vocational interests are well developed, and that most people already know somewhat what area best fit them.

To our knowledge, this is one of the first studies combining all these variables to predict academic choices. More research focusing not only on personality traits or/and sex, and academic choices is called for. Inclusion of sexual orientation, using different methods, could yield different and interesting results. Finally, larger samples of asexual individuals could also be analyzed, as there is not much literature regarding these individuals.

5. Limitations

The study used a convenience sample, and this sample was divided somewhat arbitrarily in the three scientific areas, for example, a cluster analysis could be done, to allocate the participants according to their personality traits. Majors were not that well distributed among the three scientific areas, and sexual orientations too, as some groups were overrepresented.

The same score processes done in the first study, on the DTI, could also be done on the HEXACO inventory. Personality traits are already studied for decades with large and intercultural samples, so even if calculations of reliability and scores differ, end results might not differ as much. For example, when examining sex differences, similar results in emotionality might show up. Nonetheless, this should not be used as excuse for not improving measurements.

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7. Appendices

7.1. APPENDIX A – CEP embodied opinion

USP- INSTITUTO DE PSICOLOGIA DA UNIVERSIDADE DE SÃO

PARECER CONSUBSTANCIADO DO CEP

DADOS DO PROJETO DE PESQUISA

Título da Pesquisa: Diferenças individuais de personalidade, sexo e orientação sexual em estudantes universitários de diferentes áreas do conhecimento

Pesquisador: CHRISTIAN KENJI OLLHOFF

Área Temática:

Versão: 2

CAAE: 51519321.1.0000.5561

Instituição Proponente: UNIVERSIDADE DE SAO PAULO

Patrocinador Principal: Financiamento Próprio

DADOS DO PARECER

Número do Parecer: 5.079.013

Apresentação do Projeto:

Trata-se de projeto de Mestrado a ser desenvolvido no Instituto de Psicologia da USP. Consiste em "uma pesquisa quantitativa e correlacional que irá identificar se há variabilidade na personalidade da população universitária de diversas áreas do conhecimento, diferenciando também entre eles, sexo e orientação sexual."

Para a aferição da personalidade, propõe-se o uso do inventário de personalidade HEXACO-60, enquanto para aferição da orientação sexual será apresentada uma escala Kinsey de sete pontos com uma escala de atração sexual, um questionário sobre motivações de escolha do curso, uma escala sobre Felicidade Subjetiva (EFS), um questionário sociodemográfico, um inventário de Pensamento Dicotômico (IPD) e uma escala de Masculinidade-Feminilidade Tradicional (MFT).

Objetivo da Pesquisa:

Objetivo primário: identificar se há variação nos traços de personalidade de estudantes de diferentes períodos, em diferentes áreas do conhecimento, em nível de graduação no ensino superior.

Objetivo secundário

1. Comparar traços de personalidade entre sexos e orientações sexuais de estudantes de graduação.
2. Comparar traços de personalidade de estudantes de graduação entre as diferentes áreas do

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conhecimento.

3. Verificar a correlação do grau de masculinidade-feminilidade e as orientações sexuais.

4. Identificar possíveis diferenças de dicotomia de pensamento dos participantes.

5. Identificar motivações de escolha de curso e área do conhecimento.

Avaliação dos Riscos e Benefícios:

Riscos

De acordo com o pesquisador, "a participação pode gerar ansiedade, dúvidas, reflexões e cansaço."

Benefícios

De acordo com o pesquisador, "melhor compreensão da personalidade individual e de outras pessoas; feedback da personalidade individual."

Comentários e Considerações sobre a Pesquisa:

Os participantes são estudantes universitários de graduação maiores de idade, a serem identificados e recrutados por meio de lista de e-mail e mídias sociais (WhatsApp, Facebook e Instagram). O "n" amostral total é de cerca de 600 estudantes. A pesquisa será respondida pelos participantes de forma online.

Os dados coletados consistem em informações sócio demográficas, motivações, orientação sexual, traços de personalidade, dicotomia de pensamento e masculinidade-feminilidade. Após a coleta de dados, os participantes receberão seus resultados do teste de personalidade. Espera-se que, deste modo, a participação seja mais atrativa, aumentando a adesão à pesquisa.

Os cursos serão divididos em três áreas do conhecimento: ciências humanas (administração, artes, música, direito, economia, jornalismo, pedagogia, linguagens, turismo, filosofia, letras e geografia), ciências biológicas (educação física, psicologia, farmácia, medicina, medicina veterinária, odontologia, biologia, fonoaudiologia, enfermagem, fisioterapia e nutrição) e ciências exatas (engenharia civil, mecânica, elétrica, e da produção, estatística, computação, geologia, matemática, física e química). Dentro das áreas, os semestres dos cursos de graduação serão divididos em quatro períodos: 1° ao 3° semestre, 4° ao 6° semestre, 7° ao 9° semestre e 10° ao 12° semestre.

Considerações sobre os Termos de apresentação obrigatória:

1. Foi apresentado TCLE no qual constam informações sobre o objetivo do estudo e suas etapas, além de esclarecer o participante sobre os riscos da pesquisa e as correspondentes providências a serem tomadas pelo pesquisador. Assegura-se, ainda a possibilidade de desistência do

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participante a qualquer momento da pesquisa, bem como o sigilo de dados e a confidencialidade da identidade do participante. Também está prevista indenização quando couber.
2. Foi apresentada uma justificativa para a ausência de Declaração de Instituição e Infraestrutura, uma vez que a pesquisa será realizada de forma remota.

Conclusões ou Pendências e Lista de Inadequações:

O projeto está aprovado.

Considerações Finais a critério do CEP:

Considerações finais a critério do CEP:

Diante do exposto, o Comitê de Ética em Pesquisa com Seres Humanos, de acordo com as atribuições definidas na Resolução CNS nº 510 de 2016, na Resolução CNS nº 466 de 2012 e na Norma Operacional nº 001 de 2013 do CNS, manifesta-se pela aprovação do projeto de pesquisa proposto.

Situação: Protocolo aprovado.

Este parecer foi elaborado baseado nos documentos abaixo relacionados:

Tipo Documento	Arquivo	Postagem	Autor	Situação
Informações Básicas do Projeto	PB_INFORMAÇÕES_BÁSICAS_DO_PROJETO_1810566.pdf	15/09/2021 13:51:33		Aceito
Declaração de Instituição e Infraestrutura	justificativa_ausencia_infraestrutura.pdf	15/09/2021 13:48:12	CHRISTIAN KENJI OLLHOFF	Aceito
Declaração de Pesquisadores	termo_compromisso_pesquisador.docx	31/08/2021 09:08:30	CHRISTIAN KENJI OLLHOFF	Aceito
Projeto Detalhado / Brochura Investigador	projeto_plataforma.docx	31/08/2021 09:06:40	CHRISTIAN KENJI OLLHOFF	Aceito
Folha de Rosto	folha_de_rosto_assinada.pdf	20/08/2021 12:15:28	CHRISTIAN KENJI OLLHOFF	Aceito
Outros	escala_mft.docx	17/08/2021 11:24:45	CHRISTIAN KENJI OLLHOFF	Aceito
Outros	motivacoes_escolha.docx	17/08/2021 11:23:48	CHRISTIAN KENJI OLLHOFF	Aceito
Outros	felicidade_subjetiva.docx	17/08/2021 11:22:56	CHRISTIAN KENJI OLLHOFF	Aceito
Outros	hexaco60.doc	17/08/2021 11:22:27	CHRISTIAN KENJI OLLHOFF	Aceito

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Outros	dti.pdf	17/08/2021 11:21:31	CHRISTIAN KENJI OLLHOFF	Aceito
Outros	sociodemografico.docx	17/08/2021 11:20:28	CHRISTIAN KENJI OLLHOFF	Aceito
Outros	escala_kinsey_atracao.docx	17/08/2021 11:18:20	CHRISTIAN KENJI OLLHOFF	Aceito
Cronograma	cronograma.docx	17/08/2021 11:17:52	CHRISTIAN KENJI OLLHOFF	Aceito
TCLE / Termos de Assentimento / Justificativa de Ausência	tcle.docx	17/08/2021 11:17:31	CHRISTIAN KENJI OLLHOFF	Aceito

Situação do Parecer:
Aprovado

Necessita Apreciação da CONEP:
Não

SAO PAULO, 04 de Novembro de 2021

Assinado por:
Leila Salomão de La Plata Cury Tardivo
(Coordenador(a))

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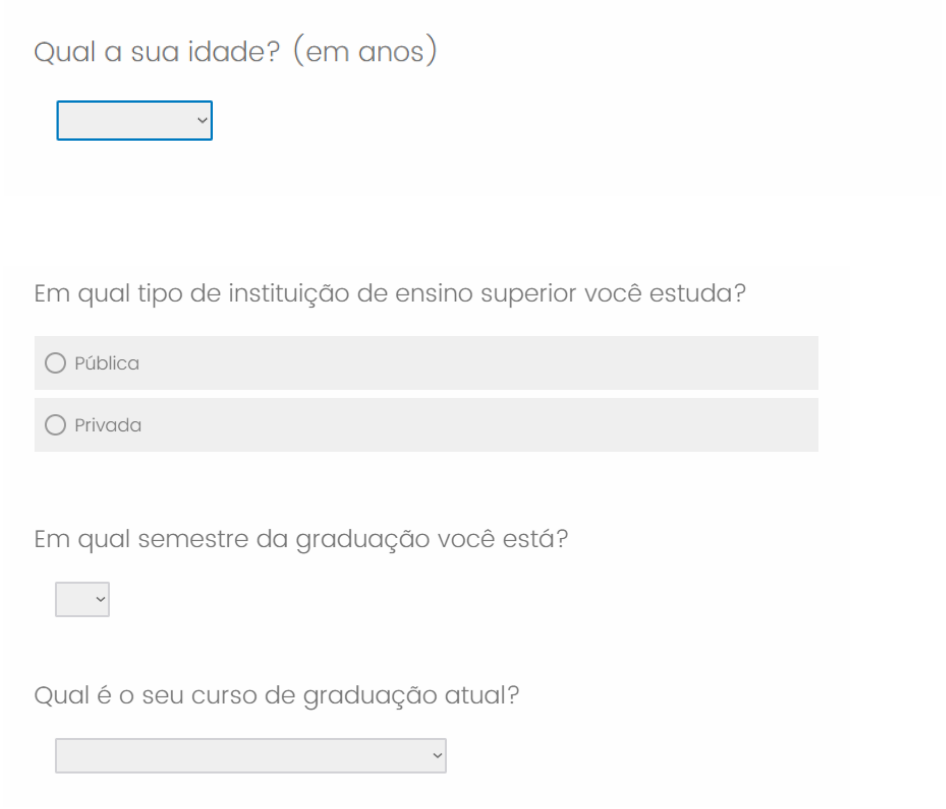
7.2. APPENDIX B – Sociodemographic questionnaire



De qual região?

- ○ Norte
- ○ Nordeste
- ○ Centro-Oeste
- ○ Sudeste
- ○ Sul

Segundo os critério do IBGE, você se autodeclara com qual cor de pele?

- ○ Branca
- ○ Preta
- ○ Parda
- ○ Amarela
- ○ Indígena
- ○ Outra (especifique)

Qual é aproximadamente a sua renda familiar mensal? (soma da renda individual dos moradores de seu domicílio)

- ◯ Até 1 salário-mínimo (até R$ 1.100)
- ◯ De 1 a 3 salários-mínimos (de R$ 1.100 até R$ 3.300)
- ◯ De 3 a 6 salários-mínimos (de R$ 3.300 até R$ 6.600)
- ◯ De 6 a 9 salários-mínimos (de R$ 6.600 até R$ 9.900)
- ◯ De 9 a 12 salários-mínimos (de R$ 9.900 até R$ 13.200)
- ◯ De 12 a 15 salários-mínimos (de R$ 13.500 até R$ 16.500)
- ◯ Mais que 15 salários-mínimos (mais que R$ 16.500)

Qual é seu sexo?

- ◯ Masculino
- ◯ Feminino
- ◯ Outro (especifique)

Com qual gênero você se identifica?

- ◯ Homem
- ◯ Mulher
- ◯ Não-Binário
- ◯ Outro (especifique)

Qual é seu status de relacionamento?

- ○ Solteiro(a)
- ○ Em um relacionamento casual ou não comprometido
- ○ Não casado(a), mas em um relacionamento sério
- ○ Casado(a)
- ○ Outro (especifique)

Você tem um relacionamento com mais de um(a) parceiro(a)?

- ○ Sim
- ○ Não

7.3. APPENDIX C – Brazilian-Portuguese Dichotomous Thinking Inventory (DTI)

Inventário de Pensamento Dicotômico (IPD)

Até que ponto você concorda com as afirmações a seguir? Para cada afirmação, por favor assinale um dos pontos da escala que vão de 1= discordo totalmente até 6= concordo totalmente.

1= Discordo totalmente	2= Discordo	3= Discordo um pouco	4= Concordo um pouco	5= Concordo	6= Concordo totalmente

		1	2	3	4	5	6
IPD1	Todas as coisas funcionam melhor quando interesses e desinteresses estão claros.	O	O	O	O	O	O
IPD2	Existem apenas "ganhadores" e "perdedores" neste mundo.	O	O	O	O	O	O
IPD3	Eu quero claramente distinguir entre o que é seguro e o que é perigoso.	O	O	O	O	O	O
IPD4	As coisas funcionam melhor quando até mesmo ambiguidades são esclarecidas.	O	O	O	O	O	O
IPD5	Penso que todas as pessoas podem ser divididas em "ganhadores" e "perdedores".	O	O	O	O	O	O
IPD6	As informações devem ser classificadas como verdadeiras ou falsas.	O	O	O	O	O	O
IPD7	Atitudes ambíguas me desagradam.	O	O	O	O	O	O
IPD8	Pessoas podem ser claramente diferenciadas como "boas" ou "más".	O	O	O	O	O	O
IPD9	Eu quero ter claramente definido se as coisas são boas ou não para mim.	O	O	O	O	O	O
IPD10	Eu quero ter claro se as coisas são "boas" ou "más".	O	O	O	O	O	O
IPD11	Todas as questões têm ou respostas certas, ou respostas erradas.	O	O	O	O	O	O
IPD12	Eu prefiro classificar informações como sendo úteis ou inúteis para mim.	O	O	O	O	O	O
IPD13	É bom quando os limites estão claros para todas as coisas.	O	O	O	O	O	O
IPD14	Penso em todo mundo como sendo meu amigo ou meu inimigo.	O	O	O	O	O	O
IPD15	É melhor quando as competições têm resultados claros.	O	O	O	O	O	O

Fator 1= Preferência pela dicotomia – Itens 1 + 4 + 7 + 10 + 13
Fator 2= Pensamento de ganhos-e-perdas – Itens 2 + 5 + 8 + 11 + 14
Fator 3= Crenças dicotômicas – Itens 3 + 6 + 9 + 12 + 15

7.4. APPENDIX D – Brazilian-Portuguese HEXACO-60

HEXACO-PI-R

(Forma de autorrelato)

VERSÃO EM PORTUGUÊS - BRASIL

INSTRUÇÕES

Nas próximas páginas você vai encontrar uma série de declarações sobre você. Por favor, leia cada declaração e decida o quanto você concorda ou discorda com o quanto a declaração descreve você. Escreva sua resposta no espaço junto à declaração, usando a escala a seguir:

5 = concordo fortemente
4 = concordo
3 = neutro (nem concordo, nem discordo)
2 = discordo
1 = discordo fortemente

Por favor, responda a todas as declarações mesmo que você não esteja completamente seguro sobre suas respostas.

Por favor, forneça as informações seguintes sobre você.

1 _____ Ficaria muito entediado numa visita a uma galeria de arte.
2 _____ Planejo e organizo as coisas com antecedência para evitar problemas de última hora.
3 _____ Raramente guardo rancor, mesmo contra pessoas que foram injustas comigo.
4 _____ No geral, me sinto razoavelmente satisfeito comigo mesmo.
5 _____ Sentiria medo se tivesse que viajar com tempo ruim.
6 _____ Eu não bajularia alguém para conseguir um aumento ou promoção no trabalho, mesmo achando que daria certo.
7 _____ Estou interessado em aprender sobre história e política de outros países.
8 _____ Costumo me cobrar muito quando tento alcançar um objetivo.
9 _____ Algumas vezes, me dizem que sou muito crítico com os outros.
10 _____ Raramente expresso minhas opiniões em reuniões em grupo.
11 _____ Às vezes não consigo deixar de me preocupar com coisas pequenas.
12 _____ Se eu soubesse que nunca seria pego, estaria disposto a roubar um milhão de reais.
13 _____ Gostaria de criar uma obra de arte, como um livro, uma música ou uma pintura.
14 _____ Presto pouca atenção aos pequenos detalhes quando estou trabalhando em algo.
15 _____ Algumas vezes, me dizem que sou muito teimoso.
16 _____ Prefiro trabalhos que envolvam interação social do que trabalhos solitários.
17 _____ Quando passo por uma experiência dolorosa preciso de alguém para me fazer sentir bem.
18 _____ Ter muito dinheiro não é especialmente importante para mim.
19 _____ Eu acho que prestar atenção em ideias radicais é uma perda de tempo.
20 _____ Tomo minhas decisões no calor do momento, e não com base em uma reflexão mais cuidadosa.
21 _____ As pessoas pensam que eu tenho um temperamento explosivo.
22 _____ Na maioria dos dias, me sinto alegre e otimista.
23 _____ Sinto vontade de chorar quando vejo outra pessoa chorando.
24 _____ Acredito que mereço mais respeito do que a maioria das pessoas.
25 _____ Se eu tivesse oportunidade, gostaria de ir a um concerto de música clássica.
26 _____ Às vezes tenho dificuldades quando estou trabalhando por ser desorganizado.
27 _____ Meu comportamento com pessoas que me trataram mal é "perdoar e esquecer".
28 _____ Sinto que sou uma pessoa impopular.
29 _____ Quando diz respeito a perigos físicos, fico com muito medo.
30 Se quero algo de alguém, vou rir até de suas piores piadas.

31 _____ Eu realmente nunca gostei de ler enciclopédia.
32 _____ Esforço-me o mínimo necessário para cumprir uma atividade.
33 _____ Tendo a ser tolerante ao julgar os outros.
34 _____ Em situações sociais, normalmente sou aquele que dá o primeiro passo.
35 _____ Preocupo-me bem menos com as coisas do que a maioria das pessoas.
36 _____ Nunca aceitaria suborno, mesmo se fosse muito grande.
37 _____ Muitas vezes me dizem que tenho uma boa imaginação.
38 _____ Sempre busco ser cuidadoso no trabalho, mesmo que leve muito tempo.
39 _____ Normalmente sou bastante flexível em minhas opiniões quando as pessoas discordam de mim.
40 _____ A primeira coisa que sempre faço em um novo lugar é fazer amigos.
41 _____ Consigo lidar com situações difíceis sem a necessidade de apoio emocional de outra pessoa.
42 _____ Teria muito prazer em possuir coisas caras e luxuosas.
43 _____ Gosto de pessoas com pontos de vista não convencionais.
44 _____ Cometo muitos erros, porque não penso antes de agir.
45 _____ A maioria das pessoas tende a ficar com raiva mais rápido do que eu.
46 _____ As pessoas são mais otimistas e dinâmicas do que geralmente eu sou.
47 _____ Sinto fortes emoções quando alguém próximo está indo embora por um longo tempo.
48 _____ Quero que as pessoas saibam que sou uma pessoa importante, de *status* elevado.
49 _____ Não me vejo como uma pessoa artística ou criativa.
50 _____ Frequentemente as pessoas me chamam de perfeccionista.
51 _____ Mesmo quando as pessoas cometem muitos erros, é muito raro eu falar algo negativo.
52 _____ Às vezes sinto que sou uma pessoa sem valor.
53 _____ Mesmo em uma situação de emergência eu não entraria em pânico.
54 _____ Não fingiria gostar de alguém apenas para conseguir favores.
55 _____ Acho chato discutir filosofia.
56 _____ Prefiro fazer o que me vem a cabeça, ao invés de manter um plano.
57 _____ Quando alguém me diz que estou errado minha primeira reação é discutir.
58 _____ Quando estou em grupo, muitas vezes sou aquele quem fala em nome do grupo.
59 _____ Permaneço indiferente mesmo em situações em que a maioria das pessoas fica sentimental.
60 _____ Ficaria tentado a usar dinheiro falsificado se eu tivesse certeza que não seria pego.

7.5. APPENDIX E – Kinsey Scale

Assinale na escala a seguir, com qual orientação sexual você mais se identifica. Por exemplo, assinale (0) se você somente possui desejo e/ou interações sexuais por alguém do sexo oposto,

ou assinale (6) se você somente possui desejo e/ou interações sexuais por alguém do mesmo sexo.

- ☐ 0 - Exclusivamente heterossexual
- ☐ 1 - Predominantemente heterossexual, mas incidentalmente homossexual
- ☐ 2 - Predominantemente heterossexual, entretanto, mais que incidentalmente homossexual
- ☐ 3 - Igualmente heterossexual e homossexual
- ☐ 4 - Predominantemente homossexual, entretanto, mais que incidentalmente heterossexual
- ☐ 5 - Predominantemente homossexual, mas incidentalmente heterossexual
- ☐ 6 - Exclusivamente homossexual
- ☐ Não tenho atração por nenhum gênero