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# The Big Five Personality Traits in Dyslexic Adults: An Exploratory Study

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## Abstract

Background: Dyslexia is a neurodevelopmental disorder that causes a pattern of learning difficulties that can be characterized by deficits in word reading accuracy, speed or fluency, and reading comprehension. Due to all this damage, emotional difficulties have been described in the literature mainly for childhood and adolescence. Within this emotional component, personality can be included. In Brazil, at the time of carrying out this research, no research had been found that investigated the personality of dyslexic adults. Thus, the present study aimed to investigate the personality of Brazilian adults with dyslexia.

Methods: A semi-structured interview was administered and the Factorial Personality Battery, based on the Big Five personality traits. The sample was composed of two groups: one with dyslexia and another control. The first was formed by nine participants, aged between 18 and 47 (M = 31.7; standard deviation (SD) = 11.8), six of whom were women. The control group was formed by 60 participants, aged between 18 and 45 years (M = 26.4; SD = 8.8), 38 of whom were women.

Results: The data did not show significant differences between the groups in most of the analyzed factors and subfactors. Increased rates of "passivity/lack of energy" and lowered rates of "openness to new ideas" were identified in the group with dyslexia.

Conclusion: These results could be useful for describing personality profiles in dyslexic adults, with these descriptions possibly providing clinical support for diagnoses and intervention procedures.

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## Keywords

dyslexia; personality; learning disabilities; adult; psychometrics

## Introduction

According to the Diagnostic and Statistical Manual of Mental Disorders (DSM-5-TR) [1], dyslexia, also referred to as "developmental dyslexia" [2], is one of the most common Specific Learning Disorders (SLDs), with this diagnostic typology being the focus of the entire description in this article. The DSM-5-TR [1] indicates a prevalence of 5 to 15% for SLDs among school-aged children, while in adults, the prevalence is unknown, however, can approach 4%. A specific prevalence for dyslexia is not provided. In addition to this, symptom manifestation can change over time, presenting either a persistent or changing set of learning difficulties [1].

Dyslexia involves a pattern of learning difficulties characterized by deficits in word reading accuracy, reading speed or fluency, and reading comprehension [1]. It is related to specific brain functioning and, consequently, cognitive processing, which may involve singular or multiple deficits [3]. One of the most frequently studied singular deficits with consistent empirical findings is in phonological processing, where certain linguistic impairments hinder word recognition, spelling, and word decoding [4].

In adults, clinical indicators include avoiding activities that require academic skills and low levels of reading abilities impacting professional performance or daily activities that require these [1]. Furthermore, in a meta-analysis study focusing on this age group and analyzing 178 publications, it was shown that cognitive difficulties generally persist over the years (such as difficulties in phonological awareness, rapid automatic naming, phonological mem-

ory, verbal working memory, and vocabulary). However, deficits become more prominent in skills requiring higher processing speed compared to phonological skills [5].

Similarly, emotional difficulties have also been described in the literature. A meta-analysis study that retrieved only 15 studies for its sample, without a specific starting year and published up to 2011, found rates of internalizing problems persist in adults (primarily depression and anxiety) [6]. Recent empirical studies have also shown results consistent with these findings [7,8]. Nevertheless, emotional performance profiles in dyslexic adults have been poorly investigated. It is also important to describe other related emotional constructs, beyond depression and anxiety, such as personality, that are included in the framework [9].

Personality can be defined as a comprehensive phenomenon involving a set of stable patterns of affective, cognitive, and behavioral dimensions in humans [10]. Research stemming from factorial and trait models has shown the existence of a well-accepted theoretical model among psychometricians, called the "Big Five personality traits" (BFPT) [11,12]. This theory has been one of the most important for describing personality structure, mainly due to its universality and applicability, ensuring more reliable results [13]. The five factors are extraversion, neuroticism, agreeableness, conscientiousness, and openness to experience [14].

Studies using the BFPT or other personality models were non-existent in the Brazilian literature that investigates adults with dyslexia until the moment this research was carried out. For this reason, none of the studies that will be presented below in this introduction section belong to that country.

Among the studies found that used the BFPT model, there are those carried out by Tops *et al*. [15], Gagliano *et al*. [16] and Saied [17]. The first was the only one that investigated adults. The authors compared the personality profile with the "NEO-PI-R" questionnaire of a group of 100 university students with dyslexia to a control group of 100 students without learning difficulties. The results showed no differences between the groups, suggesting that students with dyslexia did not perceive themselves differently from their non-dyslexic peers.

Gagliano *et al*. [16] analyzed the personality of children and adolescents, with 65 dyslexic and 70 non-dyslexic participants, assessed using the child version of the "Big Five Questionnaire". The results indicated that the dyslexic group exhibited personality traits characterized by lower originality and creativity, limited control over emotional reactions, fluctuating moods, and negative affections. Additionally, it was found that the later the dyslexia diagnosis, the more pronounced the emotional instability became. They inferred that long-term academic failure negatively affected the emotional experiences of this population.

In a study by Saied [17], associations between executive functions (EFs), gender, and personality traits were examined in students with and without specific learning disabilities, aged 11 to 12 years. Of the 80 participants, 40 had a diagnosis of this condition. All the students were tested using two instruments, one for EFs, called the "Executive Skills in Children and Adolescents Questionnaire", and another for personality traits, called "The Personality Trait Questionnaire", also based on the BFPT. This study found a significant difference between the two groups in all EF and personality trait measures. In EFs, there were declines in abilities such as working memory, emotional control, organization, planning, etc. In personality, there were higher scores in neuroticism and lower scores in extraversion, agreeableness, conscientiousness, and openness to experience. Significant relationships between EFs and personality traits were also found in some of the measures tested in the population studied. The author emphasized the importance of further investigating the interactions between these constructs.

The study of Kosmos and Kidd [18] used the "300 Word Adjective Check List" scale, which does not rely on the BFPT but on another empirically based model without prior theory. They sought to identify possible differences in personality traits between dyslexic and non-dyslexic adults, with 50 participants in each group, aged 21 to 73 years. The results showed significant differences between the two groups, with dyslexic males scoring lower in the Favorable Adjectives Checked, Achievement, Dominance, Intraception, Heterosexuality, Self-confidence, Personal Adjustment, Ideal Self, and Military Leadership scales.

In another study by Jensen *et al*. [19], the "Karolinska Scales of Personality" (KSP) inventory, based on psychopathology theories, was used. They assessed 63 Swedish prisoners aged 19 to 57 years, diagnosed with dyslexia. The results demonstrated poorer performance in tests measuring non-verbal abilities, as well as higher frequencies of paranoid and avoidant personality disorders in this population. Higher levels of anxiety and lower socialization were also found.

In a study conducted by Huang *et al*. [20], the authors aimed to identify familial environmental factors for dyslexia and to evaluate the personality, behavioral characteristics, and quality of life of children with dyslexia. A

total of 60 children diagnosed with dyslexia and 180 children without the condition, aged between 7 and 12 years, were assessed. For the personality evaluation, a child version of the Eysenck Personality Questionnaire (EPQ) was used, based on Hans Eysenck's theory, which involves three major factors: extraversion/introversion, neuroticism/emotional stability, and psychoticism/socialization. The results showed that the children with dyslexia had significantly higher scores in psychoticism and neuroticism and lower scores in extraversion compared to the children without reading difficulties.

Considering the scarcity of Brazilian studies on this topic, as well as the methodological differences and inconsistencies in the findings presented, the present study was proposed. It is known that personality characteristics can be influenced by sociocultural variables [11]. The question was whether the pattern found in Brazilian dyslexics would be similar or not to the patterns found in other countries. Therefore, the current research aimed to investigate the personality in adult individuals with dyslexia from Brazil. For this purpose, an instrument based on the BFPT was adopted, using a methodology that included a control group and a cross-sectional design.

## Materials and Methods

*Participants*

The participants were divided into two groups: dyslexia and control. The dyslexia group consisted of nine participants, including six females, aged between 18 and 47 years (M = 31.7; standard deviation (SD) = 11.8), with four having completed higher education. Regarding this number of participants, it is important to highlight that diagnosing dyslexia is still an expensive process in Brazil. There are no public policies for this to be carried out free of charge. Thus, it becomes an underdiagnosed condition due to the country's socioeconomic standard. Unfortunately, research with this diagnostic group ends up being carried out with a low number of participants [7].

The control group was composed of 60 participants, including 38 females, aged between 18 and 45 years (M = 26.4; SD = 8.8), with 39 having completed higher education. The groups were compared regarding these variables, and no statistically significant differences were found: age (U = 236; $p$ = 0.283; $r$ = 0.07); gender ($\chi^2$ = 0.038; $p$ = 0.846; V = 0.024); education level (F = 3.664; $p$ = 0.304; V = 0.237).

The inclusion criteria adopted for both groups were: minimum age of 18 years; and minimum education of completed high school. Specifically for Group 1: having a dyslexia diagnosis conducted by the Specialized Center for Learning Disabilities, a commercial partner of Brazilian Dyslexia Association; presenting only comorbidity with Attention Deficit Hyperactivity Disorder (ADHD), among the various neuropsychiatric disorders. Specifically for Group 2: not reporting a history of learning difficulties in general, according to self-report. The exclusion criterion for both groups was reporting difficulty in understanding any item of the instrument to be answered.

*Instruments*

Semi-structured Interview

This consisted of the following questions: (a) Was your dyslexia diagnosis conducted by the Specialized Center for Learning Disabilities, a commercial partner of Brazilian Dyslexia Association? (please provide proof by sending an image of the report, which can be done after this interview); (b) Did you have any comorbidities (other diagnoses along with dyslexia) as a result of the evaluation, if so which ones? (c) How old were you when you were diagnosed? (d) What interventions did you undergo previously and/or subsequently? (e) How long did you participate in each intervention in total? (f) What is your level of education? (g) What is your age? And (h) What is your gender?

The Factorial Personality Battery (Bateria Fatorial de Personalidade—BFP)

The BFP [21] is an inventory based on the BFPT. These factors are defined as follows: (1) Neuroticism (NN): concerns the emotional adjustment level (sub-factors: N1—vulnerability, N2—emotional instability, N3—passivity/lack of energy, N4—depression); (2) Extroversion (EE): the quantity and intensity of social interactions an individual can have (sub-factors: E1—communication, E2—assertiveness, E3—dynamism, E4—social interactions); (3) Sociability (SS): the quality of interpersonal relationships (sub-factors: S1—friendliness, S2—pro-social behavior, S3—trust); (4) Achievement (AA): the individual's ability for organization, persistence, control, and motivation to achieve their goals (sub-factors: A1—competence, A2—thoughtfulness/prudence, A3—effort/commitment); and (5) Openness to experience (OO): exploratory behaviors and recognition of exposure to new experiences (sub-factors: O1—openness to new ideas, O2—liberalism, O3—novelty seeking). The reliability indices of the scores comprising the neuroticism factor ranged

from 0.75 to 0.91; for the extroversion factor, between 0.66 and 0.90; for the sociability factor, between 0.72 and 0.82; for the achievement factor, between 0.65 and 0.82; and for the openness factor, between 0.68 and 0.82.

*Data Collection Procedure*

Participants in the dyslexia group were recruited by convenience based on recommendations from Specialized Center for Learning Disabilities, a commercial partner of Brazilian Dyslexia Association, during the months of May to September 2021. The project was initially submitted to the Ethics Committee of the Bauru School of Dentistry of the University of São Paulo. Conforming to the Declaration of Helsinki [22], has been approved, by the authorization number CAAE 65477822.1.0000.5417. The researchers contacted potential participants through social media platforms such as WhatsApp®. Upon contacting a chosen participant, the aim of the research was explained, and their willingness to participate was sought. If they agreed, they were asked to read and sign the consent form online. Subsequently, a semi-structured interview lasting around 10 minutes was conducted. Inclusion criteria were assessed, and the individuals were informed of their eligibility to join the investigation group.

Participants in the control group were also selected by convenience, during the months of June to September 2022. The aim was to match their age, gender, and education level as closely as possible to those of the dyslexia group already recruited. The researchers also contacted them through social media, explained the research, and asked if they would like to participate. If they agreed and confirmed they did not have a history of learning difficulties in general, they were asked to read and sign the consent form online.

All participants were asked to provide their home addresses and were informed that the response sheets for the BFP would be sent to them via mail. They were informed that completing the questionnaire would take an average of 15 minutes. This process was necessary because the published instruments are copyrighted and cannot be reproduced or digitized. Participants were informed that a psychologist researcher would be available via social media for any discomfort, questions, or if they wished to terminate their participation. The researcher was also available to help understand any item on the questionnaire. The participants who had difficulty understanding any item would be excluded from the study; however, no participants were excluded. Finally, the participants were instructed to return the completed materials via mail. The researcher reiterated that they would cover all costs, although this information was already stated in the consent form.

*Data Analysis Procedure*

Initially, spreadsheets were created for data entry using the Microsoft Excel® software (version 365, Microsoft Corporation, Redmond, WA, USA.). Subsequently, these spreadsheets were analyzed using the Jamovi software (version 1.2, The Jamovi Project, Tighes Hill, NSW, Australia). Descriptive statistics were used to obtain the frequency, mean, and standard deviation data. Due to the sample size and the absence of normal distribution, non-parametric inferential statistical analysis was selected. The adopted levels of significance were $p < 0.05$. A cross-sectional analysis was carried out, comparing the group with dyslexia with the control group.

The Mann-Whitney U test was used for numerical data, specifically for between-group comparisons of the age and raw values obtained in the BFP. The effect size was assessed using "*r*", calculated as "*z* (calculated by the Mann-Whitney test) divided by the square root of n (total number of cases)". Reference values for this analysis were: values <0.29 indicating a small effect; >0.30 a medium effect; >0.50 a large effect [23].

The Chi-square test was employed for nominal data, for expected values <5, Fisher's Exact test (F) was used. Specifically for between-group comparisons of gender was used the Chi-square test and for educational level was used the Fisher's Exact test. The effect size was assessed using Cramer's V (V). Reference values for V were: <0.2 indicating a small effect; >0.2 to 0.6 a medium effect; >0.6 a large effect [23].

## Results

Table 1 presents other interesting data obtained from the semi-structured interview conducted with the dyslexia group. It was found that the age of diagnosis was almost evenly split between childhood and adulthood. The majority had ADHD as a comorbidity (n = 6). The intervention time in years was identified. In this case, values of 0.50 in Table 1 represent six months. Most either had not received any psychological intervention or had received it for a year or less (n = 6). Concerning speech therapy, psychopedagogical, and medical interventions, a little over half had not received them or had received them for less than a year (n = 5). Interestingly, those participants diagnosed in childhood were more likely to have received interventions in terms of quantity and duration.

The raw numerical values obtained from the instrument were analyzed, and are presented in Table 2. Both descriptive and inferential statistics are included in it.

**Table 1. Data on diagnosis and intervention.**

| Age at diagnosis | n | % | Comorbidity | n | % |
|---|---|---|---|---|---|
| 7 | 1 | 11.1 % | None | 3 | 33.3 % |
| 9 | 3 | 33.3 % | ADHD | 6 | 66.7 % |
| 24 | 1 | 11.1 % | | | |
| 33 | 1 | 11.1 % | | | |
| 34 | 1 | 11.1 % | | | |
| 41 | 1 | 11.1 % | | | |
| 43 | 1 | 11.1 % | | | |
| Psy. intervention | n | % | Psy. intervention time[a] | n | % |
| No | 4 | 44.4 % | 0 | 4 | 44.4 % |
| Yes | 5 | 55.6 % | 0.50 | 1 | 11.1 % |
| | | | 1.00 | 1 | 11.1 % |
| | | | 4.00 | 1 | 11.1 % |
| | | | 5.00 | 1 | 11.1 % |
| | | | 10.00 | 1 | 11.1 % |
| Speech. intervention | n | % | Speech. intervention time[a] | n | % |
| No | 4 | 44.4 % | 0 | 4 | 44.4 % |
| Yes | 5 | 55.6 % | 0.50 | 1 | 11.1 % |
| | | | 4.00 | 2 | 22.2 % |
| | | | 5.00 | 1 | 11.1 % |
| | | | 10.00 | 1 | 11.1 % |
| Psy-Ped. intervention | n | % | Psy-Ped. intervention time[a] | n | % |
| No | 3 | 33.3 % | 0 | 3 | 33.3 % |
| Yes | 6 | 66.7 % | 0.50 | 1 | 11.1 % |
| | | | 1.00 | 1 | 11.1 % |
| | | | 4.00 | 2 | 22.2 % |
| | | | 5.00 | 1 | 11.1 % |
| | | | 10.00 | 1 | 11.1 % |
| Psych./Neur. intervention | n | % | Psych./Neur. intervention time[a] | n | % |
| No | 4 | 44.4 % | 0 | 4 | 44.4 % |
| Yes | 5 | 55.6 % | 1.00 | 1 | 11.1 % |
| | | | 3.00 | 1 | 11.1 % |
| | | | 5.00 | 1 | 11.1 % |
| | | | 10.00 | 2 | 22.2 % |

Legend: ADHD, Attention Deficit Hyperactivity Disorder; Psy., psychological; Speech., Speech Therapy; Psy-Ped., Psychopedagogical; Psych./Neur., Psychiatric/Neurological; [a], the intervention time was identified in years; in this case, values of 0.50 represent six months.

According to the analysis of the "*p*" significance value, the groups differed in "passivity/lack of energy (N3)" ($p = 0.006$; $r = 0.33$) with dyslexic individuals showing higher scores, and in "openness to new ideas (O1)" ($p = 0.006$; $r = 0.33$) and "competence (A1)" ($p = 0.044$; $r = 0.24$) with them showing lower scores. However, the effect size indicated a "small" difference for this latter subfactor, which was then considered not to be significant between the groups.

## Discussion

According to the results obtained, statistically significant differences were found between the groups in only two of the analyzed subfactors: "passivity/lack of energy" and "openness to new ideas". Adult dyslexic individuals scored higher in the former, which, according to the BFP manual, indicates a high frequency of procrastination behaviors, difficulties in starting tasks and maintaining motivation for long or difficult tasks, tending to abandon them before completion. Additionally, individuals with this profile

**Table 2. Descriptive statistics and comparative analysis of groups regarding numerical data obtained in the BFP for only statistically significant data.**

| Variables | Group | Mdn | IQR | Q1 | Q3 | $p$ [a] | Z | $r$ | Interp. |
|---|---|---|---|---|---|---|---|---|---|
| Neuroticism (NN) | Control | 3.30 | 1.55 | 2.73 | 4.28 | 0.203 | –1.283 | 0.16 | Small |
| | Dyslexia | 3.99 | 1.65 | 3.20 | 4.85 | | | | |
| Vulnerability (N1) | Control | 3.89 | 1.89 | 3.00 | 4.89 | 0.301 | –1.043 | 0.13 | Small |
| | Dyslexia | 4.67 | 2.00 | 3.67 | 5.67 | | | | |
| Emotional instability (N2) | Control | 3.33 | 1.83 | 2.50 | 4.33 | 0.972 | –0.045 | 0.01 | Small |
| | Dyslexia | 3.50 | 1.66 | 2.67 | 4.33 | | | | |
| Passivity/lack of energy (N3) | Control | 3.75 | 1.71 | 2.79 | 4.50 | 0.006* | –2.766 | 0.33 | Medium |
| | Dyslexia | 4.67 | 1.34 | 4.33 | 5.67 | | | | |
| Depression (N4) | Control | 2.19 | 1.90 | 1.85 | 3.75 | 0.372 | –0.901 | 0.11 | Small |
| | Dyslexia | 3.13 | 1.50 | 2.13 | 3.63 | | | | |
| Extraversion (EE) | Control | 3.83 | 1.27 | 3.19 | 4.46 | 0.438 | –0.784 | 0.1 | Small |
| | Dyslexia | 4.15 | 0.89 | 3.55 | 4.44 | | | | |
| Communication (E1) | Control | 3.83 | 1.33 | 3.00 | 4.33 | 0.668 | –0.437 | 0.05 | Small |
| | Dyslexia | 3.33 | 1.66 | 3.17 | 4.83 | | | | |
| Assertiveness (E2) | Control | 3.21 | 1.24 | 2.50 | 3.75 | 0.276 | –1.098 | 0.13 | Small |
| | Dyslexia | 3.43 | 1.29 | 2.71 | 4.00 | | | | |
| Dynamism (E3) | Control | 4.20 | 1.05 | 3.75 | 4.80 | 0.579 | –0.564 | 0.07 | Small |
| | Dyslexia | 4.20 | 1.00 | 4.00 | 5.00 | | | | |
| Social interactions (E4) | Control | 4.21 | 1.31 | 3.43 | 4.75 | 0.392 | –0.866 | 0.1 | Small |
| | Dyslexia | 5.00 | 1.72 | 3.71 | 5.43 | | | | |
| Socialization (SS) | Control | 5.42 | 0.72 | 4.93 | 5.65 | 0.269 | –1.114 | 0.13 | Small |
| | Dyslexia | 5.57 | 1.09 | 4.94 | 6.03 | | | | |
| Friendliness (S1) | Control | 5.42 | 1.10 | 4.92 | 6.02 | 0.755 | –0.321 | 0.04 | Small |
| | Dyslexia | 5.33 | 1.08 | 5.17 | 6.25 | | | | |
| Pro-sociability (S2) | Control | 6.00 | 1.15 | 5.38 | 6.53 | 0.52 | –0.652 | 0.08 | Small |
| | Dyslexia | 5.88 | 0.62 | 5.88 | 6.50 | | | | |
| Trust (S3) | Control | 4.63 | 1.03 | 4.00 | 5.03 | 0.242 | –1.178 | 0.14 | Small |
| | Dyslexia | 5.00 | 0.88 | 4.50 | 5.38 | | | | |
| Achievement (AA) | Control | 4.89 | 0.82 | 4.45 | 5.27 | 0.618 | –0.508 | 0.06 | Small |
| | Dyslexia | 4.70 | 0.85 | 4.44 | 5.29 | | | | |
| Competence (A1) | Control | 4.80 | 0.92 | 4.30 | 5.23 | 0.044* | –2.025 | 0.24 | Small |
| | Dyslexia | 4.30 | 0.60 | 4.00 | 4.60 | | | | |
| Consideration/prudence (A2) | Control | 5.13 | 1.50 | 4.25 | 5.75 | 0.823 | –0.233 | 0.03 | Small |
| | Dyslexia | 4.75 | 0.50 | 4.75 | 5.25 | | | | |
| Commitment/engagement (A3) | Control | 4.71 | 1.57 | 4.00 | 5.57 | 0.865 | –0.178 | 0.02 | Small |
| | Dyslexia | 4.71 | 1.14 | 4.29 | 5.43 | | | | |
| Openness to experiences (OO) | Control | 4.29 | 0.74 | 3.85 | 4.59 | 0.081 | –1.755 | 0.21 | Small |
| | Dyslexia | 3.90 | 0.64 | 3.37 | 4.01 | | | | |
| Openness to new ideas (O1) | Control | 4.10 | 0.95 | 3.77 | 4.73 | 0.006* | –2.738 | 0.33 | Medium |
| | Dyslexia | 3.00 | 0.90 | 2.80 | 3.70 | | | | |
| Liberalism (O2) | Control | 4.71 | 1.17 | 3.96 | 5.14 | 0.099 | –1.659 | 0.2 | Small |
| | Dyslexia | 4.00 | 1.14 | 3.43 | 4.57 | | | | |
| Novelty seeking (O3) | Control | 4.00 | 1.17 | 3.33 | 4.50 | 0.515 | –0.661 | 0.08 | Small |
| | Dyslexia | 4.33 | 1.17 | 3.50 | 4.67 | | | | |

Legend: Mdn, Median; IQR, Interquartile range; Q1, First quartile; Q3, Third quartile; [a], Significance value "$p$" obtained through the Mann-Whitney test; *, $p < 0.05$ (significant value); Z, Z value; $r$, Effect size; Interp., Interpretation of "$r$" value regarding effect size.

may need stimulation from others to carry out their plans and often refrain from making decisions about matters of interest [21].

Similar results were found in studies by Huang *et al.* [20] and Saied [17], with higher scores in the "neuroticism" factor in general, to which "passivity/lack of energy" is a subfactor in the BFP. However, their data referred to children and adolescents with dyslexia. Therefore, these data combined with those obtained here with adults allow the inference that repeated experiences of failure in learning situations can persist over the years and may be responsible for feelings of pessimism, frustration, low self-esteem, anxiety, and sadness [24].

Gagliano *et al.* [16] suggest that reducing frustrating and fearful situations would likely have a protective effect on the development of the personality of dyslexic individuals, possibly ensuring greater emotional stability, i.e., a lower level of neuroticism. This is a strongly adaptive personality trait and implies a greater ability to manage emotional states.

Regarding the "openness to new ideas" subfactor, the present study identified lower scores in dyslexic individuals. According to the BFP manual, individuals with deficits in this ability tend to be uninterested in exploring new topics, are more conservative and loyal to their artistic tastes, and have a rigid stance towards ideas [21]. These results were also consistent with data found by Gagliano *et al.* [16] and Saied [17]. Similarly, among the plausible hypotheses for this result is that apprehension due to past negative experiences may make it more difficult for dyslexic individuals to be open to experiencing new situations. New challenges may be synonymous with new problems that they are not yet sufficiently confident to handle [25].

Consequently, no differences were found between the groups in three major factors, namely socialization, extroversion, and achievement. The BFP defines that the first relates to an individual's quality of interpersonal relationships over time, involving aspects such as compassion, empathy, altruism, trust, etc., whereas extroversion is related to how people interact with each other and how communicative, assertive, receptive, and sociable they are [21].

Regarding these two factors, socialization and extroversion, the results found here were not consistent with those of studies conducted by Saied [17] and Jensen *et al.* [19], which investigated adolescents and adults, respectively, and showed lower levels in both factors in the dyslexia group. However, they were consistent with those of Tops *et al.* [15], who investigated university students and found no differences between the control and dyslexia groups. To support these findings, Gagliano *et al.* [16] found that although extroversion and socialization factors in dyslexic children showed lower levels, these increased progressively over the school years in their investigation. It can therefore be inferred that there may be a stabilization and equity among peers into adulthood.

The data obtained here also did not indicate differences between the groups in achievement. This factor involves characteristics such as the level of organization, persistence, control, and motivation [21]. This result was inconsistent with the research by Kosmos and Kidd [18], in which they identified that dyslexic men were less focused and achievement-oriented and had less confidence in their abilities to complete tasks. A lower performance from the dyslexia group was expected as a hypothesis, as this personality trait is related to good performance in executive functions (such as focused attention, planned behavior, organization, and orientation), which are often impaired in this diagnostic group [26,27].

It is important to note that the majority of the sample had ADHD as a comorbidity and also had not undergone intensive interventions, particularly psychological ones, which lasted for a year or less, or none at all. Changes in personality traits can occur through psychotherapy after an average of 12 to 18 months [28]. This data becomes interesting because the personality differences highlighted by the data obtained here do not show very frequent differences between the groups, beyond those already discussed.

There is a certain consensus on the variables that define personality, and beyond the neurobiological ones, there are also contextual ones [10]. This therefore raises the question of whether the Brazilian context possibly favors the development of protective factors for some traits in dyslexics, such as socialization, extroversion, and achievement.

Based on the results obtained, no differences were found between the groups with and without dyslexia in most of the factors and subfactors analyzed. Increased scores were identified in the dyslexia group for "passivity/lack of energy" and decreased scores for "openness to new ideas". As a proposal for further studies to address the limitations present in this study, it is suggested to: increase the number of participants (again controlling for age, gender, and education); control for comorbidities (e.g., covariance analysis of ADHD symptoms); and use other instruments to assess the personality based on different theories.

A greater number of participants could favor greater generalization of the data, as well as enable a covariance analysis for sociodemographic data, as well as comorbidities [4]. In turn, the use of other instruments would fa-

vor a multi-method analysis of personality, which allows a broader understanding of the difficulties and potential of the investigated public [29].

These data could be useful for describing personality profiles in dyslexic adults, with these descriptions possibly providing clinical support for diagnostic profiles and intervention procedures. However, personality is a construct that is multidetermined and mutable over time, which is why it requires ongoing investigations. Accordingly, in the Brazilian context, which is continental and multicultural, such procedures are fundamental for a more detailed understanding of its functioning, especially in specific groups such as people with dyslexia.

## Conclusion

In this study, the data did not show significant differences between the groups with dyslexia and without dyslexia in most of the factors and subfactors analyzed in a battery based on the BFPT. Only increased rates were identified in the group with dyslexia of "passivity/lack of energy" and lower rates of "openness to new ideas". These results become interesting in describing personality profiles in dyslexic adults and how clinically such a description can favor diagnoses and intervention procedures.

## Availability of Data and Materials

The datasets used and/or analyzed during the current study are available from the corresponding author on reasonable request.

## Author Contributions

RJRA and PAPC designed the research study. VRAG, BGF, GMCA and JLD made substantial contributions to acquisition of data and analysis and interpretation of data. PAPC was involved in drafting the manuscript and revising it critically. All authors contributed to important editorial changes in the manuscript. All authors read and approved the final manuscript. All authors have participated sufficiently in the work and agreed to be accountable for all aspects of the work.

## Ethics Approval and Consent to Participate

This study, conforming to the Declaration of Helsinki (2013), has been approved by the Ethics Committee of the Bauru School of Dentistry of the University of São Paulo (approval No.: CAAE 65477822.1.0000.5417). This study included a control group and a cross-sectional design; all participants included had informed consent and signed relevant agreements.

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## Conflict of Interest

The authors declare no conflict of interest.

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