



Research article

Analysis of personality traits and academic performance in higher education at a Colombian university

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ABSTRACT

This paper arises from the question of the correlation between specific personality traits and academic performance, since it is of crucial importance to consider variables other to students' grades that also affect this phenomenon. The objective was to correlate personality traits with the academic performance of students in a higher education institution. This is a quantitative, correlational research, with a final sample of 214 students. Results confirmed that there is a positive correlation between those variables. Personality traits of abstractedness and perfectionism correlate with academic performance. Results show that perfectionism and abstractedness traits and sex, affect academic performance. It is still important to notice that there are other factors (beyond the scope of this research) that could possibly have a significant impact on academic performance.

1. Introduction

Current evaluation processes generally aim at examining students' abilities when interpreting, analyzing, discussing and solving problems in science. The results of this evaluation are generally expressed in terms of grades or –at least–of a description that ends up in expert opinion (teachers) decreeing whether students have acquired the necessary skills or not (Song, 2021; Yang et al., 2020). This is what is roughly called academic performance. It turns into an important variable that allows a partial evaluation of quality in the development of teaching-learning processes.

However, it is necessary to also put the evaluation process in context; it is not only supposed to indicate if students are generally doing well or not in any given subject or area, but it also should indicate, for instance, in which subjects or areas they are particularly skilled or not. Thus it draws some light on how to develop better strategies to expand their skills where they are able at, and/or to help them to get a better understanding where they underperform. At any rate, it should end in the improvement of actual performance as students. Performing this kind of work will provide tools for planning based on needs detected through research processes, which in turns will provide a refined data to carry out relevant and effective pedagogical interventions.

Variable “personality” is specifically considered in this study as defined in the 5th edition of 16 PF questionnaire standardized by Cattell et al. (1995). It is the basis for determining personality characteristics, -which means the acceptance of all sixteen items identified and proposed by Cattell-. The hypothesis is that it is possible to establish correlations between specific personality traits and academic performance to develop accurate devices for psycho-educational intervention.

It is important to remind that there is already a considerable number of studies with a similar direction, although non if them being conclusive. At this point, it seems convenient to stressed the point that present study showed a significant bond between personality traits such as perfectionism and abstractedness, sex, and academic performance.

“What personality traits correlate with the academic performance of university students?” is the research question-based upon the above-mentioned consideration. Finally, the present research is aimed to establish that correlation. Sample is composed by students of a Colombian higher education institution.

2. Theoretical framework

The quality of academic performance has been analyzed based upon different variables (Gladius Jennifer et al., 2018; Mahmoodi et al., 2019;

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Belsare et al., 2020), but the spotlight usually stays on sociological ones, such as environmental or family dynamics; psycho-pedagogical, such as study habits or attitude towards the university; and purely psychological, such as cognitive processes or personality. Some studies suggest that the academic performance not only is associated with intellectual factors (Cáceres-Landaburu, 2017), but is an effect of multiple adaptive, behavioural and psychopathological variables, including some personality traits (Cuadra-Peralta et al., 2015).

This statement follows a long-standing line of thought proposed by RB Cattell in which he assured that intelligence, personality and motivation, each one by itself, make a great contribution when making measurements and predictions about school performance. Also results are obtained that do not differ significantly in statistical terms between the possible combinations when combining the contributions to the variance in the measurement of two of the three of them. (Cattell et al., 1966, p. 36). It is worth adding that Cattell continued his study mostly with children between ages of 12 and 14. This leaves out the evaluation of adults and university students, opposed to the case of the present study.

The theory of types and traits has been fundamental to studies trying to establish the connexions between personality and academic performance (Chagas and Freitas, 2017), especially in those which take *Extraversion/Introversion* and *Neuroticism Emotional Stability* as factors. So far, these connexions have been established primarily via correlational studies, which define the factors that affect cognitive aspects.

In terms of behaviour or psychic equilibrium, for instance, an altered person usually presents consequently alterations in all dimensions of his being, including basic and superior psychological functions (Boeker and Northoff, 2018). In the case of depression, for example, diagnostic manuals define that disorder encompasses alterations in cognitive functioning following states that are semiologically called *abulia* and *anhedonia* -apathy and disinterest in activities of daily life, and in academic activities, also- (Husain, and Roiser, 2018). In psychotic disorders, disturbances tend to be more acute, causing in many cases the absolute breakdown of the subject's bond to social context and external reality. Sometimes – even absolute - deterioration of educational or employment potential follows (Bortolon et al., 2018). Currently it is quite common to find students with various diagnoses, including attention and depression disorders and even suicidal ideas (Coentre, and Góis, 2018; Sedgwick, 2018; Mattos et al., 2018).

For researchers, addressing the issue this way implies at first to assume a position regarding the identification of factors which affect cognitive aspects or not. But given the complexity of personality, it could be hard to define the effects those factors exert each one by itself. Thus, the identification said factors commonly becomes hard to handle and usually turn into a considerable obstacle for research tasks.

Literature of the last century and up to date has stressed the importance of personality traits to understand individuals during the development of their life cycle. Consequently, some progresses have been made regarding this matter. In this sense, Schermer and Goffin (2018) took a sample of candidates for a certain job and calculated four general factors of personality (GFP) for them and computed those factors analyzing and using two different personality measures and extraction methods. At the end, two separate GFP were extracted. They found that generally, each personality GFP's score measure had only moderate correlations with each other. They also examined intelligence measures correlations and found that lower-order scales had slightly higher correlations with the intelligence measures than GFPs for both personality measures did.

Studies on academic performance have become increasingly frequent to the point of not only covering basic education, but also spreading over the field of higher education (Ramírez, 2014). One reason that explains the growing interest in these studies has to do with student drop-out rates. In the Latin American context, coverage in educational services has increased significantly, but the permanence of students until graduation does not correspond to the admission records of higher education institutions. of education (Organization for Economic Co-operation and

Development OECD, 2016). In fact, the difference is substantial. Consequently, there is a need to impact, at governmental and institutional level, the phenomena associated with academic performance, such as high drop-out rates and student impermanence.

Theoretical conceptualizations converge in defining academic performance as the level of knowledge demonstrated in a certain area or subject in relation to the student's age and academic level. Following Cupani et al. (2013) for the assessment of learning processes, educational systems use different methodologies allowing the evaluation of academic performance, usually through a quantitative estimate. In this sense, it can be added that, at best, if the aim is to conceptualize the academic performance from its evaluation, it is not only necessary to consider the individual performance of students, but also the way in which peers, the classroom or the educational context itself have an influence on it (Navarro, 2003, p.4).

Regardless the choice of the explanatory model, it is necessary to understand academic performance as a dynamic and procedural phenomenon, which integrates several variables as Erazo points it out by stating that it is not a phenomenon resulting exclusively from the conditions of students, tutors and/or their interaction. It is also the product of a tangled group of multicausal variables and conditions that predispose students and their achievement in terms of grades (Erazo, 2012, p.150). Therefore, it is of great importance to consider other types of variables, regardless of student grades, which apparently also affect academic performance and that would be worth mentioning.

Some previous research showed evidence of relations between personality, sex, and intelligence for the prediction of academic performance. Furnham and Monsen (2009) made a study in England with a sample of 250 students. Although they admitted results were quite different when elected participants were considered referring to academic performance, they also assured that intelligence, personality, and sex combined accounted for around a quarter of the variance in core participants.

Along these lines, a lot of research that has explored the way in which personality factors and academic performance are positively associated has emerged (O'Connor and Paunonen, 2007; Erazo, 2012; Zhang and Ziegler, 2018; Stajkovic et al., 2018). The intersection of personality and academic performance have been examined from a variety of perspectives, according to the different interests and research questions.

For more than two decades there has been a certain consensus in highlighting responsibility as the most appropriate feature when looking for associations with academic qualifications (Blickle, 1996; Bravidor et al., 2018). Research also that significant correlations between the factor of openness to change and analyzed scores in the final grade average of students' sample (Blickle, 1996; Farsides and Woodfield, 2002; Stajkovic et al., 2018; Sobowale et al., 2018; Von-Stumm, 2018). Multiple studies have shown that academic performance is strongly related to various measures of personality traits; many of the studies that have analyzed the relationships between personality traits and academic performance take as a conceptual reference 16PF questionnaire (Schermer and Goffin, 2018).

Another example is the research carried out in Malaysia (Ariff et al., 2020). Psychometric scores of 3167 students at a local university from 70 academic programs were used to correlate those scores with personality traits, vocational interests, and academic performance.

The above-mentioned considerations gave rise to statements such as those made by Simkin and Becerra (2013, p.47), who suggest that “if responsibility implies the ability to plan and be systematic in pursuing a goal, extroverts tend to have high social effectiveness.” People with a greater tendency to kindness– despite finding some difficulty in promoting themselves– often find some social support by virtue of their tendency to cooperation. On the other hand, other studies showed how openness to change and anxiety could be negatively associated with self-esteem (Matràngolo et al., 2015).

Sano et al. (2015) found a positive association between personality, academic performance, stress levels and sleep cycle, in a study among 66

undergraduate students for 30 days. In this work, the authors highlighted that the worst scores relate to neuroticism, which negatively influences stress levels, generates difficulties with sleep and academic performance.

Green et al. (1991) asked 140 students at a medical school to complete the 16PF questionnaire. They took a final sample of 129 useable forms and found neither evidence of relations between Cattell's personality scores and academic performance, nor between sex or even age and academic performance.

In general terms, most authors agree that not all personality factors contribute to effectively predicting student performance. However, the findings include a broader spectrum of them.

Regarding to variable sex, Steinmayr and Spinath (2008) took a sample of 342 participants (138 male and 204 female adolescents). Research aimed to study sex differences related to school achievement and some personality and motivational constructs. Results show no specific associations between sex, grades, and predictors, but authors suggest that personality and motivation are important to explain sex differences in school attainment anyway.

3. Method

Due to the characteristics of the sample and the research problem, a correlational study was made.

“Correlational designs offer the opportunity to predict scores and explain the relationship between variables. In correlational research designs, researchers use statistical correlation tests to describe and measure the degree of association between two or more variables or sets of scores. In these designs, researchers do not attempt to control or manipulate the variables as in an experiment; instead, they relate, using statistical correlation, two or more scores for each individual” (Creswell, 2003, p. 325).

Likewise, these designs do not allow to determine the direction of causality, although they do have greater external validity (Igartua Perosanz, 2014).

First, it is important to point out that this project was carried out with the approval of the University's Academic and Bioethics Committees, both entities attached to the Institutional Research Direction, so the study complies with all regulations. It is also important to notice that completing the 16PF questionnaire used to be one of this institution admissions' requests for students. It means that it is not mandatory for higher education institutions to applied this or any other personality questionnaire, and this university does not apply it anymore. Participants in this study completed a digital version. They all were informed about the questionnaire instructions and the confidential uses of their information. That was an informed consent they agreed to by clicking the start button on the screen. Names were substituted by codes, to keep track and cross data from academic records and 16PF results. Confidentiality was guaranteed and only main researchers got access to the data base and names were not exposed anywhere in anyway. Finally, the complete resulting data base is carefully guarded by only one of main researchers.

3.1. Participants

The sample's selection considered the whole population of new students of the institution (that were starting their first semester¹ in the first half of 2017) in each one of the 11 undergraduate programs. At first, 310 students were considered as the whole population. In the second phase of research (second semester of 2018), the sample was cut down to 211 students from 8 programs, being it the final sample (some students dropped out of the university or were left behind in previous semesters,

¹ Universities in Colombia use to keep records of academic performance not by years, but by semesters (two per years).

and researchers could not access their records at the time the data was collected).

The first semester students of the Medicine, Nursing, Nutrition & Dietetics, Psychology, Dentistry, Phonoaudiology, Optometry and Social Work programs were selected for the sample, as shown in Table 1.

3.2. Instruments

16 PF personality questionnaire

The Factorial Personality Questionnaire was originally created by Raymond Cattell at the University of Illinois in 1943 and theoretically based on the theory of personality traits of Allport and Odbert (1936). This questionnaire assumes personality as composed of 16 factors or traits as follows: warmth, reasoning, emotional stability, dominance, liveliness, rule-consciousness, social boldness, sensitivity, vigilance, abstractedness, privateness, apprehension, openness to change, self-reliance, perfectionism, and tension. The five global dimensions or factors of the second order are: extraversion, anxiety, tough-mindedness, independence, and self-control; it also contains four scales to evaluate the honesty and verifiability of the data obtained.

16 PF questionnaire is a psychometric battery consisting of 185 closed questions. In turns, each question consists of three response options, among which the evaluated must choose one and only one. The administration takes 15–30 min –in this case, the automated version of the 16PF questionnaire (2015)–. Results are presented with bipolar factors, which implies that they move from one end to the other of the spectrum of each trait, i.e., the score is determined in the continuum of one of those two ends. The measurement indicators are high, medium, and low pole for each factor. The dimensions of the variable are obtained through “decatypes” from the Personality Inventory 16 PF.

3.3. Procedure

16 PF questionnaire was applied in the first stage of research to the participants in a proportion of 236 females and 74 males. The research was conducted at a Colombian higher education institution of professional programs, the choice being made because the institution uses the 16 PF questionnaire.

After settling the sample, a statistical analysis was made. It allowed establishing personality profiles according to the groups of each program and a general profile with the predominant features of the global sample, which was statistically calculated.

In the second stage, the characterization of the personality of the students of first term of the first period of 2017 was carried out. A second instance involved statistical analysis of the academic performance of the students after two years of entering the university (studying 4th semester of the corresponding program). The result was calculated using statistical means (medium, mode, etc.). A third analysis was carried out six months

Table 1. Academic programs vs. initial and final sample.

Academic Program	Initial Sample	Final sample		
		Female	Male	Total
Nursing	91	58	0	58
Medicine	99	0	35	35
Dentistry	44	32	12	44
Psychology	23	18	5	23
Phonoaudiology	12	11	1	12
Nutrition & Dietetics	19	18	1	19
Optometry	17	10	5	15
Social Work	5	5	0	5
	310	211		

Source: Self made

later, to establish the correlation between personality and academic performance with an Anova technique and Fisher's exact test.

Personality and sex were taken as independent variables and academic performance as dependent variable. Personality is considered a quantitative variable, via Personality Inventory 16 PF. Sex is considered a qualitative variable with two dimensions, categorized M for men and F for women.

For the quantitative academic performance variable, a measure was established according to the evaluation scale used by the university, i.e., one-five; being one the worst and five the highest. Students' grades, (depending on each course's academic credits), do have a percentual weight for the calculation of the average at the end of each semester. A weighted average was also consolidated from the academic results of the first four semesters. Descriptive statistics were applied on this consolidated record, so the indicator for this variable is the weighted average of each student after completing four semesters of their academic training. The work began with the hypothesis that states that there is a positive relationship between personality traits and cognitive aspects of students that affects their academic performance. Statistical analysis was performed with Statgraphics Centurion XVI software.

4. Results

Results have three sections that correspond to the designed phases; It consists of a statistical analysis of the personality traits of the final sample, an analysis segmented by programs and sex. The second part of the study shows results of the academic performance of each student, according to sex, program and the entire sample. The correlation was made through Anova, but Fisher's F test is added, in order to refine the results according to the sex variable.

A correlation of the students' average academic performance was made by comparing them with personality traits and comparing them with the mean, to determine if there were significant differences. At the beginning, the correlation was made with the overall sample, finding a statistically significant relationship between personality traits and academic performance regarding to perfectionism trait, with a P value of 0,0043. However, when the sample was separated by sex, only the group of male participants showed statistically significant correlation regarding to perfectionism trait, with a P value of 0,0064 and abstractedness trait with a P Value of 0,0464. Female participants group showed no correlation when it was analysed separately.

Figure 1 shows the degree of correlation between personality traits and the score of the group of male and female participants, corresponding to the abstractedness trait (see Figures 2, 3, 4, 5).

4.1. Generalized linear models

Number of categoric factors: 17

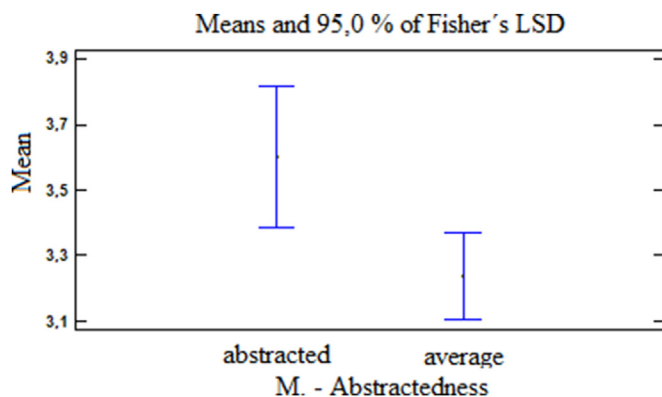


Figure 1. Results of Fisher test application in the group of male participants – abstractedness trait. Source: Self made.

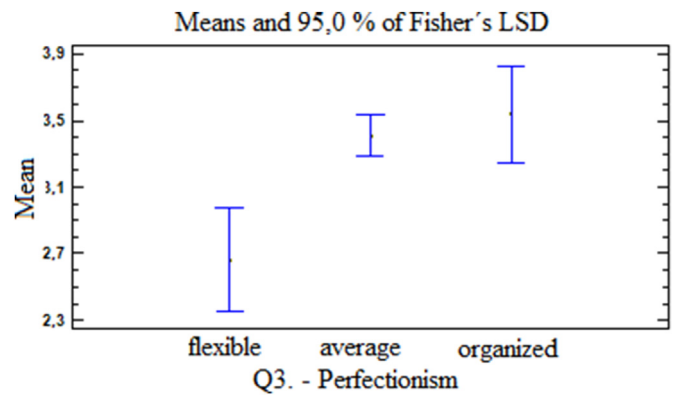


Figure 2. Results of Fisher test application in the group of male participants – perfectionism trait. Source: Self made.

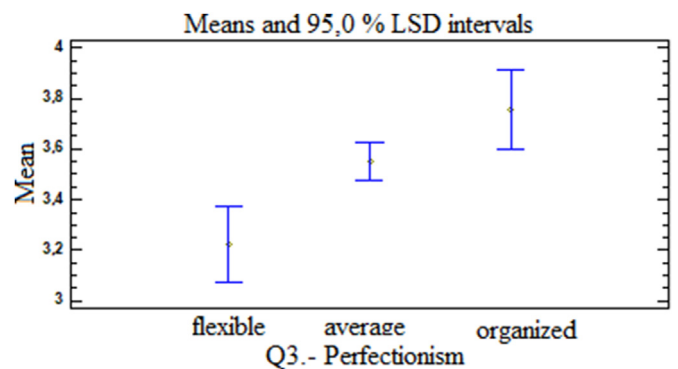


Figure 3. LSD intervals and scores.

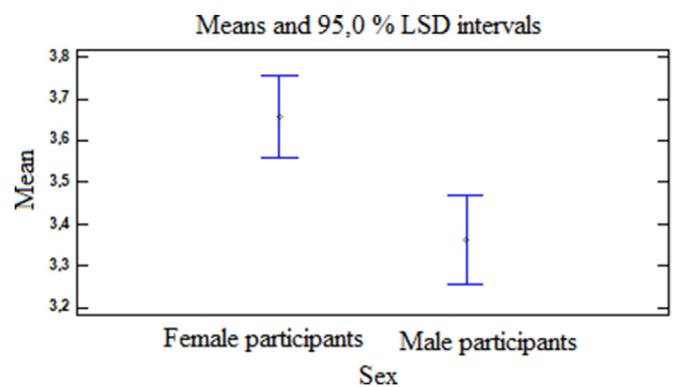


Figure 4. LSD intervals and sex.

Sex, warmth, reasoning, emotional stability, dominance, liveliness, rule-consciousness, social boldness, sensitivity, vigilance, abstractedness, privateness, apprehension, openness to change, self-reliance, perfectionism and tension.

Number of quantitative factors: 0.

Number of quantitative factors: 0.

Once the factors that were not statistically significant (p value greater than 0.05) were removed, the multifactorial sum of squares type III ANOVA the results showed a P value of 0,0000.

Once the variables that are not statistically significant were removed, the following result was obtained: a model with a R-squared equal to 12,11628 %, which includes the variables sex with a P value of 0,0002, M.- abstractedness with a P value of 0,0184, and Q3.- perfectionism with a P value of 0,0017.

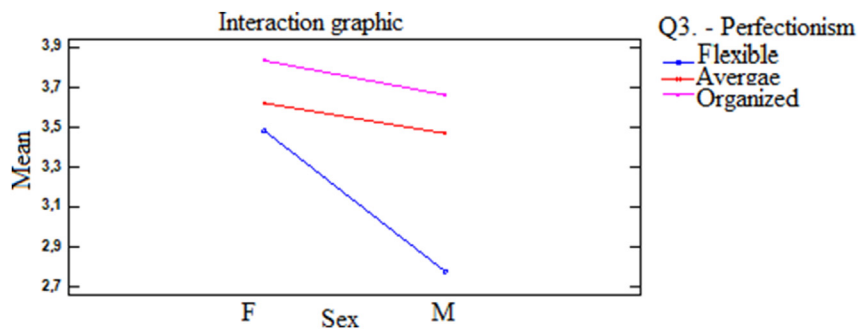


Figure 5. Interaction graphic.

P-value of the analysis of variance yielded a value less than 0.05 indicating that the model is significant to explain the relationship between the statistically significant factors in the model: *abstractedness*, *sex* and *perfectionism*, and *academic performance*.

Given that the R squared value is less than 80%, it is understood that the above-mentioned variables, as statistically significant (*Abstractedness*, *Sex* and *Perfectionism*), do have an influence on academic performance, but there are other factors outside the scope of this research that would also have a significant impact on *academic performance*.

On one hand, the correlation found explains the incidence of perfectionism as a personality trait on the response to academic evaluation, because this trait compels participants to self-scrutiny and constant a severe self-evaluation. Therefore, those people are usually very judging towards their own academic performance.

On the other hand, *abstractedness* incidence on academic performance is also especially important, given its facilitating role in educative processes. This role derives from the fact that *abstractedness* is involved at every level of learning. Moreover, it is important to notice that *perfectionism* could be a desired trait for higher education students, but not indispensable, though a certain high degree of *abstractedness* skills is. Higher education, especially in professional areas, implies the learning of concepts to explain other concepts, usually related to non-physical objects. Thus, *abstractedness* is necessary to develop skills and knowledge in any given professional career.

In this sense, results illustrate that there is a higher tendency to *abstractedness* in male participants, which is remarkable, because there were more female participants in the sample. Bearing that on mind, the importance of the findings of this research drives to the construction of a mathematical model that does not only explain the correlation between those personality traits and sex variable among the sample, but also allows predictions on academic performance in a rate of 56,8 % (when those variables are considered altogether).

The effect of perfectionism and *abstractedness* coincides with that which bivariate analysis evidenced. Regarding sex, it is evident that female participants have on average a higher academic performance than male participants due. For this reason, the possibility of sex/*abstractedness* and sex/*perfectionism* interaction was probed to find out if it is by virtue of this interaction that sex is statistically significant, as evidenced by bivariate analysis.

Analysis of variance for mean had a P value of 0,0000. Interactions were statistically significant regarding Sex with a P value of 0,0090; M.-*abstractedness* with a P value of 0,0362; Q3.- *perfectionism* with a P value 0,0003, Sex*M.- *abstractedness* with a P value of 0,2641; Sex*Q3.-*perfectionism* with a P value of 0,0760.

Interactions were not statistically significant although the sex/*perfectionism* interaction presented a p-value close to 0,05 (0,0760) when interaction graph was analyzed.

It can be noted that there is not a big difference between male and female participants (classified as organized or average), but among flexible classified participants, women tend to have a much better academic performance than men.

5. Conclusion

The purpose of this research was to correlate the personality structure and academic performance of students of a higher education institution. It can be argued that understanding and predicting the incidence of personality traits in cognitive and behavioural processes could be of great help for possible educational interventions.

Although the model shows a positive correlation between variables, specifically with personality traits related to cognitive aspects, it is necessary to continue investigating and clarifying the specific relationships between personality traits and academic performance. It is also necessary to incorporate other research designs that allow the addition of other types of analysis and mediating and/or moderating variables for greater control of results.

As a starting point for the discussion, it is important to underline a marked tendency to approach cognitive functioning from a biological perspective (Ziegler et al., 2015; Mahajan and Nadkarni, 2019; Zhang et al., 2019; Kudryashova, 2019; Dorgans et al., 2019). This raises the acceptance of some specific principles. For example, the potentiation of synaptic connections at the neuronal level that, in turn, carry implicit series of biochemical processes. These processes combine varied elements such as quantity of calcium, hippocampal activity, and sensory stimulation. All of this implies that brain activity and the construction of neuronal wiring or a central set of canonical neural calculations (Hui and Dawei, 2018) is displayed according to the demands that people make of their cognitive functions, in interaction with a suitable learning environment. While all this is undeniable, it is also true that none of it by itself considers factors such as personality.

Nevertheless, this is not a new approach. According to Hassan (2017) there are several attempts to relate personality and academic aptitude and achievement, such as Noflet & Robins (2007), Blechner and Carter (1956), Osborne and Sanders (1949), Shoemaker and Rothrer (1948), Sopchak (1958) or Thompson (1947, 1948a, 1948b, 1951). However, a review of the literature showed that there is a variation on the results about which traits correlate (and which do not), even to the point of arriving to divergent conclusions.

The present research did not find any correlation between openness to change and academic performance, an issue that has been found as a positive correlation by other researchers as can be seen in the references of this paper. The reasons for these results may be related to multiple factors, such as the type of test used to measure, which vary from the 16 PF Inventory to the Big Five Traits, among others. Also, studied variables and control of foreign and mediating variables-as correlated in the work of Stajkovic et al. (2018)- do affect the diversity of results obtained in different investigations.

Results in this research demonstrate -related to the sample-the relationship between personality factors and academic performance, and that the model is useful to explain the correlation between statistically significant traits in it: *abstractedness*, *perfectionism*, *sex*, and *academic performance* among participants in the final sample. At this point it is important to underline that although the correlation was found in the

whole sample, when divided by sex, only male participants showed that correlation. This is very striking since it was not possible to identify theoretical background in the literature review of this investigation or coincident results in previous investigations. This finding opens new questions about the incidence of the sex variable in the personality and academic performance relationship.

These results allow establishing correlations for the construction of theoretical models regarding the intersection of personality and academic performance among the sample, specifically regarding to personality traits associated to cognitive functioning such as abstractedness and perfectionism. With respect to the variable academic success, an index composed of average grades was used. It would be important for future research to control specific components of academic performance, in order to analyze its dimensions. Likewise, other analyzes could be included such as the correlation of ages, personality and academic performance.

In general terms, the work meets the objective of generating empirical evidence, which in turn allows to generate new knowledge about complex human cognitive and psychic processes and the results of the academic activity.

Academic performance of students in the first-year cohort of eight undergraduate programs is at the middle level, corresponding to a regular academic performance with an average of 3.48 on a scale of one-five; 13% achieved satisfactory academic performance after completing half of their career; The standard deviation of 0.62% with a low level of academic performance.

According to the results of the application of the Cattell 16 PF Personality questionnaire, most of the personality traits of the group studied are at a medium level. However, the predominance of traits is observed: social boldness (factor H.); abstractedness (factor M.); and openness to change (Factor Q1.). The prevalence of traits is particularly important for a deeper and more extensive statistical analysis while, according to the literature on the subject, these personality traits are good predisposes for good academic performance.

In the analysis with the Fisher test, two significant differences were found: (i) in the abstractedness factor (0.0464), which makes possible to clearly determine that those who had an abstractedness classification have a higher academic performance than those who were in the average; and (ii) in the perfectionism factor (0.0064), which implies that those who are classified as organized have higher scores than those who are classified as flexible, which had lower scores.

This finding is the most relevant finding of the work, because positive correlation results were found between the personality variable and academic performance in the sample corresponding to male participants. There are differences between grade averages in male participants' sample according to their abstractedness level. Those who have a high score tend to have better academic achievement. Those classified as organized or with average scores have a better grade averages than those classified as flexible.

This allows affirming that there is a positive correlation between dominant personality traits and sex. Sex differences in cognitive abilities found and their correlation with academic performance indicate the importance of taking these differences into account when planning pedagogical strategies, especially if it is intended to potentiate learning possibilities and performance levels.

Each sex has different tools to solve complex problems, which has already been documented by other researchers. Echavarrí et al. (2007) suggest that men use spatial and abstract reasoning more, while women use verbal strategies more frequently. If these differences are considered, more accurate knowledge transfer/acquisition methods can be designed to address curricular content according to the potential of each sex. Beyond this, the assessment would have a direction from the perspective of the differential evaluation according to sex.

Likewise, the work reveals the importance of knowing the personality characteristics of university students, in such a way that this allows for a follow-up of each one, in order to promote what has been called integral

training what brings many difficulties by the time of implementing it in universities. Designing wellness programs that taking into account these individual and sex differences, becomes a support to implement pedagogical innovation from a more accurate perspective, which would make the difference between the mere transmission of knowledge –that can be done even in a virtual modality– and a training for the integral development of students.

Finally, it is necessary to point out among the limitations of this research, namely, the loss of 96 participants of the predetermined sample. This issue was due to the withdrawal of these persons from the institution, as a result of factors not only directly related to academic performance, but also to economic difficulties and, to a lesser extent, family situations.

Another limitation refers to the fact that from the outset of the project, the sample had a greater number of female participants (236 women and 74 men) regarding the whole starting population and 152 women and 59 men in the final sample). This did not allow finding concordant results in the first statistical analysis performed with Anova. In this same sense, the authors pointed, to control the age variable based on the relationship between it and the development of the personality. As an important aspect for the eventual continuity of the project. It is also important to be able to carry out an analysis of another population with the objective of being able to generalize results. Therefore, comparative analysis in other cities or countries would be highly relevant for the results of the present study.

Regarding the difference of results according to sex, it makes reasonable to infer the importance of conducting future research problematizing the sex and personality related differences in academic performance. A methodological strategy should be designed that facilitates establishing causal relationships among these variables.

Declarations

Author contribution statement

Cirít Mateus, Rodrigo Campis: Conceived and designed the experiments; Performed the experiments; Analyzed and interpreted the data; Contributed reagents, materials, analysis tools or data; Wrote the paper.

Federico Ruiz: Performed the experiments.

Alexander Parody: Analyzed and interpreted the data; Contributed reagents, materials, analysis tools or data.

Ignacio Aguaded: Analyzed and interpreted the data; Contributed reagents, materials, analysis tools or data; Wrote the paper.

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Data availability statement

Data will be made available on request.

Declaration of interests statement

The authors declare no conflict of interest.

Additional information

No additional information is available for this paper.

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Questionnaire to all new students for admission purposes. This information was taken to build the raw database with which the researchers began this investigation.

In this same order of ideas, to Universidad Metropolitana. That Institution provided access to the sample, data and granted the application and assessment of the 16PF Questionnaire.

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