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Exploring the Relationship Between Personality Traits and e-Learning Autonomy of Distance Education Students

RESEARCH ARTICLE

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ABSTRACT

Understanding the relationship between personality traits and e-learning autonomy can help to provide tailored e-learning environments and student support. Although the related literature is rich regarding learner autonomy and personality traits, there is a dearth of research exploring the predictive relationship. This research investigates the relationship between personality traits and e-learning autonomy of distance education students. Data was collected using the Big 5 Personality Traits and e-Learning Autonomy scales from 3435 distance education students of Anadolu University's Open Education Faculty. Results show that male students have more e-learning autonomy than female students, while female students have higher scores of personality traits except for agreeableness. The e-learning autonomy of distance education students had positive correlations with four personality traits except for neuroticism. Furthermore, extraversion, agreeableness, conscientiousness, and openness were significant predictors of e-learning autonomy behaviors of distance education students.

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INTRODUCTION

Individual difference in learning is an important topic studied in the literature for many years. Research on these differences not only provides practical information for the improvement of instructional support but also contributes to a deeper understanding of emotional, cognitive, and behavioral mechanisms in the learning processes (Seel, 2011). Therefore, the effects of personality on educational behavior in traditional educational settings are extensively studied in the literature (Rauste-von Wright, 1986; Miller, 1991). On the other hand, the situation in e-learning environments and distance education is open to research. In particular, the effects of personality on learning behaviors in e-learning environments is one of the primary research topics. Because, especially after the Covid-19 Pandemic of social isolation, e-learning became one of the essential topics on the education agenda.

Wedemeyer (1971) considers independent learning as the core concept in distance education. This assumption encouraged Moore (1972) to link Wedemeyer's idea of independent learning and learner autonomy in distance education. Moore (1972, 1994) positions learner autonomy as the second dimension of independent learning. Additionally, Moore (1972) identified two dimensions of independent learning: distance teaching (structure and dialog) and learner autonomy. Moore (2018) theorized a system named Transactional Distance as one of the most well-known theories of distance education based on the core three concepts of structure, dialog, and autonomy. According to Moore (1994), learner autonomy should be a goal of distance education. After these pioneering studies in distance education, learner autonomy started to be considered and discussed in the related literature as the main precondition for the success of independent learning, distance education, and e-learning.

Learning autonomy is about the ability of a learner to take control of his/her learning. Autonomously acting people "...are less defensive and ego-protective and tend to openly acknowledge negative effect or criticism and personal shortcomings" (Legault & Inzlicht, 2013, p. 125). According to Legault (2016), autonomy is a critical psychological need for will and self-direction in one's feelings, thoughts, and actions, expressing the perception of self-direction rather than being controlled by external factors. Autonomous people are aware of their feelings and endorse their actions at the highest order of reflection (Deci & Ryan, 2002). In other words, autonomy can be defined as the "personal endorsement of one's own goals and actions."

Legault (2016) considers autonomy as a personal trait, while Holman and Hughes (2021) interpret autonomy as a characteristic of personal traits of conscientiousness, extraversion, neuroticism, and openness. Fotiadou et al. (2017) underline that learner autonomy is tightly linked to the personal traits of learners, urging them to take responsibility for their learning. However, there is a paucity of experimental research exploring the predictive relationship between autonomy and personal traits in the related literature.

Personality is defined as a person's distinctive thoughts, emotions, and behavior patterns in different situations (Seel, 2011). Personality traits can be considered indicators of behavior patterns of individuals. The five core personality traits structure, which incorporates a broad category of personality traits, is widely accepted in the literature and is well-known as the Big 5. Big 5 has developed from the psychological trait theory. The initial model was advanced by Tupes and Christal (1961) and extended to the currently accepted level of organization by Goldberg (1993). In the APA Dictionary of Psychology (VandenBos, 2015), extraversion is characterized by an orientation of one's interests and energies toward the outer world, a chronic level of emotional instability characterizes neuroticism, and openness refers to individual differences in the tendency to be open to new aesthetic, cultural, or intellectual experiences. Agreeableness is characterized by good nature, trustfulness, and cooperativeness, while extraversion is characterized by being talkative, assertive, and energetic (John & Srivastava, 1999). The five dimensions are not based on a particular theory but on the natural language in which individuals are used to describing themselves or others (John & Srivastava, 1999).

RELATED LITERATURE

Lifelong learning focuses on equipping learners with the required skills and competencies to continue their self-education process beyond the end of formal education (Candy, 1991). Gavrilyuk (2015) considers autonomy as a core value of lifelong learning. Since e-learning

settings are based on a self-learning method, learners who study in these settings should actively participate in these e-learning environments (Goi & Ng, 2008). Active participation and involvement can be difficult for students in an e-learning environment without autonomy. Similarly, related concepts of lifelong learning and independent study are also based on learner autonomy. Supporting this theoretical relation, Yurdakul (2017) reports a significant positive correlation between autonomy and lifelong learning.

The related literature is rich in the learning autonomy of distance education students. Firat (2016) investigated the e-learning autonomy of 3293 distance education students. The e-Learning Autonomy Scale (e-LAS) was developed and applied for this purpose. The autonomy of distance education students in e-learning environments was found to be higher than the average of scale. The autonomy of distance education students in e-learning environments was found to be directly proportional to the level of ICT use but not affected by program or gender. Fotiadou et al. (2017) examined the relationship between learner autonomy and specific aspects of the learning process with 100 postgraduate distance education students. A positive correlation was found between learner autonomy and both student-student and tutor-student interaction. But no significant differences were found for gender and age. Contrary to this finding, Gülten (2015) found a statistically significant relationship between autonomous learning capacity and gender in favor of females. However, no significant relationship was found between autonomous learning capacity and learning style.

Personality traits play a considerable role in learning style, learning performance, and academic success. Blickle (1996) investigated the relationships between personality traits and learning strategies in two multivariate studies. Results show that learning discipline is highly correlated with conscientiousness and elaboration with openness. Bayne (2004) claimed that the differences in learners' personality traits result in different ways of involvement in the learning progress. Supporting this claim, Komarraju et al. (2011) found that the conscientiousness and agreeableness of Big Five personality traits are positively related to all learning styles. In contrast, neuroticism is negatively related to all learning styles. Additionally, extraversion and openness were found to be positively related to elaborative processing. Big Five personality traits explained 14% of the variance in GPA. Al-Dujaily et al. (2013) found that the personality traits can be indicative of students' learning styles; in particular extraverted/introverted personal traits significantly impressed e-learning learning activity. To Tlili et al. (2016), personality traits affect learners' learning preferences (learning content, learning approach, behaviors, communication with others, etc.) in e-learning environments. Siddiquei and Khalid (2018) studied the relationship between personality traits, learning styles, and the academic performance of e-learners. Extraversion was positively related to all learning styles, whereas neuroticism was negatively related to all learning styles. GPA was positively correlated with three personality traits of openness, agreeableness, and conscientiousness, and was negatively correlated with neuroticism. No significant differences were found in learners' personality traits regarding gender.

Bruso et al. (2020) examined personality traits as a predictor of self-regulated learning. Results indicated that openness, conscientiousness, extraversion, and agreeableness contribute to self-regulation more than neuroticism in an e-learning environment. Additionally, those high in neuroticism were less skilled in self-regulation and tended to use help-seeking strategies more frequently than those in other personality traits categories. Based on analyzed experimental studies, Piechurska-Kuciel (2020) concludes that neuroticism has direct, indirect, and bidirectional negative effects on learning.

Fadaee et al. (2021) investigated the relationship between autonomy and personality traits of 156 EFL teachers. The personality traits of openness, conscientiousness, extraversion, and agreeableness were found to be significant predictors of the teachers' autonomy, while neuroticism had a weak negative correlation with autonomy. Holding et al. (2019) conclude that self-control, agreeableness, and conscientiousness are positively associated with autonomous motivation. In their research with 1544 university students, Levine et al. (2021) found that cooperative personality traits (agreeableness, assisted autonomy, and secure attachment) have a positive correlation with autonomous motivation. Kekäläinen et al. (2022) investigated the relationship between personality traits of extraversion and neuroticism, autonomous motivation, and the Theory of Planned Behavior constructs and leisure-time physical activity. Neuroticism was linked to physical activity through autonomous motivation.

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PRESENT INVESTIGATION

The related literature agrees that personality traits correlate with learning style, learning performance, and academic achievement (Jensen, 2015; Kohli & Bhatia, 2021). Also, the related literature accepts that autonomy is one of the core concepts in distance education and has a relationship with personality traits (Legault, 2016; Holman & Hughes, 2021; Fotiadou et al. 2017). But few studies have focused on the relationship between personality traits and learning autonomy in e-learning environments. Therefore, this research investigates relationship between learning autonomy and personality traits of distance education students in e-learning environments. Supporting the need of this investigation, Kühler and Jelinek (2012) underline that focusing on the detailed relationship between autonomy and the notion of self is particularly important for future studies.

This research aimed to investigate the relationship between the Big 5 personality traits and the e-learning autonomy of distance education students. Three research questions (RQ) of this study are listed below:

RQ 1. Is there a gender difference in terms of Big 5 personality traits and e-learning autonomy?
RQ 2. What is the correlation between personality traits and e-learning autonomy?
RQ 3. Is there a predictive relationship between personality traits and e-learning autonomy?

METHODOLOGY

DATA COLLECTION

Of the two scales used in this research, the Big Five Personality Traits Scale was used to assess the personality traits of distance education students. The Big Five Personality Traits Scale was developed by Rammstedt and John (2007). This scale was later adapted to Turkish by Horzum et al. (2017). The scale of 5 factors and 10 items matched the original scale, explaining 88.4% of the total variance. Each of the five personality traits was assessed using 2-items. As in the original scale, 5 items were reverse coded. Items were rated on a five-point scale from 1 "disagree strongly" to 5 "agree strongly." The determining factors are "Extraversion", "Openness", "Agreeableness", "Neuroticism", and "Conscientiousness," as in the original scale. The correlation coefficient between Turkish and original English form scores was found to be .81 for the whole scale. Relationships in terms of all factors were found to be significant at the 0,01-significance level.

The e-Learning Autonomy Scale (e-LAS) was used to assess distance education students' e-learning autonomy. e-LAS developed by Fırat (2016). e-LAS scale has 5-point Likert-type 10 items. e-LAS has a single-factorial structure, explains 66.58% of the total variance and has an excellent internal consistency ($\alpha = 0.952$). The highest score on the scale is 50, and the lowest score is 10.

Measures have been taken to protect the participants from an ethical point of view. First, no personal (private) data was collected except for the participants' age, gender, and employment status. Data was collected through an online questionnaire. Samples comprised undergraduate students from distance education programs from Anadolu University, Open Education Faculty. The survey was opened to all students on an online e-learning platform and 4089 responses were received. In the data cleaning process (cleaning of missing and/or repeated answers), 4089 responses were reduced to 3435. 1509 participants were female, while 1926 were male. The average age of females was 28.3, while the average age of males was 31.7.

DATA ANALYSIS

Descriptive statistics of %, f, $\bar{X}$, and Sd were used for general group descriptions. Independent samples t-test and Mann-Whitney U test were used to investigate the difference between genders for Big 5 Personality Traits and e-LAS. Pearson correlation coefficient test was used to investigate the correlations between personality traits and autonomy. Finally, linear regression

was used to explore the causality and direction of the relationship between Big 5 Personality Traits and e-LAS. Jomavi 1.6.23 open-source software was used to conduct statistical analysis.

FINDINGS

We presented the findings of this study in a way that answers our research questions. For this purpose, the findings were presented in the relevant research questions. Before that, we presented the common descriptive findings. The descriptive statistics of 3435 distance education students' Big 5 Personality Traits test results are provided in Table 1.

Table 1 Descriptive Statistics of Big 5 Personality Traits Test.

	EXTRAVERSION	AGREEABLENESS	CONSCIENTIOUSNESS	NEUROTICISM	OPENNESS
Mean	3.89	3.96	3.95	2.65	3.59
Standard deviation	0.929	0.714	0.820	0.908	0.857
Variance	0.862	0.510	0.672	0.824	0.734

Agreeableness has the highest average ($\overline{X}$ = 3.96) among the 5 personality traits, while neuroticism has the lowest average ($\overline{X}$ = 2.65). Standard deviations were between 0.714–0.929 and variances were between 0.510–0.862. In some cases, descriptive statistics are not enough to understand the dataset. We used the violin plots to depict summary statistics and the density of each variable. Violin plots combine box plot and kernel density plot to show peaks in the data. Violin plots of the 5 personality traits are given in the Figure 1.

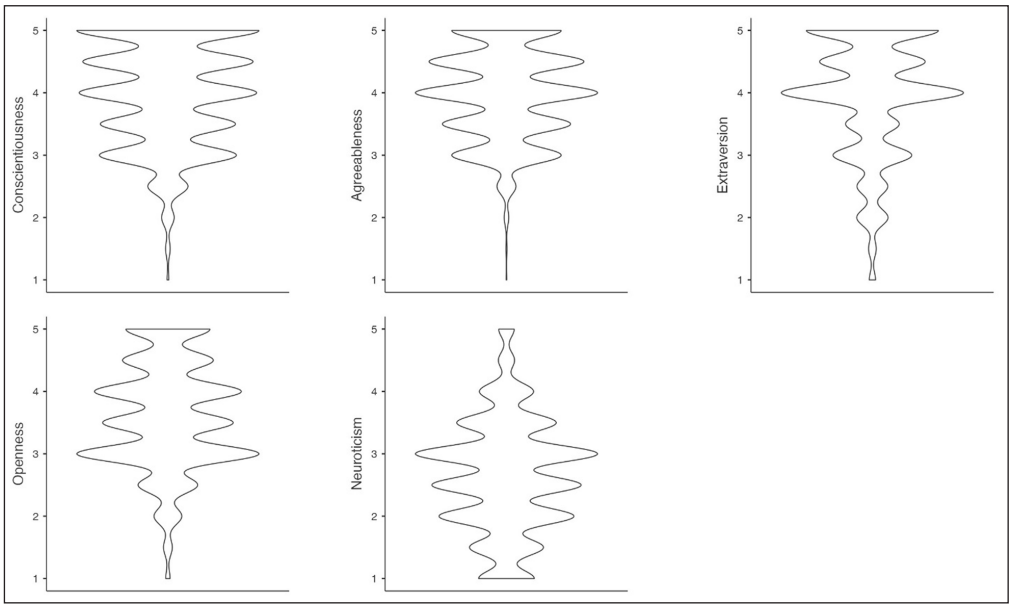

Figure 1 Violin Plots of the 5 Personality Traits.

Each side of the line in violin plots is the density estimation to show the distribution shape of the data. Wider parts of the graph represent higher probability that members of the population will take on the given value; the skinnier sections represent a lower probability. To the violin plots, "strongly agree" have highest probability for conscientiousness. Highest probability for extraversion and agreeableness was "agree", openness and neuroticism were "neutral".

Before the testing of gender differences, we analyzed descriptive statistics to elaborate dataset. For this, we examined the means and standard deviations of the e-LAS and Big 5 variables by gender groups. The gender group statistics provided in Table 2 for e-LAS and 5 personality traits.

As can be seen in Table 2, male students have a higher average than females for e-LAS ($\overline{X}$ = 3.18 > 3.14). On the other hand, female students have a higher average than male students for Extraversion ($\overline{X}$ = 3.93 > 3.86), Conscientiousness ($\overline{X}$ = 4.0 > 3.92), Neuroticism ($\overline{X}$ = 2.74 > 2.58), and Openness ($\overline{X}$ = 3.63 > 3.57). Only for agreeableness, the averages of males and females are equal ($\overline{X}$ = 3.96). This average is the highest average among all group averages.

DEPENDENT VARIABLES	GROUP	N	MEAN	SD
e-LAS	Female	1509	3.14	0.522
	Male	1926	3.18	0.569
Extraversion	Female	1509	3.93	0.914
	Male	1926	3.86	0.939
Agreeableness	Female	1509	3.96	0.703
	Male	1926	3.96	0.723
Conscientiousness	Female	1509	4.00	0.811
	Male	1926	3.92	0.825
Neuroticism	Female	1509	2.74	0.896
	Male	1926	2.58	0.911
Openness	Female	1509	3.63	0.863
	Male	1926	3.57	0.851

Table 2 Gender Group Statistics For E-LAS And 5 Personality Traits.

RQ 1: GENDER DIFFERENCES

Independent samples t-tests and Mann-Whitney U test were used to determine whether there is a gender difference in e-LAS and Big 5 averages of distance education students. Since the data did not show a normal distribution for personality traits and e-LAS, the Mann-Whitney U test was used to compare means. The findings of the Mann-Whitney U test are provided in Table 3.

	MEAN DIFFERENCE	P
e-LAS	−3.67e−6	0.001*
Extraversion	2.48e−5	0.046*
Agreeableness	−4.45e−5	0.809
Conscientiousness	2.74e-5	0.004*
Neuroticism	4.28e−5	<.001***
Openness	5.31e−5	0.044*

Table 3 Mann-Whitney U findings for gender difference in Big 5 and e-LAS.

Note: * $p < .05$, ** $p < .01$, *** $p < .001$.

The test findings showed that there was a significant difference between genders in e-learning autonomy of distance education students. This finding showed that the difference between the e-LAS averages of female and male students was statistically significant and run-in favor of male students ($\bar{X} = 3.18 > 3.14$, $p = .001 < .05$).

For personality traits, findings showed that there was a significant difference between genders for Extraversion ($p = .046 < .05$), Conscientiousness ($p = .004 < .05$), openness ($p = .044 < .05$) and Neuroticism ($p < .001$). According to these findings, female distance education students have higher averages for all 4 personality traits, except agreeableness.

RQ 2: Relationship Between Personality Traits and e-Learning Autonomy

Pearson correlation coefficient test was used to investigate the correlations between personality traits and e-learning autonomy of distance education students. The Correlation Matrix is presented in Table 4.

		EXTRAVERSION	AGREEABLENESS	CONSCIENTIOUSNESS	NEUROTICISM	OPENNESS
e-LAS	Pearson's r	0.124***	0.130***	0.146***	-0.101**	0.111***
	p-value	<.001	<.001	<.001	<0.001	<.001
	95% CI Upper	0.156	0.163	0.179	−0.068	0.144
	95% CI Lower	0.090	0.097	0.113	−0.134	0.078

Table 4 Correlation matrix of e-LAS and personality traits.

Note: * $p < .05$, ** $p < .01$, *** $p < .001$.

The results of the Pearson Correlation Coefficient test showed that autonomy has positive correlations (.111< r <.130, p < .001) with all four personality traits except for neuroticism. A significant negative correlation was found between e-learning autonomy and Neuroticism (Pearson's r = –.101, p < .001). The scatterplots of the e-LAS and 5 personality traits are provided in Figure 2.

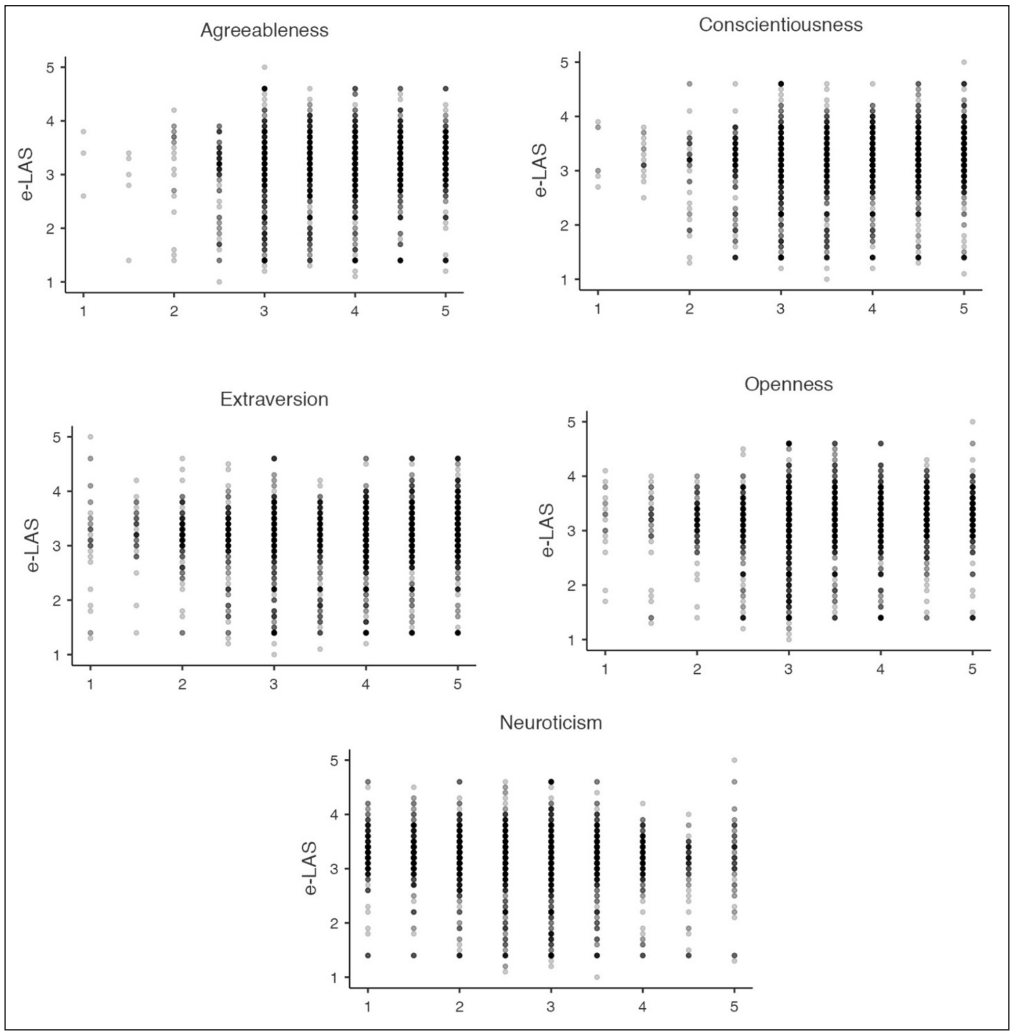

Figure 2 Scatterplots of the e-LAS and 5 Personality Traits.

RQ 3: Predictive Model for Personality Traits and e-Learning Autonomy

Linear regression was used to explore the causality and direction of the relationship between Big 5 Personality Traits and e-LAS. Results of the linear regression indicated that there was a collective significant effect between the personality traits and e-learning autonomy ($F_{(6, 3429)}$ = 2.511, t = 28.45, p < .001, R = .194, R^2 = .0375). The 5 personality traits as individual predictors of e-learning autonomy were examined further. The predictive model of personality traits and learner autonomy is provided in Figure 3.

Standardized estimates of each personality traits provided in the Figure 3. Extraversion (p = .006 < .05), agreeableness (p < .001), conscientiousness (p < .001) and openness (p = .001) were significant predictors of learning autonomy of distance education students in e-learning environments. On the other hand, neuroticism (β = –.0283, p = .122 > .05) was not a significant predictor of e-learning autonomy of distance education students.

Beside the linear regression analyze, we conducted a behavior change analyze with CIBERlite plots to show the means and correlations of determinants (personality traits) and to identify the most relevant factors contributing to the e-learning behaviors (see Figure 4).

In the behavior change analyze e-LAS was target variable and personality traits was determinants. Findings of this analyze support the findings of linear regression analyze. Both analyzes shows that extraversion, agreeableness, conscientiousness and openness are meaningful determinants for the e-learning autonomy behaviors of distance education students.

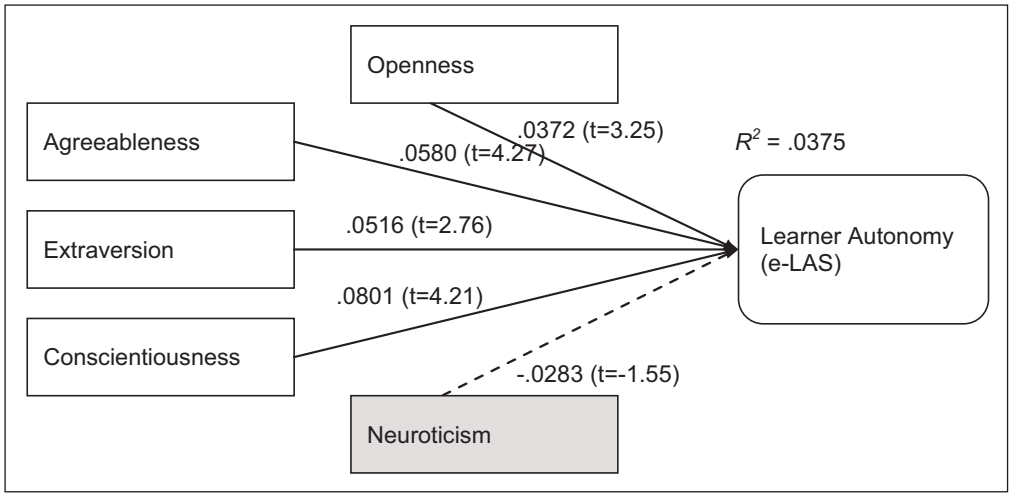

Figure 3 The Predictive Model of Personality Traits and e-Learner Autonomy.

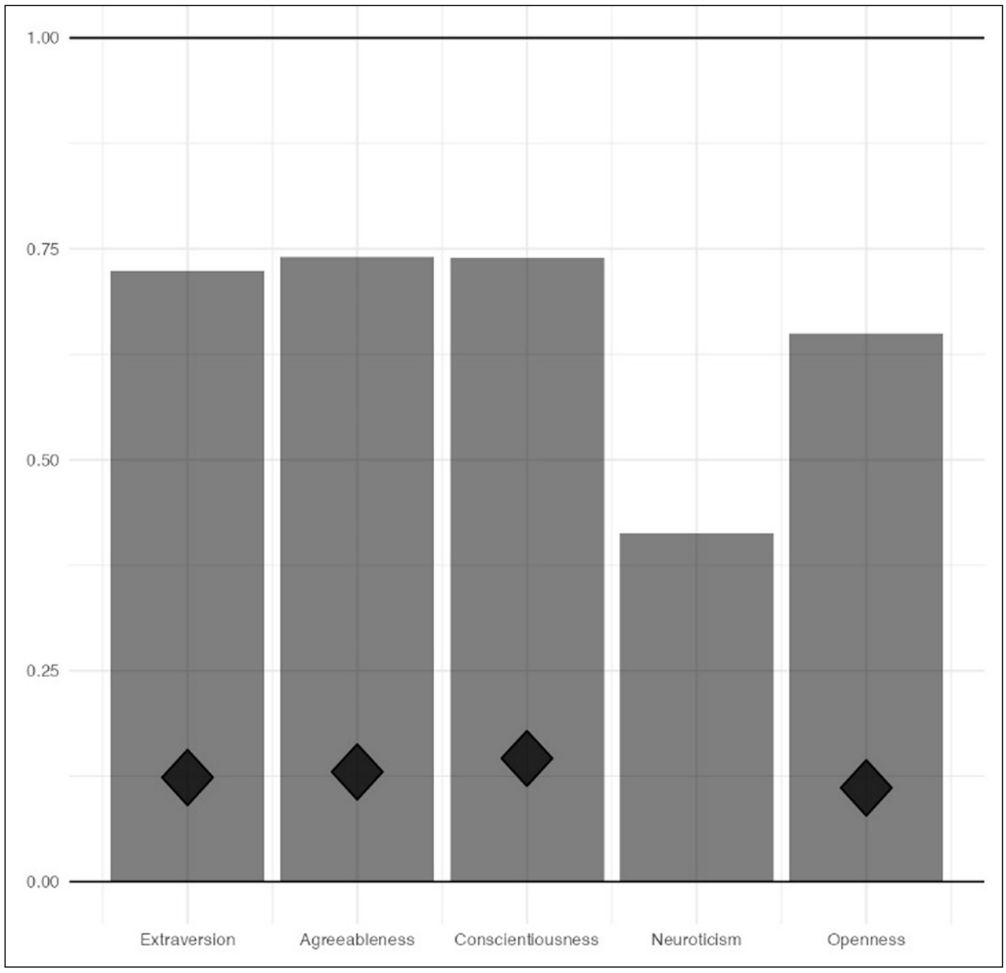

Figure 4 CIBERlite Plots of Behavior Change.

DISCUSSION

The findings are discussed with related literature for each three RQ respectively. Regarding gender difference, Firat (2016) and Fotiadou et al. (2017) report no significant difference between genders for autonomy, while Gülten (2015) reports a significant difference in favour of females. In this study, a significant difference was also found between genders regarding e-learning autonomy but ran in favour of males. These contradictory findings indicate the need for more investigations on gender differences for e-learning autonomy. Siddiquei and Khalid (2018) report no significant differences in learners' personality traits in terms of gender. However, this study found significant differences between genders for Extraversion, Conscientiousness, Openness and Neuroticism in favour of female students. Additionally, the high level of significant difference ($p < .001$) in terms of genders for Neuroticism merit further attention.

Related literature shows that openness, conscientiousness, extraversion, and agreeableness have a positive relationship with learning styles, while neuroticism has negative relation (Komarraju et al. 2011; Siddiquei & Khalid, 2018). Similarly, openness, conscientiousness, extraversion, and agreeableness contribute to self-regulation more than neuroticism in e-learning environments (Bruso et al. 2020). Finally, four personality traits are considered significant predictors of teachers' autonomy, while neuroticism is negatively correlated with autonomy (Fadaee et al. 2021). Supporting the related literature, the current research found that the e-learning autonomy of distance education students has significant positive correlations ($.055< r <.077$, $p < .001$) with all four personality traits except for neuroticism. This finding is contrary to the assumption of Hoyle (2010) that personality traits have distal effects on the online process because the personality traits are pre-existing characteristics and unfold in a situated process.

The generalizability of this study is limited to distance undergraduate education students. However, the results of this research have high generalizability potential for distance education undergraduate students considering the high number of participants. Situations may differ at different levels of education. Therefore, we recommend research data from different education levels.

This research explored the causality and direction of the relationship between autonomy and personality traits and revealed a predictive relationship between personality traits and autonomy of distance education students. Extraversion, Agreeableness, Conscientiousness and Openness were significant positive predictors of e-learning autonomy of distance education students in e-learning environments. The related literature lacks a predictive relationship between autonomy and personality traits. The findings of this research underline a significant trend and are open for further discussions based on different interventions.

CONCLUSIONS

In this research, collected data from 3435 distance education students were analyzed to answer three research questions. For RQ1, male students were found to have more e-learning autonomy than female students, while female students have higher scores of personality traits except for agreeableness. These findings show contradictories with related literature. Therefore, further meta-analyze research may focus on the gender issue for personality traits and learning autonomy. Significantly, the high level of meaningful difference for neuroticism merits further attention.

For RQ2, the study's results showed that the autonomy of distance education students has positive correlations with four personality traits except for neuroticism. For RQ3, the causality and direction of these relationships were explored with linear regression analysis. Results indicated that Extraversion, Agreeableness, Conscientiousness and Openness are significant predictors of e-learning autonomy behaviors of distance education students in e-learning environments. Neuroticism did not have a predictive role. Future research can investigate multiple correlations between personality traits, independent study, self-regulation, self-directed learning, learning autonomy, learning styles, and motivation.

SUGGESTIONS

The findings of this research can be used to develop interventions, such as self-regulation and self-directed learning strategies, to help distance education students improve their e-learning autonomy. It can also be used to help faculty and instructional designers better understand the needs of distance education students and design e-learning environments that are more inclusive, effective, and autonomy-promoting. Additionally, it is suggested that there are multiple correlations between personality traits, independent study, self-regulation, self-directed learning, learning autonomy, learning styles, and motivation, and further research can explore these associated factors and understand how they impact the autonomy of distance education students in e-learning environments. In more detail, the key recommendations are:

- Further research on gender differences in relation to personality traits and learning autonomy is needed, as the results of RQ1 indicate a significant difference in neuroticism that merits additional attention.
- Personality traits such as Extraversion, Agreeableness, Conscientiousness, and Openness have a positive correlation with e-learning autonomy in distance education students as

shown in RQ2 and RQ3 findings, and these traits can be used to identify students who may need additional support or resources to develop their learning autonomy.

- The result of RQ3 shows that these four personality traits are significant predictors of e-learning autonomy in distance education students, so it can be used to design personalized learning experiences that take into account students' personality traits to increase student satisfaction, motivation, and success in e-learning environments.

COMPETING INTERESTS

The author has no competing interests to declare.

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