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THE LOCUS OF CONTROL AND NEUROTICISM IN STUDENTS

DO STUDENTS FEEL WORSE WHEN THEY THINK THEY ARE NOT IN CONTROL?

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Abstract

The goal of this study was to find out more about the relationship between the locus of control and neuroticism in students. In order to do this, a survey was conducted among students that scored them on their locus of control (internal/external) as well as on the five factor model of personality. The five factor model includes neuroticism as one of the five factors. This approach is similar to the approach used in related studies in this domain of research. This study differs in that it looks at both the locus of control as well as the five factor model in students rather than in a more general population. The dataset used in this study was generated by administering a Qualtrics survey amongst students. This data was anonymised for the purposes of this research. This study has found that a significant correlation does exist between an external locus of control and higher neuroticism. An external locus of control was also found to be negatively correlated to the conscientiousness factor. In addition, a weak correlation exists between the locus of control and the remaining three factors.

1 DATA SOURCE, ETHICS, CODE, AND TECHNOLOGY STATEMENT

The data used in this study is owned by Tilburg University. This thesis project involved collecting data from human participants. This data is anonymised. Data was acquired through a survey made in Qualtrics (*Qualtrics XM - Experience Management Software*, n.d.). All figures in this thesis project were generated by the author with the exception of Figures 1 and 2 (Bahçekapılı & Karaman, 2020), licensed under a CC0 BY 4.0. The code in this thesis project was all written by the author with the help of Github Copilot. The python libraries and their versions used for this thesis are the following:

- matplotlib==3.8.4
- numpy==1.26.4

- pandas==2.2.2
- scipy==1.13.0
- statsmodels==0.14.2

A generative language model (ChatGPT) was used to improve the author's original content, for paraphrasing, spell checking and grammar. No other typesetting tools or services were used. The Overleaf editor was also used for checking spelling. Most references were created in BibTex format using the Scribbr Citation Generator and cited in the text using Overleaf citations. Other references were taken, in BibTex format from the DOI link of the paper cited.

2 INTRODUCTION

The goal of this research is to get a better understanding of the relationship between the locus of control and students' scores on a test of neuroticism. The research domain of this study is cognitive psychology, more specifically, cognitive theories of personality. Cognitive theories of personality focus on how individuals perceive, interpret, and think about themselves, others, and the world around them. People give meaning to events by interpreting them according to their personal beliefs (Higgins, 1990). Within the scope of this study, light will be shed on the relationship between the locus of control and neuroticism, one aspect of personality included in the five factor model of personality as can be seen in McCrae and Costa (1996). This paper describes neuroticism as "a tendency to experience dysphoric affect" (p. 164). It includes emotions such as fear, sadness, anxiety, guilt, and shame (Owens, 2023). The locus of control is a term that describes where an individual believes that control lies over the events that happen in their life (Rotter, 1966). It relates to how people interpret and think about themselves as well as others. The current state of the literature in this domain suggests that a relationship exists between the locus of control and several different facets of personality (Bahçekapılı & Karaman, 2020; Filipiak & Łubianka, 2024). This study investigates whether this relationship also exists among students.

There has been some research previously done in university students about the relationship between locus of control and student well-being that found a more external locus of control to have adverse effects on student well-being (Ćuže & Aleksić, 2021). This effect was moderated by optimism. There is also a study by Walsh, Wilding, Eysenck, and Valentine (1997) that shows that there is a significant positive correlation between locus of control and neuroticism in lecturers. In addition to this there are more studies exploring the relationship between locus of control and neuroticism in other cohorts (Filipiak & Łubianka, 2024; Judge, Erez, Bono, & Thoresen,

2002). There is also research about how the locus of control and personality traits, including neuroticism, regulate other variables, like a sensitivity to injustice (Žitný & Haľama, 2011) and GPA scores (Bahçekapılı & Karaman, 2020).

Despite there being much research about the locus of control and the big five personality traits in more general populations (Bahçekapılı & Karaman, 2020; Filipiak & Łubianka, 2024) there has not been enough research into the relationship between locus of control and neuroticism in students specifically. The academic environment that students find themselves in presents unique stressors and challenges, such as exams, social pressures, and future career uncertainty. This can also be a reason why the relationship between the locus of control and neuroticism that was previously found (Bahçekapılı & Karaman, 2020; Filipiak & Łubianka, 2024; Lima, Moret-Tatay, & Irigaray, 2021) may not apply in this cohort. Previous research has found that the locus of control has an effect on learning performance in students (Kutanis, Mesci, & Övdür, 2011). It has also been shown that college students with high neuroticism reported more interpersonal stressors Gunthert, Cohen, and Armeli (1999). In addition, research shows that neuroticism has been found to correlate with depression symptoms and burnout (Nakaya, Oshio, & Kaneko, 2006; Yusoff, Hadie, & Yasin, 2021) and that it is predictive of psychological distress (De Jong, Van Sonderen, & Emmelkamp, 1999). Clark, Watson, and Mineka (1994) found that neuroticism is related to the development of both anxiety and depression. Lima et al. (2021) found a significant correlation between neuroticism and both anxiety and depression as well. Researching the relationship between the locus of control and neuroticism in students could reveal how these personality traits affect academic performance, stress management, and overall mental health in an educational setting. We already see that there are a lot of students that struggle with mental health issues like depression, anxiety and suicidal ideation (Eisenberg, Gollust, Golberstein, & Hefner, 2007; Eisenberg, Hunt, & Speer, 2013). If we find that students with an external locus of control score higher on the trait of neuroticism, this would mean that students who believe they are more in control of outcomes score lower on a test of neuroticism, and thus experience less negative emotions. Finding this relationship would allow for further research to be conducted in order to find out if there is a causal relationship and which way this potential causal relationship goes. This is discussed in Section 6. Identifying the relationship between locus of control and neuroticism could help in designing systems that support students by reducing neurotic tendencies and improving mental health (Clark et al., 1994; Lima et al., 2021; Nakaya et al., 2006) and academic outcomes (Bahçekapılı & Karaman, 2020).

This all leads us to the research question of this thesis:

Do students with an external locus of control score higher on the trait of neuroticism in the Big 5 Personality test?

Furthermore, the following sub-questions are explored:

RQ1 *How strong is the correlation between the locus of control and the score on the trait of neuroticism in the Big 5 Personality test?*

RQ2 *Are there correlations between the locus of control and the results of the 4 other traits in the Big 5 Personality test?*

2.1 *Hypothesis*

We theorise that people with an external locus of control, who think that control lies not with them but with luck, fate or other people/institutions have a higher sensitivity to negative emotions because they have a harder time building self-esteem. It could be possible that when people assume that they have little control over the state of their life or, in the case of students, the outcome of their test results, for example, that these people have lower self-esteem and self-efficacy as well. If the things someone does contribute little to the good things in their life then they do not have a lot to take credit for and they cannot effectively build self-esteem. Conversely, if someone has an internal locus of control then they can take credit for many things that are good in their life and by doing so they can build self-esteem and a sense of self-efficacy. One could argue that they can also blame themselves more for the things in their life that are not good. However, for someone with an internal locus of control this only means that they also have the power to make these things better, contributing again to a sense of self-efficacy. This all leads to the hypothesis that if someone has an external locus of control they are more likely to experience the negative emotions that come with low self-esteem like sadness, anxiety and shame.

The *null hypothesis* of this thesis is that there is no significant relationship between the locus of control and the score on the trait of neuroticism in the Big 5 Personality test.

The *alternative hypothesis* is that students with an external locus of control score higher on the trait of neuroticism in the Big 5 Personality test than students with an internal locus of control.

2.2 *Findings*

The findings from this study have shown that there is indeed a moderate positive correlation between students having an external locus of control

and a higher score on a test of neuroticism. This allows us to reject the null hypothesis and accept the alternative hypothesis. We have also found that there is a moderate correlation between the locus of control and conscientiousness. This correlation, however, is negative. There are also weaker correlations between the locus of control and the other three factors of the five factor model (see Section 5).

3 RELATED WORKS

This section aims to summarise and discuss the literature. First, the locus of control will be explained and a recent article that studies the relationship between the locus of control and health will be discussed. After that, the five factor model will be discussed. The factors will be explained as well as the facets that comprise the factors. A recent meta analysis is discussed to better illustrate the state of the literature. Lastly, the state of the literature on the relationship between the locus of control and the five factor model of personality will be explained. A study is described that aims to clarify how both the locus of control and the five factors influence GPA scores.

3.1 *Locus of Control*

The locus of control, originally developed by Julian B. Rotter and first published in Rotter (1966), is a well studied concept (Buddelmeyer & Powdthavee, 2016; Cobb-Clark, 2015; Kesavayuth, Poyago-Theotoky, Tran, & Zikos, 2020). The word "locus" (plural: loci) comes from Latin, meaning "place" or "location" (Lewis & Short, 1879). This concept is a way to describe where an individual thinks that control lies over the things that happen in their life (Rotter, 1966). An external locus of control means that it is assumed that control over events lies not with the person, but rather with external factors such as luck, coincidence, other powerful people or institutions. An internal locus of control describes the opposite, where a person assumes that control over events lies with themself (Rotter, 1966). An example of an external locus of control can be seen if someone gets sick and they say that their sickness was caused by them getting a virus while outside and that there was not much they could have done to prevent it. Conversely, someone could believe that they got sick because their diet was lacking or they were not careful enough when in situations where they might receive a virus. This suggests an internal locus of control. A frequently used method for measuring the locus of control in individuals is administering questionnaires (Bahçekapılı & Karaman, 2020; Churchill, Munyanyi, Prakash, & Smyth, 2020; Filipiak & Łubianka, 2024; Kesavayuth et al., 2020; Lima et al., 2021). A widely known scale was developed by

Rotter (1966) that made a distinction between control by luck or powerful others and internal control. The force-choice scale asked respondents to choose between two options on 29 items, six of which were fillers in order to "make somewhat more ambiguous the purpose of the test" (Rotter, 1966, p. 10). One of the options was suggestive of a belief that control over events was internal while the other choice suggested a belief that control was either in the hands of luck or powerful others such as politicians, teachers, or the government. The score on this questionnaire was determined by awarding a point for each item where the choice suggesting an external locus of control was selected. A higher score therefore corresponds with a more external locus of control.

3.1.1 *Locus of Control and Health*

Kesavayuth et al. (2020) aimed to "analyze the importance of individuals' locus of control for their health and healthcare use" (p. 227). This study had a sample of 16,284 respondents aged 15-75. Out of these respondents, 8,171 were males while 8,113 were females. This study determined the locus of control by having the participants answer seven questions. These questions were as follows:

1. I have little control over the things that happen to me.
2. There is really no way I can solve some of the problems I have.
3. There is little I can do to change many of the important things in my life.
4. I often feel helpless in dealing with the problems of life.
5. Sometimes I feel that I'm being pushed around in life.
6. What happens to me in the future mostly depends on me.
7. I can do just about anything I really set my mind to do.

The participants were asked to rate these questions on a 7-point Likert-type scale that ranged from 1 (strongly disagree) to 7 (strongly agree). Questions one through five were scored in reverse. The scores for each question were then added up leaving each participant with a final score ranging from 7 to 49. The analysis of this study demonstrated that those who had an internal locus of control reported better self-assessed health, along with improved physical and mental well-being. Additionally, they showed reduced reliance on medical care, including both preventative and treatment measures. The study states: "Locus of control predicts health through different pathways, including social capital and health behaviors related to smoking, drinking and physical activity." (Kesavayuth et al., 2020, p. 227). This appears to be a good argument for fostering a more internal locus of control.

Kesavayuth et al. (2020) shows the current state of the literature in investigating the locus of control. Studies mainly use questionnaires (Bahçekapılı

& Karaman, 2020; Churchill et al., 2020; Filipiak & Łubianka, 2024; Kesavayuth et al., 2020; Lima et al., 2021) in order to measure the locus of control. This thesis also uses a questionnaire in order to make the results more easily compared to other studies and also to increase the reliability and replicability of this thesis. The research question of this thesis aims to investigate the relationship between the locus of control and neuroticism. Kesavayuth et al. (2020) is an interesting study because it shows that those with a more internal locus of control report better self-assessed health and improved physical and mental well-being. Ćuže and Aleksić (2021) shows this as well. Clark et al. (1994) and Lima et al. (2021) suggest that neuroticism also has an effect on mental well-being. It is therefore interesting to see if these two variables that both seem to affect mental well-being are correlated.

3.2 *The Five Factor Model*

The five factor model of personality which is used for the Big 5 Personality test was discovered by multiple researchers throughout history, as discussed in McCrae and Costa (1996) and is used to this day when exploring personality in research (Weinschenk, Rasmussen, Christensen, Dawes, & Klemmensen, 2022). This is the model that will be used in this thesis. The model consists of five personality traits: Openness (to experience), Conscientiousness, Extraversion, Agreeableness and Neuroticism. It is also called the OCEAN model as an abbreviation of the five traits.

3.2.1 *The Five Factors*

Openness refers to "a need for variety, novelty and change" (McCrae & Costa, 1996, p. 164). Conscientiousness is described in B. W. Roberts, Lejuez, Krueger, Richards, and Hill (2014) as "a spectrum of constructs that describe individual differences in the propensity to be self-controlled, responsible to others, hardworking, orderly, and rule abiding" (p. 1). It is accompanied by a strong sense of purpose and high aspiration levels. Someone with a high degree of conscientiousness is more likely to chase a job that brings them more prestige and social status. Extraversion can be defined as "a preference for companionship and social stimulation" (McCrae & Costa, 1996, p. 164). Someone with a very low score on extraversion is more likely to move away from a city and live in the countryside. "a willingness to defer to others in times of interpersonal conflict" (McCrae & Costa, 1996, p. 164) describes the fourth trait: agreeableness. Lastly, neuroticism is "a tendency to experience dysphoric affect" (McCrae & Costa, 1996, p. 164). It describes a person's tendency to experience negative emotions, including

anger, anxiety, self-consciousness, irritability, emotional instability, and depression (B. Roberts, Jackson, Fayard, Edmonds, & Meints, 2009). We will look into the trait of neuroticism in this thesis. A person with a high score on neuroticism is more likely to be depressed, have an anxiety disorder or feel guilty about having a "low prestige" job. The reason we are looking into the trait of neuroticism specifically is that it has an influence on the perceived quality of student's lives (Clark et al., 1994; De Jong et al., 1999; Gunthert et al., 1999; Lima et al., 2021; Nakaya et al., 2006; Yusoff et al., 2021) as it directly relates to experiencing negative emotions. The five factors of the model are most often measured using questionnaires (Etkin, Mezquita, López-Fernández, Ortet, & Ibáñez, 2020; Lui, Samuel, Rollock, Leong, & Chang, 2019; Murphy, Fisher, & Robie, 2021; Sutin et al., 2021; Weinschenk et al., 2022).

3.2.2 *The Facets*

Because the five factors are very broad concepts, they can be further subdivided into facets. This is also the case in the questionnaire used in this study (Buchanan & Hegarty, 2023). In the *NFFPS-30* the five factors are all further subdivided into six facets. Every question tests one facet that belongs to one of the five factors. The aggregate score for each factor is therefore comprised of the score for each individual facet that belongs to that factor. For example, the factor openness includes the facets imagination, artistic interests and adventurousness. Conscientiousness includes self-efficacy, achievement striving and self-discipline. Extraversion includes friendliness, activity level and excitement seeking. Agreeableness includes trust, modesty and sympathy while neuroticism includes the facets anxiety, self consciousness and immoderation. There are also studies that investigate specifically the facets of the five factor model (Lui et al., 2019).

3.3 *The Relationship Between the Locus of Control and the Five Factor Model*

The relationship between the locus of control and the five factor model of personality has been researched in various cohorts before (Morrison, 1997; Rossier, Dahourou, & McCrae, 2005; Walsh et al., 1997) including online students (Bahçekapılı & Karaman, 2020). Interesting effects and interactions have been found between the factors of the five factor model and the locus of control. As an example of the current state of the research a study that found effects of multiple personality traits to influence the GPA scores of students attending a distance education program will be

discussed (Bahçekapılı & Karaman, 2020). These effects were mediated by the locus of control.

3.3.1 *How Personality Factors and the Locus of Control can affect GPA scores*

Bahçekapılı and Karaman (2020) investigated the indirect effects of personality traits, self-efficacy and academic locus of control on online learner's grade point average (GPA) through path analysis. Their proposed path model (see Figure 1) shows the five factors affecting GPA as well as self-efficacy, an external locus of control (ELoC) and an internal locus of control (ILoC). The proposed model also shows self-efficacy, the ELoC and the ILoC having a potentially mediating effect on GPA.
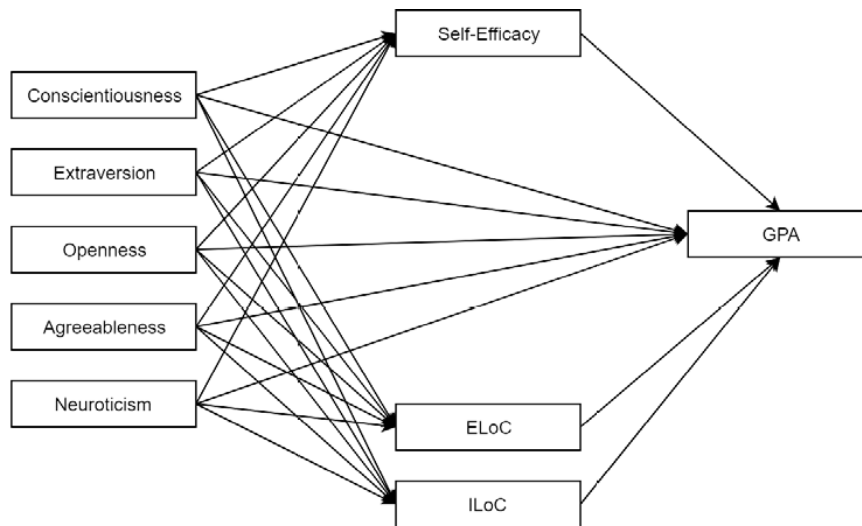
ELoC: External Academic Locus of Control, ILoC: Internal Academic Locus of Control, GPA: Grade Point Average

Figure 1: Proposed model (Bahçekapılı & Karaman, 2020)

The model was tested using a sample of 525 students aged between 19 and 59 (*M* = 30.9) attending a distance education program in two different universities in Turkey. 200 of the students were female while 325 students were male. The study used the BFI (O. John, Naumann, & Soto, 2008; O. P. John, Donahue, & Kentle, 1991) to measure the participants' personality traits. To measure the ELoC and ILoC, the study used a 17-item, 5-point Likert-type scale from Akin (2007) which scores participants on the two sub-factors. ELoC consists of 11 items while ILoC consists of six items. In order to measure participants' self-efficacy, the study used the General Self-Efficacy Scale (GSES) developed in Germany by Schwarzer and Jerusalem (Schwarzer, Jerusalem, Weinman, Wright, & Johnston, 1995). This scale uses a 4-point Likert-type scale across ten items. The scale is

scored from 10 to 40. The results of this study showed that the biggest influence on GPA was had by the ELoC variable with an effect size of β = -0.156. Second was the self-efficacy variable (β = 0.13). Both of these affected the GPA directly. The GPA was indirectly affected by the personality traits conscientiousness, openness and neuroticism. Conscientiousness (β = 0.022), openness (β = 0.037) and neuroticism (β = -0.023) were mediated by self-efficacy to indirectly influence the GPA. Conscientiousness (β = 0.056) and neuroticism (β = -0.011) were mediated by the ELoC variable to indirectly affect the GPA. Extraversion and agreeableness as well as the ILoC variable have not been shown to have a significant effect on the GPA. See Figure 2 for a visualisation of the effect of the different variables on the outcome variable GPA.

ELoC: External Academic Locus of Control, ILoC: Internal Academic Locus of Control, GPA: Grade Point Average
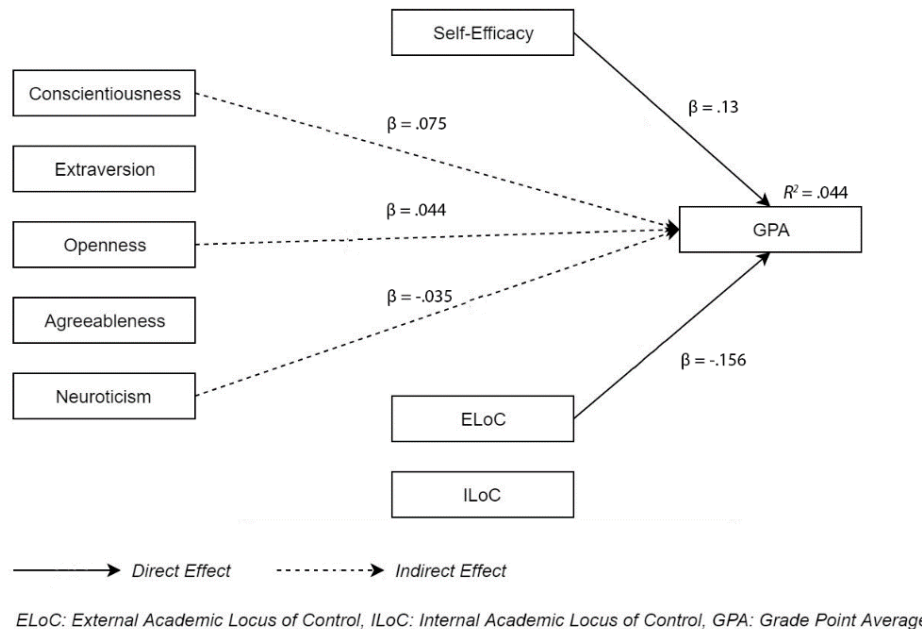
Figure 2: The resulting model (Bahçekapılı & Karaman, 2020)

This study did not research the relationship between the locus of control and neuroticism directly. Instead it studies how these variables together affect a third outcome, GPA. Thus, what this thesis is interested in is to find more clear results on how the locus of control is correlated with neuroticism in students, not how they affect another variable. Bahçekapılı and Karaman (2020) therefore makes one wonder if the factors from the five factor model and the locus of control, which together influence the GPA of students, are also correlated to each other. The research question of this thesis aims to investigate exactly that.

3.3.2 *Neuroticism and Locus of Control in Lecturers*

Walsh et al. (1997) investigated the relationship between neuroticism, locus of control, Type A behaviour pattern and occupational stress. This is an interesting study because a sample of lecturers were studied, which are often in the same environment as students. Lecturers, however, are not usually in the same age group and they are not in the same phase of life as students. In addition, lecturers and students both play different roles in the environment that they occupy. It is therefore still interesting to study the relationship between the locus of control and neuroticism in students specifically. The participants of this study were 24 male and 8 female lecturers. This study used self reporting and salivary cortisol to measure stress levels in lecture and non-lecture weeks. Neuroticism was measured using the Eysenck personality questionnaire (Eysenck, 1975) while the locus of control was measured using Rotter's locus of control scale (Rotter, 1966). The self reporting was done through the stress-arousal checklist (Burrows, Cox, & Simpson, 1977). This study found a significant correlation between the locus of control and neuroticism ($r = 0.40$, $p < .05$).

We see that the current state of the literature suggests a positive correlation between the locus of control and neuroticism (Filipiak & Łubianka, 2024; Walsh et al., 1997; Žitný & Haľama, 2011). The research question in this thesis will aim to investigate if this correlation between the locus of control and neuroticism exists in students as well since this has not been investigated sufficiently in the current literature. Some literature shows that both neuroticism and the locus of control affect similar outcome variables (Bahçekapılı & Karaman, 2020; Clark et al., 1994; Kesavayuth et al., 2020; Lima et al., 2021). It would therefore be interesting to see if neuroticism and the locus of control are directly correlated to each other as well.

4 METHODS

4.1 *Participants*

A survey was conducted amongst students. The only criterion for collecting responses was that the respondents must be students or have graduated less than a year ago. This choice was made in order to be able to gather more responses and because, having graduated less than a year ago, these people will still be a good fit for this study. Besides that, all ages, genders and nationalities were accepted.

4.2   *Materials*

4.2.1   *Measuring the Locus of Control*

The survey that determined the respondents' locus of control asked the respondents to evaluate 17 statements on a 6-point Likert-type scale (Craig, Franklin, & Andrews, 1984) (see Appendix A). This locus of control of behaviour (LCB) scale was selected because it is relatively short while still having an acceptable internal reliability ($\rho_T = 0.79$) meaning that we can use this test well in order to measure the locus of control. Having a shorter questionnaire will likely allow us to collect more responses as well as maintain the quality of the responses by reducing cognitive load on the participants answering the survey. This aims to help mitigate the risk of respondent fatigue. This effect is especially prominent in longer surveys (Jeong et al., 2023). Ideal survey length seems to be about 10-15 minutes (Revilla & Höhne, 2020; Revilla & Ochoa, 2017). This scale was selected because it was not too long and not as short as other questionnaires. The LCB scale was originally designed to be used as a guide to predict patients' likelihood of relapsing after receiving therapy for stuttering but the internal reliability suggests that it is an appropriate tool to measure the locus of control. The LCB scale is meant to measure the locus of personal control over a behavioural problem. This 17-item LCB scale is scored just like the Rotter I-E scale (Rotter, 1966). This means that a higher score indicates a more external locus of control. All the items that relate to externality are scored normally. This includes items 2, 3, 4, 6, 9, 10, 11, 12, 14 and 17. The remaining items relate to internality and are therefore scored in reverse. Therefore a 5 (strongly agree) becomes a 0 (strongly disagree). The eventual score for the locus of control is then calculated by summing the scores for each individual item. In order to test the reliability of this scale, a study was conducted where the scale was completed by a sample of 123 university students: 52 males and 71 females. The mean score on this test was 28.3 with a standard deviation of 8.5. In order to test the scale's test-retest reliability, scores were obtained from 25 non-clinical adult participants. The test was administered twice, one week apart. The Pearson correlation of this one-week test-retest was 0.90 indicating the stability of the personal control construct over time.

4.2.2   *Measuring the Five Factors of Personality*

For determining the respondent's personality score, the *NFFPS-30* questionnaire was used (Buchanan & Hegarty, 2023) (see Appendix B). This questionnaire consists of 30 items that the respondent is asked to rate on a 5-point Likert-type scale. This questionnaire was selected because it is

a shorter version of the 120 item version, the *IPIP-NEO-120*. This, again, aims to help mitigate the risk of respondent fatigue. This survey was tested on an Australian sample (N = 14,163) of 5,252 males between the age of 16 and 95 and 8,911 females between the age of 16 and 88. The distribution of scores on the five factors of the *NFFPS-30* can be found in Table 1.

Scale	Mean	Standard Deviation	Skew	Kurtosis	Internal Reliability
Openness	21.4	3.7	-0.22	-0.17	0.43
Conscientiousness	21.4	4.3	-0.25	-0.37	0.69
Extraversion	20.3	3.8	-0.34	-0.05	0.54
Agreeableness	21.7	3.3	-0.54	0.54	0.46
Neuroticism	17.0	4.6	0.10	-0.48	0.70

Table 1: Distribution of Scores on the Five Factors of the NFFPS-30

The study that evaluated the survey found that there is a significant difference in how males and females score on each of the five factors with females scoring higher than males on every factor,. This is especially true for agreeableness where females score 0.41 higher than males, and neuroticism where they score 0.40 higher on average. It is noticeable that the coefficient alpha for the five factors is not very high, meaning that not all the items that belong to one factor seem to measure the same thing very strongly. However, this is only because during the confirmatory factor analysis (CFA) items were selected based on how heavily they loaded upon that facet regardless of how they loaded on the factor. If the *IPIP-NEO-120* was shortened differently, for example by selecting those items that loaded most heavily at the factor level, the factor internal reliability, and therefore the coefficient alpha, would have been higher. This would however likely have removed useful personality measures at the facet level. About low reliability, Schmitt (1996) states that "[w]hen a measure has other desirable properties, such as meaningful content coverage of some domain and reasonable unidimensionality, this low reliability may not be a major impediment to its use" (p. 351-352). For the purposes of this study, it is useful that the coefficient alpha for the factor of neuroticism is the highest out of the five factors in the *NFFPS-30* (α = 0.70).

4.3 *Procedure*

The participants of this study were given a URL link in order to access the survey. Upon accessing this link they were directed to the online Qualtrics environment where they would complete the survey. The participants were provided with a privacy and consent statement to indicate their

informed consent to taking part in this study. Only those participants that consented were then redirected to the survey. Those that did not consent were redirected to the end of the survey. First, the participants completed the LCB scale (see Subsection 4.2). For the instructions that participants were given on how to fill out the LCB questionnaire, see Appendix 7. After completing the LCB scale, participants were tasked to fill in the *NFFPS-30* questionnaire (see Appendix 7 for directions). This questionnaire was spread over three blocks of 10 items within Qualtrics. Participants saw each of these blocks on a new page. After completing both the locus of control questionnaire as well as the *NFFPS-30* questionnaire the respondents were asked to answer a few demographic questions. These questions were asked in order to get a better understanding of the data that was collected for this study. The respondents were asked the following questions in the order shown below:

- What gender do you identify as?
- What is your nationality?
- What is your age in years?
- What is your study level?
- What is your study year?

After establishing these covariates, the survey was concluded and the response was recorded.

4.4 *Data Processing*

After the data collection took place using the survey, the data was cleaned using python (Van Rossum & Drake, 2009) and the Pandas library (The pandas development team, 2020; Wes McKinney, 2010). The data was cleaned and irrelevant variables were removed. Furthermore the unfinished responses were removed from the data as well as the responses that were not from students or recent graduates. We handle missing and unique values. There was one missing value where there was no answer for the demographic question "What is your study year?" This cell was changed to "0". Unique values included synonyms for the names of different nationalities. These were manually found in the dataset and changed to the most common name for that nationality. After this, the data was explored by looking into the distributions of the answers to the demographic questions. After this we calculate the score for each factor of the five factor model as well as the locus of control score by inverting the score for the necessary questions and changing the text answers from the survey to numbers. This way we can add up the scores for individual questions to calculate the final scores. We create new columns in the data frame to store the scores for each response. When the scores are calculated we visualise the data we have

collected by generating histograms for each factor and the locus of control. Seeing as this is a relatively small sample size, determining whether or not the data was normally distributed was important. In order to find out if the data was normally distributed two different tests of normality were conducted. One was a visual test, namely a Q-Q plot for all five factors of the five factor model. While the other test was a formal statistical test, namely the Shapiro-Wilk test (Shapiro & Wilk, 1965). After performing the tests of normality, the data was explored further to see what the mean and standard deviation was for each factor and the locus of control. This was also done for each gender separately to see the difference in how males and females scored on this survey. With the data exploration done and the necessary scores calculated, the correlations between each factor and the locus of control could be analysed. This was done using a Pearson correlation for the factors that were normally distributed and a Spearman correlation for those factors that were not normally distributed.

5 RESULTS

There were 70 responses to the survey. Out of all the responses, 48 were complete and the other 22 were incomplete and therefore excluded from the analysis. Out of the 48 included responses, 25 were female, 20 were male and 3 were non-binary/third gender. The respondents were mainly aged between 21 and 25. This age bracket made up 42 of the 48 finished responses. A little over half of the responses (26) were Dutch. Other nationalities included Bulgarian, Polish, Romanian, Italian and Turkish. Most of the responses (39) were from university bachelor and master students with some of the responses (4) coming from HBO students and some coming from people that graduated less than a year ago. Most respondents were in either their first or fourth year of studying with 10 respondents being in their first study year and 15 respondents being in their fourth study year. Nearly all the finished responses were from students or recent graduates.

5.0.1 *Distributions and Normality*

In order to see if the data was normally distributed, the histograms of the data were inspected (see Figure 3). We can see that for most factors and the locus of control the data looks to be normally distributed. However, the openness factor appears to have a significant negative skew. The conscientiousness factor also seems to have a slight negative skew. After visualising the distributions using Q-Q plots we can see that most of the
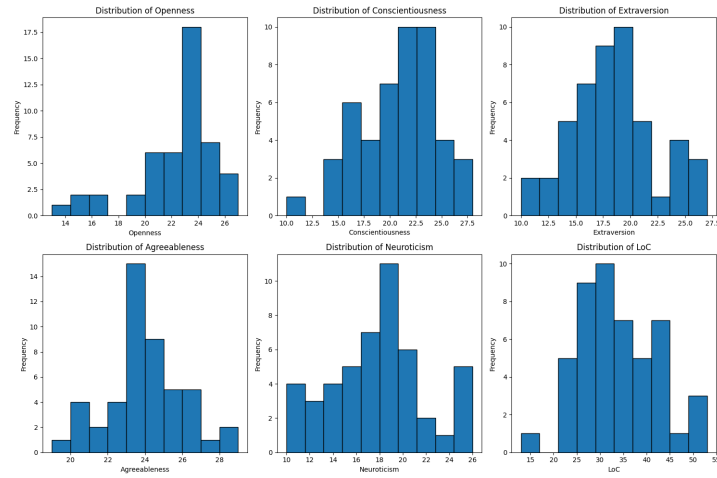
Figure 3: Distribution of the five factors and the locus of control

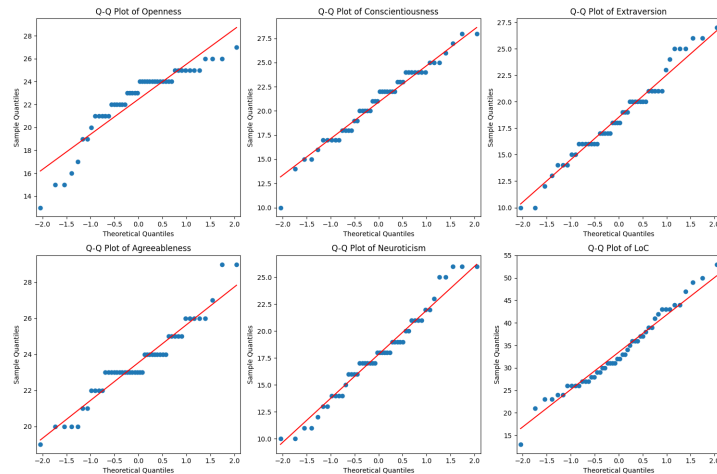data is normally distributed with the clear exception of openness. This can be seen in Figure 4.

Figure 4: Q-Q plots of the five factors and the locus of control

The results of the more formal statistical Shapiro-Wilk test bring us more clarity. The test shows us that the openness factor is indeed not normally distributed ($W = 0.864$, $p \leq 0.05$). In addition, we can see that the factor agreeableness is also not normally distributed ($W = 0.949$, $p \leq 0.05$). The results of the Shapiro-Wilk test can be found in Table 2. All the other factors and the locus of control scores were found to be normally distributed.

Factor	Test Statistic W	p-value
Locus of Control	0.980	0.5647
Openness	0.864	0.0001
Conscientiousness	0.976	0.4138
Extraversion	0.973	0.3183
Agreeableness	0.949	0.0370
Neuroticism	0.970	0.2442

Table 2: The results of the Shapiro-Wilk test

5.0.2 *Data Exploration*

When investigating the summary statistics of the data, it is found that the mean score for neuroticism is the lowest of all factors (M = 17.77, SD = 4.09) while agreeableness has the highest mean score in our sample (M = 23.57, SD = 2.10). We can see in Table 3 that the locus of control has a higher standard deviation (SD = 8.30) than the factors. This is likely because it is a bigger scale (scores range from 0 to 85) than the factors of the five factor model (scores range from 6 to 30). It is also noteworthy that

Factor	Mean	Standard Deviation
Locus of Control	33.48	8.30
Openness	22.46	3.06
Conscientiousness	20.90	3.78
Extraversion	18.52	4.00
Agreeableness	23.54	2.10
Neuroticism	17.83	4.09

Table 3: Mean and standard deviations of the locus of control and the Big Five

females in this study, on average, score higher than males on almost every factor except for conscientiousness ($M_{females}$ = 20.44, M_{males} = 22.05). This can be seen in Table 4. What can be seen as well is that females scored almost an entire standard deviation higher than males on the neuroticism factor ($M_{females}$ = 18.76, M_{males} = 15.65). For the purpose of data exploration, the "Non-binary/Third gender" class is excluded from further analysis as this only includes 3 responses. It would therefore not be useful to generate a mean and standard deviation score. These responses are however still included in the correlation scores later in this section.

5.0.3 *Correlations*

An alpha level of 0.01 was selected for this analysis to instill a confidence level of 99% in our results. Using the Pearson Correlation coefficient, a

Factor	Gender	Mean	Standard Deviation
Locus of Control	Male	29.95	5.80
	Female	34.52	8.36
Openness	Male	21.25	3.64
	Female	23.28	2.37
Conscientiousness	Male	22.05	3.75
	Female	20.44	3.55
Extraversion	Male	18.45	4.26
	Female	18.68	3.96
Agreeableness	Male	23.00	2.10
	Female	23.84	2.15
Neuroticism	Male	15.65	3.23
	Female	18.76	3.78

Table 4: Mean Differences in Personality Traits across Gender

moderate correlation was found between the locus of control and neuroticism ($r(46) = 0.57$, $p < .001$). This correlation is similar to correlations found in previous studies in different cohorts (Walsh et al., 1997). A significant correlation was also found between the locus of control and conscientiousness ($r(46) = -0.43$, $p = .002$). We see that the correlation between locus of control and neuroticism is positive, indicating that students with a more external locus of control score higher on a test of neuroticism. Conversely we can see that there is a negative correlation between locus of control and conscientiousness. This indicates that students with a more external locus of control score lower on conscientiousness. In other words, students with a more internal locus of control score higher on a test of conscientiousness. There also seems to be a weak positive correlation between the locus of control and agreeableness ($r(46) = 0.39$, $p = .007$) indicating that students with a more external locus of control score higher on agreeableness. The remaining factors seem to only have a very weak or no association with the locus of control with openness having a correlation of $r(46) = 0.18$, $p = .213$ and extraversion having a correlation score of $r(46) = -0.17$, $p = .251$. A visualisation of the correlations can be found in Figure 5. Additionally, Spearman correlations were calculated for the factors openness and agreeableness as non-parametric alternatives to the Pearson Correlation coefficient, because these factors were found to be not normally distributed. These correlations found a weak association between the locus of control and openness ($r(46) = 0.27$, $p = .060$) as well a moderate association between the locus of control and agreeableness ($r(46) = 0.42$, $p = .003$).
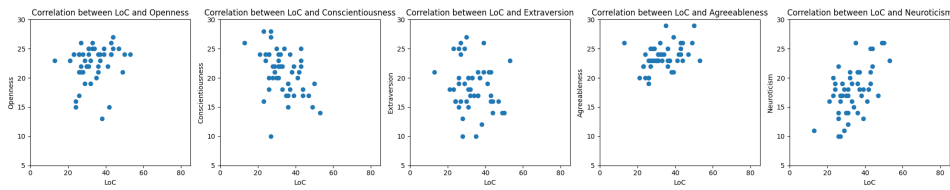
Figure 5: The correlation of each factor of the five factor model and the locus of control

6 DISCUSSION

The goal of this study was to discover more about the nature of the relationship between the concept of locus of control and the concept of neuroticism in students. Additionally, this study aimed to investigate if there are other interesting relationships between the locus of control and the other four factors of the five factor model of personality: openness, conscientiousness, extraversion and agreeableness. This study has found that there is a moderate correlation between the locus of control and neuroticism. More specifically, a more external locus of control has been found to correlate with a higher score on a test of neuroticism. Moreover, a more external locus of control has been found to correlate negatively, and to a moderate amount, with the score on the conscientiousness factor. This study has also shown that there is a weak to moderate correlation between the locus of control and agreeableness with a more external locus of control correlating with a higher score on agreeableness. Some uncertainty remains about the relationship between the locus of control and openness as the Pearson correlation showed no significant result while the Spearman correlation showed a weak association between the two variables. Mixed results were found in earlier research where openness predicted locus of control. This effect was different in strength and direction between genders (Filipiak & Łubianka, 2024).

6.1 *Directions for Further Research*

The results of this study warrant further research into the chain of causality between the concepts of locus of control and the five factor model of personality. If somehow shifting the locus of control in students from external to more internal can lower their score on neuroticism then this could possibly positively affect both physical and mental health outcomes (Lahey, 2009; Slavish et al., 2018). The results of further research could be used to guide policy making in order to change the teaching methods and other aspects of the education system. This can potentially give students

more responsibility and give them a stronger sense of control over the outcomes of their own education.

A possible future study could be a within-subject study where a method is used to shift a participants' locus of control from external to internal. Their neuroticism score would be measured before and after applying the method. If shifting students' locus of control to a more internal locus lowers their score on tests of neuroticism then this knowledge can be used to guide policy making in educational institutions. If these institutions, like universities, can reward a more internal locus of control amongst students then this could create an environment where students are less neurotic and therefore experience less negative emotions. Lower neuroticism is also found to be related with various (mental) health outcomes (Lahey, 2009; Slavish et al., 2018). Since we know that mental health is a particular concern amongst students, this can be quite relevant (Storrie, Ahern, & Tuckett, 2010). Perhaps this can even improve the efficacy of the education that these students receive - it could help students be less neurotic and improve their life satisfaction, sleep and (mental) health (Zhang et al., 2023).

An interesting thing to note for future research looking into a causal relationship between the big five traits and the locus of control is that the big five traits seem to have a significant heritable component as found by Weinschenk et al. (2022). This heritability could suggest that the locus of control is caused by the big five personality traits rather than the other way around.

6.2 *Limitations of the study*

Something that is interesting to note concerning this research is that, while the survey was administered in English, most of the respondents did not have English as their native language and were actually Dutch.

7 CONCLUSION

In conclusion, this thesis found that there is indeed a correlation between the locus of control in students and their score on a test of neuroticism. A correlation between the locus of control and conscientiousness was also found. We have rejected the null hypothesis that there is no significant relationship between the locus of control and the score on the trait of neuroticism in the Big 5 Personality test. We have accepted the alternative hypothesis that students with a more external locus of control score higher on the trait of neuroticism in the Big 5 Personality test than students with an internal locus of control. A more external locus of control seems to

correlate moderately with a higher score on neuroticism and a lower score on conscientiousness. This can be considered as yet another reason why it is desirable to foster in students a more internal locus of control.

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APPENDIX A

Below is the LCB scale questionnaire used to determine the locus of control. *Directions:* Below are a number of statements about how various topics affect your personal beliefs. There are no right or wrong answers. For every item there are a large number of people who agree and disagree. Please mark how strongly you agree/disagree with each statement. *0 - Strongly disagree 1 - Generally disagree 2 - Somewhat disagree 3 - Somewhat agree 4 - Generally agree 5 - Strongly agree.*

1. I can anticipate difficulties and take action to avoid them	
2. A great deal of what happens to me is probably just a matter of chance	
3. Everyone knows that luck or chance determines one's future	
4. I can control my problem(s) only if I have outside support	
5. When I make plans, I am almost certain that I can make them work	
6. My problem(s) will dominate me all my life	
7. My mistakes and problems are my responsibility to deal with	
8. Becoming a success is a matter of hard work, luck has little or nothing to do with it	
9. My life is controlled by outside actions and events	
10. People are victims of circumstance beyond their control	
11. To continually manage my problems I need professional help	
12. When I am under stress, the tightness in my muscles is due to things outside my control	
13. I believe a person can really be the master of his fate	
14. It is impossible to control my irregular and fast breathing when I am having difficulties	
15. I understand why my problem(s) varies so much from one occasion to the next	
16. I am confident of being able to deal successfully with future problems	
17. In my case maintaining control over my problem(s) is due mostly to luck	

Below is the *NFFPS-30* questionnaire used to determine the scores for the Five Factor Model of personality. *Directions:* The following statements describe people's behaviours. Please select how accurately each statement describes you. Describe yourself as you generally are now, not as you wish to be in the future. Describe yourself as you honestly see yourself, in relation to other people you know of the same sex as you are, and roughly your same age. *1 - Very inaccurate, 2 - Moderately inaccurate, 3 - Neither accurate nor inaccurate, 4 - Moderately accurate, 5 - Very accurate.*

1. Trust others.	
2. Get angry easily.	
3. Love large parties.	
4. Take charge.	
5. Find it difficult to approach others.	
6. Am always busy.	
7. Sympathise with the homeless.	
8. Jump into things without thinking.	
9. Am concerned about others.	
10. Yell at people.	
11. Become overwhelmed by events.	
12. Avoid contact with others.	
13. Love to daydream.	
14. Take advantage of others.	
15. Leave a mess in my room.	
16. Am often down in the dumps.	
17. Dislike changes.	
18. Do just enough work to get by.	
19. Enjoy being reckless.	
20. Have a high opinion of myself.	
21. Waste my time.	
22. Tend to vote for conservative political candidates.	
23. Get stressed out easily.	
24. Know how to get things done.	
25. Do not enjoy going to art museums.	
26. Don't understand people who get emotional.	
27. Break my promises.	
28. Am able to control my cravings.	
29. Am not interested in theoretical discussions.	
30. Look at the bright side of life.	