The effects of Dark Triad traits on student entrepreneurship

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"***During the preparation of this work, the author used ChatGPT in order to refine the text and check for spelling mistakes. After using this tool/service, the author reviewed and edited the content as needed and takes full responsibility for the content of the work.***"

Contents

1. INTRODUCTION

1.1 Problem statement

Entrepreneurship is widely acknowledged as a key driver of economic development, innovation and job creation (Acs et al., 2008). In recent years there has been a growing interest in the psychology behind entrepreneurship, especially focusing on the effect of certain psychological characteristics on the likelihood of a person starting a business (Rauch & Frese, 2000; Przepiorka, 2016). Traditionally, researchers focused on positive traits such as resilience, creativity, and self-efficacy (Zhao et al., 2010), however, nowadays more nuanced pictures are arising. Recently, researchers have been examining the possible effects of darker personality traits on entrepreneurship. More specifically, the so-called Dark Triad: narcissism, Machiavellianism, and psychopathy (Klotz & Neubaum, 2016).

The Dark Triad traits, most associated with antisocial behavior, are linked to certain psychological characteristics that may give people an advantage in the entrepreneurial world. For example, individuals that possess narcissism traits may demonstrate an elevated confidence and a strong sense of vision; Machiavellianism is often associated with opportunism and manipulation on a strategic level; and psychopaths are known to be more stress resistant and are more tolerant to risk taking (Paulhus & Williams, 2002; Klotz & Neubaum, 2016). Overall, these Dark Triad traits are often viewed as negative traits in a social context, however, in an entrepreneurial context these traits may positively contribute to decision making, especially in situations where the environment is uncertain or where there is a lot at stake.

1.2 Research question and objective

This thesis will focus specifically on the effects of the Dark Triad traits on student entrepreneurship. Student entrepreneurship is defined by various scholars. A group of researchers see student entrepreneurship as students who are currently enlisted in an entrepreneurship course (Fiet, 2001). A different group of researchers look at student entrepreneurship as individuals or groups of people who are actively enrolled in academic programs and in addition also run their own business at the same time (Ridder & Sijde, 2006). The role of student entrepreneurship represents a more unique subdomain in the research of entrepreneurship, since a lot of university students nowadays have gained access to a lot of valuable resources such as funding opportunities or interdisciplinary collaborations. More importantly, students tend to be at a stage where they can develop critical aspects that can influence entrepreneurial tendencies, such as identity formation (Mei & Syamco, 2022), career planning and exploration of risk (Akpoviroro et al., 2021; Zhao et al., 2010). Therefore, students are a vital part of entrepreneurial development. This ultimately leads to the research question: To what extent do Dark Triad traits impact the likelihood of a student to become an entrepreneur?

1.3 Academic and practical relevance

Currently, in the academic world the impact of the Dark Triad traits on entrepreneurship remains underexplored, especially the impact on student entrepreneurship. There are various studies which link Dark Triad traits to entrepreneurial success (McLarty et al., 2023; Wu et al., 2019), however not all studies agree on the consensus that the three different traits; narcissism, Machiavellianism and psychopathy impact the likelihood and success of entrepreneurship. For example, McLarty et al. (2023) found that entrepreneurship may well be affected by Machiavellianism and psychopathy, however narcissism had no impact at all. Whereas Wu et al. (2019) reported that Machiavellianism had positive impacts on entrepreneurial intentions, but narcissism and psychopathy had negative impacts on entrepreneurship. Since a lot of studies contradict each other, it is my goal to get more clarity by

comparing studies to find more common ground. If a common conceptual basis can be established, this thesis aims to examine which of the Dark Triad personality traits significantly influence the entrepreneurial ambitions of students, a group that has received relatively little attention in the existing literature.

2. LITERATURE REVIEW

2.1 Entrepreneurial intentions

An individual with entrepreneurial intentions can be described as someone who is interested in owning or starting their own business (Bae et al., 2014). These entrepreneurial intentions are often seen as the first step toward entrepreneurial behavior and therefore widely used in entrepreneurship research as a reliable predictor of future entrepreneurial behavior (Lee et al., 2011). Among university students, these intentions are shaped by key developmental processes, such as identity formation, career exploration and risk exploration. Mei and Symaco (2022) highlight that entrepreneurial identity plays a significant role in students' decision making and behavior, while Akpoviroro et al. (2021) note that entrepreneurship education facilitates career reflection and exploration. In addition, risk taking has been identified as one of the strongest personality related predictors of entrepreneurial intention (Zhao et al., 2010). These developmental factors are especially relevant during university years, when students try to actively shape their professional identities, assess possible career options and begin to navigate uncertainty. Therefore, entrepreneurial intentions are a valuable predictor for understanding entrepreneurial behavior, especially among the student population.

However, the relationship between intentions and actual behavior is not always linear. Scholars like Hsu and Wang (2019) and McGee et al. (2009) have pointed out that intentions may not necessarily translate into action due to various constraints such as lack of financial resources, risk aversion and lack of self-efficacy. However, given the early-stage nature of entrepreneurship among students, intentions can offer a valuable picture to assess entrepreneurial behavior.

Previous research has identified several predictors of entrepreneurial intentions. Personal characteristics such as self-efficacy (Zhao et al., 2005), resilience (Manfield & Newey, 2018), and social support (Neneh, 2020) are significant predictors for entrepreneurial intentions. In addition, contextual factors like national culture (Bogatyreva et al., 2019) and entrepreneurship education (Bae et al., 2014) have also been found influential. Previously stated studies mostly included positive personality traits, however, more recently there has been a growing interest in understanding how darker personality traits, such as the Dark Triad traits, may influence entrepreneurial intentions (Hoang et al., 2022). Despite the growing interest, research on this topic remains limited and inconclusive.

2.2 Dark Triad traits

Before conducting my research, it is important to know the main concepts and definitions regarding the theory behind the Dark Triad traits and what drives entrepreneurship. The Dark Triad traits, which can be regarded as three different personality traits, are: narcissism, Machiavellianism and psychopathy, the traits of the Dark Triad can be best described as non-pathological personality traits with socially aversive behaviors (Paulhus and Williams, 2002). While typically viewed negatively in interpersonal contexts, these Dark Triad traits may offer functional advantages in entrepreneurial environments that commonly reward traits like boldness, strategic behavior and risk tolerance (Klotz & Neubaum, 2016). Unlike traditionally studies traits in entrepreneurship, such as conscientiousness, agreeableness or openness from the Big Five, Dark Triad traits are characterized by self-serving, emotionally detached and norm

violating tendencies that can lead to advantages under high-stake or uncertain business conditions. (Klotz & Neubaum, 2016).

Characteristics for narcissism include a strong sense of superiority, self-importance and dominance (Paulhus and Williams, 2002). In addition, narcissists are more capable of taking advantage of others and they show strong exhibitionism, which enhances their self-image (Brownell et al., 2024). Regarding the entrepreneurial context, narcissists may have an increased likelihood of persisting in the face of setbacks due to inflated self-belief.

Individuals that score high on Machiavellianism are overly confident, like to take risks and can be aggressive in their communication (Do & Dadvari, 2017). Machiavellianism refers to the extreme extends individuals are willing to forgo to achieve personal goals and these individuals gain personal interests by manipulating others (Dahling et al., 2009). The high confidence and willingness to take risks in addition to their ability to influence others and their adaptability to shifting circumstances may serve them well in navigating resource acquisition and negotiation.

Psychopaths are individuals who have an enhanced self-image and are commonly described as arrogant. They also lack empathy and have a desire to engage in antisocial behavior (Paulhus and Williams, 2002). These traits can be advantageous in high-pressure or uncertain contexts, where quick decisions, emotional detachment and risk-seeking behavior are needed (Wu et al., 2019). These individuals expect other people to like them, which allows them to more easily obtain things from others, such as gifts, promises or favors (McLarty et al., 2023).

Individuals who score high on Dark Triad traits can be especially interested in starting businesses since it can give them a way of gathering power and an opportunity to exploit others to achieve personal gain, therefore making it more likely that each different Dark Triad trait can give an estimate of the entrepreneur's intentions (Brownell et al., 2024).

Some researchers have found positive associations between Dark Triad traits and entrepreneurial outcomes, such as Wu et al. (2019) and Jonason et al. (2010). However, McLarty et al. (2023) found that psychopathy and Machiavellianism were the only significant predictors. Hmieleski and Lerner (2016) found that narcissism and psychopathy were positive predictors of entrepreneurial intentions. These inconsistencies point to a need for more nuanced, trait-specific research, especially in underexplored populations such as university students.

2.3 Theoretical integration and Hypothesis development

While sections 2.1 and 2.2 outlined the concepts of entrepreneurial intentions and the Dark Triad traits separately, a theoretical integration is necessary to explain how and why these socially aversive traits might influence students' intentions to become entrepreneurs. Researching the link between personality psychology and entrepreneurial behavior allows for a more nuanced approach to identifying which types of individuals are more likely to engage in entrepreneurial activity.

Traditionally, entrepreneurial intentions have been linked to positive psychological attributes such as self-efficacy, creativity and perseverance. However, since entrepreneurship regularly occurs in uncertain, high-risk and competitive environments, these more socially aversive traits may offer specific advantages. The Dark Triad traits, which include Machiavellianism, psychopathy and narcissism, share features that may align with the demands of entrepreneurial contexts according to Klotz & Neubaum

(2016). Especially in situations that require bold decision-making, risk perseverance or resource manipulation.

The Theory of Planned Behavior (Azjen, 1991) provides a useful scope from a theoretical perspective. According to the Theory of Planned Behavior, intentions are influenced by attitudes toward behavior, subjective norms and perceived behavioral control. The Dark Triad traits may influence one or more of these components. For example, narcissism may affect attitudes toward entrepreneurship through inflated self-perception and a desire for recognition. Machiavellianism may influence perceived behavioral control due to strategic competence. Psychopathy may affect subjective norms, since psychopaths are less influenced by social disapproval or failure.

In addition, the Dark Triad traits may even compensate for or mimic some of the positive predictors of entrepreneurial intention. For example, a trait of narcissism is overconfidence, however this overconfidence can also resemble high self-efficacy (Brownell et al., 2024). Individuals who score high on Machiavellianism may emulate resilience through their calculated pursuit of their goals, while psychopaths may engage in high-risk behavior without the emotional hesitation often seen in other individuals (Wu et al., 2019). These examples suggest that even though the motivational basis of people who score high on the Dark Triad traits may differ (e.g. overconfidence instead of high self-efficacy), the behavioral outcomes may well be similar.

However, empirical findings remain inconsistent. While some studies found all three Dark Triad traits to be significant predictors (Jonason & Webster, 2010; Wu et al., 2019), other researchers identified only one or two traits as relevant (McLarty et al., 2023; Hmieleski & Lerner, 2016). This creates a need to explore these relationships in specific contexts, such as among university students, where personality development and career orientation are still forming.

Based on the reviewed literature and theoretical reasoning, the following hypotheses were derived:
H1: Machiavellianism is positively associated with entrepreneurial intentions among (university) students.
H2: Psychopathy is positively associated with entrepreneurial intentions among (university) students.
H3: Narcissism is positively associated with entrepreneurial intentions among (university) students.
H4: The Dark Triad traits collectively are positively associated with entrepreneurial intentions among (university) students.

3. METHODOLOGY / RESEARCH DESIGN

3.1 Research design

For this thesis a quantitative, cross-sectional correlational research design is used to investigate the relationship between the Dark Triad personality traits (Machiavellianism, psychopathy and narcissism) and the intentions among university students to become entrepreneurs. A quantitative approach is appropriate for this research, as it enables the use of statistical methods to draw inferences from the data, which can then be used to generalize findings for a wider population. In addition, a correlational research design is suitable for this study, as this study aims to examine the relationship, strength and direction between the Dark Triad traits and entrepreneurial intentions of students. This design allows for the examination of patterns of association without introducing experimental manipulation.

Furthermore, given the fact that the dependent variable "entrepreneurial intentions" is binary, logistic regression is the appropriate analytical method. Logistic regression is specifically designed to model the relationship between one or more independent variables and a binary outcome, making it suitable for predicting the likelihood of entrepreneurial intention based on the Dark Triad traits. Additionally, it allows for the inclusion of control variables to account for potential control variables.

3.2 Data and measurement

This study utilizes secondary data from the Global University Entrepreneurial Spirit Student's Survey (GUESS) 2023, which consists of one of the largest international research projects which examines entrepreneurial intentions and activity among university students. The dataset includes more than 200,000 responses from students across more than 50 countries. This GUESS survey is well-suited to this research, since it includes comprehensive items on entrepreneurial intentions, current entrepreneurial activity, and socio-demographic data, along with variables relevant to psychological constructs, which include the Dark Triad traits. The variables that will be used for this study are presented in Table 3.2.1.

Table 3.2.1: Variable Description and Scale/Type

Variable	Description	Scale/Type
Entrepreneurial intentions	Measured by the following question: "Are you currently trying to start your own business/to become self-employed?"	Binary question (Yes = 1, No = 0)
Machiavellianism	Consists of 4 questions from the SD3 scale.	7-point Likert scale (1 = Strongly disagree to 7 = Strongly agree)
Psychopathy	Consists of 4 questions from the SD3 scale.	7-point Likert scale (1 = Strongly disagree to 7 = Strongly agree)
Narcissism	Consists of 4 questions from the SD3 scale.	7-point Likert scale (1 = Strongly disagree to 7 = Strongly agree)
Gender*	Consists of 2 options, male and female.	Binary question (Male = 0, Female = 1)
Age groups**	Age in years, consists of 5 different groups: <25, 25–30, 30–35, 35–40, >40.	Categorical
Field of Study	Academic discipline. Consists of 12 different disciplines.	Categorical
Entrepreneurial exposure***	Measured by the following question: "Are your parents self-employed and/or majority owners of a business?"	Binary question (Yes = 1, No = 0)

*Gender has been altered from its original form in the GUESS 2023 database. All students that have picked "other" in the survey have been removed from the study to more easily interpret results.
**The database used the birth year of students instead of numerical values to measure age. To better interpret results, I decided to convert the birth years to numerical values of age and then decided to group them into the 5 different groups that are stated in the description.
***Entrepreneurial exposure was turned into a binary variable instead of a categorical variable to better interpret results.

3.3 Data analysis

The analysis will be conducted using R Studio and will follow a structured, multi-step approach designed to explore, describe and model the relationship between Dark Triad personality traits and entrepreneurial intentions among university students.

Descriptive Statistics
The first step will involve generating descriptive statistics for all relevant variables, including means, standard deviations, frequencies and proportions. This step is essential for understanding the basic characteristics of the sample, checking for any irregularities or outliers, and providing context for subsequent analyses.

Correlation Matrix
Then, a correlation matrix will be used to examine the bivariate relationships between the Dark Triad traits. This helps identify potential multicollinearity issues and provides a preliminary sense of how these traits relate to one another and to entrepreneurial intentions among university students. Pearson correlations will be used to examine the relationships between the Dark Triad traits since these are two continues variables. Point-biserial correlations will be applied when analyzing associations between the Dark Triad traits and entrepreneurial intentions, since the latter is a binary variable.

Logistic Regression Analyses
Since the dependent variable, entrepreneurial intentions, is binary, logistic regression is the most appropriate method for modeling the data. Logistic regression allows us to estimate the probability that a student intends to become an entrepreneur based on the Dark Triads, while also accounting for control variables such as gender, age group, field of study and parental entrepreneurship. The results will also include odds ratios, which make the effect sizes more interpretable in practical terms.

ANOVA (Analysis of Variance)
To explore whether the mean levels of the Dark Triad traits differ significantly across demographic subgroups (e.g., different study field, gender or age groups), one-way ANOVAs will be performed. These ANOVAs are useful for identifying whether group membership is associated with variations in trait expression, which could indirectly influence entrepreneurial intentions.

Post Hoc Tests
If significant differences are found in the ANOVA tests, post hoc analyses will be used to determine which specific groups differ from one another. This adds depth to the analysis by revealing more nuanced relationships that are not apparent from overall significance alone.

4. RESULTS

4.1 Data Cleaning and Descriptive Statistics

To answer my research question, I used R studio to analyze my GUESS 2023 database. The first thing I did in R Studio was install all the necessary packages to write the codes. For this analysis I installed the following packages: readxl, dplyr, psych, ggplot2 and car. After loading the packages, I cleaned the dataset by removing all invalid values (e.g., values that scored -99 when this clearly wasn't possible), as well as remove all cases that were missing responses on any of the twelve questions that measured the Dark Triad traits. Then, average scores were computed for each Dark Triad trait based on the questions that were asked in the GUESS 2023 survey. The descriptive statistics of the Dark Triad traits can be found in table 4.1.1 and the entrepreneurial ambition in combination with the other control variables can be found in table 4.1.2.

Table 4.1.1: Descriptive Statistics for Dark Triad Traits

Trait	Mean	SD	Min	Max	N
Machiavellianism	2.72	1.90	1	7	11922
Psychopathy	2.61	1.77	1	7	11922
Narcissism	3.80	1.71	1	7	11922

Table 4.1.2: Frequency and Percentage of Categorical Study Variables

Category	N	%
Age_Group		
25–30	1774	14.9
30–35	993	8.3
35–40	691	5.8
<25	7336	61.5
>40	1128	9.5
Entrepreneur_Ambition		
No	2505	21.0
Yes	9417	79.0
Field_of_Study		
Business/Management	5138	43.1
Engineering	3081	25.8
Other	1623	13.6
Social Sciences	2080	17.4
Gender		
Female	5394	45.2
Male	6528	54.8
Parent_Entrepreneur		
At_Least_1_Parent_Entrepreneur	5931	49.7
No_Parent_Entrepreneur	5991	50.3

To better interpret the results, some adjustments were made. These were as follows: the control variable age was separated into 5 different groups which include students under 25, 25-30, 30-35, 35-40 and students over 40. The Gender variable originally had 3 answers: male, female and other. All students that identified as “other” were removed to better interpret the results of the study. The variable field of study originally included 12 responses. These responses were limited down to the 4 most common fields. These fields included Business/management, Engineering, Social Sciences and the collective term Other

for other study fields that were not mentioned in the survey. At last, the variable Parental Entrepreneurship was made a binary variable where 0 meant that neither parent of the students were entrepreneurs and 1 meant at least one of the parents were entrepreneurs. After all the necessary data cleaning the GUESS 2023 database consisted of 11922 observations.

4.2 Correlation matrix

To reveal whether the Dark Triad traits and Entrepreneurial Ambition show strong intercorrelations among each other I used the Pearson correlation matrix. This resulted in the following correlation matrix (see table 4.2.1):

Table 4.2.1: Correlation Matrix for Dark Triad Traits and Entrepreneurial Intention

	Machiavellianism	Psychopathy	Narcissism	Entrepreneurial Intention
Machiavellianism	1.00	0.76	0.52	0.02
Psychopathy	0.76	1.00	0.52	0.03
Narcissism	0.52	0.52	1.00	0.04
Entrepreneur_Ambition	0.02	0.03	0.04	1.00

4.3 Logistic Regression Analysis

To further analyze the database, I decided to use a logistic regression model. At first, a base model (Figure 4.3.1) was created that only includes the effects of the control variables on entrepreneurial ambition. Secondly, I created three different models that tested the control variables and one of the Dark Triad traits, Machiavellianism, psychopathy and narcissism, respectively. (Figures 4.3.2 – 4.3.4). At last, a full model (Figure 4.3.5) was created where all the Dark Triad traits were included as well as the control variables. The results of these logistic regression analyses are as follows:

Table 4.3.1: Logistic Regression Results for Control Variables Predicting Entrepreneurial Intentions

Predictor	Odds Ratio	95% Confidence Interval	p-value	
(Intercept)	5.19	[4.68, 5.75]	0.0000	***
Age_Group25–30	0.90	[0.79, 1.03]	0.1124	
Age_Group30–35	0.85	[0.72, 1]	0.0539	.
Age_Group35–40	0.66	[0.55, 0.8]	0.0000	***
Age_Group>40	0.42	[0.36, 0.48]	0.0000	***
Field of Study: Engineering	0.83	[0.74, 0.93]	0.0012	**
Field of Study: Social Sciences	0.65	[0.57, 0.73]	0.0000	***
Field of Study: Other	0.90	[0.78, 1.04]	0.1539	
GenderFemale	0.90	[0.82, 0.99]	0.0282	*
Parent_EntrepreneurAt_Least_1_Parent_Entrepreneur	1.06	[0.97, 1.17]	0.1782	

Table 4.3.1 shows the model that only includes the control variables (Age group, Field of Study, Gender and Parental Entrepreneurial background) as predictors of entrepreneurial intentions. Several variables

such as age, field of study and gender show significant associations. Especially the older age groups and the social sciences category.

Table 4.3.2: Logistic Regression Results with Machiavellianism

Predictor	Odds Ratio	95% Confidence Interval	p-value	
(Intercept)	5.31	[4.67, 6.05]	0.0000	***
Machiavellianism	0.99	[0.97, 1.02]	0.5436	
Age_Group25–30	0.90	[0.79, 1.02]	0.1055	
Age_Group30–35	0.85	[0.72, 1]	0.0490	*
Age_Group35–40	0.66	[0.55, 0.79]	0.0000	***
Age_Group>40	0.41	[0.36, 0.48]	0.0000	***
Field of Study: Engineering	0.83	[0.74, 0.93]	0.0011	**
Field of Study: Social Sciences	0.65	[0.57, 0.73]	0.0000	***
Field of Study: Other	0.90	[0.78, 1.04]	0.1567	
GenderFemale	0.90	[0.82, 0.99]	0.0240	*
Parent_EntrepreneurAt_Least_1_Parent_Entrepreneur	1.07	[0.97, 1.17]	0.1706	

Table 4.3.2 shows that Machiavellianism is added to the control variables as a predictor. The coefficient for Machiavellianism is not statistically significant. The other control variables show consistent patterns compared to the previous model. Only the age group 30-35 has become significant.

Table 4.3.3: Logistic Regression Results with Psychopathy

Predictor	Odds Ratio	95% Confidence Interval	p-value	
(Intercept)	5.27	[4.62, 6.02]	0.0000	***
Psychopathy	0.99	[0.97, 1.02]	0.6952	
Age_Group25–30	0.90	[0.79, 1.02]	0.1081	
Age_Group30–35	0.85	[0.72, 1]	0.0506	.
Age_Group35–40	0.66	[0.55, 0.79]	0.0000	***
Age_Group>40	0.41	[0.36, 0.48]	0.0000	***
Field of Study: Engineering	0.83	[0.74, 0.93]	0.0011	**
Field of Study: Social Sciences	0.65	[0.57, 0.73]	0.0000	***
Field of Study: Other	0.90	[0.78, 1.04]	0.1580	
GenderFemale	0.90	[0.82, 0.99]	0.0258	*
Parent_EntrepreneurAt_Least_1_Parent_Entrepreneur	1.06	[0.97, 1.17]	0.1745	

Table 4.3.3 shows that Psychopathy is added as a predictor alongside the control variables. Its effect is not statistically significant. Like the previous models, the other control variables remain roughly the same and hold their significance except for the age group 30-35.

Table 4.3.4: Logistic Regression Results with Narcissism

Predictor	Odds Ratio	95% Confidence Interval	p-value	
(Intercept)	4.71	[4.06, 5.47]	0.0000	***
Narcissism	1.02	[1, 1.05]	0.0838	.
Age_Group25–30	0.90	[0.79, 1.03]	0.1321	
Age_Group30–35	0.86	[0.73, 1.01]	0.0724	.
Age_Group35–40	0.67	[0.56, 0.8]	0.0000	***
Age_Group>40	0.42	[0.37, 0.49]	0.0000	***
Field of Study: Engineering	0.83	[0.74, 0.93]	0.0017	**
Field of Study: Social Sciences	0.65	[0.57, 0.74]	0.0000	***
Field of Study: Other	0.90	[0.78, 1.04]	0.1577	
GenderFemale	0.91	[0.83, 1]	0.0395	*
Parent_EntrepreneurAt_Least_1_Parent_Entrepreneur	1.06	[0.97, 1.16]	0.2134	

Table 4.3.4 shows the addition of Narcissism as a predictor of entrepreneurial ambition alongside the control variables. Narcissism is not a significant predictor of entrepreneurial ambition; however, the p-value is barely insignificant. Compared to the previous models where Machiavellianism and Psychopathy were added this is a notable difference. The other control variables stay roughly the same as in the other models.

Table 4.3.5: Logistic Regression Results with All Dark Triad Traits

Predictor	Odds Ratio	95% Confidence Interval	p-value	
(Intercept)	4.85	[4.16, 5.65]	0.0000	***
Machiavellianism	0.98	[0.95, 1.02]	0.3271	
Psychopathy	0.99	[0.95, 1.03]	0.6578	
Narcissism	1.04	[1.01, 1.07]	0.0175	*
Age_Group25–30	0.90	[0.79, 1.03]	0.1151	
Age_Group30–35	0.85	[0.72, 1.01]	0.0586	.
Age_Group35–40	0.66	[0.55, 0.8]	0.0000	***
Age_Group>40	0.42	[0.36, 0.48]	0.0000	***
Field of Study: Engineering	0.83	[0.74, 0.93]	0.0017	**
Field of Study: Social Sciences	0.65	[0.57, 0.73]	0.0000	***
Field of Study: Other	0.91	[0.79, 1.04]	0.1746	
GenderFemale	0.90	[0.82, 0.98]	0.0228	*
Parent_EntrepreneurAt_Least_1_Parent_Entrepreneur	1.06	[0.97, 1.16]	0.2055	

Table 4.3.5 includes al three Dark Triad traits together with the control variables. It is notable that narcissism does become significant with the addition of all three traits. All other control variables retain similar patterns to the previous models.

4.4 ANOVA

In addition to the logistic regression analysis, one-way Analysis of Variance (ANOVA) tests were conducted to gain further insights into how the Dark Triad traits differ across the control variables. ANOVA is a statistical technique used to determine whether there are statistically significant differences between the means of three or more independent groups. While the logistic regression analyses assessed whether personality traits predict entrepreneurial intentions, the ANOVA analyses provide information about how these traits are distributed across different subgroups within the dataset.

For the ANOVA tests, a combined Dark Triad score was used to analyze whether students who score high on Dark Triad traits are represented more often in certain subgroups. These traits were analyzed in relation to categorical variables which include age groups, gender, field of study and parental entrepreneurship status.

For each significant ANOVA result, post hoc Tukey's HSD (Honestly Significant Difference) tests were applied to explore which specific group comparisons contributed to the overall effect. This allowed for a deeper understanding of how personality traits vary across the student population, enriching the interpretation of the regression findings.

The results of these ANOVA tests are presented in the tables below.

Table 4.4.1: ANOVA Results for Dark Triad Scores Across Age Groups

Source	Df	Sum of Squares	Mean Square	F-value	p-value
Age_Group	4	372.1156	93.0288974	132.4794	< 1e-04
Residuals	11917	8368.2835	0.7022139	NA	NA

This ANOVA table examines whether Dark Triad scores significantly differ across five age groups. The F-value is 132.48 with a corresponding p-value of <1e-04, suggesting a statistically significant difference in Dark triad scores among at least some of the age categories.

Table 4.4.2: ANOVA Results for Dark Triad Scores by Gender

Source	Df	Sum of Squares	Mean Square	F-value	p-value
Gender	1	220.2777	220.2776686	308.1775	< 1e-04
Residuals	11920	8520.1214	0.7147753	NA	NA

This ANOVA table examines whether Dark Triad scores significantly differ across male and females. With an F-value of 308.18, and a p-value of <1e-04, this test indicates that there is again a statistically significant difference in Dark Triad scores between genders.

Table 4.4.3: ANOVA Results for Dark Triad Scores by Field of Study

Source	Df	Sum of Squares	Mean Square	F-value	p-value
Field_of_Study	3	101.2121	33.7373694	46.54164	< 1e-04
Residuals	11918	8639.1870	0.7248856	NA	NA

Table 4.4.3 assesses differences in Dark Triad scores among students in four different field of studies. The F-value is 46.54 and the p-value is <1e-04, indicating that there is a significant variation in mean scores across different study fields.

Table 4.4.4: ANOVA Results for Dark Triad Scores by Parental Entrepreneurial Background

Source	Df	Sum of Squares	Mean Square	F-value	p-value
Parent_Entrepreneur	1	68.41322	68.4132230	94.03678	< 1e-04
Residuals	11920	8671.98587	0.7275156	NA	NA

From Table 4.4.4 we can conclude that there is again a statistically significant difference between Dark Triad scores if at least one of the parents has an entrepreneurial background. This can be concluded from the F-value of 94.04 and the p-value of <1e-04.

4.5 Post Hoc Tests

Since all 4 of the ANOVA tests showed significant results in section 4.4, Tukey's Honest Significant Difference (HSD) tests were conducted to explore which specific group differences were statistically significant for each categorical control variable in relation to the overall Dark Triad score. The tables presented below (Tables 4.5.1 to 4.5.4) provide pairwise group comparisons with corresponding mean differences, confidence intervals and adjusted p-values.

Table 4.5.1: Tukey Post Hoc Test for Age Group

Group Comparison	Mean Difference	Lower CI	Upper CI	Adjusted p-value
25–30-<25	-0.17	-0.23	-0.11	0.0000
30–35-<25	-0.31	-0.38	-0.23	0.0000
35–40-<25	-0.36	-0.45	-0.27	0.0000
>40-<25	-0.53	-0.60	-0.45	0.0000
30–35-25–30	-0.14	-0.23	-0.05	0.0003
35–40-25–30	-0.19	-0.30	-0.09	0.0000
>40-25–30	-0.36	-0.45	-0.27	0.0000
35–40-30–35	-0.06	-0.17	0.06	0.6589
>40-30–35	-0.22	-0.32	-0.12	0.0000
>40-35–40	-0.16	-0.27	-0.05	0.0005

Table 4.5.1 shows all pairwise comparisons between the 5 age groups. This table tells us that there are several age groups that differ significantly in their average Dark Triad scores. Notably, the largest mean difference was observed between the youngest group (students under 25) and the oldest group (students over 40), with a difference of -0.53. Most comparisons were significant at $p < 0.05$, except for the comparison between age groups 35-40 and 30-35, which was not statistically significant.

Table 4.5.2: Tukey Post Hoc Test for Gender

Group Comparison	Mean Difference	Lower CI	Upper CI	Adjusted p-value
Female-Male	-0.27	-0.3	-0.24	0

Table 4.5.2 shows the Post Hoc test for gender. This test revealed a significant mean difference in Dark Triad scores between males and females. Females had significantly lower mean scores compared to males with a mean difference of -0.27.

Table 4.5.3: Tukey Post Hoc Test for Field of Study

Group Comparison	Mean Difference	Lower CI	Upper CI	Adjusted p-value
Engineering-Business/Management	-0.07	-0.12	-0.02	0.0014
Social Sciences-Business/Management	-0.26	-0.31	-0.20	0.0000
Other-Business/Management	-0.02	-0.09	0.04	0.7562
Social Sciences-Engineering	-0.19	-0.25	-0.12	0.0000
Other-Engineering	0.05	-0.02	0.11	0.2678
Other-Social Sciences	0.23	0.16	0.31	0.0000

Table 4.5.3 shows the Post Hoc test for the study fields. In this test, significant differences were found in Dark Triad scores across various fields of study. For instance, students from Social Sciences reported significantly lower Dark Triad scores than those in Business/Management, with a mean difference of -0.26 and adjusted p-value of 0.0000. In addition, Social Sciences also reported a significantly lower score than Engineering with a mean difference of -0.19 and adjusted p-value of 0.0000. The comparison between Other and Social Sciences showed a positive difference of 0.23 with an adjusted p-value of 0.0000.

Table 4.5.4: Tukey Post Hoc Test for Parental Entrepreneurial Background

Group Comparison	Mean Difference	Lower CI	Upper CI	Adjusted p-value
At_Least_1_Parent_Entrepreneur-No_Parent_Entrepreneur	0.15	0.12	0.18	0

At last, Table 4.5.4 shows the analysis between students that have at least one parent with an entrepreneurial background against students whose parents both do not have an entrepreneurial background. Here a significant mean difference of 0.15 was observed, indicating higher Dark Triad scores among students with entrepreneurial parental backgrounds. This result was statistically significant with an adjusted p-value of 0.

5. DISCUSSION

Nearing the end of this thesis, it is time to discuss and interpret the findings regarding the influence of Dark Triad traits on student entrepreneurial ambition. The results are discussed in connection with the previously introduced theories and research, with a focus on what these findings mean in practice as well as how they contribute to existing knowledge about this topic. In addition, this discussion also reflects on the study's limitations and offers possible suggestions for future research.

5.1 Conclusion

The research question that was posed in this study was the following: "To what extent do Dark Triad traits impact the likelihood of a student to become an entrepreneur?". To answer this question, a large-scale quantitative dataset was used to perform logistic regression analyses. These logistic regression analyses were used to evaluate the predictive power of Machiavellianism, psychopathy and narcissism, while controlling age, gender field of study and parental entrepreneurship.

The final findings (figure 4.3.5) show that narcissism was a consistent and significant positive predictor of entrepreneurial ambition amongst students while controlling for the other 2 Dark Triad traits and the control variables, with an odds ratio of 1.04 and a p-value of 0.0175. Psychopathy had a p-value of 0.6578, indicating that while controlling for all the Dark Triad traits and the control variables, psychopathy did not hold any significant predictive power. Machiavellianism had a p-value of 0.3271, also resulting in no significant predictive power on the entrepreneurial ambitions of students while controlling for the other variables.

Interestingly, narcissism was not a significant predictor of entrepreneurial ambition amongst students when the trait was examined alone without the other two Dark Triad traits. Narcissism only became significant when all three Dark Triad traits were included in the model. This suggests that narcissisms

influence may have been hidden at first by shared traits that it has in common with the other two Dark Triad traits. By performing a correlation matrix (table 4.2.1) we can see that the intercorrelations among the Dark Triad traits are strong, therefore the traits can consist overlapping effects. Once these overlapping effects were accounted for, narcissism became more clearly linked to entrepreneurial ambition amongst students. This shows the importance of analyzing these traits together, since their combined presence can influence how each trait relates to the outcome.

The ANOVA and Post Hoc analyses revealed that Dark Triad scores differ significantly across age groups, gender, fields of study and parental entrepreneurial background. The results of these Post Hoc analyses revealed that overall females score significantly lower on the mean Dark Triad score, with a mean difference of -0.27.

When tested for significant differences in Dark Triad scores across age groups, we found that the biggest differences were between the youngest group (under 25) and the oldest group (over 40), consisting of a mean difference of -0.53 and a p-value of <0.001. Only the comparison between the age groups 35-40 and 30-35 showed no statistically significant difference.

The Post Hoc analyses further indicated that students in Business/Management consistently exhibited higher Dark Triad trait scores compared to most other fields of study, except for the "Other" category, where the difference was not statistically significant. In addition, Social Sciences scored significantly lower than all other groups, particularly compared to Business/Management and Engineering. At last, the "Other" field did not differ significantly from either Engineering or Business/Management, however it did differ from Social Sciences.

The last Post Hoc Analysis showed that students with at least one entrepreneurial parent scored significantly higher on Dark Triad traits compared to those with no entrepreneurial background, with a mean difference of 0.15 and a p-value of <0.001.

5.2 Practical implications

These findings may offer meaningful insights for various parties such as educators, career advisors and those who develop entrepreneurship programs. Given the significant role of narcissism in entrepreneurial intentions among students, educators might consider tailoring elements of entrepreneurship curricula to channel traits such as self-confidence and ambition. This could include activities that involve leadership, public speaking or pitching ideas, since these are activities that students with narcissistic traits may naturally thrive on.

At the same time, practitioners should remain aware of narcissism's downsides, such as overconfidence or a lack of empathy. Therefore, integrating emotional intelligence training or ethical leadership development into entrepreneurship programs may be a valuable addition.
Career counselors could also use personality assessments as tools to help students better understand their motivations and potential fit for entrepreneurial paths.

5.3 Theoretical implications

The findings of this study contribute to the theoretical understanding of personality traits and entrepreneurship amongst students. Interestingly, narcissism was not a significant predictor when tested on its own, however it became significant when modeled together with Machiavellianism and

psychopathy. This finding suggests that trait overlap within the Dark Triad can mask unique effects unless considered simultaneously.

This supports the idea that even though the traits are often grouped together, they are theoretically and functionally distinct in their relation to entrepreneurship. Narcissism emerging as a significant predictor only when controlling the other traits, including the control variables, suggests that its entrepreneurial relevance lies in its unique characteristics, such as self-confidence, desire for recognition and status-seeking, rather than any shared tendencies like manipulation or lack of empathy.

The results of this finding challenge approaches that treat the Dark Triad as a unified predictor of entrepreneurial ambition and encourage a more trait-specific framework. In addition, the results also align with recent research suggesting that narcissistic traits can play an important role in entrepreneurship.

5.4 Limitations

Whilst this study contributes valuable insights into the relationship between Dark triad traits and entrepreneurial intentions among students, several limitations must be acknowledged. First, the research relied on self-reported survey data, which inherently carries the risk of social desirability bias and inaccurate self-assessment. Respondents may have over or under reported their personality traits. Secondly, the study's cross-sectional design limits the ability to make causal inferences. While associations between traits and intentions were identified, the sequence in which these variables influence one another cannot be determined, therefore making it unclear whether Dark Triad traits influence entrepreneurial ambition or if existing ambition may shape how individuals perceive or report their traits.

Additionally, while the GUESS 2023 database offers a rich dataset, the sample was limited to university students, which may not fully represent the broader population of potential entrepreneurs. Cultural and institutional differences between countries or universities may also influence both personality expression and entrepreneurial opportunities, yet these factors were not deeply explored in this study. Furthermore, although various control variables were included, such as gender, age parental background and field of study, there may be other unmeasured confounding variables that could influence the observed relationships. Lastly, although logistic regression and ANOVA models were used appropriately, some variables, such as entrepreneurial ambition, were measured in a simple binary way, which might not capture the full nuance of participants' intentions.

5.5 Future research

Building upon the findings and limitations of this study, future research should consider adopting a longitudinal design to examine how personality traits develop over time in relation to entrepreneurial intentions and actions. Such a design would allow for stronger causal claims and a better understanding of how stable or dynamic these psychological predictors truly are across different life stages. Additionally, expanding the research to include more diverse and representative samples beyond the student population would improve generalizability and shed light on how these relationships manifest in other demographic or cultural groups.

It would also be beneficial for future studies to explore the role of contextual and cultural factors in greater depth. For example, examining how entrepreneurial ecosystems, national economic climates or societal values around entrepreneurship might moderate the influence of personality on ambition could

offer a more comprehensive picture. Further refinement of the dependent variable is also recommended. Instead of a binary indicator of entrepreneurial intentions, future work could employ continuous or multi-dimensional measures that capture different types of entrepreneurial motivation, such as necessity vs opportunity driven entrepreneurship.

Finally, given that narcissism emerged as the only significant predictor among the three Dark Triad traits in the full model, it would be worthwhile to investigate the specific traits of narcissism that may drive entrepreneurial intentions. Furthermore, incorporating qualitative methods, such as interviews or case studies, could also help unpack the psychological and contextual mechanisms linking dark traits to entrepreneurial behavior.

6. REFERENCES

Acs, Z. J., et al. (2008). The Knowledge Spillover Theory of Entrepreneurship. *Small Business Economics*, 32(1), 15–30.

Akpoviroro, K. S., et al. (2021). Correlates of Entrepreneurship Education and Students' Career Reflections. *Journal of Entrepreneurship Education,* 24(S1), 1-15.

Azjen, I. (1991). The theory of planned behavior. *Organizational Behavior and Human Decision Processes,* 50(2), 179-211.

Bae, T. J., et al. (2014). The Relationship between Entrepreneurship Education and Entrepreneurial Intentions: A Meta-Analytic Review. *Entrepreneurship Theory and Practice*, 38(2), 217–254.

Bogatyreva, K., et al. (2019). When Do Entrepreneurial Intentions Lead to Actions? The Role of National Culture. *Journal of Business Research*, 96, 309–321.

Brownell, K. M., et al. (2024). The Triad Divided: A Curvilinear Mediation Model Linking Founder Machiavellianism, Narcissism, and Psychopathy to New Venture Performance. *Entrepreneurship Theory and Practice*, 48(1) 310-348

Dahling, J. J., et al. (2009). The Development and Validation of a New Machiavellianism Scale. *Journal of Management*, 35(2), 219–257.

Do, B., & Dadvari, A. (2017). The Influence of the Dark Triad on the Relationship between Entrepreneurial Attitude Orientation and Entrepreneurial Intention: A Study among Students in Taiwan University. *Asia Pacific Management Review*, 22(4), 185–191.

Fiet, J. O. (2001). The Theoretical Side of Teaching Entrepreneurship. *Journal of Business Venturing*, 16(1), 1–24.

GUESS. (2023). Global University Entrepreneurial Spirit Students' Survey 2023. [Unpublished raw data]. Provided by Dr. Maximilian Goethner, University of Twente.

Hmieleski, K. M., & Lerner, D. A. (2016). The Dark Triad and Nascent Entrepreneurship: An Examination of Unproductive versus Productive Entrepreneurial Motives. *Journal of Small Business Management,* 54(S1), 7-32.

Hoang, G., et al. (2022). Dark Triad Traits Affecting Entrepreneurial Intentions: The Roles of Opportunity Recognition and Locus of Control. *Journal of Business Venturing Insights*, 17, 1-12

Hsu, C., & Wang, S. (2019). Social Entrepreneurial Intentions and Its Influential Factors: A Comparison of Students in Taiwan and Hong Kong. *Innovations in Education and Teaching International*, 56(3), 385–395.

Jonason, P. K., & Webster, G. D. (2010). The Dirty Dozen: A concise measure of the Dark Triad. *Psychological Assessment*, 22(2), 420-432.

Klotz, A. C., & Neubaum, D. O. (2016). Research on the Dark Side of Personality Traits in Entrepreneurship: Observations from an Organizational Behavior Perspective. *Entrepreneurship Theory and Practice*, 40(1), 7–17.

Lee, L., et al. (2011). Entrepreneurial Intentions: The Influence of Organizational and Individual Factors. *Journal of Business Venturing*, 26(1), 124–136.

Manfield, R. C., & Newey, L. R. (2018). Resilience as an Entrepreneurial Capability: Integrating Insights from a Cross-Disciplinary Comparison. *International Journal of Entrepreneurial Behavior & Research*, 24(7), 1155–1180.

McGee, J. E., et al. (2009). Entrepreneurial Self-Efficacy: Refining the Measure. *Entrepreneurship Theory and Practice*, 33(4), 965–988.

McLarty, B. D., et al. (2023). The Dark Triad's incremental influence on entrepreneurial intentions. *Journal of Small Business Management*, 61(4) 2097-2125

Mei, W., & Pe Symaco, L. (2022). Students' Entrepreneurial Identity Construction : Role and Social Identity Influences. *SAGE Open*, 12(2), 1-12

Neneh, B. N. (2020). Entrepreneurial Passion and Entrepreneurial Intention: The Role of Social Support and Entrepreneurial Self-Efficacy. *Studies in Higher Education*, 47(3), 1–17.

Paulhus, D. L., & Williams, K. M. (2002). The Dark Triad of Personality: Narcissism, Machiavellianism, and Psychopathy. *Journal of Research in Personality*, 36(6), 556–563.

Przepiorka, A. M. (2016). Psychological Determinants of Entrepreneurial Success and Life-Satisfaction. *Current Psychology*, 36(2), 304–315.

Rauch, A., & Frese, M. (2000). Psychological approaches to entrepreneurial success. A general model and an overview of findings. *International Review of Industrial and Organizational Psychology*, 101-142.

Ridder, A., & van der Sijde, P. (2006). Launching students into enterprise: Experiences with technology as a launching platform. *International Journal of Continuing Engineering Education and Lifelong Learning*, 16(5), 121-132.

Shinnar, R. S., et al. (2014). Self-Efficacy, Entrepreneurial Intentions, and Gender: Assessing the Impact of Entrepreneurship Education Longitudinally. *The International Journal of Management Education*, 12(3), 561-570.

Wu, W., et al. (2019). Effect of Narcissism, Psychopathy, and Machiavellianism on Entrepreneurial Intention—the Mediating of Entrepreneurial Self-Efficacy. *Frontiers in Psychology*, 10(6), 1-14.

Zhao, H., et al. (2005). The Mediating Role of Self-Efficacy in the Development of Entrepreneurial Intentions. *Journal of Applied Psychology*, 90(6), 1265-1772.

Zhao, H., et al. (2010). The Relationship of Personality to Entrepreneurial Intentions and Performance: A Meta-Analytic Review. *Journal of Management*, 36(2) 381–404.