



The Relation between ADHD-like Behavior and Entrepreneurial Intentions, and the role of ESE in this Relation

Master Thesis

Erasmus School of Economics

MSc Economics and Business – Industrial Dynamics and Strategy

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Acknowledgements

Writing my master thesis was a unique and enthusiastic experience for me. For this venture, I would like to express my sincere thanks to a number of people.

To begin with, I would like to offer my deep gratitude to my supervisor Ms. Indy Bernoster for her patient guidance and continuous support throughout the writing process. Due to her constructive feedback, her comments and her perfectionism, she managed to assist me in doing my best and evolve throughout the process. Moreover, I really appreciated the precision with which she read my thesis and her quick replies to my e-mails, a fact that contributed to our flawless communication. I have been extremely lucky to have a supervisor who cared so much about my work and I could not have imagined having a better supervisor for my master thesis.

Furthermore, I want to thank my parents and my sister who always supported me during my academic year. I feel extremely grateful for their constant belief in me and their insistence on achieving my goals. Last but not least, my sincere thanks go to my friends and my classmates for their helpful advices and their encouragement that also assisted me in the accomplishment of my thesis.

Abstract

The present study investigates the relationship between a psychiatric disorder, Attention-Deficit/Hyperactivity Disorder (ADHD), and the entrepreneurial tendency of an individual. Taking into account the importance that entrepreneurial self-efficacy (ESE) has for an individual who pursues an entrepreneurial career, we will also examine whether it can, in some way, explain the potential impact of ADHD on entrepreneurial intentions. The dataset we use consists of 159 economic students from the Erasmus University Rotterdam and was gathered in September 2013. We will perform ordinary least squares regressions along with principal component analysis and Sobel test for the analysis of our data. The results indicate a positive association between entrepreneurial self-efficacy and entrepreneurial intentions, and a negative one between ADHD and entrepreneurial self-efficacy. With regard to our initial aim, we could not find conclusive evidence about a direct connection of ADHD with entrepreneurial intentions. However, we find supportive evidence about an indirect relation between ADHD-like behavior and entrepreneurial intentions through ESE. Our results suggest that a student with ADHD symptoms exhibits lower entrepreneurial self-efficacy, leading to fewer probabilities in becoming an entrepreneur. Due to the limitations of our study, future research is proposed for a more in-depth analysis of the present topic.

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1. Introduction

A substantial body of research has investigated the effect of a variety of determinants on entrepreneurship. These determinants have been categorized in three broad categories, the personal characteristics of an individual (e.g. extroversion, risk-taking behavior, education, family); the economic environment (e.g. macroeconomic and financial environment); and the institutional environment (e.g. political system, culture and values), and are proven to have an effect on entrepreneurial activity (Cuervo, 2005; Shane, 2003). Other factors that have been examined extensively as to their relationship with entrepreneurship are gender (Bruni, Gherardi, & Poggio, 2005; Marlow & Patton, 2005; BarNir, Watson, & Hutchins, 2011) and age (Kautonen, Tornikoski, & Kibler, 2011; Hatak, Harms, & Fink, 2015; Sahut, Gharbi, & Mili, 2015). Under this prism, a recent trend focuses on mental disorders that could have an impact on entrepreneurship. Freeman (2015) examines in his study the connection between entrepreneurship and a variety of mental health conditions, particularly depression, ADHD, anxiety, substance abuse, and bipolar disorder. Few of the above conditions have been analyzed in depth with regard to entrepreneurship, such as depression (Bradley & Roberts, 2004) and ADHD (Verheul, Block, Burmeister-Lamp, Thurik, Tiemeier, & Turturea, 2015).

Considering that the literature on the relationship between entrepreneurship and mental disorders is in very early stages, the present paper aims to expand it. Specifically, we are going to examine whether one psychiatric disorder, namely Attention-Deficit/Hyperactivity Disorder (ADHD), influences entrepreneurial intentions, as well as the role of entrepreneurial self-efficacy (ESE) in this potential relationship. According to the American Psychiatric Association, ADHD is a common mental disorder that affects mainly children and adolescents under the age of 18, but it also affects adults (Parekh, 2017). It includes symptoms such as inattention, hyperactivity and impulsivity (Parekh, 2017) and in the present study we will investigate all three symptoms. Interestingly, the worldwide prevalence of ADHD is 5.29% (ADHD-Institute, 2017). Taking into consideration that this constitutes a high percentage of the global population, it gives further motive to researchers, and to the present study, to examine the role that ADHD plays in entrepreneurship.

One of the first attempts to capture the impact of ADHD on entrepreneurial tendencies is that of Kirby (2008), who finds that students with this disorder are more entrepreneurial than

those without. Another important contribution, that sheds more light to the relationship under examination, is conducted by Verheul et al. (2015) on university students as well. They also find supporting evidence of a positive effect of ADHD on entrepreneurial intentions, which in their study is explained through the characteristic of risk-taking (Verheul et al., 2015). More studies emerged in recent years that provide significant proof on the matter. One of these highlights that individuals with ADHD are more likely to have entrepreneurial intentions, as well as entrepreneurial action (Lerner & Verheul, 2016). Finally, one recent study stresses that ADHD leads to a higher probability of business venturing, and not only the intention of an individual to start an enterprise (Lerner, Verheul, & Thurik, 2018).

One aspect that could play an explanatory role in the above relationship is entrepreneurial self-efficacy (ESE). Numerous studies have demonstrated the existence of a linkage between ESE and entrepreneurial intentions. Chen, Greene and Crick (1998) point out, that students with higher ESE have higher intentions to become entrepreneurs. Other studies uncovered similar results and strengthen the positive nature of this relation (Zhao, Seibert, & Hills, 2005; McGee, Peterson, Mueller, & Sequeira, 2009). Thus, having established the importance of ESE concerning entrepreneurial intentions, we now shift our attention to whether ESE connects with ADHD and how. It is worth noting that, at least to our knowledge, there is no literature that directly associates these two elements. However, it has been proven that individuals with ADHD have decreased levels of self-esteem and self-efficacy (Newark, Elsässer, & Stieglitz, 2016). Moreover, Tabassam and Grainger (2002) discover lower scores of academic self-efficacy beliefs in students with ADHD. Hence, it would be interesting to investigate in a more straightforward way if and how ADHD affects ESE, and furthermore what connections exist in the threefold ADHD-ESE-entrepreneurial intentions.

Building on the above, the present study will focus on how exhibiting ADHD-like symptoms affects the tendency of becoming an entrepreneur, and whether this is explained by the self-perceived confidence in being an entrepreneur. In other words, we are going to use ESE as a mediator between ADHD and entrepreneurial intentions. Hence, our research question is the following:

How does ADHD-like behavior affect entrepreneurial intentions, and is this association mediated by ESE?

In order to explore our research question, we will use a dataset of 159 students from the Erasmus University Rotterdam. This sample contains, among others, information about their entrepreneurial intentions, ESE, and symptoms of ADHD. First, we will study the impact of ADHD on entrepreneurial intentions, and then test whether this potential association is affected by the addition of ESE.

The present study has a number of contributions to both the academic literature and the community in general. First, with regard to the academic literature, we will expand the present literature on the effect of psychiatric disorders on entrepreneurship, which so far has been limited. This will be done by attempting to further explore the relationship between ADHD and the intention of an individual to become an entrepreneur. Moreover, since there is poor literature on the direct effect of ADHD on entrepreneurial self-efficacy, we will try to fill this gap by looking at the above relationship. Second, regarding the contribution to the community, the present study sheds light on future career path opportunities for individuals that exhibit ADHD-like symptoms.

The master thesis has the following structure: the next chapter discusses the prior literature regarding ADHD, entrepreneurial intentions, and ESE as well as their interrelations. The methodology chapter includes the sample used in the present paper and analyzes the variables, after which the results of the research follow. Finally, we conclude by discussing the results along with the limitations of the research and the possibilities for future research, and also the practical implications of the findings are presented.

2. Literature framework

This section firstly discusses the definition of ADHD along with some of its characteristics. Then, the concept of entrepreneurial intentions is analyzed, and two intention-based models are introduced. Later, we examine the association of ADHD with entrepreneurial intentions and with entrepreneurial self-efficacy. Finally, we arrive at our hypotheses.

2.1 Attention-Deficit/Hyperactivity Disorder (ADHD)

ADHD “represents a developmental disorder of behavioral inhibition that interferes with self-regulation and the organization of behavior toward the future” (Barkley, 1997). The worldwide prevalence of ADHD is 5.29% and prevalence rates can vary depending on a few factors. Particularly age, where variation is observed among children-adolescents (7.1%) and adults (3.4%), with higher prevalence in those aged 18 and under; gender, with males exhibiting symptoms of ADHD more frequently than females; and presentation of the disorder, in which the inattentive presentation is higher than the hyperactivity/impulsivity (ADHD-Institute, 2017). Moreover, it has been observed that other psychiatric comorbidities coexist with ADHD, for instance anxiety, depression, and personality disorder, which could make it difficult to recognize the true prevalence rates (ADHD-Institute, 2017).

In the context of this disorder there are three main symptoms that occur in the individuals suffering from ADHD. Inattention refers to an individual’s inability to keep his/her focus and contains symptoms such as forgetting daily tasks, not paying attention to details, being easily distracted, or having problems in organizing tasks (Parekh, 2017). Hyperactivity is defined as moving or performing actions in levels that are higher than normal (e.g. excessive talking and fidgeting) (“Hyperactivity”, 2018); and impulsivity is linked with spur of the moment acts that happen without careful thinking (“Impulsivity”, n.d.). Hyperactivity/Impulsivity can be expressed through the following symptoms; inability to remain seated and desire to constantly be on the move, extreme talkativeness, interruption of others, or difficulty in waiting (in lines etc.) (Parekh, 2017). Based on all the symptoms presented (but not limited to the) above, people that are diagnosed with ADHD can be categorized in three types, namely the inattentive, the hyperactive/impulsive, or the combined type (Parekh, 2017).

2.2 Entrepreneurial Intentions

Entrepreneurial intentions have been defined as the motive to follow an entrepreneurial career and start a new business (Pillis, & Reardon, 2007; Wilson, Kickul, & Marlino, 2007). Bird (1988), highlights that entrepreneurial intentions also refer to the creation of new values in already established endeavors. Two intention-based models have been used extensively in the literature to predict entrepreneurial intentions, Ajzen's Theory of Planned Behavior (TPB) and Shapero's model of the entrepreneurial event (SEE). According to the TPB, behavioral intentions of an individual rely on attitude toward the behavior (the reaction to a specific circumstance and to a specific object), subjective norms (the performance or not of the behavior affected by social pressure), and perceived behavioral control (the degree of difficulty in performing the behavior) (Ajzen, 1991). On the other hand, the SEE model suggests that entrepreneurial intentions emerge from perceptions of desirability (appealingness of business creation) and feasibility (individual's ability to start an enterprise), and propensity to act upon opportunities (tendency to act on one's decisions) (Shapero & Sokol, 1982). Krueger, Reilly, and Carsrud (2000) attempted a comparison of the two models, in order to conclude which can explain entrepreneurial intentions more effectively. Their results reveal that the SEE model is slightly better, without this diminishing the usefulness of TPB model (Krueger et al., 2000).

2.3 ADHD and Entrepreneurial Intentions

An increasing amount of studies shows the way some personality traits are linked with entrepreneurial affect, cognition, and action, but in a clinical manner (Wiklund, Hatak, Patzelt, & Shepherd, 2018). Regarding the relationship between ADHD and entrepreneurship, the existing literature has found different connections. One significant study points out, that university students with ADHD-like symptoms have a higher inclination in following an entrepreneurial path than wage-employment after their studies (Verheul et al., 2015). Towards the same direction another study also highlights that a positive connection does exist between ADHD-like symptoms and the intention to start an enterprise, through the aspect of hyperactivity (Wiklund, Yu, Tucker, & Marino, 2017). Furthermore, it has been proven that both symptoms that fall in the spectrum of this disorder can accommodate entrepreneurial action (Wiklund, Patzelt, & Dimov, 2016), but also that the individuals who have been diagnosed with ADHD have a higher probability to

take such actions (Lerner, Verheul, & Thurik, 2018). Finally, deviating from the strict concept of entrepreneurship, it has been identified that the more increased the symptoms of ADHD, the more probable it is for individuals to engage with self-employment (Verheul, Rietdijk, Block, Franken, Larsson, & Thurik, 2016). Following the proven positive relationship between ADHD-like behavior and entrepreneurial intentions we expect the following:

Hypothesis 1: ADHD-like behavior is positively related to entrepreneurial intentions.

2.4 Entrepreneurial Self-Efficacy (ESE) and Entrepreneurial Intentions

Entrepreneurial self-efficacy (ESE) refers to a person's belief about his/her abilities in becoming successful and overcoming burdens when starting an enterprise (Drnovšek, Wincent, & Cardon, 2010). Considering the definition of ESE, it is not difficult to deduce that self-efficacy is a key concept when it comes to entrepreneurship. This concept has been extensively discussed in the literature of entrepreneurial intentions for the past decades. Boyd and Vozikis (1994) propose that higher levels of ESE in the initial steps of career progress lead to more powerful entrepreneurial intentions. They also consider ESE a significant variable that could dictate not only the intensity of entrepreneurial intentions, but also the possibility that these will conclude in actions (Boyd & Vozikis, 1994). Moreover, the imperativeness of ESE has also been noted with regard to following an entrepreneurial path (Krueger & Brazeal, 1994). Another valuable addition to the literature is that of Chen et al. (1998), who identify the positive and significant relationship, in students and business executives, between ESE and the probability to become an entrepreneur. All of the above constitute strong arguments in support of our second hypothesis:

Hypothesis 2: ESE is positively related to entrepreneurial intentions.

2.5 ADHD and ESE

An additional relationship we will examine in the present paper is that of ADHD-like behavior with ESE. It has been observed that individuals with ADHD express lower self-esteem and self-efficacy rates compared to healthy groups (Newark et al., 2016; Philipson et al., 2007; Ramsay & Rostain, 2008; Safren, 2006). Nevertheless, there is no literature that directly connects ADHD with entrepreneurial self-efficacy, as far as we know. For this reason, we will exploit the measurements of ESE that Chen et al. (1998) have developed,

using five entrepreneurial roles, namely risk-taking, innovation, marketing, management and financial control. Out of these five, Chen et al. (1998), Long (1983) and others have distinguished the risk-taking and innovation roles as the primary entrepreneurial capabilities, because these two separate entrepreneurs form managers.

In the present study we consider risk-taking, innovation, management, and general entrepreneurial tendency as representative factors for extracting hypotheses about ESE. With regard to risk-taking propensity, literature has shown that the adults suffering with ADHD are more prone to make risky decisions than the healthy ones (Mäntylä, Still, Gullberg, & Del Missier, 2012). Also, Verheul et al. (2015) have found a significant positive relationship between students with ADHD-like behavior and the tendency in taking risks.

Moving on to innovation, it has been defined as “the successful implementation of a creation” (Heunks & Roos, 1992, p. 6). From this definition we deduce that innovation and creativity are used interchangeably. Since there is no literature to directly connect ADHD with innovation, we will use creativity as an indicator for innovation. In his 1997 book, Weiss demonstrates that a higher degree of creativity is observed in people that have ADHD. Along the same lines, some studies indicate that adults with ADHD are better in performing and achieving creative tasks compared to those without ADHD (White & Shah, 2006; 2011). Moreover, it has been argued that creative thinking is advanced in someone with this disorder, due to her/his inattentiveness and to “the widening of attentional focus” (Abraham, Windmann, Siefen, Daum, & Güntürkün, 2006). A study that strengthens this relationship even further highlights that similar characteristics, such as risk taking, impulsivity, and emotionality, appear both in individuals that are highly creative and that have ADHD (Cramond, 1994). As has already been mentioned above, we expect a positive relation between ADHD-like behavior and creativity, and thus innovation.

Considering the management aspect of ESE, it can include features such as time management, setting goals, organization, planning, and taking responsibilities. Turning our attention to children with ADHD, it has been noted that they show signs of weak planning, organization and time management skills (American Psychiatric Association, 2000). Specifically, when compared to a healthy group of children, those with ADHD lack in skills like task remembering, priorities setting, and action planning for the completion of assignments among other things (Abikoff & Gallagher, 2008; McCandless & O’Laughlin, 2007; Sullivan & Riccio, 2007). Moreover, boys that suffer from ADHD, in comparison with a

control group, are found to be more prone to take responsibilities for social successes, but less likely to do so for social failures (Hoza, Pelham, Milich, Pillow, & McBride, 1993).

When discussing the general entrepreneurial tendency aspect of ESE, we refer to abilities and expectations about venturing into new business. To be more precise, starting a new enterprise, leading it to success, and conforming to the entrepreneurial image are some of the characteristics of this aspect. Dimic and Orlov (2014) have found that people with ADHD show higher levels of entrepreneurial tendencies, and thus they could be a possible abundant source of future entrepreneurs.

Taking into consideration all of the above, we expect a positive association between ADHD-like behavior and the aspects of risk-taking, innovation, and general entrepreneurial tendency. However, based on the literature, ADHD-like behavior and the aspect of management are more likely to have a negative interrelation. Consequently, we anticipate a positive relation between ADHD-like behavior and ESE, because three of the four determinants of ESE appear to have a positive connection with ADHD in previous literature. Hence our hypotheses are:

Hypothesis 3: ADHD-like behavior is positively related to ESE.

Hypothesis 3a: ADHD-like behavior is positively related to the risk-taking aspect of ESE.

Hypothesis 3b: ADHD-like behavior is positively related to the innovation aspect of ESE.

Hypothesis 3c: ADHD-like behavior is negatively related to the management aspect of ESE.

Hypothesis 3d: ADHD-like behavior is positively related to the general entrepreneurial tendency aspect of ESE.

2.6 The mediating role of ESE

Having established a relationship between ADHD and ESE, and ESE with entrepreneurial intentions, in the above literature, we expect ESE to have a mediating role in the connection of ADHD-like behavior and entrepreneurial intentions. Since the relations of ESE with entrepreneurial intentions and of ADHD with ESE are expected to be positive, then the mediating role is expected to be positive as well.

Hypothesis 4: The relationship between ADHD-like behavior and entrepreneurial intentions is mediated by ESE.

3. Data and Methods

In this section we present information about our sample and measurements of our variables. Then, we provide a description of data analysis and of hypotheses testing.

3.1 Data collection

The data employed in the present study include students of the Erasmus University Rotterdam. Specifically, the dataset contains 159 students and was gathered in September 2013 by researchers of the Erasmus School of Economics. Students that did not respond to at least one item were not included in the sample, and so the final number of observations is 158.

3.2 Measures

3.2.1 *Dependent Variable*

In order to measure the *Entrepreneurial_intentions* of the students, the following question was asked: How likely is it (in %) that in 5 years you will have your own company? The percentage of the answers ranges between 0%, for those who have no intention of becoming an entrepreneur in the next 5 years, and 100%, for those with the highest intention.

3.2.2 *Independent Variable*

The independent variable *ADHD_like_behavior* is measured using the 6-item ADHD Self-Report Screener (ASRS-6) of the World Health Organization (Kessler et al., 2005). This scale is a shorter version of the original 18-question screener that measure the frequency of symptoms of ADHD (DSM-IV criterion A symptoms) (Kessler et al., 2005). Based on this 6-item scale, students were asked to describe how they felt in the last six months for the following: 1) How often do you have trouble wrapping up the final details of a project, once the challenging parts have been done?; 2) How often do you have difficulty getting thing in order when you have to do a task that requires organization?; 3) How often do you have problems remembering appointments or obligations?; 4) When do you have a task that requires a lot of thought, how often do you avoid or delay getting started?; 5) How often do you fidget or squirm (move) with your hands or feet when you have to sit down for a long

time?; 6) How often do you feel overly active and compelled to do things, like you were driven by a motor? A five-point Likert scale is used to measure each symptom, 1=never, 2=rarely, 3=sometimes, 4=often, and 5=very often. The independent variable *ADHD_like_behavior* is a mean value of these six questions.

3.2.3 Mediator

As mediator in the present study we use the variable *ESE*. The questionnaire exploits the paper of Chen et al. (1998) for the creation of the *ESE* variable. Chen et al. (1998) in their paper use a variety of questions in order to measure the five factors of ESE: Marketing, Innovation, Management, Risk-taking, and Financial control. In these questions students were asked to point out the degree of their ability in performing specific roles and tasks, which are measured on a five-point Likert scale ranging from 1=totally disagree to 5=totally agree. The questions are the following: Please indicate your degree of certainty in performing the following roles/tasks. 1) Establish and achieve goals and objectives; 2) Generate new ideas; 3) Develop new products and services; 4) Perform financial analysis; 5) Reduce risk and uncertainty; 6) Take calculated risks; 7) Make decisions under uncertainty and risk; 8) Manage time by setting goals; 9) Take responsibility for ideas and decisions; 10) Start my own firm; 11) Lead my own firm to success; 12) When you think of the word “entrepreneur”, how closely do you fit that image (1=0%, 7=100%)? In order to obtain the mediator *ESE*, we take the mean value of these twelve questions. We also use the Principal Component Analysis (PCA) method to categorize ESE into four aspects (Table 1). The first is comprised of questions four, five, six, and seven and represents the *Risk_taking* aspect. The second is the *Innovation* aspect and consists of questions two and three. *Management* is the third aspect and includes questions one, eight, and nine. The fourth and final one is the *General_entrepreneurial_tendency* with questions ten, eleven and twelve. We result in this categorization based on the weight of the twelve questions on each of the four aspects. Specifically, we set 0.3 as the threshold, meaning that for a question to belong to a certain aspect it needs to have a weight of 0.3 or higher.

Table 1: Principal Component Analysis of ESE

	Risk taking	Innovation	Management	General Entrepreneurial Tendency
1) Establish and achieve goals and objectives	0.0515	0.1819	0.5548	-0.1099
2) Generate new ideas	-0.0364	0.6836	0.0008	-0.0394
3) Develop new products and services	0.0153	0.5951	-0.0364	0.0768
4) Perform financial analysis	0.3166	-0.1394	0.3148	0.0604
5) Reduce risk and uncertainty	0.5828	-0.0636	0.0699	-0.0814
6) Take calculated risks	0.5650	-0.0469	-0.2441	0.0849
7) Make decisions under uncertainty and risk	0.4734	0.1938	0.0781	-0.0197
8) Manage time by setting goals	-0.1056	-0.2195	0.5984	0.0639
9) Take responsibility for ideas and decisions	-0.0125	0.1754	0.3983	0.0648
10) Start my own business	-0.0093	-0.0291	-0.0465	0.6120
11) Lead my own firm to success	-0.0153	0.0172	0.0367	0.5645
12) Fit the entrepreneurial image	0.0287	0.0450	0.0322	0.5109

N=158 observations

3.2.4 Control Variables

For the testing of our hypotheses we make use of the following control variables. The *Gender* variable is chosen because it has been proven to influence both entrepreneurial intentions and ESE, with male individuals scoring higher than females in these two (Wilson et al., 2007). It is a dummy variable taking the value of 0 for men and 1 for women. We also include the variable *Age* since it affects entrepreneurial intentions. According to Hatak et al. (2015), as a person ages his/her intentions decline. In our dataset age ranges from 17 to 32 years. Furthermore, these authors have found a significant relationship between previous entrepreneurial experience and intentions (Hatak et al., 2015), and thus we control for whether a respondent currently has ownership of a company, *Compown*, which is a dummy variable taking the value of 0 for yes and 1 for no.

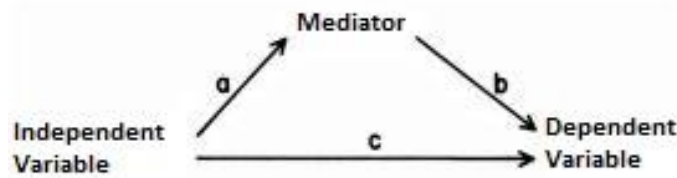
3.3 Analysis

To examine our hypotheses, we use the Stata Software for data analysis. We perform ordinary least squares (OLS) regressions, and we use *Age*, *Gender* and *Compown*, as control variables in testing all our hypotheses. First, we examine the relationship of ADHD-like behavior with entrepreneurial intentions. We run a regression with *ADHD_like_behavior* as the independent variable and *Entrepreneurial_intentions* as the dependent (Hypothesis 1). To test Hypothesis 2, we introduce *ESE* as the independent variable and *Entrepreneurial_intentions* as the dependent. Then, we use *ADHD_like_behavior* as the independent variable and *ESE* as the dependent (Hypothesis 3). For Hypotheses 3a-3d, *ADHD_like_behavior* is the independent variable and *Risk_taking*, *Innovation*, *Management*, and *General_entrepreneurial_tendency* are the dependent, accordingly.

Hypothesis 4 demonstrates that ESE plays a mediating role in the relationship between ADHD-like behavior and entrepreneurial intentions. According to Baron and Kenny (1986), three regression equations must be estimated to explore mediation and specifically, 1) a regression of the mediator with the independent variable; 2) a regression of the independent with the dependent variable; and 3) a regression of the dependent with the independent and the mediator (Barron & Kenny, 1986) (Figure 1). For the present study this implies that we should establish a connection, firstly, between ADHD and ESE; secondly,

between ADHD and entrepreneurial intentions; and thirdly, between ADHD-like behavior, ESE and entrepreneurial intentions.

Figure 1: The basic causal chain involved in mediation



Source: adapted from Barron and Kenny (1986, p. 1176)

To test if Hypothesis 4 is confirmed, we propose the following process based on Baron and Kenny's approach: to get the first regression of the mediation, we use the regression of Hypothesis 1; and to get the second regression, we use that of Hypothesis 3. Finally, we perform a regression same as the first one but with the addition of *ESE* to see if there is a mediating effect. If the relation between ADHD-like behavior and entrepreneurial intentions shows a differentiation, then we could say that ESE does have a mediating role. To examine whether the ESE carries the influence of ADHD-like behavior to entrepreneurial intentions, we perform a Sobel test. We also include a further check by running regressions substituting *ESE* with each of its four aspects as mediators. In the Results section we will illustrate our findings for the above regressions.

4. Results

This section begins with an analysis of some descriptive statistics. The results of our regressions follow, and we close with a robustness check.

4.1 Descriptive statistics

Some statistics about our sample are represented in Table 2. Specifically, 40.51% of the students are female and the average age is 22.22 years. Moreover, it is observed that the majority of respondents has entrepreneurial intentions higher than 50 in a scale of 100, as the mean is 55.108, a percentage that is expected since the questionnaire was given to economics students. An interesting fact obtained by the ASRS, is the rate of individuals with ADHD-like symptoms. According to Kessler's (2005) method, an individual that scores more than 21 points out of a total of 30 (3 or higher in the first three items and 4 or higher in the remaining three) in the ASRS-6, is positive for ADHD. More specific, using this method of testing, we find that 9.49% of the students exhibit these symptoms. Finally, by observing the mean of ESE (3.687) on a scale of 1 to 5, we deduce that the majority of respondents score higher than option 3, which is 'neither agree nor disagree'.

Furthermore, some important associations are revealed by looking at the correlations in Table 2. To be more precise, a positive and significant correlation between ESE and entrepreneurial intentions is given by the coefficient, 0.504, at 1% significance level. Along the same lines, two of the aspects of ESE, general entrepreneurial tendency and innovation, also appear to have a positive and significant effect on entrepreneurial intentions, as illustrated by their coefficients, 0.652 and 0.329 respectively, both at 1% significance level. Another interesting connection is that between management and ADHD-like behavior, where we observe a negative coefficient, -0.277, at 5% significance level.

Table 2: Means, Standard deviation, and Correlations

	Variable	Mean	Sd.	1	2	3	4	5	6	7	8	9
1	<i>Entrepreneurial_intentions</i>	55.108	27.412									
2	<i>ADHD_like_behavior</i>	2.782	0.519	-0.061								
3	<i>ESE</i>	3.687	0.484	0.504**	-0.168							
4	<i>General_entrepreneurial_tendency</i>	-3.78e	1.579	0.652**	-0.087	0.796**						
5	<i>Management</i>	-3.90e	1.386	0.132	-0.277*	0.628**	0.260*					
6	<i>Innovation</i>	3.83e	1.345	0.329**	-0.146	0.613**	0.403**	0.279*				
7	<i>Risk_taking</i>	-3.04e	1.319	0.125	0.055	0.590**	0.261*	0.225	0.109			
8	<i>Compown</i>	0.930	0.255	-0.275*	0.085	-0.233	-0.284*	-0.053	-0.142	-0.073		
9	<i>Age</i>	22.215	0.255	0.245	0.004	0.035	0.010	0.000	0.117	0.001	-0.123	
10	<i>Gender</i>	0.405	0.492	-0.063	-0.158	-0.162	-0.246	0.194	-0.134	-0.187	0.074	-0.095

N=158 observations; Sd= standard deviation; *** $p < 0.001$; ** $p < 0.01$; * $p < 0.05$

4.2 Regressions

In this subsection we present the results of our regressions and reach at conclusions about our hypotheses. Considering the first hypothesis, that ADHD-like behavior is positively related to entrepreneurial intentions, we run an ordinary least squares (OLS) regression. In Table 3 we show the results of this regression, which suggest that there is a negative relationship between entrepreneurial intentions and ADHD-like behavior. However, we cannot confirm Hypothesis 1, as the coefficient of *ADHD_like_behavior* is insignificant ($p > 0.05$). Even after running the same regression without including a set of controls (i.e. only with the dependent and independent variables), we do not get a significant coefficient (see Appendix 1). Possible reasons for the insignificant results will be analyzed in the Limitations section.

The second hypothesis in the present paper is concerned with the effect of entrepreneurial self-efficacy on entrepreneurial intentions. We test this hypothesis using an OLS regression and present the results below in Table 3. Based on the coefficient and the p-value of ESE ($\beta = 26.674$, $p < 0.001$) we could conclude that this relationship is a positive and significant one. Hence Hypothesis 2, stating that ESE is positively related to entrepreneurial intentions, is confirmed.

Table 3: Regression results of *ADHD_like_behavior* and *ESE* on *Entrepreneurial_intentions*

	<i>Entrepreneurial_intentions</i>	
	Coeff. (SE)	Coeff. (SE)
<i>ADHD_like_behavior</i>	-2.456 (4.067)	-
<i>ESE</i>	-	26.674 (3.908)***
<i>Age</i>	2.279 (0.822)**	2.313 (0.720)**
<i>Gender</i>	-1.809 (4.300)	2.455 (3.760)
<i>Compown</i>	-25.997 (8.244)**	-15.194 (7.380)*
constant	36.242 (23.513)	-81.492 (24.486)**
<i>N</i> (observations)	158	158
R-squared	0.124	0.327
Adjusted R-squared	0.101	0.309

SE= robust standard errors; *** $p < 0.001$; ** $p < 0.01$; * $p < 0.05$

Moving on, we test our third hypothesis which is the following: ADHD-like behavior is positively related to ESE. The same linear regression as the other two hypotheses is employed to gain insights on the connection of ADHD with ESE. As we can observe from

the results (Table 4), ADHD-like behavior has a negative impact on the entrepreneurial self-efficacy of a student ($\beta=-0.166$, $p<0.05$). This result is not in line with our expectations, thus we are not able to confirm Hypothesis 3.

Table 4: Regression results of *ADHD_like_behavior* on *ESE*

	<i>ESE</i>
	Coeff. (SE)
<i>ADHD_like_behavior</i>	-0.166 (0.073)*
<i>Age</i>	-0.001 (0.015)
<i>Gender</i>	-0.173 (0.077)*
<i>Compown</i>	-0.390 (0.147)**
constant	4.612 (0.419)***
<i>N</i> (observations)	158
R-squared	0.106
Adjusted R-squared	0.083

SE= robust standard errors; *** $p < 0.001$; ** $p < 0.01$; * $p < 0.05$

Having established a linkage between ADHD-like behavior and ESE, even though it is a negative one, we move on to examine the four aspects of ESE that correspond to hypotheses 3a-3d. To test these hypotheses, we again run four OLS regressions and Table 5 depicts the results. Concerning the impact of ADHD-like behavior on the risk-taking aspect of ESE our results reveal a positive relationship, but no conclusion can be reached for Hypothesis 3a due to the insignificance of the coefficient ($\beta=0.081$, $p>0.05$). Between ADHD symptoms and innovation, a negative relation is revealed ($\beta=-0.413$, $p<0.05$). This means that having ADHD symptoms lowers the innovation self-efficacy of a student, thus Hypothesis 3b is not confirmed since it predicted a positive sign. Hypothesis 3c presumes a negative impact of ADHD on management, and looking at the results ($\beta=-0.662$, $p<0.01$) we can see that this is confirmed in the present study. Consequently, we could infer that, on average, the more symptoms of this disorder a student exhibits, the less his/her management self-efficacy will be. Finally, regarding Hypothesis 3d, unlike our predictions, the relationship between ADHD-like behavior and general entrepreneurial tendency is found to be negative. Nevertheless, we cannot take this result into consideration because it is insignificant.

Table 5: Regression results of ADHD_like_behavior on ESE aspects

	<i>Risk-taking</i>	<i>Innovation</i>	<i>Management</i>	<i>General</i>
	Coeff. (SE)	Coeff. (SE)	Coeff. (SE)	Coeff. (SE)
<i>ADHD_like_behavior</i>	0.081 (0.205)	-0.413 (0.206)*	-0.662 (0.208)**	-0.314 (0.232)
<i>Age</i>	-0.012 (0.041)	0.048 (0.042)	0.006 (0.042)	-0.028 (0.047)
<i>Gender</i>	-0.482 (0.217)*	-0.390 (0.217)	0.447 (0.220)*	-0.792 (0.245)**
<i>Compown</i>	-0.335 (0.415)	-0.563 (0.417)	-0.232 (0.422)	-1.625 (0.469)**
constant	0.555 (1.184)	0.774 (1.189)	1.744 (1.203)	3.339 (1.339)*
<i>N</i> (observations)	158	158	158	158
R-squared	0.040	0.068	0.078	0.144
Adjusted R-squared	0.015	1.315	1.331	0.122

SE= robust standard errors; *** $p < 0.001$; ** $p < 0.01$; * $p < 0.05$

Having examined the above hypotheses, we continue by analyzing Hypothesis 4 that refers to the mediating role of ESE in our initial relationship between ADHD-like behavior and entrepreneurial intentions. Again, an OLS regression is performed and we present the results in Table 6. It appears that the inclusion of ESE causes a change in the initial relationship. ADHD-like behavior is now positively related with entrepreneurial intentions. Moreover, an important fact can be drawn from Table 6, and that is the high significance level of the coefficient and the p -value of ESE ($\beta=27.085$, $p<0.001$), meaning that ESE has an influence on the regression.

In order to examine the mediation more thoroughly, we run a Sobel mediation test. In Table 7 we observe that the total effect, which is the coefficient of ADHD-like behavior on entrepreneurial intentions, is statistically insignificant ($c=-2.456$, $p>0.05$) and the direct effect, which is the coefficient of ADHD-like behavior on entrepreneurial intentions after including ESE, remains statistically insignificant ($c'=2.053$, $p>0.05$). Nevertheless, we can see that the Sobel parameter is statistically significant ($ab=-4.509$, $p<0.05$). The Sobel parameter represents the mediation, in which a is the connection between ADHD-like behavior and ESE ($a=-0.166$, $p<0.001$), and b is the connection between ESE and entrepreneurial intentions ($b=27.085$, $p<0.05$). Since the product of a and b is statistically significant, we could talk about an indirect path that connects ADHD-like behavior with entrepreneurial intentions through ESE. Thus, the Sobel test provides supporting evidence for the mediating role of ESE in the relationship under examination, confirming Hypothesis 4.

Table 6: Regression results of the mediating effect of ESE

	<i>Entrepreneurial intentions</i>	
	Coeff. (SE)	Coeff. (SE)
<i>ADHD_like_behavior</i>	-2.456 (4.067)	2.053 (3.634)
<i>ESE</i>	-	27.085 (3.983)***
<i>Age</i>	2.279 (0.822)**	2.313 (0.722)**
<i>Gender</i>	-1.809 (4.300)	2.872 (3.840)
<i>Compown</i>	-25.997 (8.244)**	-15.425 (7.408)*
constant	36.242 (23.513)	-88.684 (27.645)**
<i>N</i> (observations)	158	158
R-squared	0.124	0.328
Adjusted R-squared	0.101	0.306

SE= robust standard errors; *** $p < 0.001$; ** $p < 0.01$; * $p < 0.05$

Table 7: Sobel Mediation Test

	Coeff. (SE)
Sobel (ab)	-4.509 (2.073)*
a coefficient	-0.166 (0.073)*
b coefficient	27.085 (3.983)***
Indirect effect	-4.509 (2.073)*
Direct effect (c')	2.053 (3.634)
Total effect (c)	-2.456 (4.067)
Total effect being mediated	1.836

SE= robust standard errors; *** $p < 0.001$; ** $p < 0.01$; * $p < 0.05$

4.3 Robustness check: the mediating role of each of the four aspects of ESE

Taking into account the insignificant result for the direct relation between ADHD-like behavior and entrepreneurial intentions (Table 3), and the significant indirect path that links ADHD-like behavior with entrepreneurial intentions through ESE (Sobel mediation test), we will perform further analyses to examine which of the risk-taking, innovation, management, and general entrepreneurial tendency aspects of ESE may play a mediating role. It is evident from the results presented below in Table 8, that the coefficient and the p-value of the innovation ($\beta=5.660$, $p<0.001$) and of the general entrepreneurial tendency ($\beta=11.544$, $p<0.001$) aspects are both significant and positive. From these results it can be deduced that the two aforementioned aspects could act as mediators in the indirect relationship between ADHD-like behavior and entrepreneurial intentions.

Table 8: Regression results of the mediating effect of the four aspects of *ESE* in the *ADHD_like_behavior* -*Entrepreneurial_intentions* relation

	<i>Entrepreneurial_intentions</i>			
	Coeff. (SE)	Coeff. (SE)	Coeff. (SE)	Coeff. (SE)
<i>ADHD_like_behavior</i>	-2.640 (4.056)	-0.124 (3.960)	-0.811 (4.179)	1.173 (3.094)
<i>Risk_taking</i>	2.248 (1.600)	-	-	-
<i>Innovation</i>	-	5.660 (1.537)***	-	-
<i>Management</i>	-	-	2.485 (1.572)	-
<i>General</i>	-	-	-	11.544 (1.074)***
<i>Age</i>	2.306 (0.819)**	2.010 (0.793)*	2.264 (0.818)**	2.607 (0.622)***
<i>Gender</i>	-0.726 (4.355)	0.400 (4.177)	-2.919 (4.336)	7.338 (3.361)*
<i>Compown</i>	-25.243 (8.236)**	-22.809 (7.972)**	-25.422 (8.212)**	-7.244 (6.474)
constant	34.995 (23.456)	31.861 (22.634)	31.909 (23.559)	-2.303 (18.139)
<i>N</i> (observations)	158	158	158	158
R-squared	0.135	0.195	0.138	0.502
Adjusted R-squared	0.106	0.169	0.109	0.486

SE= robust standard errors; *** $p < 0.001$; ** $p < 0.01$; * $p < 0.05$

5. Discussion and conclusion

In this section we start with discussing the main conclusions of the present study. After that, we provide some academic and social implications of our study. Finally, possible limitations are analyzed and some recommendations for future research are presented.

5.1 Discussion

The aim of the present study is to examine the relationship between ADHD-like behavior and entrepreneurial intentions, and at a further step to look at the role that ESE might play in this relationship. Contrary to our primary expectations based on the literature, our study could not produce significant results to support a direct impact of ADHD-like behavior on entrepreneurial intentions. To be more specific, after running several regressions (with/without control variables) our analysis is not capable of providing statistically significant results, regarding a direct link between ADHD-like behavior and entrepreneurial intentions. In the Limitations section that follows, we will try and analyze possible reasons for these insignificant results. With regard to the role of ESE as a mediator, the present study offers some supportive results. The regressions we run reveal the existence of a significant indirect connection of ADHD-like behavior with entrepreneurial intentions through ESE, and specifically through the significant relations between ADHD-like behavior with ESE, and ESE with entrepreneurial intentions. As a concluding remark, we observe that two aspects of ESE, namely innovation and general entrepreneurial tendency, could act as mediators in the ADHD-entrepreneurial intentions relationship – in a better way than risk-taking and management – due to their significant coefficients and p-values.

Despite the fact that the present study could not offer definitive answers on one part of its research purpose, it provides some other interesting results. Firstly, in line with previous literature (Boyd & Vozikis, 1994; Krueger & Brazeal, 1994; Chen, Greene, & Crick, 1998), we find a positive and significant effect of ESE on entrepreneurial intentions. Specifically, this implies that students with higher entrepreneurial self-efficacy are more likely to follow an entrepreneurial path. Secondly, the effect of ADHD-like behavior on ESE is confirmed by our significant results. However, these results contradict our hypothesis that this effect would be positive, since we arrive at a negative relation. This means that, on average, students who exhibit ADHD-like symptoms are less likely to have high entrepreneurial self-

efficacy. From these two findings we are able to extract a third and equally important one, which is the indirect association linking ADHD-like behavior with entrepreneurial intentions through ESE. Thus, the inclusion of ESE provides a way to indirectly connect ADHD-like behavior with entrepreneurial intentions, an association that would not have been possible without ESE, in the present study.

5.2 Implications

The contribution of the present study is twofold; one is of academic interest and the other of social. Concerning the academic one, our study provides insights to a domain that is rather new and underexplored. To be more precise, because there is limited literature that connects the effect of psychiatric disorders on entrepreneurship, by examining the relationship of ADHD and entrepreneurial intentions we try to fill a gap by expanding the literature towards this direction. Moreover, by examining the linkage between ADHD and entrepreneurial self-efficacy, we attempt to introduce a relationship that to our knowledge has not been previously studied. Hence, by doing so another contribution is made to the literature on entrepreneurship and psychiatric disorders. The social aspect of the present study is also related with the establishment of a connection between ADHD and ESE. Even though our results indicate a negative relation, our study could offer new career possibilities for individuals that show ADHD-like symptoms. For instance, an individual with these symptoms has lower entrepreneurial self-efficacy, especially with regard to innovation and management aspects, meaning that it would be more difficult for him/her to become an entrepreneur. We base this assumption on the significant relationships we find between ADHD with ESE, and ESE with entrepreneurial intentions. Future studies could be conducted to expand the aforementioned insight about the entrepreneurial career for people with ADHD.

5.3 Limitations and future research

The present study has a number of limitations that could partly explain the insignificance of some of the results, but at the same time could indicate possibilities for future research. One such limitation has to do with the way entrepreneurial intentions are measured. Specifically, we obtain the variable *Entrepreneurial_intentions* from the following question: "How likely is it (in %) that in 5 years you will have your own company?". This type of

question cannot directly account for the entrepreneurial intentions of a student, since it includes other factors (e.g. financial, social, family background) that could influence the response, and thus lead to biased answers. It is recommended that future research should attempt to explore entrepreneurial intentions by using, for example, a set of questions aimed at indirectly identifying an individual's intention. One suggestion would be to exploit the entrepreneurial intentions questionnaire (EIQ), built by Liñán and Chen (2009).

Another limitation has to do with the sample used in the present study. Specifically, the dataset contains answers that are provided only by students, thus excluding full-time wage workers, unemployed individuals, or adults who possess the experience and the resources to venture into an entrepreneurial career. A possibility for future research would be to also focus on the groups of people mentioned above in order to have a more complete picture. Furthermore, the rather low number of respondents in the sample ($N=158$) could influence the outcome, an effect that would be much lower as the number of respondents increases. For instance, a few "extreme" answers (i.e. answering every question at the lowest or highest scale) in a small sample would be of greater magnitude, than it would in a much larger sample. Future research could, thus, be conducted using a larger sample in order to avoid this kind of influenced outcome. This could be done by including more respondents from the specific university, or by expanding the research to more universities.

5.4 Conclusion

Given the significance and complexity of entrepreneurship, in the present study we tried to establish whether there is a connection of it with psychiatric disorders. Specifically, we examined the relationship between ADHD and entrepreneurial intentions under the influence of ESE. The results reveal an indirect link of ADHD with entrepreneurial intentions through ESE, but not a direct one. Based on these findings, and considering the implications that our study suggests, future research should be held towards this direction investigating the possible impact of psychiatric disorders on entrepreneurship.

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Appendix 1: Regression of ADHD-like behavior on entrepreneurial intentions without controls

To test in a further step the relationship between ADHD-like behavior and the entrepreneurial intentions, we run an ordinary least squares regression, without the addition of control variables. As we can see from Table 9, the effect of ADHD-like behavior on entrepreneurial intentions remains insignificant in this case as well, which is evident from the insignificant coefficient and p-value of *ADHD_like_behavior* ($\beta=-3.228$, $p>0.05$).

Table 9: Regression results of *ADHD_like_behavior* on Entrepreneurial_intentions without controls

	Entrepreneurial_intentions
	Coeff. (SE)
<i>ADHD_like_behavior</i>	-3.228 (4.219)
constant	64.086 (11.937)***
<i>N</i> (observations)	158
R-squared	0.004
Adjusted R-squared	-0.003

SE= robust standard errors; *** $p < 0.001$; ** $p < 0.01$; * $p < 0.05$