The Relationship between Subclinical Autism Symptoms and Entrepreneurial Intentions

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Preface

Writing this thesis ''The Relationship between Subclinical Autism Symptoms and Entrepreneurial Intentions", is my final step towards obtaining my Master of Science degree in Strategy Economics at Erasmus School of Economics. This master programme has provided me with the knowledge and skills to become a leading change maker.

A combination of several factors motivated me to conduct this study within the field of psychology and entrepreneurship. First of all, the Seminar in Strategic Behaviour taught as part of my master programme inspired me to choose a topic that looks into individual level drivers of entrepreneurship. Additionally, the thesis information session at the beginning of this year enthused me about how research in psychology and economics can be combined. Moreover, my brother was the final link towards defining the topic of this thesis. After a challenging childhood he was diagnosed with Asperger syndrome. Nowadays, he successfully runs his own business, which really helped him to adjust his job to his own needs. Thereby, the topic of my thesis was born by linking a mental disorder with entrepreneurship. In this study I explore whether subclinical autism symptoms are related to the intentions of students to become an entrepreneur in the future.

I would like to take this opportunity to thank several people that helped me to conduct and improve this study. First of all, Dr. Niels Rietveld helped me to shape my ideas towards a suitable topic and introduced me to Kristel de Groot MSc. I am very thankful to Kristel de Groot MSc for providing me with two of her datasets. Furthermore, my supervisor Annelot Wismans MSc has guided me throughout the whole process. She delivered detailed feedback and was readily available to answer my questions. Also, she really helped me to critically think about my research and strive for excellence. Moreover, I want to acknowledge the additional efforts that Dr. Niels Rietveld made by judging this thesis as a second reader. Lastly, I want to thank my parents for giving me the possibility to pursue my studies at Erasmus School of Economics and their support.

 I hope you enjoy reading this thesis as much as I have enjoyed writing it.

Bo van Wendel de Joode

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Abstract

Recently, an interdisciplinary research field within psychology and economics has evolved. The potential positive sides of mental health disorders have been reviewed by relating (sub)clinical symptoms to entrepreneurship. Although some positive relationships were found for some disorders, like attention-deficit/hyperactivity disorder, much is yet to be understood. The current study explores whether subclinical autism symptoms are related to entrepreneurial intentions. Thereby, it is to date the first to study autism as a mental disorder within this context. Cross-sectional data for this research was collected through questionnaires conducted amongst Dutch students. Self-reported subclinical autism symptoms were measured by the Autism-Spectrum Quotient. Besides an overall autism score, this questionnaire subdivides symptoms into five different domains: imagination, attention to detail, attention switching, social skills, and communication skills. Ordinary Least Squares regression analyses were conducted, and three separate autism symptoms were found to be associated with entrepreneurial intentions. A positive association was found between having a sharp attention to detail and entrepreneurial intentions. Poor attention switching and poor social skills turned out to be negatively associated with entrepreneurial intentions. The overall degree of autism symptoms seems to be unrelated to the entrepreneurial intentions that students exhibit. Lastly, a moderation analysis showed that gender does not play a moderating role in the relationship between autism symptoms and entrepreneurial intentions. This study shows that autism could be a fruitful area for more research. Future research should try to overcome the limitations of this study, examine the robustness of the conclusions and elaborate on the findings of this research.

Keywords: entrepreneurship, entrepreneurial intention, autism, subclinical symptoms, gender

Table of content

1. Introduction

Over 1% of the Dutch population, approximately 200.000 people, are estimated to have autism (NVA, 2019). Furthermore, 1 million people are directly involved with persons that are diagnosed, like teachers, healthcare providers, parents, sisters, and brothers. People that are diagnosed with autism encounter enduring impairments in communication and social interaction (American Psychiatric Association, 2013). Additionally, people exhibit restrained patterns of behaviour, activities, and interests. Often, people with autism experience difficulties to participate in the society, like participation in a work environment. Global rates show that a great number of adults with autism are unemployed, which is estimated to sometimes be as high as 85% (Autism Speaks, 2020).

Research on mental disorders has repeatedly focused on negative aspects and hurdles that people face. However, a recently evolving stream of research has started to analyse mental disorders in a context in which they might be an asset, namely entrepreneurship. Previous research on entrepreneurship, has shown that certain personality traits can be linked to entrepreneurship (e.g. Digman, 1990; Zhao, Seibert, & Lumpkin, 2010). Furthermore, personal attitudes, like risk taking and innovativeness, have been related to the tendency to prefer entrepreneurship over employment (Douglas & Shepherd, 2002; Harris & Gibson, 2008). Some characteristics of mental disorders have also been related to entrepreneurial intentions. Several studies have found positive relationships between attention-deficit/hyperactivity disorder (ADHD) symptoms and intentions to become an entrepreneur (e.g. Verheul et al., 2015; Wiklund, Yu, Tucker, & Marino, 2017). Moreover, some authors have studied how bipolar disorder and entrepreneurship are related (e.g. Biasi, Dahl, & Moser, 2015). Several authors have opted that more research is needed on the topic of mental disorders and entrepreneurship, and proposed that in non-clinical contexts psychiatric symptom scores could be useful instruments to investigate (Verheul et al., 2015).

Until now, the relationship between autism and entrepreneurship has not been investigated. A possible explanation could be that, at first view, the relationship between autism and entrepreneurship might not be obvious. Nonetheless, more research into this area could be worthwhile. Wiklund, Hatak, Patzelt, and Shepherd (2018) proposed that by becoming an entrepreneur, people with autism have the possibility to adjust their work to their own weaknesses and strengths. As more job control can be exerted through entrepreneurship as compared to employment, people with autism have more flexibility and control over the work-related tasks that best suit their needs (Stephan & Roesler, 2010). Furthermore, some autism symptoms can be seen as positive features, like an exceptional attention to details and strong focus of attention (Baron-Cohen, Wheelwright, Skinner, Martin, & Clubley, 2001). When you start your own business, you have to perform certain activities for which having a sharp attention to detail is important (Lerner, Verheul, &

Thurik, 2019). Moreover, a strong focus improves concentration and reduces wasting time (Wong, Donelly, Neck, & Boyd, 2018). To date, no study has yet explored the relationship between subclinical autism symptoms and entrepreneurial intention. Therefore, this exploratory study steps into this research gap in order to increase the knowledge in the research field of mental disorders and entrepreneurship. Thereby, it formulates an answer to the following main research question:

Research question: *Are subclinical autism symptoms related to entrepreneurial intentions?*

In order to answer this question, data has been gathered through survey research. Several questionnaires were completed by a sample of Dutch students that were recruited via multiple test subject platforms of Erasmus University Rotterdam. The Autism-Spectrum Quotient of Baron-Cohen et al. (2001) is used as a self-report instrument to measure autism symptoms. Furthermore, an adjusted version of the entrepreneurial intention questionnaire from Liñán and Chen (2009) is administered to quantify entrepreneurial intentions. Behavioural intentions are good predictors of whether people finally engage in certain behaviour, according to the Theory of Planned Behaviour (Ajzen, 1991). Thereby, entrepreneurial intentions can predict eventual decisions to become an entrepreneur. Therefore, entrepreneurial intention is used as the dependent variable in this research. The research question will be supported by several (sub)hypotheses. First, the relationships between entrepreneurial intention and five autism symptoms are analysed separately. Second, the association between the overall degree of symptoms and the intention to become an entrepreneur is analysed. Finally, the research explores whether gender plays a moderating role in these relationships. Ordinary Least Squares (OLS) regression analyses are estimated for the student sample to examine these relationships.

This research is important to conduct as it can contribute in several ways. This study is the first to link possible positive features of autism to entrepreneurial intentions. In general, it adds to the current literature on mental disorders and entrepreneurship by providing an extra disorder that can be analysed within this context besides disorders like ADHD or bipolar disorder. Wiklund et al. (2018) concluded that additional research within this field is important because of the societal implications it can have. Although this study looks into subclinical levels of autism, it could provide insights into how people with autism might be suitable to pursue a career as entrepreneur. This research can improve our understanding of how certain autism traits are associated with entrepreneurial intentions. Awareness about these traits can be created in entrepreneurship education, and policies could be adjusted in order to stimulate entrepreneurship amongst people that exhibit certain characteristics. Thereby, this study can be a meaningful stepping stone for future research that elaborates on autism and entrepreneurship.

The remainder of this study is organized as follows. First, the relevant literature on the topics of entrepreneurial intention, mental disorders and autism is described, after which the hypotheses are developed. Hereafter, the data and methodology section will explain how the data is structured and how variables and mathematical models are conceptualized. Furthermore, in this chapter descriptive statistics and correlations will be presented. The next section will show the OLS regression results. Additionally, a robustness check is performed to check if the results hold when additional control variables are included. Consequently, in the discussion chapter implications of the research findings, limitations of this study, and several suggestions for further research are described. Lastly, the conclusion underscores the main results of this research.

2. Literature review

2.1 Personality, attitudes and entrepreneurial intentions

Much previous research on entrepreneurship has studied how certain personality characteristics can explain the intentions of people to engage in entrepreneurial behaviour. Ajzen (1991) developed the Theory of Planned Behaviour, which predicates that the behavioural intentions that people exhibit are good predictors of their final decision to engage in a certain behaviour. This can especially be applied to the context in which people have to choose amongst multiple alternatives. For example, employment decisions where people choose whether they want to work for a company or establish their own firm as an entrepreneur. The entrepreneurial intentions lead to subsequent actions that realize these intentions by establishing a new venture. Also, empirical studies confirm this positive effect. For example, Bogatyreva, Edelman, Manolova, Osiyevskyy, and Shirokova (2019) showed that students that have entrepreneurial intentions are on average three times more likely to become an entrepreneur after they graduate, compared to students that lack intentions. Entrepreneurial intention is thus a valid construct to predict eventual entrepreneurship.

The linkage between personality traits and entrepreneurship was a popular research area in the 1980s-1990s. Often, research in entrepreneurship is related to a personality model that includes five broad personality dimensions, known as the Big Five (Digman, 1990). These include; extraversion, agreeableness, conscientiousness, openness to experience, and emotional stability. Furthermore, some authors argued that next to the Big Five risk propensity should be analysed separately (Paunonen & Jackson, 1996), while others see it as a compound trait that is just a specific combination of the Big Five personality constructs (Nicholson, Fenton-O'Creevy, Soane, & Willman, 2005). Zhao et al. (2010) performed a meta-analysis of these constructs and their relationship with entrepreneurial intentions. Overall, they found that four personality traits were positively related to entrepreneurial intentions, except agreeableness. However, only conscientiousness and openness to experience are strongly related, and therefore the effect of the Big Five traits is only moderate in magnitude. Reviews that were performed prior to Zhao et al. (2010) found different results. For example, Gartner (1988) argued that in the trait approach so many different traits have been attributed to entrepreneurs that the combination of these traits leads to contradictions. A single person would then have to exhibit a seemingly impossible combination of too many different personality traits. So, he argued that entrepreneurs should be analysed on the basis of a behavioural approach and not just on a fixed state of existence as is the case in trait research. Overall, there is an ongoing debate whether there is a specific set of personality traits that defines a successful entrepreneur, because studies provided mixed results (Bolton & Lane, 2012).

Besides personality traits, personal attitudes have also been related to entrepreneurial intentions. The Theory of Planned Behaviour predicates that attitudes can be important antecedents of eventual behaviour (Ajzen & Fishbein, 2005). Douglas and Shepherd (2002) found that more risk tolerant individuals have stronger tendencies to prefer self-employment as a career choice. Moreover, people who favour independence have higher entrepreneurial intentions, because they have a positive attitude towards decision-making autonomy. Bolton and Lane (2012) also concluded that risk-taking attitudes are related to entrepreneurial tendencies, and that additionally proactiveness and innovativeness play a role. Harris and Gibson (2008) showed that attitudes like personal control, achievement, and self-esteem explain entrepreneurial intentions. Furthermore, they confirmed that innovativeness affected entrepreneurial intentions which is in line with the findings of Bolton and Lane. However, Ajzen and Fishbein (2005) stated that for many individuals and behaviours the use of attitudes that are too implicit and broad have shortcomings in predictive validity. Therefore, research on more specific attitudes or personality traits is valuable. Fayolle and Liñán (2014) postulated that there is a great potential for research on entrepreneurial intentions to help gain a better understanding on personal level variables that influence the decision towards becoming an entrepreneur.

2.2 Mental health disorders and entrepreneurial intentions

In the field of psychology and entrepreneurship, authors recently started to investigate the insights that characteristics of several mental health disorders can give about entrepreneurial intentions. Usually, mental disorder traits have been viewed in negative contexts, but certain traits could actually be positive features for entrepreneurs (Antshel, 2018). Nowadays, most studies in this context have analysed how ADHD is related to entrepreneurship, and entrepreneurial intentions specifically. Verheul et al. (2015) found that students that show more ADHD symptoms have stronger intentions towards becoming an entrepreneur. A later study confirmed this positive result, but showed that it is mainly driven by the hyperactivity component (Verheul et al., 2016). Wiklund et al. (2017) also found a positive association with hyperactivity, and concluded that this beneficial influence is caused by increased sensation seeking tendencies that are induced by the hyperactivity component. Furthermore, Wiklund et al. (2017) concluded that the attention-deficit component is negatively related to entrepreneurial intentions. Also, individuals with ADHD are known for their impulsive decisions. They seek novelty, and therefore the decision to engage in entrepreneurship evolves intuitively in a sense that they feel it is an appropriate action (Wiklund, Patzelt, & Dimov, 2016). In this regard their impulsivity is actually a positive asset to become an entrepreneur.

Besides ADHD, other mental health issues have been researched in relation to entrepreneurial intentions. One of those is bipolar disorder, which is characterised by extreme mood shifts. There is robust evidence that individual levels of need for accomplishment and creativity are strongly related

to bipolar disorders, but also to entrepreneurship (Jamison, 2005). Biasi et al. (2015) exploited the relationship between prescribed lithium as a drug for the disorder and entrepreneurship, and found that those who were prescribed the drug had higher chances of creating their own firm. However, another study failed to find a relationship between mania risk and entrepreneurial intentions (Johnson, Freeman, & Staudenmaier, 2015). Taking these studies into account, Johnson, Madole, and Freeman (2018) evaluated the influence of sixteen different bipolar traits on entrepreneurship. Overall, they found that only extraversion, hubristic pride, proactive personality, and improvisational proclivity were characteristics that significantly correlated with entrepreneurial intentions.

Furthermore, there is a research stream that has focused on the relationship between the so-called dark triad and entrepreneurship. This triad includes subclinical psychopathy, Machiavellianism, and subclinical narcissism (Paulhus & Williams, 2002). These three constructs are offensive but yet non-pathological extreme personalities that can be related to the Big Five personality characteristics as analysed before. Negative associations with conscientiousness and agreeableness are consistent amongst the three. Do and Dadvari (2017) investigated the influence of the dark triad on individuals' entrepreneurial intentions. Overall, there is a positive association. People who score high on the dark triad, conceptualized as a combined measure for the three constructs, have higher tendencies to engage in entrepreneurial behaviour. Moreover, they found support that the dark triad has an influence as a mediator between entrepreneurial attitude orientation and entrepreneurial intention.

Nevertheless, research in this area is still in its early days. As outlined, research has been done on mental disorders like ADHD, bipolar disorders, and the dark triad personalities, but there are much more mental disorders of which their relationship with entrepreneurial intentions is yet to be understood. Wiklund et al. (2018) concluded that from a practical viewpoint it is important to perform more research on entrepreneurship and mental disorders, because of the societal implications it can have. The entrepreneurial advantages of mentally disordered can lead entrepreneurship to be an important alternative career choice, on the one hand due to the possibility to earn money, but also as a means to potentially improve mental health. Furthermore, Verheul et al. (2015) have used validated psychiatric symptom scores to measure ADHD symptoms and stated that these can be a fruitful instrument for new research opportunities by using them in non-clinical settings.

2.3 Autism and employment

One of these under researched mental disorders in an entrepreneurial context is autism. Autism includes multiple different forms, like Kanner's autism, Asperger syndrome, and pervasive developmental disorder-not otherwise specified (PDD-NOS). Autism symptoms can vary between individuals dependent on their level of development, age, and severity of the disorder. Therefore, it is

known as a spectrum of disorders; autism spectrum disorder (ASD) (American Psychiatric Association, 2013). The American Psychiatric Diagnostic and Statistical Manual of Mental Disorders (DSM-5) has been developed as a tool to specify diagnostic criteria for mental disorders within psychology and psychiatry. According to DSM-5, people with ASD in general experience persistent impairment in mutual social interaction and communication. Moreover, they exploit restricted patterns of activities, interests, and behaviour. Nevertheless, there are several positive aspects identified for people with autism, like their sharp attention to detail and good pattern identifications (Baron-Cohen, Ashwin, Ashwin, Tavassoli, & Chakrabarti, 2009).

Recently, many large corporations improved their efforts to employ people with ASD. They hire people with autism because of the value of some of their specific skills. They bring in innovation because they have a different way of thinking, and their unique traits like focus and attention to detail can be very relevant for some jobs, like software testing (Austin & Pisano, 2017). Examples of these companies include SAP, Microsoft, Hewlett Packard Enterprise, and the Israeli Defence Forces even have a Special Intelligence Unit that is primarily occupied by employees with ASD. Their example proved that people with autism can spot certain patterns that other people cannot identify. Furthermore, SAP aims to have 65,000 employees with autism by 2020 (Wong et al., 2018). Also, Wong et al. (2018) stated that additional employment strengths range from their cognitive abilities to absorb and retain large amounts of information to their personality behaviour patterns like honesty, fairness and justice.

Although some companies are improving their recruitment programmes, still many individuals with ASD experience employment difficulties. Holwerda, Van Der Klink, Groothoff, and Brouwer (2012) found that when people with autism are employed, most of them are working part-time. In order to achieve a viable work participation, it is important that there is a fit between the work environment, the job and individual, as has been predicated by Person-Environment fit theory. When this theory is especially focussed on work, it is known as a theory of Person-Job fit which emphasizes the importance of a balance between the attitude, skills, knowledge, motivation, and abilities of the person and his work (Edwards, 1991). If this is well balanced, it will contribute to work-functioning and well-being of the employee, while imbalance could contribute to more stress and dysfunction of the individual. As the needs and abilities of people with ASD are different, this might reflect why they choose to opt for part-time employment (Holwerda et al., 2012).

However, most of the people with autism are actually unemployed. Studies report unemployment rates of autistic adults of around 85% in the United States, and 80% elsewhere (Platzer, 2019; Wong et al., 2018). Moreover, whereas autism prevalence was estimated to be around 1 out of

166 in the United States in 2006, it has risen to 1 out of 68 people in 2016. As prevalence rates are rising, the additional demand on social welfare infrastructures increases (Baker & Steuernagel, 2009). Overall, people with autism thus face high levels of under- and unemployment.

2.4 Autism and entrepreneurship

From a societal and policy perspective, further research into the relationship between ASD symptoms and entrepreneurship could have interesting implications. As indicated, many individuals with autism face employment difficulties, self-employment could thereby provide an opportunity as an alternative career choice. Knowledge about how certain autism traits are related to entrepreneurial intentions could foster awareness and provide insights into these traits in for example entrepreneurship education or policies to promote entrepreneurship for people that exhibit certain characteristics.

For people with mental disorders, including autism, entrepreneurship as a career choice can be suitable for several reasons. Both job demands and job control influence stress (Karasek, 1979). Job demand is related to the hecticness of a job, such as a high workload and related time pressure. Moreover, job control is about the decision authority individuals have, such as personal control over tasks that are performed in the work environment. Although entrepreneurs in general have higher job demands, they also have more job control, which could reduce stress (Stephan & Roesler, 2010). These long-term stress reductions offer the potential to reduce the onset of mental disorders. Second, job control improves the flexibility that people have to shape their work towards their individual special needs. Thereby, entrepreneurship offers the possibility for people with ASD traits to better adjust their job to their own strengths and weaknesses (Wiklund et al., 2018). Entrepreneurship then leads to a higher utility compared to employment, because normal jobs are not adapted to their needs.

Another potential explanation for the decision to engage in entrepreneurship is simply because most jobs might not be suited for people with ASD, or because job application processes have barriers that hinder them to successfully receive a job offer. These barriers are for example the social barriers and communication difficulties that people with autism face in the application process (Lorenz, Frischling, Cuadros, & Heinitz, 2016). This leads to higher chances that entrepreneurship because of mental disorders is just necessity-driven (Wiklund et al., 2018).

Most research on positive work-related traits of autism is based on case-studies, and research linking mental disorders and entrepreneurial intentions quantitatively has not yet investigated the relationship with ASD. This could have to do with various reasons. First of all, ADHD-entrepreneurship-research has mostly relied on self-report screeners for ADHD symptoms that for example have six items and therefore is relatively easy to collect (e.g. Verheul et al., 2015; Wismans, Thurik, Verheul, Torrès,

& Kamei, 2020). The most common autism self-report screener used is the Autism-Spectrum Quotient (AQ), which contains 50 questions and thus is more time-intensive to administer (Baron-Cohen et al., 2001). Second, the relationship between autism and entrepreneurial intention might simply be less obvious as compared to other mental disorders. For example, in the case of ADHD in which there was a clear hyperactivity effect. Finally, research could be lacking due to the fact that combined individual level data on both mental health disorders and entrepreneurial intentions is simply not widely available. Nonetheless, the DSM-5 states that some abnormalities of attention and hyperactivity that people with ADHD show are also common characteristics of people with ASD (American Psychiatric Association, 2013). Therefore, it could be expected that some relationship between entrepreneurial intentions and ASD symptoms is present.

2.5 Hypotheses development

The symptoms or traits that are related to ASD can be organized into five distinct classifications. These are; imagination, attention to detail, attention switching, social skills, and communication (Baron-Cohen et al., 2001). People that have autism-like symptoms show abnormalities of behaviour in these domains. In general, these abnormalities relate to poor imagination, an extraordinary attention to detail, poor attention switching which can be interpreted positively in the sense that it implies a strong focus of attention, and poor social- and communication skills. It is likely that each of these symptoms will have its own distinct relationship with entrepreneurial intentions. Thus, it is important to not only just look at the overall relationship between having a higher prevalence of autism symptoms and entrepreneurial intentions, but also at separate links. This approach is consistent with ADHD-entrepreneurship-research, in which the components of attention-deficit and hyperactivity are often analysed separately (e.g. Verheul et al., 2016; Wiklund et al., 2017; Wismans et al., 2020). By only looking at the overall relationship, separate positive and negative symptom effects could balance each other out in the overall effect of autism symptoms on entrepreneurial intentions, while the separate symptoms are significantly associated with intentions to become an entrepreneur. Furthermore, this research does not only study people that exhibit high subclinical symptoms on all five domains, but can also distinguish between people that only show a few of these ASD symptoms. Consequently, this research can look into the relationship that separate subclinical symptoms have with the entrepreneurial intentions of these people.

2.5.1 Hypothesis 1

The relationship between each of the five symptom dimensions and entrepreneurial intentions will be investigated. In order to do this five sub hypotheses are defined, each related to one of the symptoms.

First of all, autism is related to a limited imagination (Baron-Cohen et al., 2001). Especially when autism is diagnosed in young children, difficulties in imagination are evident, such as a lack of imaginative play with others (American Psychiatric Association, 2013). Imagination can be seen as a foundation to engage in creative thought and is thereby a driving force for innovativeness (Chiu, 2015). Innovativeness can be seen as a predisposition to creativity, whereby creativity is a means to generate new ideas (Gurteen, 1998). Also, imagination in itself has been used as a synonym for engaging in creative thought (Gaut, 2003). Therefore, imagination, creativity, and innovativeness are interrelated concepts.

Hmieleski and Corbett (2006) found that creativity, measured as the ability of persons to improvise in constrained circumstances, is positively related to entrepreneurial intentions. Furthermore, Bolton and Lane (2012) found correlations between innovativeness and the intention of people to become an entrepreneur. Law and Breznik (2017) also confirmed that amongst students there is a significant positive relationship between innovativeness, measured by original and creative thinking, and entrepreneurial intentions. Studies on imagination and entrepreneurial intentions are less available, but Chang, Yao, Chen, King, and Liang (2016) showed that people with a larger imagination have a higher valuation towards becoming self-employed. Thus, it can be concluded that people with a poor imagination are potentially less likely to be willing to engage in entrepreneurial activity, as expressed in hypothesis 1a.

Hypothesis 1a: *Higher scores on poor imagination symptoms are negatively associated with entrepreneurial intentions.*

Second, people with autism are known for the attention they give to details (Baron-Cohen et al., 2001). This can be seen as a positive personality strength, because of accuracy and commitment to quality (Wong et al., 2018). Furthermore, it is an important entrepreneurial success factor (Bird, 1988). This is because attention to detail is related to an entrepreneurial preference to perform hands-on work. On the other hand, it could also be a negative aspect because entrepreneurs need be good at a variety of skills, when they work on a variety of tasks (Lazear, 2004). However, Lerner et al. (2019) found that starting your own firm involves associated activities that require a sharp attention to detail. Examples include tasks that are administrative, formal or just lengthy in nature (Lerner, Hunt, & Verheul, 2018). These activities are sometimes negatively related to the likelihood to engage in entrepreneurial behaviour for people with ADHD, because those people may procrastinate such activities or are more easily distracted because of other activities that are more stimulating in nature (Lerner et al., 2019). On the contrary, people with ASD might actually be positively inclined towards performing such activities in an entrepreneurial context. Therefore, it is hypothesised that a sharp

attention to detail is likely to be positively related to entrepreneurial intentions, as indicated in hypothesis 1b.

Hypothesis 1b: *Higher scores on sharp attention to detail symptoms are positively associated with entrepreneurial intentions.*

A third autism symptom relates to attention switching. People with autism have problems with switching their attention, but therefore exhibit a sharp focus (Baron-Cohen et al., 2001). In the spectrum of disorders, people have fixated and restricted interests that are abnormal in focus (American Psychiatric Association, 2013). Wong et al. (2018) stated that this intense focus is a positive aspect because it is related to improved concentration and avoids the waste of time. Tight focus on the one hand is important for entrepreneurial success, but it could be equally important for entrepreneurs to sometimes be able to expand this focus in order to ''see the big picture'', for example when organizational growth is an important goal (Bird, 1988). However, this does not yet give conclusive evidence about how focus is related to entrepreneurial intentions that precede actual entrepreneurship.

Research on ADHD has found that attention-deficit has a negative relationship with entrepreneurial intentions (Wiklund et al., 2017). An important aspect of attention-deficit is that people often experience difficulty to sustain their focus (American Psychiatric Association, 2013). Although it has been less documented, people with ADHD symptoms sometimes exhibit hyper focus, instead of attention-deficit. Wiklund et al. (2016) showed that hyper focus is related to persistence, passion, and the commitment of time to various activities and tasks. In process of time, people developed specific expertise in those tasks. Consequently, entrepreneurs with ADHD that displayed hyper focus specialized their businesses activities into related areas. Thereby, they showed more successful intuitive decision making as opposed to individuals that displayed inattention and diversified their businesses into unrelated areas. These characteristics can also be related to people with ASD who show a stronger focus. It can be hypothesised that people that show a strong focus are probably more likely to have a stronger entrepreneurial intention, see hypothesis 1c.

Hypothesis 1c: *Higher scores on strong focus symptoms are positively associated with entrepreneurial intentions.*

Fourthly, people with autism display difficulties with their social skills (Baron-Cohen et al., 2001). It is an essential characteristic of ASD that there are persistent impairments in mutual social interactions (American Psychiatric Association, 2013). This is for example evident in their deficits to engage in social-emotional reciprocity, like sharing their feelings and thoughts with other people. Also, adults can struggle to understand how their behaviour is suitable in one situation, but not in a different

one. Social abilities are positively associated with self-employment decisions (Hartog, Van Praag, & Van Der Sluis, 2010). For engaging in entrepreneurial activity social skills are of importance, because you need competencies to be able to interact with others (Schoon & Duckworth, 2012). For example, the interaction with people to find opportunities and gather the necessary resources to exploit those opportunities (Naktiyok, Karabey, & Gulluce, 2010).

This is also evident if social ties and networks are considered. The personal network of entrepreneurs affects access to emotional and social support, and whether they can use their network to obtain knowledge and other resources (Aldrich, 1999). If entrepreneurs have a bad position within social locations, they may be cut off from both critical resources and rising opportunities. Therefore, people that have disadvantaged opportunities to network, have less entrepreneurial possibilities. Thereby, social networks are likely to affect the entrepreneurial intentions that people have. Impoverished social skills are thus likely to reduce the chances for people to establish the networking ties necessary to engage in entrepreneurship, and thereby lower their actual intentions to become an entrepreneur, as expressed in hypothesis 1d.

Hypothesis 1d: *Higher scores on poor social skill symptoms are negatively associated with entrepreneurial intentions.*

A final ASD symptom relates to communication impairments. On the one hand, this concerns difficulties in understanding the different ways in which language can be used in communication, like white lies and irony (American Psychiatric Association, 2013). On the other hand, nonverbal communication which is often used in social interaction lacks behind. For example, atypical, reduced or even absent usage of eye contact, or a failure to use expressive communication gestures in a spontaneous manner. Communication has proven to be an important skill and success factor for entrepreneurs (Makhbul & Hasun, 2011; Roodt, 2005). Liñán (2008) showed that entrepreneurial skills, including communication skills, significantly influence entrepreneurial intentions through personal attraction and perceived behavioural control. Naktiyok et al. (2010) investigated the relationship between entrepreneurial self-efficacy (ESE) and entrepreneurial intention and found a positive relationship between both. In their study ESE is based on several subdimensions of which 'defining the core purpose' is most strongly related to the entrepreneurial intentions of students. Defining the core purpose is conceptualized as the communication skills people perceive to have in order to attract investors and key staff. Therefore, it can be argued that communication skills could be associated with entrepreneurial intentions. Thus, poor communication skills are likely to lead to a lower entrepreneurial intention, as indicated in hypothesis 1e.

Hypothesis 1e: *Higher scores on poor communication skill symptoms are negatively associated with entrepreneurial intentions.*

2.5.2 Hypothesis 2

As outlined above, the five symptoms of ASD are expected to each have their separate link with the entrepreneurial intention of an individual. The poor imagination, poor social- and poor communication skills are expected to have a negative association with entrepreneurial intentions. On the other hand, a sharp attention to detail and strong focus are assumed to be positively linked with entrepreneurial intentions. As the expected relationships are both positive and negative in nature, it is not easy to predict the direction of the overall relationship that all ASD symptoms together have on entrepreneurial intent. It might be the case that the positive aspects together have an equally strong association with entrepreneurial intentions as compared to the combined link of the three negative relationships. In this case, the overall relationship of ASD symptoms on the intentions of people to become an entrepreneur will balance out and prove to be insignificant. However, by assuming that each of the five symptoms is of equal importance, it can be hypothesised that the overall relationship with entrepreneurial intentions should be negative given that three out of five components have a negative relationship. Therefore, hypothesis 2 is stated as follows:

Hypothesis 2: *Overall, higher scores on ASD symptoms are negatively associated with entrepreneurial intentions.*

2.5.3 Hypothesis 3

In the relationships that have been set out above another important factor should not go unnoticed. Namely, that gender differences could potentially influence the links that ASD symptoms have with entrepreneurial intentions. Many studies have shown that males often find entrepreneurship more attractive as compared to females (e.g. Gurbuz & Aykol, 2008; Shook & Bratianu, 2010). Furthermore, there is a gender gap in ASD, because men are diagnosed four times more often as compared to woman (American Psychiatric Association, 2013). Earlier research has shown that gender can play a moderating role between entrepreneurial intention and its antecedents (Shinnar, Giacomin, & Janssen, 2012). Consequently, a moderation analysis will be conducted to assess whether gender has an influence on the relationships between ASD symptoms and entrepreneurial aspirations.

First of all, there might be differences between men and woman related to the poor imagination symptoms. Law and Breznik (2017) studied whether the relationship between innovativeness and entrepreneurial intention depends on gender differences. They found that the relationship between innovativeness and entrepreneurial intention is stronger for males as compared

to females. On the other hand, it has been shown that opposed to males, females with autism actually have a better imagination (Hiller, Young, & Weber, 2014; Lai, Lombardo, Auyeung, Chakrabarti, & Baron-Cohen, 2015). Therefore, a poor imagination in itself is more likely to be observed amongst men. Thus, males are more likely to have a poor imagination and their level of imagination is likely a more important determinant for their entrepreneurial intentions as compared to females. Then it is likely that the negative association between a poor imagination and entrepreneurial intentions is weaker for woman as expressed in hypothesis 3a. Or otherwise stated, the relation is stronger for men.

Hypothesis 3a: *The negative association between poor imagination symptom scores and entrepreneurial intentions is less strong for woman.*

Also, potential gender differences can be identified related to attention to detail. Baron-Cohen (2002) found that in general males have a superior attention to relevant details, on average they are for example better in detecting particular static or moving features, as compared to woman. As indicated before, men are also more likely to have a higher entrepreneurial intention. Thus, if men both have a better attention to detail and are more likely to be positively inclined towards entrepreneurial behaviour, the relationship between both could be stronger as compared to the relationship for woman, see hypothesis 3b.

Hypothesis 3b: *The positive association between sharp attention to detail symptom scores and entrepreneurial intentions is less strong for woman.*

Third, there could be differences between men and woman related to their ability to focus. May, Cornish, and Rinehart (2014) concluded that attention symptoms of ASD are similar between boys and girls. On the contrary, Hull, Mandy, and Petrides (2017) found that males are more impaired in their performance on task switching, and thus display a stronger focus of attention. Furthermore, Bálint et al. (2009) concluded that there is a gender difference in ADHD symptoms, because woman have less inattention and a better focus as compared to men. Overall, there is not a clear consensus on whether woman or men display less attention switching, or otherwise stated a better focus. Therefore, it is expected that there will not be a moderating effect of gender on the relationship between focus and entrepreneurial intentions:

Hypothesis 3c: *Gender does not moderate the positive association between strong focus symptom scores and entrepreneurial intentions.*

Furthermore, there are possible gender differences related to social skills. As indicated, social networks are of importance for entrepreneurship. Aldrich (1999) showed that the underrepresentation of woman in entrepreneurship can be linked to the fact that they are often

excluded from the business networks of men. These business networks are related to social interaction and gender differences. Most of male-female social interactions take place in environments in which men have greater power and a higher status (Hanson & Blake, 2009). Females are therefore more often in an inferior social position relative to males and have unequal access to opportunities. Rivet and Matson (2011) found that for people with intellectual disabilities woman have higher endorsements of social impairments compared to men. However, they also stressed that for people without intellectual disabilities or ASD there are no gender differences evident in social skills. So, although there are in general not many differences in gender evident related to social skills on its own, woman are impaired in their social access to important networks for entrepreneurship. Thus, if woman have worse access to these networks and have poor social skills, they might even be less inclined to see entrepreneurship as an interesting career opportunity because they are disadvantaged in this respect, as compared to men:

Hypothesis 3d: *The negative association between poor social skill symptom scores and entrepreneurial intentions is stronger for woman.*

Lastly, gender differences have been studied in the relationship between entrepreneurial intention and communication. Rivet and Matson (2011) concluded that there are no significant gender differences related to communication symptoms for adults without ASD. May et al. (2014) also confirmed that there are no gender related communication differences within children that have ASD. Since there are in general no communication skill differences across woman and men, both for people with and without ASD, it can be hypothesised that gender will not influence the relationship between poor communication skills and entrepreneurial intent as indicated in hypothesis 3e.

Hypothesis 3e: *Gender does not moderate the negative association between poor communication skill symptom scores and entrepreneurial intentions.*

To summarize, Figure 1 gives an overview of the expected relationships that have been outlined above.

Poor imagination
H1a

Sharp attention to detail
H1b

Overall ASD symptoms
H2

Strong focus
H1c

Poor social skills
H1d

Poor communication skills
H1e

Entrepreneurial intentions

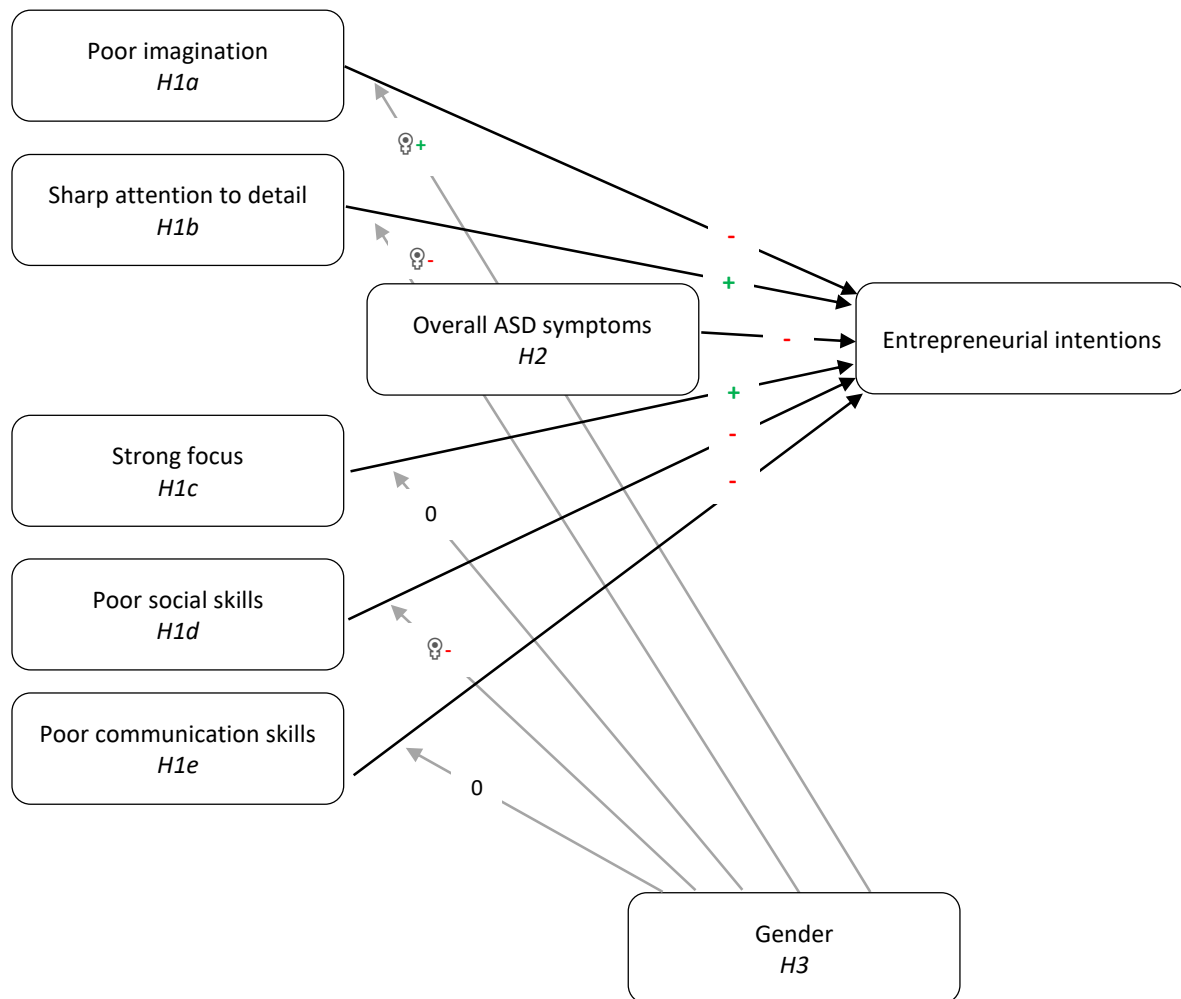Gender
H3

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Figure 1: *Conceptual framework of expected relationships*

3. Data & Methodology

3.1 Data

The data used in this research has been made available by the Erasmus University Rotterdam. Kristel de Groot, ERIM PhD Candidate in the field of Strategy & Entrepreneurship, collected data in two cross-sectional datasets. She conducted multiple questionnaires amongst students using the online survey tool Qualtrics. These students were recruited via three university test subject platforms; EURO, EconLab, and ERAS. EURO and EconLab are open platforms, so also students from other universities can participate in studies, but mostly consist of Rotterdam School of Management and Erasmus School of Economics students respectively. The ERAS platform is restricted and only open for psychology students. Participation was on a voluntary basis, but subjects earned a fixed participation fee of 25 euro (EURO & EconLab), or could redeem compulsory test subject hours (ERAS). Also, the study welcomed all subscriptions on the platforms, but excluded participants that had undergone brain surgery or were pregnant (due to physiological lab measurements that were conducted in her study). The data was collected during two time periods. The first dataset was gathered in the period March 2017 until December 2017, and contains 126 observations. The collection of the second dataset took place between October 2017 and January 2018, and includes 141 test subjects.

Before the surveys started several measures were taken to reduce possible response biases. First of all, it was emphasized to complete the questionnaire in a quiet surrounding to improve concentration. Secondly, it was indicated that there were no right or wrong answers in order to reduce the likelihood that people give socially desirable responses. Lastly, the anonymity of the research was emphasized.

The questions that were addressed in the surveys were derived from several entrepreneurship questionnaires from earlier studies including Souitaris, Zerbinati, and Al-Laham (2007), Bolton and Lane (2012), and Liñán, Urbano, and Guerrero (2011). Furthermore, the AQ was obtained from Baron-Cohen et al. (2001). Additionally, some control variables were gathered related to personal characteristics like the gender, age, and study field of respondents.

In this study, both datasets are combined into one larger dataset of 267 observations to get a sufficient sample size. The two samples resemble each other to a reasonable extent in terms of individual demographic characteristics. The average age of respondents is around 21 years old in both samples. Due to the background of the lab platforms most students have a study background in business administration, economics, or social sciences (mostly psychology). These three categories combined account for 85% of studies in sample 1 and 95% in sample 2. Furthermore, there are around 52% female respondents in sample 1, which is a gender distribution that is similar for both the Dutch

student population and the student population of Erasmus University Rotterdam (VSNU, 2018). In sample 2 there are 61% female respondents, so males are a bit underrepresented in this dataset.

3.2 Methodology

In this study several models are estimated to explain the level of entrepreneurial intentions that students exhibit. The mathematical models that relate to each of the hypotheses are conceptualized as follows:

H1: *Entrepreneurial Intention* = β_0 + $\beta_1 AQ_{imagination}$ + $\beta_2 AQ_{attention\ to\ detail}$ + $\beta_3 AQ_{attention\ switching}$ + $\beta_4 AQ_{social\ skill}$ + $\beta_5 AQ_{communication}$ + $\beta_6 female$ + $\beta_7 age$ + $\beta_8 age^2$ + $\beta_9 Business\ Administration$ +$\beta_{10} Economics$ + $\beta_{11} Other\ study$ + ϵ_i

H2: *Entrepreneurial Intention* = β_0 + $\beta_1 AQ_{total\ score}$ + $\beta_2 female$ + $\beta_3 age$ + $\beta_4 age^2$ + $\beta_5 Business\ Administration$ +$\beta_6 Economics$ + $\beta_7 Other\ study$ + ϵ_i

H3: *Entrepreneurial Intention* = β_0 + $\beta_1 AQ_{imagination}*female$ + $\beta_2 AQ_{attention\ to\ detail}*female$ + $\beta_3 AQ_{attention\ switching}*female$ + $\beta_4 AQ_{social\ skill}*female$ + $\beta_5 AQ_{communication}*female$ + $\beta_6 AQ_{imagination}$ + $\beta_7 AQ_{attention\ to\ detail}$ + $\beta_8 AQ_{attention\ switching}$ + $\beta_9 AQ_{social\ skill}$ + $\beta_{10} AQ_{communication}$ + $\beta_{11} female$ + $\beta_{12} age$ + $\beta_{13} age^2$ + $\beta_{14} Business\ Administration$ +$\beta_{15} Economics$ + $\beta_{16} Other\ study$ + ϵ_i

3.2.1 Dependent variable

The dependent variable in all model specifications is the entrepreneurial intention of students. Entrepreneurial intentions can be measured in different ways, but often people indicate via a questionnaire whether they would like to start a business in the future. Verheul et al. (2015) for example used a dummy variable in which students indicated whether they wanted to become an entrepreneur after completion of their study. In this study a modified version of the entrepreneurial intention questionnaire (EIQ) from Liñán and Chen (2009) is used. This modified questionnaire is consistent with the one that was constructed in Liñán et al. (2011). The reasoning behind these modifications was to address possible problems of acquiescence bias, this bias arises when individuals tend to agree with statements in a scale (Liñán et al., 2011). Therefore, some items were reversed in the modified questionnaire.

The EIQ is a survey that builds on both the theoretical and empirical application of the Theory of Planned Behaviour from Azjen (1991) to entrepreneurship. Furthermore, it has been cross-checked with many instruments that other researchers used to conceptualize entrepreneurial intentions. Liñán et al. (2011) performed a reliability and convergent validity analysis in order to see which factors explain the variability amongst variables and removed those variables that did not load on the expected factor, in this way items that are most closely related were detected. They identified four

statement questions that combinedly were constructed as a measure for entrepreneurial intention (see Table 1). The scale showed good reliability with a Cronbach's alpha of 0.81. This score is well above the proposed threshold of 0.7 (Taber, 2018). In the dataset used in this study, the Cronbach's alpha for combining the four measures equals 0.90, which is even above the score of Liñán et al. (2011). So, within this dataset it is a reliable scale to measure entrepreneurial intentions.

Table 1: *Selected items of EIQ*

Item of Liñán et al. (2011)	Statement
A04	I am ready to do anything to be an entrepreneur.
A06	I will make every effort to start and run my own business.
A13	I am determined to create a business venture in the future.
A17	My professional goal is to be an entrepreneur.

Students rate their agreement with each of the single statements on a 7-point Likert scale, where value 1 indicates total disagreement, and value 7 total agreement. So, the higher his or her entrepreneurial intention, the higher the score he or she will attach to each of the statements. As validated by the Cronbach's alpha scores, these statements can be combined into a single measure. This is done by composing an average score over the four combined statements, which is the measure of entrepreneurial intention in this research.

3.2.2 Independent variables

The main independent variables measure subclinical autism symptoms. The AQ of Baron-Cohen et al. (2001) is a useful self-administered survey instrument that is used to measure the extent to which adults with an ordinary intelligence exhibit traits that are associated with ASD. The AQ consists of 50 statement questions that people score on a 4-point Likert scale. In this research value 1 indicates a strong disagreement, whereas value 4 marks strong agreement. This is reversely coded compared to Baron-Cohen et al. (2001), but has been done in order to scale the overall dataset in a similar direction. The 50 questions can be subdivided into pairs of 10 questions that evaluate the five different ASD symptoms. These five domains are similar to the symptoms discussed in the literature review and hypotheses, and include; imagination, attention to detail, attention switching, social skills and communication. Appendix Table A displays the reversely coded AQ questionnaire including a symptom classification per question.

Respondents score 1 point on each question dependent on whether they mildly or strongly report abnormal autism-like behaviour, which is consistent with the official AQ scale used in Baron-Cohen et al. (2001). So, if for example a subject answers the question "I prefer to do things with others rather than on my own'' with a slightly or definitely disagree response, this reflects an abnormality in

social skills. Consequently, the subject will score 1 point on the AQ. A respondent can get a score that sums up to a maximum of 50 points. Overall, Baron-Cohen et al. (2001) concluded that a score of over 32 points is a cut-off point to categorize subjects that exhibit clinically significant levels of autism symptoms, but this does not necessarily imply that those individuals actually have ASD.

In this research the AQ questionnaire data of respondents has been recoded from the 4-point Likert scale into dummy variables that indicate whether people score points on the AQ with value 0 or 1. Those points have been summed up to continuous scores. On the one hand, each participant receives a subdomain score for each of the five areas, so an AQ score that ranges from 0-10 for poor imagination, strong attention to detail, a strong focus, poor communication skills, and poor social skills. These scores are used to express the subclinical symptoms stated in hypothesis 1. On the other hand, the scores are also summed up to a total AQ score, ranging from 0-50. The total AQ score is used as the independent variable for the model of hypothesis 2. Finally, the subdomain symptoms scores are multiplied with gender to estimate moderation models for hypothesis 3.

3.2.3 Control variables
Several control variables are included in each of the models. Previous research on entrepreneurial intention has concluded that gender, age, and study field are important factors to control for (e.g. Liñán et al., 2011; Schwarz, Wdowiak, Almer-Jarz, & Breitenecker, 2009). Other potential control variables are whether students have followed entrepreneurship courses, because those courses raise entrepreneurial intention through inspiration (Souitaris et al., 2007), and familial factors like having parents that are entrepreneur. This is because the exposure to entrepreneurship has intergenerational influence, and students whose parents are entrepreneur have higher entrepreneurial intentions (Carr & Sequeira, 2007; McElwee & Al-Riyami, 2003). The last two control variables are only available for the first sample and will therefore be addressed via a robustness check. The first three controls are included in the main model specifications.

For hypothesis 1 and 2, gender is included as a control. The dummy female equals value 1 if a respondent is female and 0 if the subject is male. Models for hypothesis 3 control for gender via an interaction term of gender and AQ symptom scores, and separately include the dummy variable and ASD symptom variables. Age is conceptualized as a discrete variable that indicates how old someone is in years. Besides the linear age relationship, a quadratic age term is included as well, to control for an inverse u-shaped relationship with entrepreneurial intentions (Schwarz et al., 2009).

Lastly, study field controls for the kind of study that a subject pursues. In dataset 1, students could choose the category of their study from a predetermined list that consisted of 11 specified categories and an additional option to choose for ''other''. In dataset 2, subjects were free to enter

the actual name of their studies. To make the datasets compatible, the study names of dataset 2 have been transformed into the study fields of dataset 1. This classification is mostly based on the faculty to which a study belongs. For example, a few respondents follow the master Business Information Management from the Rotterdam School of Management, and therefore are categorized into the study field business administration. More questionable is how to classify those students that are pursuing double degree studies from different faculties. In this dataset 13 respondents followed a second study at another faculty. These students have been classified into a single study field by choosing the category that is consistent with the first mentioned study name. However, the results are robust to excluding these respondents, as the sign and significance of all coefficients remains similar.

Although most previous research controlled for study programmes, it has done so in various extents. Schwarz et al. (2009) made a distinction between business, humanities, and science and technology students, and found that students in business sciences have the highest entrepreneurial intentions. Wach and Wojciechowski (2016) controlled for educational background by including a binary variable that equalled 1 if a subject followed an economics or business study and 0 otherwise, and also found significant results for this dummy. However, Zhang, Duysters, and Cloodt (2014) controlled for study field by including a dummy for technological background, and actually found that engineering students have higher entrepreneurial intentions as compared to other students. Moreover, Mueller (2011) included a dummy for social sciences as compared to other studies. As there is not a clear-cut approach towards controlling for study background, it is decided to include a categorical variable for the study that respondents pursue. This variable has the following four categories: business administration, economics, social science, and other study. The category other study combines all kinds of other studies besides the beforementioned three into a single variable, and is composed of eight study fields that each had a frequency below 2.5%. The sample size was too small to include those studies separately. Social studies are used as the reference category, as most students pursue a social study.

3.2.4 Descriptive statistics

Table 2 displays descriptive statistics of the main variables. Students in this sample are on average 21 years old, and 57% of them is female. On average students have an entrepreneurial intention of around 3.18 points. Two subjects failed to fill out the AQ survey, and therefore ASD symptom score variables are only available for 265 people. The mean total AQ score is 16.07, which is comparable to the value found by Ruzich et al. (2015) in a nonclinical sample of 6,934 subjects. Furthermore, the maximum AQ score that has been obtained is 34, within the given population there is one subject that exhibits clinically significant levels of autism given the 32+ threshold of Baron-Cohen et al. (2001). Considering the five separate symptom scores, there are students that have scored the

minimum (0) and maximum (10) points that potentially can be awarded for a single symptom domain. On average, students score highest on the ASD symptom attention to detail, and comparatively low on symptoms of poor social- and communication skills.

Most people follow a study in social sciences, which is mainly driven by psychology students that participated via the ERAS platform. One third of the subjects pursues a degree in economics, whereas 21% of the participants follows a study in business administration. Only 10% of the participants pursues a study in a different field.

Table 2: *Descriptive statistics (in)dependent- and control variables*

Variable	Obs.	Mean	Std. Dev.	Min.	Max.
Entrepreneurial Intention	267	3.18	1.41	1	6.75
AQ total score	265	16.07	5.68	5	34
AQ imagination	265	2.75	1.76	0	8
AQ attention to detail	265	5.14	2.33	0	10
AQ attention switching	265	3.61	2.04	0	9
AQ social skill	265	2.21	1.65	0	9
AQ communication	265	2.31	1.74	0	10
Age	267	20.87	2.59	17	33
Variable	**Obs.**	**%**			
Gender	267	100%			
Male	115	43.07%			
Female	152	56.93%			
Study field	267	100%			
Social study	96	35.96%			
Economics	89	33.33%			
Business Administration	56	20.97%			
Other study	26	9.73%			

Table 3 displays the correlations of the main variables. The total AQ score is not significantly correlated with entrepreneurial intention, but three of the separate symptom domains do significantly correlate with entrepreneurial intention. Attention to detail is positively correlated, whereas attention switching and social skills are negatively correlated with entrepreneurial intentions. The five AQ subdimensions are logically significantly positively related to the overall AQ score. Furthermore, entrepreneurial intention, total AQ score, and AQ imagination symptom score have negative significant correlations with being female. Following a social study is significantly negatively correlated with entrepreneurial intentions, while being a business administration student is positively correlated.

Table 3: *Correlation matrix*

Variable	1	2	3	4	5	6	7	8	9	10	11	12	13
1. Entrepreneurial Intention	1												
2. AQ total score	-0.02	1											
3. AQ imagination	0.09	0.48*	1										
4. AQ attention to detail	0.16*	0.48*	-0.01	1									
5. AQ attention switching	-0.15*	0.67*	0.18*	0.06	1								
6. AQ social skill	-0.16*	0.62*	0.20*	-0.02	0.38*	1							
7. AQ communication	-0.05	0.67*	0.19*	0.09	0.39*	0.44*	1						
8. Age	0.07	0.04	0.15*	-0.01	-0.02	-0.01	0.04	1					
9. Female	-0.18*	-0.19*	-0.27*	-0.07	-0.08	-0.02	-0.12	0.13*	1				
10. Social study	-0.15*	-0.32*	-0.34*	-0.16*	-0.09	-0.16*	-0.20*	-0.09	0.38*	1			
11. Business Administration	0.24*	0.09	0.04	0.04	0.05	0.05	0.11	-0.14*	-0.09	-0.39*	1		
12. Economics	-0.08	0.19*	0.20*	0.21*	0.02	0.08	0.03	0.06	-0.32*	-0.53*	-0.36*	1	
13. Other study	0.03	0.09	0.18*	-0.12*	0.04	0.07	0.12	0.25*	0.01	-0.25*	-0.17*	-0.23*	1

* p<0.05

3.2.5 Model estimation strategy

Due to the continuous nature of entrepreneurial intention as a dependent variable it is chosen to conduct OLS regression analyses for all models. For the analysis models have been estimated using STATA software version 15.1. OLS is an extensively used method to fit linear statistical models, and has some important underlying assumptions. One of those assumptions is homoskedasticity, which implies that the variance of regression errors should be constant (Hayes & Cai, 2007). If this assumption is not met, there is heteroskedasticity which can lead to inefficient coefficient estimates or affects significance tests by making t-statistics invalid. To test for heteroskedasticity three Breusch-Pagan/Cook-Weisberg tests were performed. One for a model with the separate five symptom domain scores, one for a model with the total AQ score, and additionally one test for the moderation model. Appendix Table B1, B2, and B3 show that the null hypotheses of constant variance cannot be rejected at a 5% significance level. Furthermore, Appendix Figure B1, B2, and B3 show that the variance of errors is quite randomly distributed. Thus, heteroskedasticity is not likely to be a problem. Still, OLS models are estimated using heteroskedasticity-robust standard errors.

Other assumptions include that there should be random sampling and no perfect collinearity. There is enough sample variation in the explanatory variable AQ, so there will not be perfect collinearity. However, random sampling is not guaranteed, because it could be the case that a certain type of students self-selects themselves towards participating in studies of the test platforms of Erasmus University Rotterdam. Lastly, the zero conditional mean assumption states that the expected conditional value of errors given the values of the independent variables should be zero (Hayes & Cai, 2007). This assumption is potentially violated, because omitted variable problems are likely and cross-sectional data is used instead of panel data, which makes it harder to control for omitted variable bias. For this reason, the hypotheses look into associations instead of causal relationships.

4. Results

The OLS regression analyses have been performed to test each of the hypotheses and are displayed in Table 4. Furthermore, Figure 2 visually summarizes the results that were found. The following subsections will discuss the results per hypothesis.

4.1 Results hypothesis 1

First of all, hypothesis 1 tests how the five separate symptom domain scores are associated with entrepreneurial intentions. Model 2 of Table 4 displays the results of the regression that has been conducted for this hypothesis. Hypothesis 1a stated that the relationship between a poor imagination and entrepreneurial intention was expected to be negative. The coefficient for imagination symptoms is positive which indicates that those people that score higher on poor imagination symptoms actually are likely to have higher entrepreneurial intentions. However, the coefficient is insignificant at a 5% significance level. The negative relationship has not been confirmed, and therefore hypothesis 1a is rejected.

Hypothesis 1b postulated that the relationship between a sharp attention to detail and entrepreneurial intention is positive. The results show that the association between AQ attention to detail symptoms and entrepreneurial intention is positive and significant at a 1% significance level (β=0.176, p=0.004). A one standard deviation increase in the AQ attention to detail score is related to an increase in entrepreneurial intention with 0.176 standard deviations on average, ceteris paribus. This is relatively the strongest association that is found in this research. Thus, hypothesis 1b is not rejected.

Higher scores on AQ attention switching are related to a stronger focus, and were expected to be positively related to entrepreneurial intentions. The attention switching coefficient is negative and significant at the 5% significance level (β=-0.147, p=0.020). On average, if a student has a one standard deviation higher attention switching AQ score, this is associated with a 0.147 standard deviation lower entrepreneurial intention, ceteris paribus. Thus, a strong focus is negatively associated with the intention to become an entrepreneur. The association is in opposite direction as compared to what was hypothesized. So, hypothesis 1c is rejected since people that display a stronger focus are likely to have lower entrepreneurial intentions.

Lastly, hypothesis 1d and 1e looked into the association between poor social- and communication skills and entrepreneurial intentions. Both hypotheses postulated that a negative relationship was expected. The coefficient for social skill symptoms is negatively significant at a 5% significance level (β=-0.140, p=0.028). A one standard deviation higher score on poor social skills is related to a drop in entrepreneurial intention with 0.140 standard deviations on average, ceteris

paribus. Thus, poor social skills are negatively associated with entrepreneurial intentions. Therefore, hypothesis 1d is not rejected. The coefficient for poor communication symptoms is negative as well. However, hypothesis 1e is rejected, because the result is not significant.

4.2 Results hypothesis 2

The results of the regression analysis that was conducted to test hypothesis 2 are shown in Model 3 of Table 4. Hypothesis 2 stated that the overall relationship between all ASD symptoms and entrepreneurial intentions was expected to be negative. The coefficient for total AQ score is negative, but insignificant. Therefore, no association between the combined AQ symptoms and entrepreneurial intent is found. Thus, hypothesis 2 is rejected. Consequently, the links that separate symptoms have with entrepreneurial intentions likely balance each other out in the overall relationship.
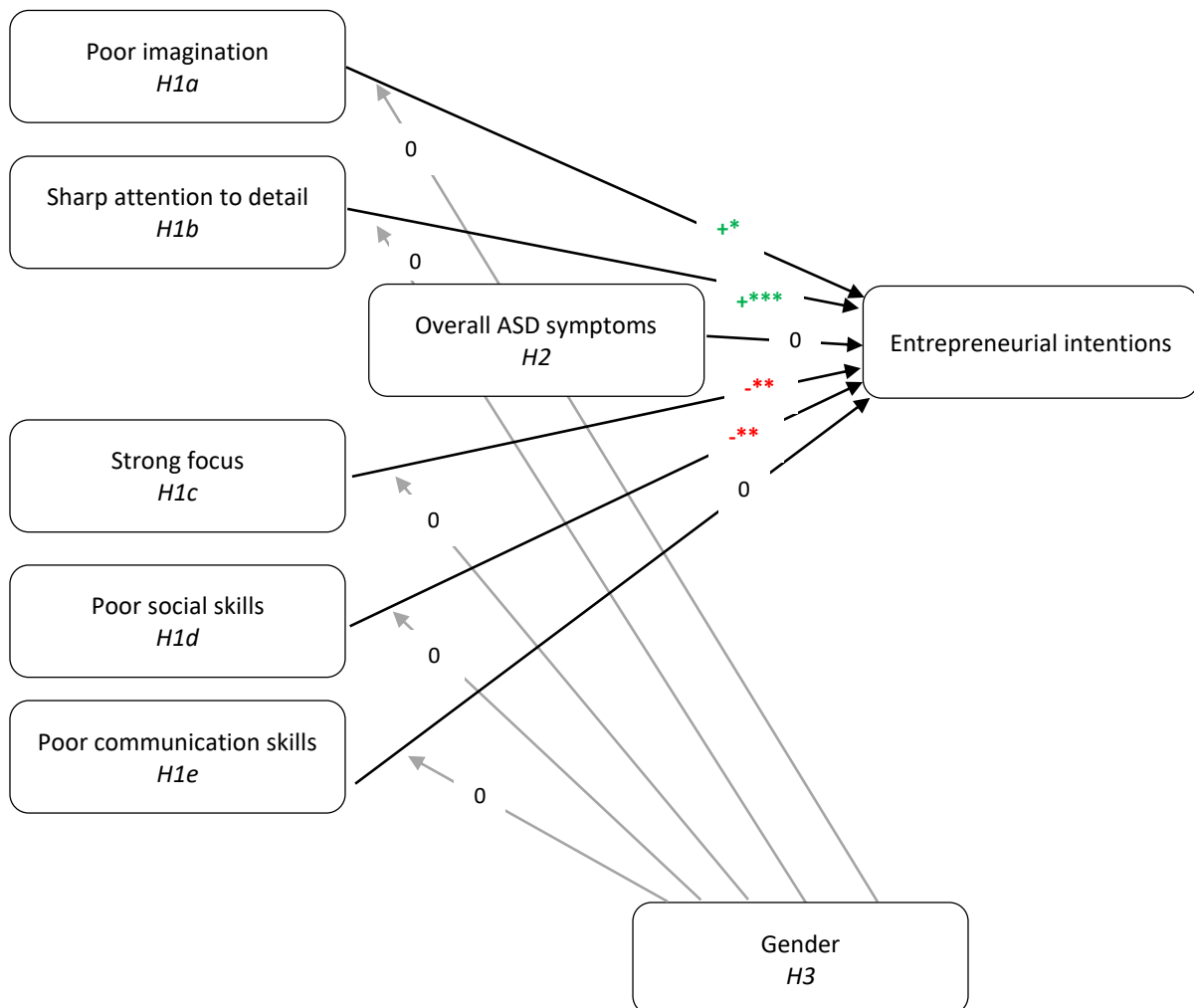
*p<0.1, ** p<0.05, *** p<0.01*

Figure 2: *Overview of found relationships*

Table 4: OLS regression results with dependent variable entrepreneurial intention

Variables	(1) Entrepreneurial Intention			(2) Entrepreneurial Intention			(3) Entrepreneurial Intention			(4) Entrepreneurial Intention		
	B	β	SE	B	β	SE	B	β	SE	B	β	SE
AQ imagination				0.081*	0.101*	0.045				0.139*	0.173*	0.078
AQ attention to detail				0.107***	0.176***	0.037				0.116**	0.191**	0.057
AQ attention switching				-0.102**	-0.147**	0.043				-0.138**	-0.198**	0.065
AQ social skill				-0.120**	-0.140**	0.054				-0.211**	-0.246**	0.091
AQ communication				-0.025	-0.031	0.056				0.017	0.021	0.090
AQ total score							-0.022	-0.087	0.014			
Female*AQ imagination										-0.091	-0.112	0.100
Female*AQ attention to detail										-0.008	-0.017	0.072
Female*AQ attention switching										0.054	0.090	0.089
Female*AQ social skill										0.146	0.170	0.113
Female*AQ communication										-0.068	-0.084	0.114
Female	-0.549***	-0.193***	0.183	-0.518***	-0.181***	0.175	-0.579***	-0.202***	0.184	-0.574	-0.201	0.514
Age	-0.693*	-1.270*	0.376	-0.917**	-1.676**	0.370	-0.700*	-1.278*	0.384	-0.909**	-1.660**	0.365
Age^2	0.017**	1.398**	0.008	0.021**	1.786**	0.008	0.017**	1.411**	0.009	0.021***	1.781***	0.008
Business Administration[a]	0.778***	0.224***	0.249	0.767***	0.221***	0.228	0.843***	0.243***	0.251	0.762***	0.220***	0.230
Economics[a]	-0.064	-0.021	0.207	-0.128	-0.042	0.212	0.019	0.006	0.216	-0.133	-0.044	0.213
Other study[a]	0.122	0.026	0.330	0.216	0.045	0.334	0.192	0.040	0.330	0.225	0.047	0.342
Constant	10.397**		4.148	12.913***		4.095	10.765**		4.243	12.761***		4.026
Observations	267			265			265			265		
R^2	0.120			0.207			0.127			0.216		
Adjusted R^2	0.100			0.173			0.103			0.166		

B= unstandardized beta; β= standardized beta; SE= robust standard error

[a] The reference category for the study field coefficients is social study.

* p<0.1, ** p<0.05, *** p<0.01

4.3 Results hypothesis 3

Hypothesis 3 stated that gender has a moderating effect on the relationships between the five separate ASD symptoms and entrepreneurial intentions. Model 4 of Table 4 shows the results of the moderation analysis. Although the separate symptom associations remain significant in this model, none of the interaction terms between gender and these symptoms is significant.

Hypothesis 3a expected that the negative association between poor imagination symptoms and entrepreneurial intention would be weaker for woman. This is not confirmed because the interaction between gender and imagination symptoms is insignificant, and thus hypothesis 3a is rejected.

Hypothesis 3b stated that the positive relationship between a sharp attention to detail and entrepreneurial intent would be less strong for woman. As the interaction term between the dummy female and the AQ score for attention to detail is insignificant, this hypothesis is rejected as well.

It was expected that gender would not moderate the link between a strong focus and entrepreneurial intention. The interaction term for AQ attention switching is insignificant. Therefore, hypothesis 3c is not rejected.

Also, it was postulated that the negative relationship between poor social skills and entrepreneurial intentions would be stronger for woman. The interaction between female and social skills is insignificant, and thus does not indicate a moderating effect. Therefore, hypothesis 3d is rejected.

Lastly, hypothesis 3e stated that there would not be a moderating effect for the association between poor communication skills and entrepreneurial intent. As the interaction term between gender and AQ communication is insignificant, hypothesis 3e is not rejected. Overall, the gender of students does not play a moderating role in the relationship between ASD symptoms and entrepreneurial intention.

4.4 Control variables

Most of the relationships between entrepreneurial intentions and the added control variables are as expected from the literature. Woman are likely to have a significantly lower entrepreneurial intention as compared to men. Also, there is an inversely u-shaped relationship with age. The study field results indicate that business administration students are likely to have a significantly higher entrepreneurial intention as compared to social science students. The coefficient for economics students is negative and insignificant, and those students are thus not likely to have a higher entrepreneurial intention as compared to students that pursue a social study. Furthermore, the

entrepreneurial intention of students that follow one of the studies that are in the remaining category is not significantly different compared to social science students.

4.5 Model comparison

The possible relationships between ASD symptoms and entrepreneurial intention have been specified in several distinct ways. Also, a simple model with only the control variables was estimated in Model 1. Of all these models, the model of hypothesis 1 as displayed in Model 2 of Table 4 has the highest adjusted R^2 (0.173). Thus, by separately including the five ASD symptoms most variance of entrepreneurial intention is explained by the variables. Moreover, the difference between the adjusted R^2 of Model 1 and 3 shows that the total AQ score variable does not explain much of the variation in entrepreneurial intention. The adjusted R^2 of Model 4 more closely relates to Model 2 (0.166), but is still smaller. Therefore, the model for hypothesis 1 is probably best specified as compared to the other models.

5. Robustness check

As has been indicated in the methodology section, an additional robustness check was performed. This robustness check has been conducted in order to be able to add two additional control variables to the main models. Namely, whether students followed entrepreneurship courses, and whether they have parents that are entrepreneurs themselves. Previous research has shown that these are two important factors that raise entrepreneurial intentions (Carr & Sequeira, 2007; McElwee & Al-Riyami, 2003; Souitaris et al., 2007). Data for the two control variables was only available for the first dataset that included 126 observations. Whether someone has followed entrepreneurship courses is conceptualized as a dummy variable that equals 1 if a respondent indicated that his or her study includes courses that are focused on entrepreneurship and 0 otherwise. Overall, 41% of the respondents has followed courses related to entrepreneurship. Furthermore, a dummy variable is constructed to indicate whether students have a parent that is entrepreneur. This dummy equals 1 if one or both parents have their own business and 0 otherwise. In total, 29% of the students in the sample have one or two parents that are a business owner. The results of this robustness check are shown in Table 5.

First of all, the control variable for entrepreneurship courses has a positive association with entrepreneurial intentions in all models. Whether a parent owns a business is also positively related to entrepreneurial intentions. However, the coefficients for these variables are insignificant at a 5% significance level in all specifications.

When the relationships between ASD symptoms and entrepreneurial intention are addressed several observations can be made. The five separate domain symptoms of hypothesis 1 all still have a similar sign as compared to the main model (see Model 2). Nevertheless, the significance of all coefficients has vanished. Thus, the significant findings for hypothesis 1 are not robust to this robustness check model. The association between the total AQ score and entrepreneurial intention is still negative and insignificant (see Model 3). Therefore, the conclusion for hypothesis 2 would remain similar. Also, all interaction terms that test for the moderation effect of gender are insignificant in this specification (see Model 4). Consequently, the results for hypothesis 3 have not changed.

Furthermore, the control variable for gender is negatively significant in most models, but the inversely u-shaped age relationship is not confirmed. Also, there are no significant results for controlling for study field at a 5% significance level.

Overall, the main differences are thus evident for hypothesis 1. These differences could be caused by the fact that both control variables are omitted variables in the main analysis. Omitted variable bias would be a problem if the two control variables are correlated with separate autism

symptoms and are determinants of the dependent variable entrepreneurial intention. Previous studies showed that following entrepreneurship courses and having parents that are entrepreneur do influence entrepreneurial intentions (Carr & Sequeira, 2007; McElwee & Al-Riyami, 2003; Souitaris et al., 2007). However, no significant correlations between the five separate autism symptoms and the two added control variables can be identified within the dataset of this study. Moreover, the sign of all coefficients in the robustness check is equivalent to the directions that were found in the main model, and only changes in significance were evident. A more plausible explanation for the differences in significance is that the robustness checks models are based on a relatively small sample size (N=124) compared to the previous models (N=265). When the regressions are conducted for the same small sample (N=124) without adding entrepreneurship courses and whether parents have their own business, it yields similar conclusions as the robustness check model.

Table 5: *OLS regression results with dependent variable entrepreneurial intention and additional controls*

Variables	(1) Entrepreneurial Intention B	β	SE	(2) Entrepreneurial Intention B	β	SE	(3) Entrepreneurial Intention B	β	SE	(4) Entrepreneurial Intention B	β	SE
AQ imagination				0.091	0.112	0.079				0.146	0.179	0.133
AQ attention to detail				0.061	0.095	0.053				0.127*	0.195*	0.069
AQ attention switching				-0.044	-0.065	0.059				-0.092	-0.136	0.082
AQ social skill				-0.077	-0.097	0.072				-0.212*	-0.267*	0.119
AQ communication				-0.042	-0.052	0.090				-0.006	-0.007	0.132
AQ total score							-0.011	-0.046	0.022			
Female*AQ imagination										-0.102	-0.117	0.174
Female*AQ attention to detail										-0.117	-0.215	0.107
Female*AQ attention switching										0.082	0.138	0.119
Female*AQ social skill										0.242	0.294	0.154
Female*AQ communication										-0.081	-0.103	0.172
Female	-0.933***	-0.325***	0.259	-0.843***	-0.291***	0.264	-0.948***	-0.328***	0.261	-0.692	-0.239	0.770
Entrepreneurship courses	0.588	0.202	0.356	0.576	0.196	0.379	0.660*	0.225*	0.377	0.702*	0.239*	0.400
Parent(s) own business	0.530*	0.169*	0.276	0.479*	0.152*	0.281	0.529*	0.168*	0.279	0.464	0.147	0.291
Age	-0.053	-0.096	0.595	-0.249	-0.451	0.617	0.075	0.136	0.618	-0.279	-0.505	0.629
Age^2	0.004	0.299	0.013	0.008	0.615	0.014	0.001	0.082	0.014	0.008	0.686	0.014
Business Administration[a]	0.246	0.068	0.411	0.232	0.065	0.426	0.246	0.068	0.423	0.131	0.036	0.431
Economics[a]	-0.633*	-0.194*	0.350	-0.606	-0.182	0.366	-0.641*	-0.192*	0.374	-0.645*	-0.194*	0.350
Other study[a]	-0.355	-0.089	0.330	-0.323	-0.081	0.356	-0.341	-0.085	0.338	-0.307	-0.077	0.392
Constant	2.724		6.505	5.000		6.716	1.390		6.749	5.155		6.868
Observations	126			124			124			124		
R^2	0.235			0.276			0.244			0.306		
Adjusted R^2	0.183			0.190			0.184			0.187		

B= unstandardized beta; β= standardized beta; SE= robust standard error

[a] The reference category for the study field coefficients is social study.

 * $p<0.1$, ** $p<0.05$, *** $p<0.01$

6. Discussion

The objective of this study was to investigate if subclinical autism symptoms are related to entrepreneurial intention. ASD symptoms were measured through the AQ questionnaire of Baron-Cohen et al. (2001) and the association with entrepreneurial intention was explored by estimating OLS regression models. This discussion chapter will interpret the relationships that were found and give several explanations for alternative findings. Furthermore, the limitations of this research are discussed and several directions for further research will be given.

6.1 Research findings

First of all, the links between separate symptoms of autism and the intention to become an entrepreneur were analysed. No relationship between a poor imagination and entrepreneurial intention was found. Although most previous research analysed the relationship between innovativeness and entrepreneurial intention instead of imagination, there was one study of Chang et al. (2016) that did find a positive relationship between a higher level of imagination and entrepreneurial intention. As no association was found in this research it is in contrast with the findings of Chang et al. (2016). Therefore, there is yet no conclusive evidence as to how imagination is related to entrepreneurial intent. Although the measurement of entrepreneurial intention in the study of Chang et al. (2016) is quite similar to the conceptualization employed in this study, there are several differences between both studies. First of all, Chang et al. (2016) based their measure of imagination on a 27-item assessment method, whereas this research uses the AQ. Also, their study looked at Taiwanese electrical- and computer engineering students, which makes their data sample quite specific. The dataset of this research includes Dutch students with various study backgrounds. These differences could explain why the relationship between imagination and entrepreneurial intent is not consistent between both studies.

The results for people that have a good attention to detail are as expected beforehand. Having a sharp attention to detail is positively associated with entrepreneurial intention. Previous research showed that as opposed to people with ADHD, people with ASD prefer to perform activities that require this perception of details, including entrepreneurship (Lerner et al., 2018; Lerner et al., 2019). Also, it was found that this aspect is important for the entrepreneurial success that can be obtained (Bird, 1988). Therefore, people with a sharp detail perception might feel more confident towards becoming an entrepreneur, because they could be more successful in the end.

Contrary to what was hypothesized, poor attention switching, also explained as a strong focus, is negatively associated with entrepreneurial intentions. This is an unexpected result, as previous research on attention-deficit, which implies a lack of focus, found a negative relationship between

inattention and entrepreneurial intention (Wiklund et al., 2017). A potential explanation lies in the argument of Bird (1988) who said that entrepreneurs should also be able to expand their focus to ''see the bigger picture''. If people know that they are not able to switch their attention across multiple important tasks, they might think that they would likely be less able to perform well in entrepreneurship, and therefore might be less willing to become an entrepreneur in the future.

This research showed that poor social skills are negatively associated with entrepreneurial intentions. Previous research of Hartog et al. (2010) showed that good social abilities are positively related to self-employment decisions. Both findings are thus coherent with each other. Students that have worse social skills thus are likely to have lower entrepreneurial intentions.

As a last symptom communication difficulties were investigated. No association between poor communication skills and entrepreneurial intention was found. Although previous research did indirectly address that there could be a positive relationship between entrepreneurial intention and good communication capabilities (Liñán, 2008; Naktiyok et al., 2010), it did not look at the direct association between both. Based on reasoning one might expect that your communication skills might be important if you want to become an entrepreneur. However, communication competence could be equally important for becoming an employee. Atkins and Kent (1988) for example showed that oral communication skills are the most important feature that recruiters look at in the decision to hire someone for a job. When communication ability is crucial anyhow, it might not influence the future employment versus entrepreneurship perception in itself. Also, of all five symptoms, social- and communication skills are most strongly correlated with each other. So, part of the expected relationship might already be captured in the negative association between social skills and entrepreneurial intentions.

Overall, there is no association between the combined effect of all ASD symptoms and entrepreneurial intentions. So, students that have a higher AQ score do not likely have a lower or higher entrepreneurial intention as compared to students with lower AQ scores. Therefore, overall autism symptoms might not hinder people to be willing to become an entrepreneur in the future. This is not necessarily an unexpected result, given the individual symptom relationships that were found in both positive and negative directions.

The moderation analysis showed that not a single moderating effect of gender on the relationship between ASD symptoms and entrepreneurial intentions was found. Although Shinnar et al. (2012) did propose that gender has a moderating role between entrepreneurial intention and its antecedents, this research does not confirm that this is the case for the association between autism symptoms and entrepreneurial intention. Nonetheless, this research does underscore that it is

important to control for gender in general, as female students in this sample are likely to have a lower entrepreneurial intention as compared to male students, which is consistent with the findings of Liñán et al. (2011) and Schwarz et al. (2009).

Lastly, the robustness check that was performed checked whether the relationships hold if two additional control variables were added to the OLS regression analyses. When the dummies for entrepreneurship courses and whether parents have their own business are included in the models, several results change. Namely, the results of separate autism symptoms disappear. However, the conclusions for the association between overall ASD symptoms and entrepreneurial intention and the moderation analysis remain identical. The change in significance does not seem to be primarily caused by adding the two control variables but is mostly driven by the smaller sample size (N=124) as compared to the overall dataset (N=265).

6.2 Research implications

Although previous research has started to investigate relationships between subclinical symptoms related to mental health disorders, it has focused on other disorders like ADHD. ASD research was missing and this could have to do with the fact that researchers thought that there would not be an obvious relationship between autism symptoms and entrepreneurial intention. However, this research has shown that several autism symptoms are associated with entrepreneurial intentions. Thereby, it proves that ASD can be a fruitful topic in this scientific research stream, whereby it can be a stepping stone for future research to build on.

By analysing the separate symptoms, the findings have implications for determinants of entrepreneurial intention in general. Those students that have a sharp attention to detail are more likely to be positively inclined towards becoming an entrepreneur. Moreover, students that have a strong focus and or weak social skills are less likely to have the desire to become an entrepreneur. Hereby, three additional constructs that can determine entrepreneurial intention have been identified by this research.

As predicated by the Theory of Planned Behaviour, intentions are likely to be converted to subsequent actions to realize them (Ajzen, 1991). Therefore, students that have high entrepreneurial intentions are more likely to become an entrepreneur in the future as compared to students with a low entrepreneurial intention (Bogatyreva et al., 2019). The findings of this study have emphasized that certain personal characteristics of people are associated with entrepreneurial intention. However, only if more research has been conducted on how these characteristics will drive eventual entrepreneurship, it can become a basis to provide policy makers with recommendations to stimulate entrepreneurship.

6.3 Limitations and suggestions for further research

Several limitations of this study can be identified and further research can amplify the results found in this study. First of all, data was collected across a population of students. Therefore, research findings are not necessarily representative for the whole population. Future research could extent on this study by gathering data across a larger population that also consists of non-students. In doing so, it could draw more generalisable conclusions.

Second, this study uses cross-sectional data, and thereby looks at associations instead of causal relationships. Although causal relationships are hard to establish, an avenue for further research can be to collect panel data. Thereby, it is possible to control for more factors and provides the possibility to address reverse causality issues that can be present in cross-sectional data analysis.

Thirdly, the sample size of this research is not large (N=265), especially for the robustness check analysis (N=124). This is small as compared to other studies that for example looked at ADHD symptoms and entrepreneurial intention, like Verheul et al. (2015) who used a dataset of 10,104 observations. It would be interesting to check whether significant results for ASD symptoms can be obtained if the analysis would be replicated by including the control variables for entrepreneurship courses and whether parents have their own business for a much larger sample size.

Several separate ASD symptoms proved to be associated with entrepreneurial intentions. Still, more research is needed in order to be able to give profound policy recommendations to stimulate entrepreneurship. Although some personal characteristics can increase the willingness of students to become an entrepreneur in the future, it is not certain if these characteristics will define their eventual success and wellbeing. This will depend on several factors and is yet not clearly understood. Thus, future research could try to investigate how certain traits influence the success and failure of actual entrepreneurs. When more clarity is provided on this topic, policy makers could aim to especially stimulate those people that are suited to become a successful entrepreneur, and not only those people that are willing to become an entrepreneur.

There is no clear relationship between overall ASD symptoms and entrepreneurial intention which shows that those students that score high on the AQ do not lag behind others in terms of their willingness to become an entrepreneur in the future. The fact that no negative link between the degree of ASD symptoms and entrepreneurial intention was found provides a hopeful future research avenue into the relationship with clinical levels of autism. Future research could also perform a more in-depth qualitative analysis into people that have been diagnosed with ASD. How they perceive entrepreneurship as a career option themselves can provide insights into how they can be supported to pursue those options. Personally, they could indicate which symptoms they perceive themselves to

be positive features for or barriers towards entrepreneurship. If this is understood in a more thorough manner it could help people with ASD by granting aid and support in areas that are important for them. For example, by providing mentorship and coaching to overcome obstacles and further enhance their positive traits.

Additionally, more research is needed on the wellbeing of people with autism when pursuing a career in entrepreneurship, and the relationship with having an ASD diagnosis and entrepreneurial success. Future research could explore whether people with ASD feel satisfied if they pursue an alternative career as an entrepreneur. Lastly, it would be interesting to investigate how this can be linked to the quality and success of their own business. Findings of such a research could provide important policy recommendations. If it for example shows that people with ASD are satisfied and successful if they become an entrepreneur, entrepreneurship amongst them could be stimulated by the government in order to reduce the high unemployment rates.

7. Conclusion

The aim of this research was to explore whether subclinical autism symptoms are related to entrepreneurial intentions. In previous literature, five autism symptoms have been identified. Namely; a poor imagination, sharp attention to detail, strong focus, poor social skills, and poor communication skills. It was hypothesized how these symptoms are related to entrepreneurial intentions by looking at separate symptom effects, the effect of the overall AQ symptom score, and whether gender played a moderating role in these relationships.

Overall, this study has shown that several ASD symptoms are associated with the intention of students to become an entrepreneur. Having a sharp attention to detail is positively related with entrepreneurial intention. However, students that have a strong focus are less likely to have the desire to become an entrepreneur. Furthermore, poor social skills are negatively associated with entrepreneurial intentions as well. In this research the symptoms of imagination and communication are not related to entrepreneurial intention.

Also, the results of this study have shown that the combined symptoms as expressed in the overall AQ score are not associated with the entrepreneurial intention of students. Thus, students that have a high overall score on the AQ seem not more or less likely to be willing to become an entrepreneur in the future as compared to students that have a lower overall AQ score. Moreover, the moderation analysis has shown that gender does not moderate the relationships between the separate symptoms and entrepreneurial intent. So, being male or female does not affect how strong the association between a certain symptom and entrepreneurial intention is. However, being a female in general is negatively related to entrepreneurial intentions.

To conclude, this research has identified that three out of five subclinical autism symptoms are associated with entrepreneurial intentions. Those symptoms are poor social skills, a strong focus, and a sharp attention to detail. It has underscored the importance of analysing separate ASD symptoms instead of just looking at the overall relationship between those symptoms and entrepreneurial intentions.

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Appendix

Appendix A Autism-Spectrum Quotient questionnaire

Table A: *Autism-Spectrum Quotient questionnaire including symptom categories*

Statement	1	2	3	4	Symptom category
1. I prefer to do things with others rather than on my own.	DD	SD	SA	DA	Social skill
2. I prefer to do things the same way over and over again.	DD	SD	SA	DA	Attention switching
3. If I try to imagine something, I find it very easy to create a picture in my mind.	DD	SD	SA	DA	Imagination
4. I frequently get so strongly absorbed in one thing that I lose sight of other things.	DD	SD	SA	DA	Attention switching
5. I often notice small sounds when others do not.	DD	SD	SA	DA	Attention to detail
6. I usually notice car number plates or similar strings of information.	DD	SD	SA	DA	Attention to detail
7. Other people frequently tell me that what I've said is impolite, even though I think it is polite.	DD	SD	SA	DA	Communication
8. When I'm reading a story, I can easily imagine what the characters might look like.	DD	SD	SA	DA	Imagination
9. I am fascinated by dates.	DD	SD	SA	DA	Attention to detail
10. In a social group, I can easily keep track of several different people's conversations.	DD	SD	SA	DA	Attention switching
11. I find social situations easy.	DD	SD	SA	DA	Social skill
12. I tend to notice details that others do not.	DD	SD	SA	DA	Attention to detail
13. I would rather go to a library than a party.	DD	SD	SA	DA	Social skill
14. I find making up stories easy.	DD	SD	SA	DA	Imagination
15. I find myself drawn more strongly to people than to things.	DD	SD	SA	DA	Social skill
16. I tend to have very strong interests, which I get upset about if I can't pursue.	DD	SD	SA	DA	Attention switching
17. I enjoy social chit-chat.	DD	SD	SA	DA	Communication
18. When I talk, it isn't always easy for others to get a word in edgeways.	DD	SD	SA	DA	Communication
19. I am fascinated by numbers.	DD	SD	SA	DA	Attention to detail
20. When I'm reading a story, I find it difficult to work out the characters' intentions.	DD	SD	SA	DA	Imagination
21. I don't particularly enjoy reading fiction.	DD	SD	SA	DA	Imagination
22. I find it hard to make new friends.	DD	SD	SA	DA	Social skill
23. I notice patterns in things all the time.	DD	SD	SA	DA	Attention to detail
24. I would rather go to the theatre than a museum.	DD	SD	SA	DA	Imagination
25. It does not upset me if my daily routine is disturbed.	DD	SD	SA	DA	Attention switching
26. I frequently find that I don't know how to keep a conversation going.	DD	SD	SA	DA	Communication
27. I find it easy to "read between the lines" when someone is talking to me.	DD	SD	SA	DA	Communication
28. I usually concentrate more on the whole picture, rather than the small details.	DD	SD	SA	DA	Attention to detail
29. I am not very good at remembering phone numbers.	DD	SD	SA	DA	Attention to detail
30. I don't usually notice small changes in a situation, or a person's appearance.	DD	SD	SA	DA	Attention to detail
31. I know how to tell if someone listening to me is getting bored.	DD	SD	SA	DA	Communication
32. I find it easy to do more than one thing at once.	DD	SD	SA	DA	Attention switching

33. When I talk on the phone, I'm not sure when it's my turn to speak.	DD	SD	SA	DA	Communication
34. I enjoy doing things spontaneously.	DD	SD	SA	DA	Attention switching
35. I am often the last to understand the point of a joke	DD	SD	SA	DA	Communication
36. I find it easy to work out what someone is thinking or feeling just by looking at their face.	DD	SD	SA	DA	Social skill
37. If there is an interruption, I can switch back to what I was doing very quickly.	DD	SD	SA	DA	Attention switching
38. I am good at social chit-chat.	DD	SD	SA	DA	Communication
39. People often tell me that I keep going on and on about the same thing.	DD	SD	SA	DA	Communication
40. When I was young, I used to enjoy playing games involving pretending with other children.	DD	SD	SA	DA	Imagination
41. I like to collect information about categories of things (e.g. types of car, types of bird, types of train, types of plant, etc.).	DD	SD	SA	DA	Imagination
42. I find it difficult to imagine what it would be like to be someone else.	DD	SD	SA	DA	Imagination
43. I like to plan any activities I participate in carefully.	DD	SD	SA	DA	Attention switching
44. I enjoy social occasions.	DD	SD	SA	DA	Social skill
45. I find it difficult to work out people's intentions.	DD	SD	SA	DA	Social skill
46. New situations make me anxious	DD	SD	SA	DA	Attention switching
47. I enjoy meeting new people.	DD	SD	SA	DA	Social skill
48. I am a good diplomat.	DD	SD	SA	DA	Social skill
49. I am not very good at remembering people's date of birth.	DD	SD	SA	DA	Attention to detail
50. I find it very easy to play games with children that involve pretending.	DD	SD	SA	DA	Imagination

* source: Baron-Cohen et al. (2001), items are reversely coded whereby; DD= definitely disagree, SD= slightly disagree, SA= slightly agree, DA= definitely agree.
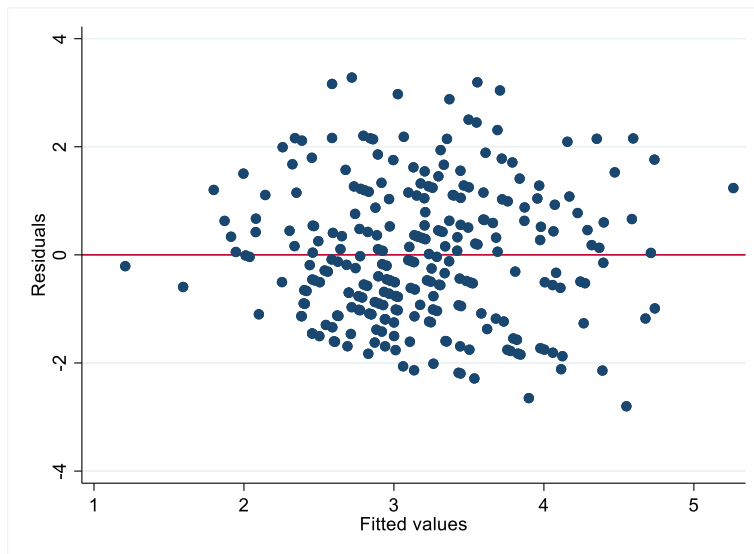
Appendix B Heteroskedasticity tests

Figure B1: Homoskedasticity plot fitted values AQ symptom scores per domain

Table B1: STATA test output for heteroskedasticity AQ symptom scores per domain

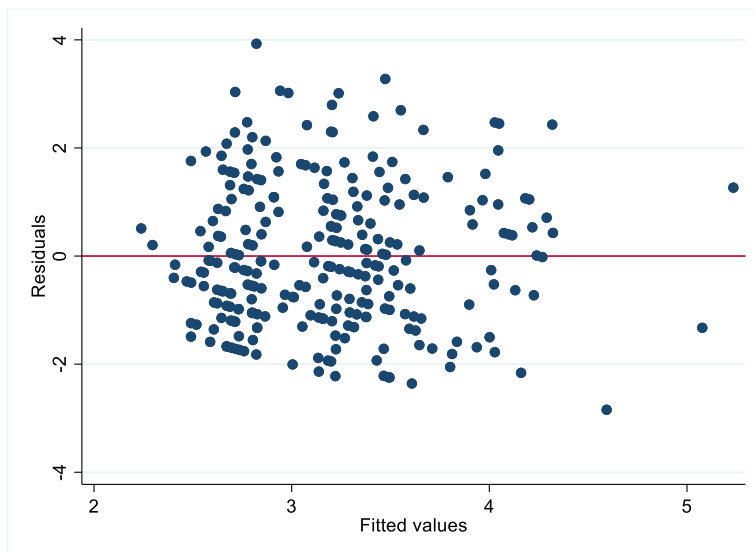| Breusch-Pagan / Cook-Weisberg test for heteroskedasticity |
| --- |
| H_0: Constant variance |
| Variables: fitted values of Entrepreneurial Intention |
| Chi2(1)   =   3.68 |
| Prob > chi2 =   0.0551 |

Figure B2: Homoskedasticity plot fitted values total AQ score

Table B2: *STATA test output for heteroskedasticity total AQ score*

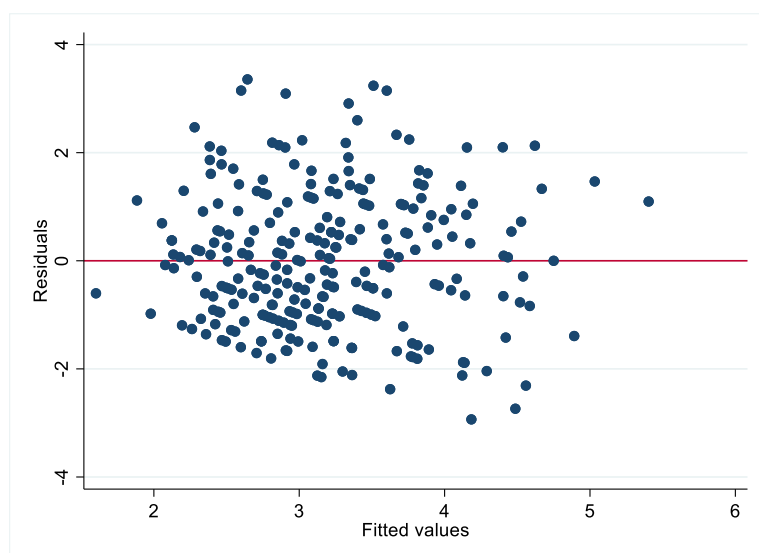| Breusch-Pagan / Cook-Weisberg test for heteroskedasticity |
| --- |
| H$_0$: Constant variance |
| Variables: fitted values of Entrepreneurial Intention |
| Chi2(1)   =   1.45 |
| Prob > chi2 = 0.2291 |

Figure B3: *Homoskedasticity plot fitted values moderation model*

Table B3: *STATA test output for heteroskedasticity moderation model*

Breusch-Pagan / Cook-Weisberg test for heteroskedasticity
H$_0$: Constant variance
Variables: fitted values of Entrepreneurial Intention
Chi2(1)   =   3.47
Prob > chi2 = 0.0627