# What is the impact of sensory processing sensitivity on entrepreneurial intent and opportunity recognition moderated by the entrepreneurial trait profile and the Big Five?

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### Abstract

Purpose – The purpose of this research is to examine how sensory processing sensitivity affects entrepreneurial intent and opportunity recognition ability, moderated by personality, such as the ETP and the Big Five.

**Method/approach/design** – A systematic literature review of sensory processing sensitivity was conducted to evaluate existing literature on SPS, giving a complete overview of the current status-quo. A questionnaire was created, using a stratified random sample was drawn at the University of Twente for representation reasons. Multiple regression analyses were used on the variables SPS, EI, and OR.

**Findings** – The findings reveal that sensory processing sensitivity does not show a significant relationship with either opportunity recognition or entrepreneurial intent. The moderation of personality could also not be confirmed. The findings highlight literature that supports the positive relation between opportunity recognition ability and entrepreneurial intent, so did interviews conducted in the end.

**Research limitations/implications** – Limitations of this research include the weak reliability of the personality scale used. Hence, this could have been a reason why the moderation could not be measured. Although that scale was validated prior, it will not be recommended for further research. Implications related to the now broadened scope of SPS, especially with regards to OR ability under stress. The underlying biological implications were discovered from interviews and contribute to the assumptions of the relationship.

**Practical implications** – Practical implications include the need for support systems for individuals with SPS, as well as efforts in education on the individual personality differences people entail.

**Originality/value** – While the study extends the literature on sensory processing sensitivity, the concept of entrepreneurship was originally added to the literature. Although the hypotheses drawn could not be confirmed, some findings still indicate possible relations that need further investigation.

**Keywords** – Entrepreneurship, entrepreneurial intent, opportunity recognition, big five, sensory processing sensitivity, entrepreneurial personality, information processing

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## List of abbreviations

BMS	Behavioural, Management and Social science
CTW	Engineering Technology
EI	Entrepreneurial intent
ETP	Entrepreneurial trait profile
HSPS	High sensory processing sensitivity
ITC	Geo-Information Science and Earth Observation
LSPS	Low sensory processing sensitivity
MSPS	Medium sensory processing sensitivity
OE	Opportunity exploitation
OR	Opportunity recognition
SDB	Social desirability bias
SLR	Systematic literature review
SPD	Sensory processing disorder
SPS	Sensory processing sensitivity
SRMR	Standardized root mean residual
TNW	Science and Technology
UT	University of Twente

### Overview of key definitions relevant for this research

The **Big Five** personality traits are a taxonomy for personality traits. They consist out of five factors which can be found in every person. These five factors are extraversion, agreeableness, conscientiousness, neuroticism, and openness to new experiences (Goldberg, 1992).

An **entrepreneur**, according to global entrepreneurship monitor, is defined by any attempt at new business or new venture creation, such as self-employment, a new business organization, or the expansion of an existing business, by an individual, a team of individuals, or an established business (GEM, 2018).

**Entrepreneurial intent** is a self-acknowledged conviction by a person that they intend to set up a new business venture and consciously plan to do so at some point in the future (Thompson, 2009, p.676).

**Information processing** means interpreting incoming information (stimuli) to make a response which is suitable within a particular context of an objective, problem, or situation (Atkinson & Shiffrin, 1971).

**Information overload** is representing "a state of affairs where an individual's efficiency in using information in their work is hampered by the amount of relevant, and potentially useful, information available to them. [...] The feeling of overload is usually associated with a loss of control in the situation, and sometimes with a feeling of being overwhelmed" (Bawden & Robinson, 2009, p. 3).

An **opportunity** is an idea or dream that is discovered or created by an [...] entity and that is revealed through analysis over time to be potentially lucrative (Short, Ketchen Jr, Shook, & Ireland, 2010, p. 55).

**Opportunity recognition** is defined as the cognitive process through which individuals conclude that they have identified an opportunity (Baron, 2004, p. 1).

**Sensory processing sensitivity** (SPS) is a trait that differentiates individuals according to the extent to which they deeply process environmental stimuli ((Yano & Oishi, 2018, p. 49).

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#### **1. INTRODUCTION**

Sensory processing sensitivity (SPS) is a genetically determined personality trait that roughly 20% of the population inhibits (Aron & Aron, 1997). SPS is affecting the individual perception of the environment, resulting in higher sensitivity towards both internal and external stimuli. This is due to different regions of the brain being targeted or activated when dealing with information within individuals with high levels of SPS (HSPS) (Acevedo et al., 2014). HSPS are not only thought to perceive more but also to process more of the stimuli they perceive (Forgas & George, 2001). When thinking about competitive advantages based on the information one perceives and processes, especially in the business context, HSPS seem to benefit from increased information processing. Yet, research on SPS in relation to entrepreneurship lacks depth. The scope of SPS has not been covering entrepreneurial concepts. This research is aiming at closing the gap.

As mentioned before, individuals with high levels of SPS cannot only perceive more stimuli, they are able to put the information together more easily as well (Jagiellowicz et al., 2010). Thereby, an individual must use connections in the brain, established through experience, to turn diverse and seemingly unrelated internal/external stimuli into information, which is then grouped into known patterns that help identify an economically valuable opportunity (Baron, 2006). Opportunities are all around, and some individuals seem more sensitive towards uncovering contingencies in their surroundings (Alvarez & Barney, 2007). This research proposes HSPS to fit into the niche of more sensitive individuals who could potentially show increased opportunity recognition ability. Without the mental capacity to process information, a valuable opportunity cannot be identified (Neisser, 1967). Due to their natural predisposition, HSPS may be capable of identifying relevant opportunities quicker with the same amount of information around, or they are capable to identify opportunities with less information input than other individuals could.

HSPS have also been characterized by a certain set of stereotypical personality traits (Aron & Aron, 1997). Hence, HSP are characterized as being more introverted and neurotic, yet very intelligent human beings. Due to their non-stop perception of every stimulus surrounding them, they are suffering from constant stress (Andresen, Goldmann, & Volodina, 2017; Gerstenberg, 2012). Therefore, stress-avoidance is a priority that leads to a more introverted and neurotic personality, as a consequence. Yet, these character traits are stereotypically describing HSPS, but there is a deviation from the mean (Aron & Aron, 1997).

As the literature on SPS has never considered concepts of entrepreneurship, there is no evidence of the relationship of highly sensitive towards entrepreneurship. Based on the literature, strong links between the natural composition of highly sensitive individuals in terms of stimuli perception and processing as well as opportunity recognition ability exists (Aron & Aron, 1997). It is assumed that individuals, who are better at identifying opportunities, would also show more entrepreneurial intent (Karimi, Biemans, Lans, Chizari, & Mulder, 2016). Entrepreneurial intent refers to a self-acknowledged conviction by an individual intending to set up a new business venture and consciously plan to realize it at some point in the future (Thompson, 2009). Intentions to start a firm are sparked by many factors, such as the urge for self-realization, financial independence or the knowledge that an opportunity identified has great potential (Ismail et al., 2009). Yet, naturally, due to their personality traits, HSPS are thought to not show strong entrepreneurial intent, as entrepreneurship is a large stressor in individuals personal environment, that could easily be avoided by not pursuing (Evers, Rasche, & Schabracq, 2008). However, the drive of identifying relevant business opportunities may spark interest and motivation in the intelligent HSPS which motivates them to pursue entrepreneurship after all (McClelland, 1965).

It is assumed that due to the heightened sensitivity towards their surroundings, individuals with SPS would be better at identifying opportunities as they seem to perceive and memorize more input (Forgas & George, 2001). As mentioned, the input is crucial when it comes to making the final decision on whether to act on the opportunity entrepreneurially (Endsley, 1995), thus the ability to identify relevant opportunities may be positively linked to entrepreneurial intent (Ismail et al., 2009). Lastly, due to the high-stress levels that individuals with high levels of SPS perceive, it is assumed they would not be willing to realize themselves entrepreneurially, as the job of an entrepreneur is typically linked to much stress (Evers et al., 2008). These assumptions have yet to be tested.

Personality has a major influence on entrepreneurship, suggesting that there is an ideal set of entrepreneurial traits, more commonly referred to as the entrepreneurial trait profile (ETP) (Schmitt-Rodermund, 2004). The ETP is essentially an entrepreneurial constellation of the Big Five personality traits within a person that is particularly predictive of characteristics necessary for entrepreneurial activities. The Big Five personality traits, also known and referred to as the five-factor model in literature, are five main descriptors of personality. The ETP is thought to make success more feasible and, thus, positively influence entrepreneurial intent (Schmitt-Rodermund, 2004; Zhao & Seibert, 2006). Individuals show intent based on the information input they receive prior to making the decision on whether to act on it or not. Therefore, it is crucial that these individuals are open many impressions (stimuli), in order to evaluate their options for the better. According to Ardichvili, Cardozo, and Ray (2003), individual personality traits are one of the core factors influencing opportunity recognition. Thus, it appears plausible to take personality traits, namely the ETP and the individual Big Five, as a moderator for the relationships between the main hypotheses.

This results in the following research question: What is the impact of sensory processing sensitivity on entrepreneurial intent and opportunity recognition moderated by the entrepreneurial trait profile and the Big Five?

The aim of this study is to connect SPS to entrepreneurial concepts and, therefore, to broaden the scope of this relatively young topic of research. Thereby, theoretical and empirical evidence will be combined to provide a clear structure and a well-rounded research frame.

First, a systematic literature (SLR) review on SPS with regards to entrepreneurship will be conducted to evaluate the existing connections that have been made previously. This will also help to clarify whether the literature on SPS has not been focusing on entrepreneurship at this point in time. The results of the SLR will help to put SPS into perspective and provide a complete and coherent overview of the status quo. The research question of this study will be answered by creating an online questionnaire, which targets the various entrepreneurial sub-constructs tested for. Therefore, a stratified random sample will be used to create a representative outcome of the general public by the questionnaire. In the end, interviews with HSPS will be held to verify findings and put them into a perspective.

This research contributes to the research of SPS, providing focused results that link SPS to entrepreneurial concepts as a result of the SLR. Based on the empirical research, insights on possible relationships between SPS and OR as well as EI can be drawn, while linking the relationships to personality. Managers can contribute from the findings by gaining an understanding of different personalities, which will improve leadership styles. HSPS may be superior at OR, and their ability may be leveraged for open innovation processes within a company. Lastly, society at large benefits from the insights, as individuals may be motivated to reflect on their personality and evaluate their motivation towards entrepreneurship.

#### 2. THEORETICAL BACKGROUND

In order to be able to comprehend the concepts used for this research, the key concepts will be defined in the following.

#### 2.1 Hypersensitivity

Sensory processing sensitivity (SPS) is classified as a genetically determined trait involving a deeper cognitive processing of stimuli, which is driven by higher emotional reactivity (Aron, Aron, & Jagiellowicz, 2012). SPS differentiates individuals according to the extent to which they deeply process environmental stimuli (Aron & Aron, 1997). Individuals, who are high in SPS, have a much greater reactivity to internal and external stimuli (Aron, 2013). Both internal and external stimuli may impact the individual's mental life and health, which may even be caused by the emotional behavior of others towards them or the subtlest changes in the environment, which they are more likely to notice (like changes in lights and sounds or intonations). Individuals high in SPS are often overaroused and are more prone to being introvert in novel situations in order to avoid the excessive stimuli they perceive (Aron & Aron, 1997). These characteristics have made it challenging to clearly differentiate SPS from other traits, such as neuroticism and introversion, which explains the heavy link of SPS to these concepts in literature. SPS has been confused with many concepts. It was argued that SPS shows some clear characteristics, and Aron and Aron (1997) proposed a more distinctive differentiation. Whereas neuroticism does only relate to negative emotions, SPS has been found to relate to both positive and negative emotions. Additionally, qualitative research based on interviews showed that some high-SPS individuals showed traits of extraversion. Additional correlation analyses showed distinctions between SPS and neuroticism as well as introversion in quantitative studies (Aron & Aron, 1997; Listou Grimen & Diseth, 2016; Smolewska, McCabe, & Woody, 2006).

In the past, SPS has been confused with other concepts. The highly sensitive person studies of Aron and Aron (1997) show that sensitivity is related but not identical with social introversion, related but not identical with emotionality and not merely the combination of both concepts. It is more one of two mental strategies of dealing that individuals have developed over time when with stimuli. The easiest way to describe both strategies is either (1) responding more or (2) responding less to what the individual perceives. Aron and Aron (1997) proposed that SPS the strategy for humans who are *more* responsive; they can be characterized by being more prone to "pause to check" in a new situation, being more sensitive to subtle stimuli, and employing deeper or more complex processing strategies for planning effective action. All of this is driven by stronger emotional reactions, both positive and negative ones, which again differentiates from neuroticism. Emotions related with high levels of neuroticism are solely negative. Highly sensitive individuals are fundamentally more reflective than fearful of punishment. They also have a more rapid and efficient unconscious processing (or more commonly referred to as intuition), more useful dreams or heightened suggestibility. Thus, HSPS individuals are able to process given information in the environment more rapidly, whilst perceiving more information of what other individuals would automatically discard in the information processing process. This is also relating to the fact of overarousal and feeling of being overwhelmed by the environment, and consequently avoiding certain situations.

Sensory processing sensitivity comes with its benefits and disadvantages. Benefits of SPS may link to openness to experience new based on their levels of AES. These findings relate to the rich, inner life that HSPS individuals experience (Ahadi & Basharpoor, 2010), but may also be related to general well-being (Aron & Aron, 2018). Therefore, higher AES is influencing deeper information processing, as individuals who are high in AES have a better mental space. HSPS also get deeply excited by stimuli, which if they do have the right mindset, will contribute to their happiness. Generally, AES relates to the positive aspects of SPS, meaning that individuals are able to think more deeply about their experience and bring information

together. HSPS are characterized as strongly empathetic people. The benefits of SPS have been linked to information processing ability, as HSPS are better equipped to compare new sensory input to old input, and obtain a greater storage ("memory") (Baron, 2008; Jagiellowicz et al., 2010). Disadvantages have linked SPS to social phobia (Neal, Edelmann, & Glachan, 2002), avoidant personality disorders (Meyer & Carver, 2000), anxiety and depression (Liss, Timmel, Baxley, & Killingsworth, 2005), and higher perceived stress levels and less stable mental health (Benham, 2006). Personality wise, SPS will have a significant impact on neuroticism (Aron & Aron, 1997), and also show correlations with behavioral suppression (Carver & White, 1994), introversion (Eysenck, 2012) and behavioral inhibition (Aron & Aron, 1997). Negative consequences of SPS were interpreted by Ahadi and Basharpoor (2010), as they concluded that HSPS tend to worry more, tend to avoid environmental stimuli which therefore limits their social relations and reduced positive emotions. This relates to the sub-constructs of LST and EOE, which if increased, bring out the negative side effects of SPS. Due to their higher emotional reactivity, negative experiences have a greater impact on HSPS. This explains the development of mental health issues (Ahadi & Basharpoor, 2010). Lastly, studies also show that parents supervision is important for highly sensitive kids, as neglection and overarousal will lead to increased chances of depression (Liss et al., 2005), whereas the right treatment and environment for HSPS kids will enable them to bloom and flourish (Pluess & Belsky, 2013).

The terms responsiveness and sensitivity are used interchangeably through the literature of Aron and Aron (1997). However, the term sensory processing disorder (SPD) also appears to be confused with SPS a lot. SPD is a condition in which a person has difficulty organizing and integrating sensory information for use (Reisman, 2002). SPD relates to conditions such as sensitivity to touch, hyperactivity, fear of crowds, autism, or trouble with balance and other (fine/gross) motor skills. Therefore, SPD is not the same as SPS because SPD only indicates a heightened perception of stimuli, but the ability to process them accordingly and is not covered by the scope of this research.

#### 2.2 Systematic literature review on SPS

A systematic literature review is conducted for a deeper reflection of existing literature as well as a coherent comparison mechanism of what has been done and may still be missing. In dissertations, reviewing existing literature concerning a specific research topic benefits in increasing awareness and understanding and shows the commitment of the researcher's search of the literature (Frank & Hatak, 2014; Okoli & Schabram, 2010). The influence of personality receives increasing attention in the field of entrepreneurship. As information on SPS is still lacking more depth, especially with regards to management studies, a systematic literature review seems to be the best fit (Fink, 2005). Although some scholars argue that a SLR is not beneficial when limited studies have been done, as it will not reflect the best information frameworks there are, it has become common practice for literature reviews with a less focused scope (Bryman & Bell, 2011; Okoli & Schabram, 2010).

Using the structure of Fink (2005), the central question guiding this systematic literature review could be described as "What is known about SPS in relation to the concept of entrepreneurship in adults?".

#### 2.2.1 Search Strategy

For the search of the literature, the databases SCOPUS and Web of Science were employed. Additionally, Google Scholar has been used to find literature did not show in the database search. Scopus and Web of Science are article databases and allow for cross-disciplinary, in-depth exploration of the article among multiple journals.

Narrowing the search requires inclusion and exclusion criteria that are objective and unbiased. The general inclusion criteria for this literature review are papers referring to the trait "SPS" or "Sensory Processing Sensitivity" within their title, abstract or keywords. Over the years, several terms and concepts, similar to SPS, have been used in referring to a similar combination of traits. Although some frameworks are similar in respect to sensitivity, only the theory on SPS is recognized as a trait and moreover, finds its core in cognitive processes (Andresen et al., 2017). Therefore, the scope of this literature review solely focusses on SPS and other traits, such as SPD had to be carefully excluded via screening. Secondly, keywords referring to personality traits have been added since the study researches a moderating effect, representing the second layer of inclusion criteria for a narrower scope. The following keywords have been applied throughout the title, abstract and keywords: 'personality', 'traits', 'characteristics', and 'Big Five'. The reasoning behind the inclusion of personality was the individually present moderating effect that may differ for HSPS from other individuals. In order to capture similar results to the Big Five, the separate traits have also been entered as search words. The search words included: 'alertness' and 'emotional stability' as these are also associated with personality literature on the Big Five, as well as 'neuroticism', 'introversion', 'extraversion', 'openness', 'agreeableness' and 'conscientiousness'. Third and last, the inclusion of the variable of entrepreneurship needed to be considered, representing the third condition for literature collection. For this purpose, the following words have been used in screening titles, abstracts and keywords: 'entrepreneur', 'management', 'business', 'firm', 'company', 'opportunity recognition' and 'entrepreneurial intent'.

Next, the applicable subject areas had been selected, including scholars in psychology, business, management and accounting and social studies due to the fact that only these fields of study are in line with the field and topic of this research. Other inclusion criteria that could have been applied were the year of publication, journal and publication language. However, based on the limited amount of research available found when applying the three literature selection criteria, these screening conditions were not applied.

#### 2.2.2 Practical screen

A graphical representation of the practical screen can be found in Figure 1. The initial search combining Sensory Processing Sensitivity and SPS in Scopus and Web of Science resulted in 34 document results. After applying the second layer of personality traits, 25 remained. Concluding the search, 12 articles remained after applying the third layer of criteria.

After filtering for the applicable subject areas, 10 document results remained. It was found that a significant portion of the articles focused on the effects of SPS on children and the role that parents play in this relationship growing up. Since content related to adolescence is not relevant for answering the central question guiding this literature review, the following words and were excluded: "children", "childhood environment", "parents", "life-altering events", "parent-child relations", "adolescent", "young adult", "child", "infant", "infants", "child behaviour", "child of impaired parents" and "childhood". This resulted in a total of 8 relevant papers.

As expected, only a few studies apply SPS in the business management research field. However, as eight articles do not suffice for a SLR, the central question guiding this literature review was altered. The third layer of criteria focusing on entrepreneurship was decided to not be applied in the search strategy any longer due to a wider variety of input that could be generated from only the first two selection criteria depths. Therefore, a change in the central question was necessary to 'What is known about SPS in relation to the personality characteristics of adults?'. Restarting with 25 articles after applying the first search word layer, the same subject areas and exclusion words were applied, deriving at 10 documents in total.

In Google Scholar, the first 10 pages were screened for additional articles. The screening involved an evaluation by reading the abstract. This search contributed an additional seven articles. When applying a 'backward search' (Okoli & Schabram, 2010), an additional five articles could be identified articles which have been incorporated in the literature framework. Finally, the website hsperson.com, which is dedicated to contributing efforts to research on SPS, is stating a list that recommended certain studies for research. This list offered one additional study that was not yet included. This resulted in a total of 23 articles on the personality of people with high SPS.



Figure 1 - Search strategy graphic representation

#### 2.2.3 Analysis of articles

When analyzing articles in a systematic literature review, a certain structure is needed. According to Okoli and Schabram (2010), a systematic literature review is aimed at providing distinctive steps to ensure a complete and coherent overview of the current state of the art. This includes the **status of current knowledge, the justification for new research, quality description and criticism.** The steps will be applied in the following and will provide an overview of the different outcomes. The articles found were considered in closer detail in order to be able to assess their individual and combined implications towards SPS on human behavior. The analysis of the articles is structured based on the findings of the systematic literature review which can be found in Appendix 8.1. These findings regard the general construction of SPS, SPS as an individual personality trait, implications about the Big Five and SPS, as well as the physical relation of SPS to stress, as this is an often-researched relation.

#### 2.2.3.1 The status of current knowledge

Disagreement on the construction and the biological direction of SPS is popular. Although the common agreement is found in the existence of an underlying concept proving individual differences in environmental sensitivity, researchers argue for different theoretical insights. Most accepted are the sensory processing sensitivity, biological sensitivity to context theory and the differential susceptibility theory (Andresen et al., 2017; Lionetti et al., 2018). These theories suggest that the general population entails lower levels of sensitivity, with HSPS being the rare exception. Further research dedicated efforts to the differentiation of SPS from other traits to create a clearer, common understanding of the concept and reduce the confusion that had been surrounding literature in regards. Aron et al. (2012) spend their research capacities on differentiating SPS from other evolutionary inhabited traits. SPS has been confused with the Big Five trait of Neuroticism before SPS had its own clear distinction, thus work in differentiating the concepts was also of need (Smolewska et al., 2006). The brain mechanisms underlying SPS have been investigated by Jagiellowicz et al. (2010), suggesting which mechanisms cause the differences in individuals with and without SPS. They found that SPS was associated with greater activation in brain areas that are involved in high-order visual processing when detecting minor changes in stimuli. The findings remained significant even after controlling for neuroticism and introversion. Therefore, SPS is activating a different area of the human brain.

It has been found that SPS is a personality trait that is inherited. In their research on SPS, Acevedo et al. (2014) were able to give an indication that SPS is indeed a personality trait, which is associated with enhanced awareness and behavioral readiness to environmental stimuli. This finding appears to be of importance to this research. The authors suggest that the trait is found in roughly 20% of humans and was identified in over 100 other species as well. This related to the responsiveness to the environment and to social stimuli when seeing facial impressions and reacting to them accordingly. The authors find that neural activations were in regions that related to sensory information, emotional meaning-making, and empathy. SPS also increased self-other processing, self-awareness, and cognitive processing. The responses stayed consistent when interacting with or reacting to both partners and strangers.

SPS is responsible for causing variances of personality traits and mental health, ultimately being responsible for individuals to be more prone to suffer from mental illness. Relating the concept of SPS to personality traits and mental health was done by Ahadi and Basharpoor (2010). Thereby, they used the Big Five personality factors. The authors conducted a regression analysis between the three factors of SPS; EOE, LST, and AES, as well as each Big Five factor. Results outlined a negative relationship between SPS and extraversion and affect (emotionality), which indicates that these persons are very emotional and tend to worry. The authors also indicated findings on ease of excitation, which individuals with SPS try to avoid

because of the fear of overwhelmingly lot of sensory stimuli. This avoidance can consequently limit their social relations, reduce the positive emotions and lead them into introversion. A positive relationship between SPS and openness as well as conscientiousness could be identified. Possible explanations for that were the rich experiences and extreme positive/negative emotions an individual made, predicted increased levels of openness and conscientiousness as well. Mental health constructs were also tested for and results showed a positive relation between SPS and physical problems, anxiety, social functioning disorder, and depression. This accords with findings of Liss, Mailloux, and Erchull (2008). The high level of stimuli that people with SPS have to process internally create constant and dominant stimulation which causes anxiety. EOE and LST were found to particularly represent the negative aspect of SPS, which is related to anxiety and depression and also present in the conceptualized HSPS one-factor scale. AES, on the other hand, was found to significantly relate to anxiety, but not to depression. This may relate to individuals who report a rich, complex inner life so they can enjoy fine arts and music, but due to a high level of conscientiousness, they may spend more time thinking about their actions which can result in anxiety. Liss et al. (2008) also related individuals who score low in AES to be more prone to suffering from communication deficits due to externally-oriented thinking. Communication deficit is a symptom of autism as well, hence confusion of the origin may arise.

SPS has been proven to cause more stress, thus this statistically positive relation has been described by a vast majority of researchers (Benham, 2006; Brindle, Moulding, Bakker, & Nedeljkovic, 2015; Carr & Nielsen, 2017; Evers et al., 2008; Gerstenberg, 2012). As pointed out, increased stress levels will lead to a higher tendency in anxiety. As a result, individuals who inhabit the trait of SPS are more likely to experience stress and show anxious tendencies or anxiety related depression. Results show that the constructs of stress or anxiety are independent of personality constructs and the Big Five (Gerstenberg, 2012). Individuals who have SPS will always perceive greater stress levels, regardless of whether they, for example, find themselves to be highly neurotic or not. This finding is interesting when being linked to Jagiellowicz et al. (2010) findings on brain areas involved when processing stimuli, as SPS targets different brain areas compared to individuals who do not show HSPS.

#### 2.2.3.2 Justification for new research

One factor that came to attention during the research of SPS was the overall disagreement on the construction of SPS. Some authors consider SPS as one construct (Carr & Nielsen, 2017; Pazda & Thorstenson, 2018), whereas others treat it as one overarching construct that entails three sub-components (Liss et al., 2008; Listou Grimen & Diseth, 2016). These three subcomponents are ease of excitation (EOE), low sensory threshold (LST) and aesthetic sensitivity (AES), which combined describe the trait of SPS. Ease of excitation is being easily overwhelmed by external and internal stimuli, aesthetic sensitivity refers to the awareness of aesthetics and low sensory threshold is referring to the individual reflection of unpleasant sensory arousal to external stimuli. The three traits relate differentially to behavioral activation and inhibition as well as to the Big Five. Smolewska et al. (2006) found that some Big Five factors relate more to a certain SPS factor over others. Neuroticism, for instance, was found to be most strongly related to EOE, confirming that there is a tendency to become easily overwhelmed and disrupted by stimulation. It is recommended, though, to use the rather general factor of SPS exclusively, as AES, for instance, is more related to positively worded items in the measurement scale and is not mainly about "aesthetic sensitivity" (Aron & Aron, 2018). Still, a one-way solution has not been introduced yet. The general disagreement on the composition has been criticized in literature, as SPS is missing clear common ground and structured definition when measuring the concept (Gerstenberg, 2012).

The disagreement was only very recently picked up by Lionetti et al. (2018) who spend their research efforts on the classification of SPS. Results of a confirmatory factor analysis supported a bifactor structure of SPS, meaning that the HSP scale consists of both one general sensitivity construct as well as three individual subscales. Both are simultaneously valid rather than mutually exclusive. Additionally, Lionetti et al. (2018) also demonstrated a normal and continuous distribution of SPS in the general population, resulting in three classifications which they gave flower metaphors based on the fragility. The highly sensitive individuals (orchids) make for 31% of the population, then the broader mass in between was classified as medium sensitive (tulips) entailing 40%, and lastly, the low sensitive population (dandelions) makes for 29% of the population. Lionetti et al. (2018) could, therefore, conclude that individuals differ on rather to the degree of sensitivity they inhibit than the relative composition of the different HSPS components they inherit. However, the authors are still looking forward to replication of their study, using the preliminary cut-off scores in an independent sample.

#### 2.2.3.3 Quality description and criticism

Measurement of SPS seems to be an issue. A key point of critique seems to be the lack of diversity. All available research is building upon the work done by Aron & Aron (1997). These researchers introduced the concept of SPS, and the Highly Sensitive Person (HSP) -scale for measuring SPS among individuals. Since it has become the universally applied measurement construct within this field of research. Although attempts have been made to validate the construct since its introduction in 1997, the researchers have never reflected on how the items for the questionnaires were selected and by what means a person was characterized as highly sensitive. Also, the measurement is based on a self-completion test, which is considered not to be objective. Lastly, according to Aron & Aron (1997), it can be assumed that 20% of the general population carry the trait SPS. In former research, Aron and Aron made a cut at the higher end of the spectrum, at 25% precisely, and assumed that this would entail the HSPS individuals of the population drawn. Consequently, this technique is more of an assumption than an accurate test of SPS of an individual per se. Thus, an extension to accurately measure whether a person is actually highly sensitive, instead of just relying on the approximated values and self-report measures, would be a desirable contribution to existing literature. This could be a weakness of the concept measured, as further validation would be desirable. However, the researchers Aron & Aron, who introduced the concept of SPS in 1997, have dedicated their research efforts to further on complete the theory and correct diminish smaller errors that were identified over time as well as broaden the scope. The broadened scope especially helped to raise awareness of the concept of SPS and may motivate further research.

Most recently, a bi-factor solution for SPS was introduced by Lionetti et al. (2018), suggesting that the HSP scale reflects both three independent scales as well as one general, overarching sensitivity factor across all items. Along with this pursuit, in their recent paper Lionetti et al. (2018) were able to detect a normal distribution of SPS in the general population, being 29% for low sensitivity, 40% for medium sensitivity, and 31% for high sensitivity. Although this is not an exact testing outcome just yet, the normal distribution is applicable to a population and is already more accurate than estimating a rough 20% of a population sample will entail high SPS. Cut-off rates regarding personality constructs should be treated with care. As SPS, like other constructs, is a question of degree rather than yes/no, it indicates a more fluent and fluctuating distribution that would deny the use of a strict cut-off rate. SPS is a continuous variable and is best to be measured continuously. One reason for that may be the noise that is included in any self-report measurement. Therefore, cut-offs may disqualify some participants by labeling them in a wrong category, leading to statistical measurement errors (Aron & Aron, 2018).

What became apparent when scanning the articles of this systematic literature review was that many scholars build upon student samples at a university setting (Gearhart & Bodie, 2012; Gerstenberg, 2012; Liss et al., 2008; Smolewska et al., 2006; Yano & Oishi, 2018). This may be related to the relative ease of setting and data collection. Some authors gave their students' academic course credit as an incentive for participating. Another striking objective that became visually apparent in the SLR table (Appendix 8.1) was the use of quantitative data collection by (nearly) all authors under review. The conduction of only one data gathering method may be problematic, especially when that one method is collectively used and not questioned (Bryman & Bell, 2011). Results should be consistent with the use of several data collection methods. These shortcomings were also criticized by Gerstenberg (2012). Therefore, the literature groundings of SPS can only benefit from diversity.

Furthermore, research calls for the need of longitudinal studies into SPS (Acevedo et al., 2014; Andresen et al., 2017; Jagiellowicz et al., 2010; Liss et al., 2008; Smolewska et al., 2006; Yano & Oishi, 2018). Due to the nature of SPS's deeper processing of stimuli, it is found that HSPS individuals process information in brain regions responsible for awareness, attention, and responsiveness; which consequently may be beneficial in similar future situations; since HSPS individuals recognize similarities sooner (Acevedo et al., 2014). It is proposed that over time the experienced stress may reduce because of the similarity of a former experience (Acevedo et al., 2014; Liss et al., 2008). In order to examine this possible relation, longitudinal research is required. A second reason for the need of longitudinal studies lies in the nature of cross-sectional correlational studies as they do not prove causal effects, these can only be tested by longitudinal studies (Andresen et al., 2017; Liss et al., 2008; Smolewska et al., 2006).

The last point of criticism that was identified is linking to the fact that SPS has not yet been related to business literature. In a very recent addition, Andresen et al. (2017) were able to relate SPS to human resource literature. The research of the authors, uniquely, entails the managerial implications of SPS in relation to economic benefits. Due to the characteristics of SPS, it is believed that the implication can impact job performance, thus insights may be of high interest and relevance in literature in the near future.

#### 2.3 Information processing

In order to understand in which ways SPS is improving opportunity recognition ability, the basic concepts of information processing need to be outlined, as information processing is an underlying basic assumption in the relationship between the two main constructs. Decision making, subjectively perceived as good or bad, is based on the information humans process. Sensory stores are 'preattentive', suggesting that stimuli can be entered into sensory stores regardless of whether or not the subject is paying attention to the source (Neisser, 1967). The brain then filters the information and classifies the importance. Preattentive processing is important in education, and for the prediction of cognitive ability. According to Neisser (1967), the input comes in a rather literal form and can be overwritten by further inputs of the same modality. Sensory processing sensitivity is thought to increase the stimuli one perceives and memorizes (Forgas & George, 2001) as well as a more rapid and accurate sense-making of the surroundings when connecting already known to new inputs (Jagiellowicz et al., 2010), thus the ability to process and store information must be given. Hence, a closer look at information processing and memory is given, to fully clarify the underlying principles that relate SPS to OR.

There are a couple of basic assumptions for information processing. It is assumed that the information made available by the environment is processed within the processing systems, therefore attention and short-term memory is of importance. These processing systems are able to transform or even alter the information in systematic ways. Recognizing and processing available information in the environment is the first step of

the opportunity recognition process. As opportunity recognition is one of the main concepts of this research, the information processing ability is of importance. The ability to process more stimuli in an accurate way enables the individual to save more relevant information on which one then identifies opportunities. Also, for SPS, information processing entails high relevance due to the fact that it is supposed they react more sensitively. All information on the human being actively recognizes and acts on is based on the sensory input that is perceived or capable of being perceived. Due to the high sensitivity to environmental stimuli, HSPS individuals recognize more sensory input, which consequently increases the amount of available data for information processing as well as for the decision-making process. As drafted in more detail shortly, successful information processing is also based on learning from experience, since familiar patterns are recognized. Hence, HSPS may relate subconsciously more familiar patterns due to a higher number of stimuli perceived.

Thus, information processing will be illustrated in the following to enable full comprehension of the key variables of this research, namely SPS and the opportunity recognition process. The following four stages explained build upon the framework developed by Endsley (1995). The model was chosen due to the comprehensibility and the wide application of the model of situation awareness in dynamic decision making (p.35) in psychology literature.

#### 2.3.1 A model of information processing in dynamic decision making (Endsley, 1995)

#### 2.3.1.1 Perception

The first step in the model, perception, relates acquire information about a status, certain attributes (like color, noise, taste or sounds), as well as the dynamics in the environment. The information is made available in this step. Humans need to encode the information (status, attributes, and dynamics) that is surrounding them in the environment they interact in. Therefore, adequate processing and responses are necessary. Perception is guided by experiences, subjectively belonging to the human being perceiving the world in his own way. When information is extracted from the environment, it is transferred to short-term memory, temporarily. A message is sent to the brain. The information needs to surpass the next stage. Therefore, if the stimuli have features of interest or activate a familiar pattern, the response is registered as important (stimulating). HSPS individuals are thought to perceive more information encoded in the environment (Jagiellowicz et al., 2010). Therefore, they may perceive more familiar patterns which they are them able to become aware of actively.

#### 2.3.1.2 Situation awareness (working memory)

Situation awareness goes beyond simply being aware of all elements comprising the situation and presents a complete understanding of the significance of these elements. This part of the sensory registration process stores information only temporarily. Therefore, it greatly relies on memory to form patterns which provide the decision maker a holistic picture of the environment, comprehending what is of significance. Once a decision has been made about the value or importance of that information, it will either be discarded or transferred to the long-term memory. Information in the working memory can last for 15 to 20 seconds. It can, however, be recalled for the next 20 minutes, when the individual makes up his mind and assesses the information to be of importance shortly after. The organization and retention, as well as data chunking of input information, build the main source of information retention. The human brain builds in sequential repetition to store information in the long-term memory.

When considering HSPS individuals, they are (sub-)consciously aware of more elements that are comprised in a certain situation due to their processing of more stimuli. They are also thought to have a greater imagination and more vivid memory of prior experience; thus, they may perceive a situation in a completely different way and form more/different patterns accordingly (Acevedo et al., 2014; Aron & Aron, 1997). When the HSPS individual is able to link together more data chunks, it will result in a more comprehensible depiction of the environment. Therefore, HSPS are hypnotized to make more holistic pictures of their surroundings, as well as evaluating their importance.

#### 2.3.1.3 Decision phase

For the decision phase, all three forms of memory, short-term, working and long-term, play together to make an imminent decision. In this phase, the human being uses his ability to project future actions of the elements present in the environment. This is achieved by the use of prior knowledge, current knowledge of the status and knowledge on the dynamics of the situation. Thus, information processing has much more underlying factors than collecting the sole information in the environment. It includes comprehending the meaning of that particular piece of information, comparing it, and then generating possible future scenarios, goals, and outcomes (Endsley, 1995). People high in SPS are able to "pause to check" when making a decision, and therefore able to use more information build on past experience to evaluate the decision they are about to make. This is one possible explanation of why they often get the feeling over overarousal, as they need sufficient time to check all decision alternatives (Ahadi & Basharpoor, 2010; Aron & Aron, 1997). When having sufficient time, however, and not being under stress, their decisions are thought to be more grounded.

### 2.3.1.4 Execute the chosen course of action

The resulting outcome of the information processing process needs to be acted upon. There are two influences for deciding on a final course of action which need to be distinguished. On the one hand, the **quality of action** may be directly influenced by environmental factors the individual is facing, like some environmental actions might hinder the individual to execute the task to the fullest quality (e.g. cold and stiff hands when climbing a rock). On the other hand, the **anticipated effort** of the response execution can also significantly influence the decision paths that are chosen (Wickens, Keller, & Shaw, 2015). This relates to the knowledge that hands are cold, thus it is much harder to execute under those conditions and it would be safer to not climb up.

#### 2.3.2 Memory

Different stages of memory are outlined in the following, as they influence the situation awareness and the decision phase (figure 2). The ability for the right interplay between the different stages of memory, as well as to store information long-term (or long-term-working) is crucial for the ability to recognize opportunities. Opportunity recognition ability is linked to information processing. In order to process information and make the right decisions, prior knowledge needs to be scanned for ready-known solution practices. In order to link SPS to OR, and to identify how HSPS store and process information, the memory process must be explained. This passage will aim at giving a brief overview.

#### 2.3.2.1 Short-term memory

The short-term memory also referred to as working memory, sorts and processes lots of input, but also loses most of it in a matter of seconds if not rehearsed. Working memory is a capacity-limited mental workspace, which enables simultaneous maintenance and processing of currently active information (Alloway, 2006). Information that is considered important is rehearsed and passed on the long-term memory. This process is known as encoding. The process of the short-term memory is not always stable. Research suggests that the short-term memory is affected and degraded by extreme conditions, such as extreme cold (Van Orden, Benoit, & Osga, 1996) or high altitude (Kramer, Coyne, & Strayer, 1993).

#### 2.3.2.2 Long-term memory

Information stored in the long-term memory is constant over time. Information stored includes sets of facts, skills, acquired procedures, training, learning practices, etc. The information in the long-term memory is only forgotten slowly. The recognition part of the perceptual process starts in the long-term memory, where information is retrieved and compared to the new input information when recognized.

#### 2.3.2.3 Long-term working memory (LTWM)

Long-term working memory was first classified by Ericsson and Kintsch (1995). They refer to it as longterm memory, which has critically underlying situation awareness (Durso, Rawson, & Girotto, 2007). While certain elements may not be rehearsed in an active manner which would be necessary to remain long-term, they remain in the working memory and can, therefore, be quickly retrieved and brought back to mind. This has the benefit of recognizing dynamic situations and keeping track of current events, both designed to protect the human being. Both long-term memory and long-term working memory lie at the core of decision making, namely that of meta-cognition with is the knowledge about one's own knowledge.

The human memory is a large, permanent collection of nodes that become complexly and increasingly interassociated as well as interrelated through the learning process (W. Schneider & Shiffrin, 1977). It must be noted that most of these nodes are passive and inactive and remain stored until needed. Currently activated nodes, however, are termed short-term store. Short-term storage is a temporary state and information is to be lost or forgotten when it reverts from an active into an inactive phase. Many stages in the information processing process are supported by memory. The memory system has traditionally been defined by its time constant.

#### 2.3.3 Situation assessment and decision making

Apart from building the basis for solid decision making, information processing has a significant impact on the process of decision making itself. Considerable evidence highlights that a person's manner of characterizing a situation will determine the decision-making process path to solve a particular upcoming problem. Manktelow and Jones (1987) demonstrated that the context of a problem largely determines the strategy an individual undertakes and, thus, impacts the ability of problem-solving by individuals. "Active elaboration and transformation of the available stimulus information, require the activation and the use of previous knowledge structures, and result in the creation of new knowledge from the combination of stored information and new stimulus details" (Forgas & George, 2001, p. 9). The subjective assessment of the situation and the context determine the adequate adoption of knowledge, based on direct and indirect associations from memory. The assessment depends on experience and acquired skills, but also personality plays a key role in making these evaluations (Zahra, Korri, & Yu, 2005). Strong-minded or overconfident individuals, for instance, have such strong beliefs, that these will also shape the recognition of information. Various decision-making strategies then lead to one final choice (Endsley, 1995). Consequently, information processing is needed to be able to recognize opportunities that might be of future value. The moderators of this research take personality into account which is respectively linked to the way in which individuals process information.

The information processing ability varies from individual to individual, including persons who inhibit the trait of SPS. Due to extensive cognitive developed frameworks, HSPS individuals are superior in situation assessment (Evers et al., 2008). Their increased stimuli perception and memory will allow for grounded decision making based on past experience. Additionally, confidence in their own evaluation will aid the decision-making process. The confidence may come from increased AES levels in HSPS individuals,

especially when they find themselves relaxed and not under pressure when evaluating a situation and deciding on the course of action (Aron & Aron, 1997; Pluess & Belsky, 2013).

A downside of information processing presents itself when too many stimuli are around. Referred to as information overload, the term is used to describe a difficulty in understanding the surroundings and making appropriate decisions accordingly. Information overload is representing "a state of affairs where an individual's efficiency in using information in their work is hampered by the amount of relevant, and potentially useful, information available to them. [...] The feeling of overload is usually associated with a loss of control in the situation, and sometimes with a feeling of being overwhelmed" (Bawden & Robinson, 2009, p. 3). Information overload generally refers to the quantity in information, which is exhausting the



Figure 2 - Information processing process (Wickens et al., 2015)

storage, preservation, and extraction of information. A natural response of individuals when being confronted with much input is to shut down to protect itself from overstimulation (Bawden & Robinson, 2009). In the case of information overload, information becomes a hindrance rather than help. Since HSPS individuals find themselves rather under pressure due to stress and social inhibition (Liss et al., 2005), information overload may be something that HSPS experience frequently. Thus, the situation assessment and the decision making may be postponed to a time where the individual is finding mental peace and has the time to make a decision, away from stressors in the environment. Hence, the smoothness of the process may be hindered more frequently. Figure 2 indicates the normal information processing process (Wickens et al., 2015). The attentional resources, highlighted in blue, will be limiting all steps in the information processing process.

Lastly, referring to the adverse effects, the overdominance bias has to be taken into consideration (see figure 2). The overconfidence bias influences inference and situation assessment. This phenomenon indicates that people appear to be more confident than they have a right to be, based on their own inferences. The bias will have three influences, as it may lead to an underestimation of the frequency of events (thus the time required for success), an underestimation that will lead to under-preparation and result in loose of control, and thirdly, influencing people to be less vigilant. HSPS individuals are not expected to suffer from that

bias, due to their natural reflective and introvert personality (Benham, 2006), yet the bias is something to keep in mind when dealing with overly extroverted individuals like it is the case for entrepreneurs. Thus, the overconfidence bias will be taken into consideration when measuring the key variables.

### 2.4 Opportunity recognition

In this section, opportunity recognition ability will be introduced as it is one of the three key variables of this research. Its understanding is necessary for the relation between SPS to the entrepreneurial variables of this research.

Opportunity recognition (OR) can be defined as the cognitive process through which individuals conclude that they have identified an opportunity (Baron, 2004, p. 1). Opportunity recognition is described as the constant search for patterns, which involves many steps the individual undertakes to recognize. The term opportunity includes three central characteristics: (1) the potential economic value, (2) newness, and (3) perceived desirability (Baron, 2004). The patterns an individual can identify rely on cognitive frameworks that have been acquired through experience (e.g. prototypes) and they play a central role in the OR process. The cognitive process of OR is built around the answer of the following three questions, which relate to the initial process the individual undertakes, how the individual perceives patterns and weighs their importance accordingly, and which particular mental structures play a role in the OR process. Mental structures, acquired through experience, are a leading factor of the connections the individual made and can make to turn diverse and seemingly unrelated internal/external stimuli into information, which is then to sort into known patterns that help identify an opportunity (Baron, 2004, 2006). New business ideas are more likely to be discovered when an individual is able to "connect the dots", hence make use of previously developed patterns. "The prototypes of experienced entrepreneurs were more clearly defined, richer in content, and more concerned with factors and conditions related to actually starting and running a new venture" (Baron, 2006, p. 104). The cognitive process of OR builds around the individual information processing ability and pattern recognition is a key component of OR ability.

Despite the number of researchers in the field, disagreements exist between the nature and composition of opportunities (Hansen & Shrader, 2007). The two most popular schools of thought suggest that opportunities are either discovered or created (Alvarez & Barney, 2007). Other theorists view opportunities as an end product of a creative process that evolves gradually and is the result of a synthesis of ideas over time (Dimov, 2007). Whereas some definitions focus on the chance to introduce innovative goods, services, or processes (Gaglio, 2004), others put their main concern on the role opportunities play in creating new ventures (Baron, 2008). In their literature review, Short et al. (2010) contrasted all dominant views on OR and came to the following definition: "An opportunity is an idea or dream that is discovered or created by an [...] entity and that is revealed through analysis over time to be potentially lucrative" (p. 55).

Still, opportunities may exist for years, even decades, before an individual recognizes, acts on and exploits them (Venkataraman, 1997). Entrepreneurial opportunities are generally understood as "*situations in which new goods, services, raw materials, and organizing methods can be introduced and sold at greater than their costs of production*" (Shane & Venkataraman, 2000, p. 220). This implies that entrepreneurial opportunities are aiming towards a chance to meet a market need, interest or want through unique or creative combinations of resources in order to deliver superior value (Ardichvili et al., 2003). Mental structures, acquired through experience, are a leading factor of the connections the individual made and can make to turn diverse and seemingly unrelated internal/external stimuli into information, which is then to sort into known patterns that help identify an opportunity. When situations appear, such as unmet customer or market

needs, under-employment of resources or new information becomes suddenly available, opportunity recognition is a necessary condition to recognition changes in the environment.

Kuckertz, Kollmann, Krell, and Stöckmann (2017) argue that the mere recognition, however, is not sufficient. The discovery of opportunities does not imply the exploitation which is necessary for an entrepreneurial activity. Thus, opportunity recognition and opportunity exploitation must be treated as separate constructs, although consecutive steps in the entrepreneurial process. This research will lay its main focus on recognition.

Certain attributes for a superior recognition have been identified. Individuals, who are highly alert, identify information asymmetry, and have certain personality traits (like optimism, self-efficacy, and creativity) are more likely to recognize opportunities (Ardichvili et al., 2003; Baron, 2006). Likewise, some of these attributes are used to describe individuals with SPS (Aron & Aron, 1997). Individuals are more prone to recognize opportunities based on mental structures they build and can, therefore, take and process stimuli better and turn the impulse into information (Neisser, 1967; Wickens et al., 2015). In order to be able to identify opportunities, the information processing abilities need to be superior. Individuals with SPS are also known to react more sensitive to stimuli (Jagiellowicz et al., 2010). Based on the increased number of stimuli they perceive and process, they save much information that could be used at a later point in time. This relates to all stages in the information processing process, as well as the memory constructs, which will aid in making decision-making more well-rounded. Additionally, HSPS individuals also tend to "pause to check" and carefully evaluate their options when making a final call due to them being neurotic and their fear of making a wrong decision (Aron & Aron, 1997). This indicates that they let more information influence the ultimate outcome and rely on their past experience to evaluate, which in turn should positively influence their opportunity recognition ability. Therefore, the first hypothesis of this research could be derived.

#### Hypothesis 1.1: Sensory processing sensitivity is positively related to opportunity recognition ability.

The hypothesis may, however, only hold for a certain amount of information input. As mentioned in a previous chapter, SPS has certain benefits and downsides. The advantages and disadvantages of SPS may relate to a model that replicates an inverted u-curve. When there is nearly no information present, even highly sensitive individuals will not recognize opportunities. However, they may not need a lot of information to combine it, forming a relevant opportunity based on their perceiving. Referring to the constitution of OR (Baron, 2006), only three factors need to be present to identify a relevant opportunity, the potential economic value, the newness, and the perceived desirability. Once an individual is able to identify all three, an economically valuable opportunity presents itself. Following up, the more information they perceive, the easier it will get to identify opportunities, both in a higher quality or quantity. However, once a critical amount of information has exceeded, the opposite effect will show. As previously described, the phenomenon of information overload will occur. This relates to the feeling of easily being overaroused, as HSPS will exit situations that cause them too much stress. Hence, they will not be able to recognize opportunities as they protect themselves from overstimulation (Aron & Aron, 1997). The phenomenon is demonstrated in figure 3, indicating an inverted u-curve for the opportunity recognition ability. HSPS individuals will, therefore, differ from individuals without SPS, who are expected to show a more linear relationship due to not showing the same reaction to being overly aroused by many stimuli (figure 4).

What becomes visible from both curves is that HSPS should identify opportunities sooner and to a higher quantity, whereas once information has reached a certain level, a drop will occur caused by stress and

arousal. On the contrary, for the normal population, a more linear relation is expected, seeking for more information in an environment to identify an opportunity. If this assumption holds, a trend should become visible in the scatterplot analysis of the dataset.



#### 2.5 Entrepreneurial Intent

Focus has shifted towards the distinguishment of nascent entrepreneurs from individuals who only show entrepreneurial intent. Thompson (2009) pioneered, as he was one of the firsts, if not even the first, to draw a clear definition. He defined entrepreneurial intent as "a self-acknowledged conviction by a person that they intend to set up a new business venture and consciously plan to do so at some point in the future" (p.676). Thus, individuals who are not thinking about becoming an entrepreneur do not have entrepreneurial intent. On the other hand, individuals who are actively seeking entrepreneurship and are undertaking steps in order to become one, are one step beyond entrepreneurial intent.

Entrepreneurial intention indicates the effort that a person is willing to make in order to carry out entrepreneurial behavior. Three motivational factors were found to influence that behavior (Ajzen, 1991; Liñán & Chen, 2009). First, attitude towards self-employment (personal attitude) refers to the degree to which the individual holds a positive or negative personal impression about becoming an entrepreneur. Secondly, subjective norm refers to the perceived social pressure to carry out (or not out) entrepreneurial behaviors. Thirdly, perceived behavioral control relates to the individual perception of the degree of difficulty of becoming an entrepreneur. The concept is relatively similar to self-efficacy for that reason (Bandura, 1997) and to perceived feasibility (Shapero & Sokol, 1982). All three concepts have the sense of capacity regarding fulfillment of firm-creation and independence in common.

Research in psychology indicates that intentions are a critical predictor of consequent planned behavior (Bagozzi, Baumgartner, & Yi, 1989). Exogenous influences (like demographics, social or financial support) affect attitudes and indirectly intentions (Shapero & Sokol, 1982). Consequently, entrepreneurial intentions have been an important phenomenon in research. The final decision of starting an own business is, consequently, rather planned than out of spontaneous response (Ajzen, 1991). Demographic factors influencing entrepreneurial intent are age, sex, education, work experience, and role models (Ismail et al., 2009; Thompson, 2009). Mazzarol, Volery, Doss, and Thein (1999) and Kolvereid (1996) indicate that females have a weaker desire to become entrepreneurs than males. Prior working experience in entrepreneurial businesses also increases entrepreneurial intention compared to no prior experience

(Kolvereid, 1996). However, Mazzarol et al. (1999) found that the sector is crucial at this point, indicating that government sector work experience leads to less entrepreneurial intention compared to their counterparts in the private sector. Kolvereid (1996) also shows that the type of experience matters, thus already developed high entrepreneurial experience will affect entrepreneurial intent positively. Having a parent who is an entrepreneur leads to a higher entrepreneurial intent in individuals (Krueger Jr, Reilly, & Carsrud, 2000). Webb, Quince, and Association (1982) found that students who had undertaken entrepreneurship courses reported a higher entrepreneurial intention as a consequence compared to students who had not.

The prior stated information indicates that individuals who show entrepreneurial intent do that based on the information input they perceive regarding entrepreneurial activities and process respectively. Superior information processing will not only help in identifying relatively more opportunities but will also influence entrepreneurial intent in a positive way (Zhao & Seibert, 2006). As the individual is processing more stimuli that are within the environment, he or she can compare more decision options based on previously saved mental structures (frameworks). This may influence EI positively, as not only more options arise when processing the given data, but options could potentially be classified as safer or more relevant than others due to sufficient knowledge of the situation. Entrepreneurial intent relates to the willingness an individual is about to make carrying out entrepreneurial activities. This willingness will be much higher when a safe option is recognized. As it is to mention that EI increases through education and/or experience, adequate information processing of these inputs must be given. The ability to recognize opportunities also build on the ability to process information accordingly, relating to pattern recognition and experience. Given that experience seems to positively influence both ORA and EI, it may even moderate their relationship. Plans and future scenarios increase the possibility of success and provide safety. Having outlined that planned behavior is positively related to EI, an entrepreneurial opportunity must occur prior to plans to act on which an individual must first be capable to identify.

#### *Hypothesis 1.2: Opportunity recognition ability is positively related to entrepreneurial intent.*

A third main hypothesis was drawn, relating SPS to EI. As this research is part of larger research conducted, this hypothesis will not be analyzed in this research. However, the need to briefly sketch its underlying principles is there for coherence and completeness, considering it is of importance for the understanding of the second and third group of depth for drawing the hypotheses.

Individuals who are highly sensitive tend to suffer a lot from stress and try to avoid unknown, and therefore stressful, situations by any means. The job of an entrepreneur is relatively more stressful, the number of work hours are larger compared to average jobs, security is lower as well as respective payment (Wiklund, Hatak, Patzelt, & Shepherd, 2018). Individuals with SPS are more prone to suffer from higher stress, which may lead to anxiety and depression (Benham, 2006). Therefore, HSPS individuals may be afraid of the prospects of becoming entrepreneurially self-employed and independent. Due to their security-seeking behavior as a coping mechanism of being overly aroused easily, HSPS individuals may not show high entrepreneurial intent. This is a consequence of rather emotional reasons than intellectual reasons, having outlined that HSPS individuals are thought to be intelligent and reflective when given the time to process information accordingly. In an entrepreneurial context, the landscape is stressful and often requires "hot" decisions (see decision-systems hot vs. cool, hot as being impulsive ad rapid and cool as in analytical and reflective) (Wood & Bechara, 2014). Making impulsive decisions based on short time frames may exactly be one of the reasons HSPS do not show entrepreneurial intent. This builds the foundation of the following

hypothesis, which again will not be answered in this research, but is important for the second and third groups of hypotheses.

Additional Hypothesis 1.3: Sensory processing sensitivity is negatively related to entrepreneurial intent.

### 2.6 The Big Five

When describing the individuality of human beings, it is most commonly referred back to personality. Personality is what distinguishes people and sets them apart from each other. According to Revelle (1995), personality is one coherent pattern of affect, cognition, and desires as they lead to behavior.

Personality traits are broad descriptions of the individual differences people have, expressing in the way they behave, feel and think. The Big Five personality traits, also known and referred to as the five-factor model in literature, are five main descriptors of personality. In psychology literature, they are best accepted and most commonly used. They act as a general basis for personality trait identification and evaluation. This theory provides a common language to describe the human personality (Goldberg, 1993). The initial model was first outlined by Tupes and Christal (1980) but failed to reach academic interest. This changed when Digman (1990) advanced the five-factor model and Goldberg (1993) extended it further. The five traits include:

- 1. Extraversion
- 2. Conscientiousness
- 3. Neuroticism
- 4. Agreeableness
- 5. Openness to experience

With the items being translated into over 40 languages, and the results being back-translated suggests that the phenomena can be expressed and observed in all the languages examined (McCrae, 2007).

As this research is part of a bigger project, only three out of the five Big Five will be considered in more detail in the following, as these traits are the once of relevance for the focus of this research. The three factors covered are conscientiousness, neuroticism, and openness.

### 2.6.1 Conscientiousness

Conscientiousness is the Big Five trait capturing individual differences based on the degree of organization, persistence, and motivation towards goal-directed behavior. Individuals scoring high on conscientiousness are described as organized, reliable and ambitious (Allport, 1961; Costa & McCrae, 1985). Barrick and Mount (1991) have linked this concept to the ability to work hard. Success at work can be linked to the trait of conscientiousness (Judge, Higgins, Thoresen, & Barrick, 1999). Some scholars regard conscientiousness as a broad personality term, which composes two facets: achievement motivation and dependability. Achievement motivation, on the one hand, drives individuals into becoming more independent. Dependability, on the other hand, reflects the extent to which one is organized, deliberate, and methodological. Conscientious individuals, therefore, fulfill their duties and responsibilities (McClelland, 1965). Collins, Hanges, and Locke (2004) and Stewart and Roth (2007) confirmed this assumption in their studies via meta-analyses.

Since conscientious individuals are driven by a high need for achievement, a career in entrepreneurship appears natural as they prefer situations in which their own achievements are a result of their own efforts and hard work. McClelland (1961) proposed that the high need for achievement would drive an

entrepreneur much stronger than a normal employee or manager, as those typically work with, for and through others. As entrepreneurs differ significantly on 4 personality dimensions from managers, this assumption was supported in a meta-analysis by Zhao and Seibert (2006). They found that conscientiousness, agreeableness, neuroticism, and openness all differentiated significantly from managers personalities. Entrepreneurs scored significantly lower on neuroticism and agreeableness than managers, significantly higher on openness and conscientiousness.

#### 2.6.2 Neuroticism

Neuroticism has also been referred to as "emotional stability" in literature and represents the individual adjustment a person needs to emotionally comprehend the environment (Zhao & Seibert, 2006). Individuals high on neuroticism tend to experience numerous negative emotions, including anxiety, depression, hostility, impulsiveness, self-consciousness, and vulnerability. The feeling of being tense and jittery is the best indicator of Neuroticism (Costa & McCrae, 1992). People who score low on neuroticism, on the other hand, can be characterized as calm, even-tempered, relaxed and self-confident.

Neuroticism is one of three Big Five (together with openness and agreeableness), which appears to be most relevant to career success (Judge et al., 1999). Entrepreneurs work in a relatively unstructured environment, often over hours, and are the primary person responsible for all aspects of the company. They, typically, have a substantial financial and personal factor invested in a company. The work environment, workload, family-work concoct, and the financial risk of starting a new business can create physical and mental stress (Zhao & Seibert, 2006). However, entrepreneurs are often described as individuals who show high self-confidence (Chen, Greene, & Crick, 1998; Crant, 1996), and they tend to show a strong belief that they have the ability to control outcomes in their environment (Simon, Houghton, & Aquino, 2000). These are traits that define low levels of neuroticism. Therefore, individuals who carry out a career as an entrepreneur are expected to have lower levels of neuroticism, as they strongly believe in their own (future) achievements. Zhao and Seibert (2006) showed lower levels of neuroticism in entrepreneurs and due to the fact that entrepreneurs can determine their workload independently and therefore structure their environment to their liking, they are less neurotic. Self-confidence in entrepreneurs is typically also higher, which causes less neurotic behavior.

#### 2.6.3 Openness

Openness to experience is one of the Big Five dimensions of individual personality difference. Openness has been characterized in "both structural and motivational terms. Openness is seen in the breadth, depth, and permeability of consciousness, and in the recurrent need to enlarge and examine experience" (McCrae & Costa, 1997, p. 826). Individuals, who score high on openness, are tolerant of ambiguity, able to make remote and unusual associations; they are also curious, innovative and imaginative (McCrae, 2007). Open people notice more about the world, due to attention to both internal and external stimuli (Evans & Rothbart, 2007). Someone scoring high on openness can be characterized as innovative, creative, imaginative, reflective and even untraditional. On the other hand, someone scoring low on openness is more conventional, has a much narrower interest, and is unanalytical (Zhao & Seibert, 2006). Aesthetic chills are particularly relevant to openness; people who score high in openness are particularly sensitive to art and beauty, as they are prone to experiencing a wide range of feelings and emotions (Terracciano, McCrae, Hagemann, & Costa, 2003). Openness to experience has been found to link to the likelihood of obtaining a leadership position. Schretlen, van der Hulst, Pearlson, and Gordon (2010) linked openness to broad intellectual skills and knowledge, which indicates that openness to experience leads to knowledge and skill

gains, which naturally increase with age. Openness has been found to be extremely stable over time (Soldz & Vaillant, 1999).

Open people notice more about the world as they are mot attentive to both internal and external stimuli (McCrae, 2007). Since they are more creative and more willing to create something larger than themselves (Engle, Mah, & Sadri, 1997), openness is thought to be one of the main personality traits of a good entrepreneur. As managers tend to stick more to rules and regulations evens o in fast-changing business environments, flexibility has been seen as a great attribute of entrepreneurs (Zhao & Seibert, 2006).

#### 2.6.4 The entrepreneurship prone personality profile

A person can fit the role of an entrepreneur better than others, based on his or her personality. Growing evidence suggests that there exists such thing as an entrepreneurship-prone personality profile, which is essentially an entrepreneurial constellation of the Big Five traits within a person that is particularly predictive of characteristics necessary for entrepreneurial activities. This set of personality traits, however, is not meant to relate exclusively to entrepreneurs, but only reflect a characteristic constellation that will ultimately make entrepreneurial behavior (in the future) more likely (Obschonka, Schmitt-Rodermund, Silbereisen, Gosling, & Potter, 2013). An entrepreneurship prone personality profile, or simply entrepreneurial trait profile (ETP), consists of high extraversion, openness to new experiences, and conscientiousness, and low agreeableness and neuroticism. The combination of such traits is expected to generate successful entrepreneurship (Costa, McCrae, & Holland, 1984; Schmitt-Rodermund, 2004).

One aspect to note is that the entrepreneurial trait profile which is seen as ideal, so the highest values in extraversion, conscientiousness, and openness; and the lowest values in agreeableness and neuroticism is not representing a desirable real person or a perfectionated entrepreneur. These values are rather to be taken as a fixed statistical extreme profile, which means add up into a single index. Each individuals deviation from the maximum can be assessed by an overall goodness-of-fit measure (Obschonka et al., 2013). Goodness-of-fit measures as such have been used in numerous previous studies on personality before (Asendorpf & van Aken, 1999; Block, 2008; Chapman & Goldberg, 2011).

Highly sensitive individuals are supposed to deviate from the ETP norm, hence not show an ideal ETP (Aron & Aron, 1997; Schmitt-Rodermund, 2004; Zhao & Seibert, 2006). Indeed, HSPS does not determine any of the Big Five per se, so deviations are natural and possible (e.g. being high in extraversion is possible even with HSPS), however, certain trends in personality are common and more likely. Thus, HSPS are expected to not show high extraversion due to their analytical and rather shy and reflective personality (Aron & Aron, 1997). This is, however, a reason as to why HSPS individuals are expected to be very contentious as well. As being stereotypically seen as empathic people, who listen well and show support, HSPS would be generally seen as more agreeable. Given the high conscientiousness, agreeableness may also result from trying to avoid conflict which may result in stress and anxiety for HSPS (Liss et al., 2005). Avoiding conflict and giving in is not beneficial for entrepreneurial activities (Zhao & Seibert, 2006). Due to their neurotic tendencies, HSPS may doubt their course of action and suffer from the stress of making a final call that will decide on their company's course of actions (Judge et al., 1999). Since the decision for the own company depends on self-sustainment and survival, the stress will be increased. Naturally, HSPS are careful to avoid this. Lastly, due to their genetical predisposition of high stimuli recognition, HSPS are more open and reflective to their surroundings, a quality necessary for entrepreneurs when recognizing opportunities (Zhao & Seibert, 2006).

On the other hand, having a high ETP is not impossible for HSPS. Indeed, personality may change due to the life cycles of an own business, as people grow with their tasks (Oosterbeek, Van Praag, & Ijsselstein, 2010). Thus, if a HSPS had an ideal ETP, they would be suffering less from the downsides of their own personality and be able to identify economically valuable opportunities in the environment, which previously they could not as their levels of neuroticism, anxiety, and agreeableness were holding them back. Due to their superior stimuli perception and processing abilities, they will find it easier to grasp information from the environment and turn them into opportunities respectively, before a potential competitor could.

The following hypothesis derives from the assumptions of the ETP:

# H2: The positive relationship between SPS and OR is moderated by the ETP; higher levels of ETP is strengthening the positive relationship between SPS and OR.

Since the ETP is assumed to have a moderating effect, the individual sub-constructs that entail the Big Five will also be considered more up close.

Some personality traits that are used to classify HSPS are not ideal for entrepreneurs (Aron & Aron, 1997; Schmitt-Rodermund, 2004; Zhao & Seibert, 2006). Because of having a personality that is less prone to entrepreneurial success, it can be assumed that SPS will have a negative influence on EI, as HSPS will naturally avoid being the center of attention and demonstrating their abilities under stressful conditions (Aron & Aron, 1997). Conscientiousness is assumed to have a moderating impact on that relationship. Individuals who are high in continuousness, like to plan their actions and are able to memorize information from their environment well (Zhao & Seibert, 2006). Contentiousness is supposed to make the relationship toward EI stronger, hence the negative relationship between SPS and EI is anticipated to become weaker the higher conscientious the individual is.

# *Hypothesis 3.1.1: The negative relationship between SPS and EI will be moderated by conscientiousness. The more conscientious, the weaker the negative the relationship between SPS and EI becomes.*

Openness to new experiences is found to be high in entrepreneurs, therefore expected to positively influence EI. Individuals who are open are tolerant of ambiguity, able to make remote and unusual associations; they are also curious, innovative and imaginative (McCrae, 2007). These attributes have been used to describe HSPS as well, due to the fact of them being analytical and curious about their surroundings (Aron & Aron, 1997). Thus, openness is supposed to make the link to EI stronger, hence the negative relationship between SPS and EI is anticipated to become weaker the more open an individual appears to be.

# *Hypothesis 3.1.2: The negative relationship between SPS and EI will be moderated by openness to new experiences. The more open, the weaker the negative the relationship between SPS and EI becomes.*

Highly sensitive individuals are strategic minds (Aron & Aron, 1997). In order to recognize opportunities, the individual needs to be alert (Baron, 2006). Since conscientiousness is associated with achievement motivation and dependable high work performance as well as with the ability to memorize information easily and reflect upon it, OR ability should be influenced positively. The more conscientious an HSPS individual, the stronger the relationship between SPS and OR should become.

*Hypothesis 3.2.1: The positive relationship between SPS and OR will be moderated by conscientiousness. The more conscientious, the stronger the relationship between SPS and OR becomes.*  When an individual shows high levels of Neuroticism, the tendencies to self-doubting behaviors and less confidence in oneself increase (Zhao & Seibert, 2006). This is the case for HSPS individuals. Being less emotionally stable will result in high stress, anxiety or depression. Thus, the initial mental space for opportunity recognition may not be given, as individuals may focus on their protecting own rather than being alert towards the environment surrounding them (Ajzen, 1991). Also, neuroticism makes HSPS individuals doubt about a chosen course of action, as they will want to perfection the outcome by having more time to reflect and choose wisely. As it is important to act upon opportunities fast, due to the chance of somebody else acting upon it first, neuroticism is thought to hinder the positive relation between SPS and OR.

# *Hypothesis 3.2.2: The positive relationship between SPS and OR will be moderated by neuroticism. The more neurotic, the weaker the relationship between SPS and OR becomes*

Openness to new experience enables the individual to have a more open point of view on what is taking place in the environment surrounding him/her. Highly sensitive individuals are more generally more fearful of new stimuli, because of the easy of being overaroused. On the other hand, they are able to make unusual associations and are imaginative and creative (Aron & Aron, 1997). Generally, HSPS individuals are thought to be more open, based on their natural curiosity. Hence, they will be more open to embracing opportunities as well once they are able to identify one.

# Hypothesis 3.2.3: The positive relationship between SPS and OR will be moderated by openness to new experiences. The more open, the stronger the relationship between SPS and OR becomes.

Conscientiousness is associated with motivation to perform independently at high levels. This personality trait is especially found in entrepreneurs. An entrepreneur needs the ability, and the confidence, to act independently at a high-performance level. However, entrepreneurs also need to ability to recognize opportunities for sustainment. When a conscientious individual is able to identify highly relevant opportunities, the need for acting on it will result (Ajzen, 1991; Ardichvili et al., 2003). Thus, conscientiousness is anticipated to moderate the relation between the ability to recognize opportunities and the resulting entrepreneurial intent positively.

# *Hypothesis 3.3.1: The positive relationship between OR and EI will be moderated by conscientiousness. The more conscientious, the stronger the relationship between OR and EI becomes.*

For the positive relation between OR and EI, sufficient knowledge of the initial situation is key. An individual must be in the mental state to identify opportunities and process information accordingly. As neuroticism is thought to lead to less self-esteem (McCrae, 2007), individuals may not believe in the opportunities they have identified. Consequently, they lack the belief that with the opportunity they were able to identify, success could follow. Therefore, fear (caused by anxiety and stress) is blocking the belief in oneself that the future as an entrepreneur would actually be worth the try. Thus, the motivation to start entrepreneurially is low, hence EI is expected to be moderated in a negative way by neuroticism.

# *Hypothesis 3.3.2: The positive relationship between OR and EI will be moderated by neuroticism. The more neurotic, the weaker the relationship between OR and EI becomes.*

When being able to ident opportunities, openness to new experiences will moderate EI. This may be due to the fact that individuals are looking forward to the prospects that their identified opportunity could bring, both in terms of economic value and self-realization. Hence, being open to the idea of entrepreneurship, therefore showing EI, is a result of having an open personality to what the future could hold. Additionally,

being able to identify opportunities is influencing the quality of an opportunity positively, whereas being open to the environment is influencing the quantity as well. Thus, an open individual with OR ability has not only many opportunities to select from, but also ones in high qualitative standards.

Hypothesis 3.3.3: The positive relationship between OR and EI will be moderated by openness to new experiences. The more open, the stronger the relationship between OR and EI becomes.

### **3. METHODOLOGY**

In order to comprehend the research of this thesis, the suitable research design, data collection, and data analysis method will be defined in this section. To test the hypotheses, a quantitative research was conducted due to the cross-sectional design of the study as well as for the generation of a representative overview (Bryman & Bell, 2011). Additionally, the collection strategy will be illustrated, the relationship assumed, and conceptual models operationalized.

### 3.1 Research design

The lack of secondary data in the field of SPS required the collection of primary data. By using both quantitative and qualitative data gathering methods, the findings of the qualitative research method helped interpret and put the results of the quantitative measurements in context. Ultimately, this is leading to a higher understanding of the concept and a more valid and reliable research (Bryman & Bell, 2011). A mixed method research is conducted due to the expected limited number of individuals with SPS.

The chosen quantitative method in this study is an online self-completion questionnaire. This method has been chosen because it is a convenient way of addressing a large sample as well as researching multiple variables at once (Babbie, 2007; Bryman & Bell, 2011). The chosen method is cheap to administer, reduces the error of bias and provides for a greater anonymity for the respondent which increases the reliability of the response (Phellas, Bloch, & Seale, 2011). However, since the research requires multiple concepts to be tested, one of the main concerns is to keep the questionnaire short and simple in order to avoid questionnaire fatigue (Bryman & Bell, 2011). A pre-test among students provided a check for comprehensibility and a confirmatory factor analysis of the scales and the Cronbach's Alpha for internal reliability.

The sample was retrieved from students enrolled in the University of Twente (UT). This university offers 10,435 students an education in five different academic faculties (W. Nijhuis, a center for educational support, personal communication, May 30th, 2018). Solely UT students have been included in the study, firstly because of the difficulty involved in achieving a stratified random sample based on multiple universities. Secondly, a reason for relying solely on UT students was due to the time constraints of this research, as it was limited to the scope of a master thesis. Third and lastly, students from the UT were easily accessible to the author(s) of this research due to the sharing of the same University. It was concluded to only focus on the UT for stratifying reasons, as the results, when stratified, should give a general depiction of the whole population.

The sampling method used is a stratified random sampling method. Stratified random sampling is a variant of random sampling, which allows specific subgroups to be studied in greater detail. The technique is useful as it ensures the presence of a key subgroup within a larger sample. Therefore, characteristics under the study of the whole population should be known (Marshall, 1996). As SPS is a small and very specific subgroup within a larger population, it appears reasonable to use a stratified random sample to detect the presence of the subgroup. The stratified random sample was made proportional to the size of each study programme individually, as well as the level of education and gender (see table 1). The first stratification was based on study direction and has been categorized into *MINT* (Mathematics, Informatics, Natural & Technology) and *Social* studies. Thereby, MINT consisted of faculties TNW, CTW, EWI, and ITC, whereas

Social consisted out of the faculty BMS. The second criterion applied was the current level of education applied on Bachelor, Master and Ph.D. students, and finally stratified on gender (male or female). The criteria used will ensure homogeneous groups within the strata (Bryman & Bell, 2011). Consequently, the results are relatively unbiased and more resembling a normal distribution (Hsieh, Ding, Wu, & Pedram, 1996).

The use of student samples has been criticized heavily, mainly due to concerns with the generalization to non-student populations (Bello, Leung, Radebaugh, Tung, & Van Witteloostuijn, 2009; Peterson & Merunka, 2014; Randall & Gibson, 1990). However, since the study is supported by a systematic literature review, the implied homogeneity of students and the convenient access of university students is given, a student sample is used (Bello et al., 2009). Moreover, student samples are very common in entrepreneurial research (Liñán & Chen, 2009). Although the homogeneity of the sample might increase the research validity, reproducibility was kept in mind (Peterson & Merunka, 2014).

#### 3.2 Population & sampling

The final sample consisted of 103 students from the UT. Theories concerning the optimum sample size are at issue and have been heavily criticized over the years (Fowler Jr & Cosenza, 2009). Recommendations differ in sample-to-variable, as, 5:1 has been found adequate but the 10:1 ratio is more commonly applied. The recommendation of Hair, Black, Babin, and Anderson (2014) suggests looking at the number of independent variables, preferred significance level, and R2. The survey of this research was designed to measure eight independent constructs (SPS, OR, EI and each of the Big Five). Based on a significance level of .05 and a preferred R<sup>2</sup> of 20 percent, the sample should entail approximately 90 respondents. Therefore, the acceptable sample is set at 100. This number is similar to Cohen (1992) recommendation and is furthermore supported by using the rule of thumb of Green (1991) for multiple regression analyses.

The data collection for this research has been conducted via different distribution channels. At first, personal acquaintances have been approached via private e-mail or been contacted directly and been asked to further distribute the questionnaire within their personal network as well. Among these contacts, members of students' associations and other UT-based associations were included. In the e-mail, the link to the online survey was provided. The online survey had been created by the use of Google Docs. Secondly, students have been approached via social media, using special groups within Facebook and LinkedIn, not directly affiliated to the UT but well used by the students. Consequently, some bias is involved in the stratified random sampling because of the distribution channels, since direct friends and/or colleagues are more likely to respond on the request. All approaches have been executed while considering the individual privacy rights.

The quantitative element of the research was supported by the qualitative method of semi-structured interviews. This method aids at a deeper understanding of the findings provided in the questionnaires. Additionally, research regarding entrepreneurship relies heavily on surveys. By supporting the method with interviews, the room is given for triangulation of the results as encouraged by Shook, Priem, and McGee (2003). During the interviews, questions were asked relating to the main concepts of the questionnaire; Entrepreneurial Intent, Opportunity Recognition, and Sensory Processing Sensitivity (see appendix 8.5 for the interview guide). The questions were presented in a way that the necessary data was retrieved while also the necessary background stories and motives became apparent. Overall, the aim of the interviews was solely to verify outcomes of the quantitative study and to get a rounded overview of a) individuals who are entrepreneurs despite being highly sensitive, and b) identifying barriers for highly sensitive individuals for

not becoming entrepreneurs. The advantage of this method is the allowance for flexibility from both the interviewer and the interviewee (Bryman & Bell, 2011).

Stratified Random Sample										
	Bachelor	Male	Female	Master	Male	Female	PhD	Male	Female	Total
MINT	38	27	11	26	18	8	4	3	1	67
SOCIAL	19	10	9	14	7	7	2	1	1	34
TOTAL	57	37	20	39	25	15	6	4	2	103

Table 1 - Stratified random sample distribution

#### 3.3 Operationalization

This research focuses on the relationship between three main concepts and the influence of two moderators. Therefore, the questionnaire created captured all elements by testing SPS, OP, EI and the Big Five. In total, the questionnaire contained 43 items, 34 measuring the main concepts, as well as 9 additional items for control and information purposes, including questions on study faculty, type of study or entrepreneurship parents.

Prior research provided several well-known scales for the measurement of the constructs and have been selected based on reliability and length of this research. Due to time constraints, it was preferred to select already established measurement scales. The chosen scales include the HSP-scale by Aron and Aron (1997), the opportunity recognition scale by Ozgen and Baron (2007), as well as the OR scale by Kuckertz et al. (2017) have been used for the measurement of OR. For measuring the concept EI, the scale of Liñán and Chen (2009), and for the Big Five the measurement created by Rammstedt and John (2007) have been used. The reason for using two OR scales is based on security and reassuring, as using a 3-item scale for measurement is risky in samples. This is due to needing a high reliability on the 3-item test as well as three distinct factors in the factor analysis for this OR scale. However, the probability of clear results showing is less in this type of research as it is limited by scope and time. So, for security a second measurement was applied, to test how both of the scales would perform and be able to draw a comparison between the two.

Besides the measurement scale, also the Likert scale measurements were used from the prior research to ensure intact validity and reliability. The OR scale of Ozgen and Baron (2007) and the Big Five were measured on a 5-point Likert scale ranging from 1 = disagree strongly/fully disagree to 5 = agree strongly/fully agree. The HSP-scale was measured on a 7-point Likert scale ranging to the extent to which the respondent could associate him/her self in the situation (1 = not at all and 7 = extremely). EI and OR (Kuckertz et al., 2017; Liñán & Chen, 2009) have also been measured using a 7-point Likert scale anchored by 1 = totally disagree and 7 = totally agree.

In the following sections, each construct that was used for measurement in the questionnaire will be introduced shortly.

#### 3.3.1 Measuring sensory processing sensitivity (Aron & Aron, 1997)

The Highly Sensitive Person or HSP-scale is the only self-report measure for assessment of the general sensitivity to the environment (Aron & Aron, 1997). Based on a 27-item questionnaire, it measures the personality trait SPS.

In this research, a 12-item scale is used to measure SPS, which is a shorter version of the original 27-item scale (Aron & Aron, 2018). The shortened scale is found to be comparable to the HSP-scale in psychometric and construct validity properties, the Cronbach's alpha range between .74 (Pluess & Boniwell, 2015) and .89 (Lionetti et al., 2018). Example items are 'Do you seem to be aware of subtleties in your environment?', 'Do changes in your life shake you up?' and 'Are you bothered by intense stimuli, like loud noises or chaotic scenes?'.

Recent research indicates the division of SPS into three groups (high, medium and low) (Lionetti et al., 2018). For the purpose of the identification of Highly Sensitive People, as necessary for the interviews, the mean score of SPS was computed. Therefore, preliminary cut-off scores were used to determine certain personality profiles for the sake of clustering groups in this research (Lionetti et al., 2018). The sole purpose of the clustering was to determine the profile for contacting interview participants at the very end of the research, to validate the hypotheses. The cut-off rates were not used during the quantitative analysis. Highly sensitive people comprise of the 31% highest scores, 29% of the lowest scores make for the low-sensitive group and 40% in the middle of the medium-sensitive group. For the cut-off rates for the present study, low- sensitive people present an average score below 3.5, highly-sensitive are classified by an average score of above 4.5 and medium-sensitive individuals entail average scores between 3.5 and 4.5. However, cut-off rates must be applied with caution, since the HSP-scale is a self-report measurement that may result in some noise due to its constitution (Aron & Aron, 2018), as already mentioned and mentioned and criticized in the analysis of the SLR.

#### 3.3.2 Measuring opportunity recognition ability (Ozgen & Baron, 2007, Kuckertz et al., 2017)

For the measurement of opportunity recognition, an established 3-item scale was used, which is a selfreport tool. Ozgen and Baron (2007) conducted an exploratory factor analysis in their research on all items they included. The results showed irregularities within the construct of opportunity recognition. Two clearly distinct factors emerged, one on self-reflecting ability to recognize opportunities and the other on alertness to opportunities when they are present. The same factors had previously been reported in research by Singh, Hills, Hybels, and Lumpkin (1999). As the reliability only resulted in a satisfactory level on two factors, the others revised the measure of opportunity recognition. The three items used to measure the construct of OR were as follows: (1) "While doing about day-to-day activities, I see potential new venture ideas all around me", (2) "I have a special alertness or sensitivity towards new venture opportunities", and (3) Seeing potential new venture opportunities does not come very natural to me", which is reverse scored. The reliability resulting from the three items was relatively high with a Cronbach's alpha of 0.80 scoring a "good" on internal consistency. The results of Ozgen and Baron (2007) research underlines the fact that OR cannot be measured in one single question and more factors have to be considered to do so. Therefore, the opportunity recognition item scale for this research will build upon the 3-item scale Ozgen and Baron (2007) used.

As it is risky to measure one of the main concepts of this research with only a 3-item scale, as the factor analysis may not result in three distinct factors, another scale was introduced to measure OR. The reliability from such a measure may suffer significantly. Due to the self-assessment nature of the questionnaire, a natural bias has to be calculated for. The decision was also grounded due to be able to compare the measuring power of the two consecutive scales. The 5-item opportunity recognition scale was developed by Kuckertz et al. (2017) and is a relatively recent addition to the literature. The authors make a point to differentiate between opportunity recognition, which they characterize by "being alert to potential business opportunities, actively searching for them, and gathering information about new ideas and services" (p.92), and opportunity exploitation, which they define as "developing a product or service based on a perceived
entrepreneurial opportunity, acquiring appropriate human resources, gathering financial resources, and setting up the organization" (p.92). They criticize the lack of distinct measures for both very different concepts, which hinders to obtain a common understanding of similarities and differences. The scale was specifically developed to overcome these limitations. The 5-item OR scale is measured on a 7-point Likert scale. The factor analysis resulted in two factors, one for OR and one for OE which both performed well ( $\chi 2/df = 3.76$ , CFI = 0.94, SRMR = 0.05). In the one factor model, which measured each scale individually, the retest results did perform equally as well ( $\chi 2/df = 7.32$ , CFI = 0.87, SRMR = 0.09). To statistically assess the mode (reflective vs. formative), Kuckertz et al. (2017) ran a confirmatory tetrad analysis (CTA). The CTA returned insignificant, suggesting that both measurement models are reflective. The coefficient  $\alpha$  for the opportunity recognition scale was 0.87, which is considered adequate. The total item correlations ranged from 0.62 to 0.76, averaging at 0.7, which is also adequate. Each of the 5 items has been tested as "reflective" by a confirmatory factor analysis.

## 3.3.3 Measuring entrepreneurial intent (Liñán & Chen, 2009)

In order to measure the variable of entrepreneurial intent, the entrepreneurial intention questionnaire (EIQ) of Liñán and Chen (2009) will be used. The EIQ was specifically developed to overcome previous research limitations. The goal was to better comprehend which factors are affecting entrepreneurial perceptions. In the past, a lot of research on entrepreneurial intentions has used linear regression models like the one of Chandler and Lyon (2001) despite the risk of biased results. The six items representing the measurement scale are all aggregates measures for the three motivational antecedents from the theory of planned behavior (TPB) (PA, SN, and PBC), measured on a 5-point Likert-scale. The items asked for have been based on theory and been previously validated via empirical research Liñán and Chen (2009). The measurement of six items instead of only one was used based on Nunnally (1978), who suggests that multi-item scales are more reliable than single-item scales. Example items are: 'I am ready to do anything to be an entrepreneur' and 'I have very seriously thought of starting a firm'. Structural Equation Modelling was used to test the empirical validity of the measurement (Liñán & Chen, 2009). The factor analysis resulted in four factors on all four constructs they measured, in line with the theoretical assumptions prior. This includes one overall factor for EI. Previous research shows Cronbach's alphas on the factors within the construct ranged from .776 to .953, which indicates "reliable" to "very good" on internal consistency (Liñán & Chen, 2009).

# 3.3.4 Measuring the Big Five (Rammstedt & John, 2007)

The Big Five framework, as the measurement of personality constructs, is included in this research, as it is supposed to show effects on entrepreneurial concepts, namely SPS, EI and OR, as certain traits increase the entrepreneurial satisfaction and likelihood (Schneider, 1987). When measuring the Big Five, many established options are given to researchers. The first Big Five Inventory (BFI) was developed in the late 1980s. 44 short-phrase items, which took about 5 minutes response time, were sufficient to measure the Big Five. However; there are more inventory tests, like the 140-item NEOP Personality Inventors (Costa & McCrae, 1992), the 100-item trait-descriptive inventory (Goldberg, 2006), the 60-item NEO Five-Factor Inventory (Costa & McCrae, 1992), and the most used and popular 50-item International Personality Item Pool (IPIP) (Goldberg 2006). There are many more item tests to test an individual's personality, Credé, Harms, Niehorster, and Gaye-Valentine (2012) give a neat overview and comparison in their article.

When asking respondents to complete a long survey with seemingly repetitive items, boredom, fatigue, and annoyance may result (Burisch, 1984; Robins, Hendin, & Trzesniewski, 2001). The likelihood that respondents will attend the questionnaire at all, fill it in with care or agree to follow-up research, therefore, shrinks.

The demand for shorter personality instruments is growing. Two minimal personality measures were developed by Rammstedt and John (2007) introducing a single-item ability rating (BFI-10) and Gosling, Rentfrow, and Swann Jr (2003) introducing a 10-item measure of the Big Five (TIPI). These short instruments show respectable psychometric characteristics, which suggests that a short version of the BFI may be feasible (Burisch, 1997). For this research, the focus is on the Big Five instrument of Rammstedt and John (2007), who adapted the original Big Five inventory, a 44 short-phrase item pool, and abbreviated it into 10 items, with 2 items on a 5-point Likert scale (1 = Disagree strongly, 5 = Agree strongly), one being normally scored and one being reverse scored per item. The Big Five inventory scales captured 70% of the Big Five inventory variance and retrained 85% of the retest reliability. For Agreeableness, a third item was included, as the correlation and the validity of Agreeableness can be increased by including a representation of altruism. This resulted in a total of 11 items. The reliability coefficients ranged from a .58 (agreeableness) to a .84 (extraversion), averaging at a .73. The BFI-10 was chosen over the TIPI because it shows a clear five-factor structure and has high internal reliability, whereas Gosling et al. (2003) report item intercorrelations within the TIPI and the expected five-factor structure did not emerge. Therefore, the BFI-10 will be used to measure the Big Five in this research. Short instruments are recommended to be used instead of long ones when the time is limited, personality is not the primary topic of interest or brevity prevents survey fatigue (Gosling et al., 2003).

### 3.3.5 Determine an entrepreneurial trait profile

The entrepreneurial trait profile (ETP) measurement in this research will be inspired by research conducted by Schmitt-Rodermund (2004) who introduced the concept of the ETP originally and has been widely cited in literature accordingly (Obschonka et al., 2013; Rauch & Frese, 2007; Thompson, 2009). Generally, the higher the value an individual is able to reach in the ETP, the more of an entrepreneurial personality the individual inhabits. On the Likert scale ranging from 1-5, which measures the Big Five constructs, the trait profile will be as follows: agreeableness (5 = low, 1 = high), conscientiousness (1 = low, 5 = high), extraversion (1 = low, 5 = high), neuroticism (5 = low, 1 = high), openness (1 = low, 5 = high). Consequently, the ETP consists of high extraversion, conscientiousness, and openness, as well as low agreeableness and neuroticism. To determine the total score, however, agreeableness and neuroticism are measured reversely (see table 2).

CONSTRUCT	SCORE	MEANING
EVTDAVEDSION	1	Individual scores low on extraversion
EATRAVERSION	5	Individual scores high on extraversion
CONSCIENTIOUSNESS	1	Individual scores low on conscientiousness
CONSCIENTIOUSNESS	5	Individual scores high on conscientiousness
ODENNIESS TO EVDEDIENCE	1	Individual scores low on openness to experience
OPENNESS IO EXPERIENCE	5	Individual scores high on openness to experience
A CDEE A DI ENIESS*	1	Individual scores high on agreeableness
AGREEADLENESS.	5	Individual scores low on agreeableness
NEUDOTICISM*	1	Individual scores high on neuroticism
NEURO IICISM*	5	Individual scores low on neuroticism

Table 2 - ETP score determination Items with a \* are reverse coded, the higher the score, the higher the ETP

In a cross-sectional study, Schmitt-Rodermund (2004) compared a sample of school students (age 14-17) in East Germany by questionnaire to a sample of business founders by the means semi-structured interviews (age: m = 39, SD = 8.64). The Cronbach's alpha for both groups is displayed in table 3.

ETP	SCORE	ALPHA STUDENTS	ALPHA FOUNDERS
EXTRAVERSION	1 = low 5 = high	.78	.71
CONSCIENTIOUSNESS	1 = low 5 = high	.78	.76
OPENNESS TO EXPERIENCE	1 = low 5 = high	.58	.71
AGREEABLENESS*	1 = high 5 = low	.56	.74
NEUROTICISM*	1 = high 5 = low	.67	.77

 Table 3 - Cronbach's alpha in groups (Schmitt-Rodermund, 2004)

In the questionnaire, out of each of the five traits, one was measured reversed according to the authors, so that scores had to be reversed again during analysis to be able to determine an accurate ETP. As the scale for agreeableness or neuroticism, in the questionnaire, determined a high score for the personality trait, whereas the ETP considers a high score for the opposite, agreeableness and neuroticism had to be reverse coded again, for the ETP particularly. Generally, it can be said, the higher the values attained on the ETP scale, the better the entrepreneurial profile becomes and vice versa.

#### 3.3.6 Control variables

The number of variables controlled was based on prior literature. Since the unit of analysis is university students, a filter variable for being a student needed to be included as anyone who is not can be excluded from this research. This relates to the measure of age, as students are typically in a certain age group. The University of Twente offers programs in Bachelors, Masters, and Ph.D.'s; thus, it is included in this research for control purposes. Zhao and Seibert (2006) argue that individuals who will be attracted to entrepreneurship will find a self-perceived match between their own personalities and the tasks demanded for entrepreneurship. Krueger Jr et al. (2000) argue that any decision involved in forming a future business is rather planned than being a conditioned, spontaneous response. Therefore, future entrepreneurial aspirations are tested for by asking whether the individuals could imagine starting a company in the future, whether they are actively planning on doing so or whether they could imagine entrepreneurship at some point in the future. This is relating to self-efficacy, which is the confidence in one's ability to successfully perform entrepreneurial roles and tasks, which is indeed positively related to students' intentions to start their own business (Zhao & Seibert, 2006). Gender is of special importance for this research, as Mazzarol et al. (1999) found that males had a significantly higher intention of starting a company and general entrepreneurial intent than females. It is, however, not expected to correlate with SPS, as the genetical trait seems to appear independent of gender (Aron & Aron, 1997). Entrepreneurship education was also controlled for, as Webb et al. (1982) found that students who had undertaken entrepreneurship courses reported higher entrepreneurship intention than other students. Krueger (1993) revealed that people whose parents were entrepreneurs were more likely to express entrepreneurial intentions themselves. Consequently, the variable is controlled for. Liñán and Chen (2009) proved by including the dummy variable "country" that there is no significant relation between country and entrepreneurial intent, which implies that intentions are formed the same way in both a European and an Asian country. Hence, this was taken as a starting point to universally applicable behavior in entrepreneurship. Nevertheless, the country was included as a control variable, both for validating their findings and for controlling the stratified random sampling.

## 3.4 The pre-test

Before the data collection starts to its fullest extent, a pre-test is considered an important step to improve the quality of a questionnaire. Following this principle, the questionnaire was pre-tested after the initial creation of such and before the full-scope data collection started. The first run of the questionnaire was considered a valuable investment of time and effort, as it helped to clarify whether the questionnaire would have succeeded in the real data collection phase. According to Babbie (2007), pretesting should never be skipped, even if it is only done on a short scale, as it provides valuable insights and feedback on the chosen measurement method. The pre-test helped to implement given feedback on any ambiguities, to process further suggestions and to pre-assess the items in the questionnaire (e.g. via email), that the technical spectrum is working without error and that data are processed and recorded. Thus, pre-testing the research design is value bale to discover expectancies before starting the primary research effort.

For the pretest, 22 students of the University of Twente have been asked to fill in the questionnaire and hand back their feedback, positive or negative so that the questionnaire could possibly be improved. Participants were of German and Dutch heritage, and 1/3 had one entrepreneurial parent, 2/3 none. The entire questionnaire was tested, not only specific subparts, in the exact format as it would have been sent out at a later point in time. This style of pre-testing has the advantage to find a full, appropriate pre-test sample (Babbie, 1990). The results of the pre-test served to clear up the ambiguity that certain questions raised, especially with regards to the SPS measurement. Using the method of pre-testing, it could be ensured that the future respondents will be able to fill in the questionnaire to their fullest capabilities and without suffering lack of understanding or comprehension. Valuable insights were given onto clearer formulations, more examples, the overall survey design, slight grammatical mistakes based on the formulation and the logical structure of the items. Consequently, minor changes had to be done resulting out of the pre-test. The changes made can be found in table 4 below.

Feedback	Adaptation
Are you a student? Yes/No – after clicking "No",	Non-students are directly forwarded to the last
non-students could exit the questionnaire	segment of the questionnaire and are, therefore, not
	asked to spend time on the questionnaire
Type of student was not clear, some filled in HBO	The question "Are you a student?" has been
	changed to "Are you a student at the University of
	Twente?"
Detailed differentiation on study program seems	Study program was generalized into two categories
irrelevant	
Some questions of the SPS measurement scale are	Examples were given to some items to give a
not easily formulated	clearer perspective on what the questions aim at
What if my parents still are entrepreneurs?	Changed "Have your parents been entrepreneurs?"
	to "Are or have your parents been entrepreneurs?"
Difficult wording in the SPS scale	Included synonyms of the words underneath the
	question
A progress bar would be nice to stay motivated, as	Included progress bar
you can anticipate how many questions are still to	
come	
What if I already own my own business? There is	Control variable "Own business" was added
no option to state that somewhere	

Table 4 - Pre-test feedback and changes

Additional feedback was provided by the student sample group of the pre-test in form of written feedback at the end of the test version where the option for written feedback was given. This has proven as very valuable and will also remain in the questionnaire for the final version. The cover letter, which was aimed at introducing the research, was improved. This is crucial, as the cover text is the first thing participants see and read when answering a questionnaire. A short introduction to the scope of the research, the content and the purpose of the research, as well as the expected benefits for each participant, were stated. A progress bar was included after one participant stressed that he lacked motivation at the end, as he did not know much more items were still to come and perceived motivation is higher when the end is in sight. The pretesting also helped to indicate a necessary timeframe to fill in the questionnaire, which averaged at 8 minutes.

The pre-test sample was tested via SPSS on internal validity and reliability. The conducted factor analysis resulted in factors complementing the literature, which was ideal. The Cronbach's alpha score resulted in a .9 for all scales except for OR 1.2, which scored below .5 and was therefore unacceptable. The 3-item scale showed an alpha of .113. This could have occurred due to the small scale of the pre-test, therefore it was decided to not discard the scale for the actual research. However, OR was tested twice and the other 5-item scale had a good alpha of .887. Consequently, all main items of this research can be measured by the means of this questionnaire based on the pre-test results.

# 4. DATA ANALYSIS

In the previous part, the original measurement scales were described. The following section will contain the outcomes of this research. Additionally, the findings of this study were compared to the resulted measured by the original scale to test for validation and consistency between both.

## 4.1 Preliminary data analysis

Initially, 185 (N=185) respondents replied to the questionnaire. The online questionnaire was publicly accessible for precisely one month. Several respondents did not meet the inclusion criteria, as they were no students or had not answered all of the questions. Therefore, the total sample consisted of 163 respondents, indicating a total drop-off rate of 11.9%. The sample was further reduced based on fulfillment of the strata. Once a stratum reached the required respondents, it was closed, resulting in 103 respondents (n=103).

Prior to the analyses, negatively worded items were reversed. This was necessary for items of the Big Five and OR, followed by computing the total score by taking the mean of the different items. As argued by Pallant (2005), the total scores based on the mean are easier to interpret. In the next chapter, an explanation of the analytical procedures will be described.

The initial descriptive statistics showed 66 males (64.1%) and 37 females (35.9%), of which 57 students were bachelor students (55.3%), 40 were master students (38.8%), and 6 Ph.D. students (5.8%). Furthermore, 35 students (34%) studied a social study, while a majority of 68 students (66%) belonged to MINT study. From the descriptives, it can be concluded that the majority of the respondents is male. More than half of the students at the UT study for their bachelor's degree, while only a small percentage is affiliated with the UT while studying for their Ph.D. Moreover, more than half of the student's studies in a MINT related study which can be contributed to the fact that the UT is a technical university, the same argument can be applied to the distribution of males/females.

The other demographics show that the majority of the sample was Dutch (56.3%), followed by German (17.5%). The remainder of respondents were international from a vast variety of countries, including India,

Vietnam, Bulgaria, Colombia and more. The age of the respondents was on average 22.9 years (SD = 2.77), ranging from 19 to 30 years. 18 is the average minimum age to start university in the Netherlands, while Ph.D. students are on average somewhere in their mid to late 20's. This age range is not uncommon in a student sample (Bryman & Bell, 2011).

Other characteristics show that 18.4% of the respondents are currently active as an entrepreneur. Additionally, more than half (57.3%) of the respondents do not have entrepreneurs as parents, while 31.1% have one entrepreneurial parent and 11.7% have both parents working as an entrepreneur. Moreover, 50 respondents (48.5%) confirmed having had any form of prior entrepreneurship education (e.g. university courses, private lectures or talks), while 44.7% did not have any courses related to the subject and 6.8% did not know whether they did or did not.

As this research was using mesurements established by various authors, the measurement scales had to be tested using the dataset of this reseach. When controlling for the internal validity of the main constructs of this research, initial analyses on SPS show a Cronbach's Alpha of  $\alpha = .788$ , for OR (first scale)  $\alpha = .937$  and OR (second scale)  $\alpha = .117$ , EI  $\alpha = .962$  and for Big Five  $\alpha = .372$ . The results indicate acceptable reliabilities for SPS, OR and EI. Based on the low negative reliability of the 3-item scale (Ozgen & Baron, 2007), the 5-item scale by Kuckertz et al. (2017) will be used ( $\alpha = .937$  vs.  $\alpha = .117$ ). The first analyses of the Big Five showed a worrisome Cronbach's Alpha. For this reason, the initial data set was checked for outliers which may have diffused the alpha. Few cases that did indeed show high levels of diffusion were able to be excluded without violating the restrictions of the strata. Due to the Big Five consisting of several factors, it is incorrect to use an overall Cronbach's Alpha, instead, the use individual scores are

recommended, due to the factor analysis showing 5 distinct factors and the Big Five consisting out of five separable constructs. Table 5 shows an overview of the separate factors. Rammstedt and John (2007) use a mean Cronbach's Alpha, for this reason, the same technique is applied, resulting in a mean of  $\alpha = .543$ . Reviewing the data, the low reliability of the Big five can probably be contributed to the fact that especially male bachelor students of the MINT faculties responded the two-item questions with high dispersions. Additionally, scales that Table 5 - Cronbach's alpha Big Five measure factors with a low number of items may cause

Factor	Cronbach's Alpha
Extraversion	.625
Agreeableness	.479
Conscientiousness	.488
Neuroticism	.688
Openness to experience	.435
Mean Cronbach's Alpha	.543

distortion and are, thus, likely to not result in a very high Cronbach's alpha anyway.

The comparison between the Cronbach alphas of the original scale's creator and the alphas resulting from this questionnaire can be found in table 6. Overall, the reliability could be replicated by using the scales, with two exceptions being OR1 and Big Five.

	SPS (Pluess & Boniwell, 2015)	OR1 (Ozgen & Baron, 2007)	OR2 (Kuckertz et al., 2017)	EI (Linan & Chen, 2009)	Big Five (Rammstedt, 2007)
Original	.74	.80	.87	.80	.73*
Cronbach's $\alpha$					

This	.788	.117	.937	.962	.543*
research's					
Cronbach's $\alpha$					

Table 6 - Cronbach's alpha comparison: Original vs. this research

\* alpha derived from the mean of all factors

## 4.2 Common method variance bias

With every research conducted, the possible threat of bias increases. The common method variance bias is considered one of the main sources of reach error, as it threatens to interfere with the causality amongst constructs which ends up manipulating possible interpretations to draw (Podsakoff, MacKenzie, Lee, & Podsakoff, 2003).

Always at risk to be biased is self-reported data, like the data that was accessed by the means of the questionnaire. Self-reported data must, therefore, always be treated with care in regard to common method variance bias as described in literature prior (J. Chen, Reilly, & Lynn, 2005; Podsakoff & Organ, 1986). In order to minimize this occurring phenomenon of distortion, interviews with individuals who showed significant signs of SPS were conducted in order to validate findings retrieved from the quantitative data analysis at a later point.

Interviewing individuals in person, however, may increase the social desirability bias (SDB). According to Fisher (1993), the occurrence of SDB can be negatively influenced by using indirect questions in contrast to direct questioning. Thus, when dealing with socially sensitive variables, a significant difference exists between direct and indirect questioning. For socially neutral variables, no significant difference could be measured. As the questionnaire is not testing for socially sensitive variables (e.g. beliefs, norms, purchasing behaviors), it can be assumed that the occurrence of SDB will be relatively low. Other techniques for gathering data more objectively, like using a close friend as a second responder or relying on objective data purely, were not feasible for the context of this research, as the main constructs of this study need to be reflected on in person (Podsakoff et al., 2003).

## 4.3 Ex-ante analysis

The hypotheses of this research concern three groups of models which increase in depth. The first group is concerned with solely the relation of SPS on the entrepreneurial variables OR and EI. For the concepts of SPS, OR, EI, and ETP, the mean sum scores were calculated for the final analysis, as the results of both the mean sum and the centered were the same in the case of SPS. To control the outcomes for possible cause and effect, the relation was controlled for gender, student entrepreneurship, parental entrepreneurship, entrepreneurial education, and study direction. The applicable analysis is a standard multiple regression analysis (Hair et al., 2014; Pallant, 2005).

Group 2 and 3 of the hypotheses focus on how SPS influences OR and EI and if and how moderators like the ETP and the Big Five traits affect this relation. Since the research question involves the possible interaction of certain moderators, a moderated regression analysis has been applied. These relationships were tested for model fitness, statistical significance, estimated model coefficients and the statistical significance of the independent variables. In order to calculate the moderators which varied due to SPS and OR being the independent variable, the main predictor (SPS or OR) was multiplied by the centered variable of ETP as well as each of the individual Big Five traits. This resulted in two separate moderator variables for measuring ETP in the relation between SPS and OR/EI and ETP in the relation between OR and EI. Centering independent variables has been found to reduce multicollinearity in the predictor variables, which is an important assumption in testing multiple regressions (Aiken, West, & Reno, 1991; Pallant, 2005).

#### 4.3.1 Assumption testing

Within the following analysis, the multiple independent variables are tested for their effects on the dependent variable, determining the strongest predictor of the dependent variable (Hair et al., 2014). Prior to the analyses, certain statistical assumptions were made and had to be checked for, whether they have been met. While the first group of hypotheses requires a check for violation of the assumption of linearity and homoscedasticity, the second and third group require multiple regression analyses. Assumptions for multiple regression analyses include sample size, multicollinearity, outliers and normality, linearity, homoscedasticity, and independence of residuals (Pallant, 2005). Every assumption will be described and checked in the following while providing a graphical representation for concrete understanding.

The following part contains many tests and graphical representations. For the sake of comprehension, it was decided to not put the figures into the appendix but display them next to the text for a more pleasant read.

### 4.3.1.1 The first group of increasing depth:

## 4.3.1.1.1.1 H1.1 SPS - EI

The scatterplot (figure 3) suggests that the correlation between SPS and EI is low due to the random spread of the data points. A random distribution of plots indicates no possible relation between the two variables, neither is the scatterplot highlighting any major outliers that may diffuse the

outcome.



Figure 5 - Scatterplot SPS - EI



Figure 6 - Scatterplot SPS - OR1

# 4.3.1.1.1.2 H1.2 SPS - OR

From the scatterplot based on the OR scale developed by Ozgen & Baron (2007), it can be suggested that there is a low positive correlation. There is one outlier scoring both high on OR and SPS (figure 4).



From the scatterplot based on the OR scale developed by Kuckertz et al. (2017), it can be suggested that there is a very low to no correlation due to the random distribution of the plots. No outliers are detected based on the scatterplot (figure 5).

## 4.3.1.1.1.3 H1.3 OR-EI

The scatterplot for the OR scale of Ozgen & Baron (2007) (figure 6) suggests some correlation between the two constructs. An upward trend can be detected, suggesting that once OR increases, so does EI. There appears to be one outlier that might influence the analysis.







The scatterplot from Kuckertz er al. (2017) (figure 7) suggests a medium correlation. An upward trend can be detected, suggesting a positive relation between the two constructs. Also, there appear to be two outliers.

Figure 9 - Scatterplot OR2 - EI

## 4.3.1.2 Second and third group of increasing depth

As previously discussed, the sample size has been designed in accordance to the desired power and ES and significance criterion (Cohen, 1992; Hair et al., 2014). Based on a significance level of .05 and a ES of .15 and eight independent variables, the required sample should consist of at least 100. Therefore, this assumption is met based on the fact that N = 103 (Hair et al., 2014).

#### 4.3.2 Multicollinearity and singularity

When the relationship between independent variables is highly correlated, the phenomenon is called multicollinearity. The opposite, singularity, is describing the case where one independent variable is, in fact, a combination of other independent variables (Pallant, 2005).

In the case of this research regarding H2.1, the Pearson correlations show values below .3 (.055 for the moderator and -.024 for SPS), indicating no relation. Furthermore, the correlation between the independent variable is high (.838). According to Pallant (2005), this should not be higher than .7. Therefore, a centralized composite variable is created. This does not alter the correlation of SPS (-.024) but does alter the moderator ETP (-.179). However, this is still below .3. The largest effect is noticeable in the correlation between the independent variables (.230), concluding they are, therefore, not bivariate correlated. Additionally, the results of the Tolerance and VIF shows no violations indicating multicollinearity, as Tolerance is higher than .10 and VIF less than 10 (.947 and 1.056, respectively) (Pallant, 2005).

H2.2 assumes that the positive relationship between SPS and OR is moderated by ETP. The correlation matrix indicates again values of below .3 (-.006 (SPS) and -.091 (moderator ETP)) for the 5-item OR measurement and the 3-item measurement (.117 (SPS) and .032 (moderator)). Thereby, both are indicating no significant relationship. The Tolerance and VIF show .947 and 1.056 respectively. Therefore, no signs of multicollinearity could be statistically outlined.

H2.3 hypothesizes an effect of ETP on the relationship between OR and EI. The correlation matrix shows values of -.179 and .733 for the moderator and OR, respectively. The bivariate correlation shows a -.091, which indicates no violations. Furthermore, the Tolerance and VIF show no violations, .992 and 1.008 respectively.

In the third group of depth, H.3.1 assumes a moderating effect by each of the Big Five individually on SPS

negatively influencing EI. The correlation matrix (table 8) indicates values below .3 for the relation between the dependent and independent constructs. The bivariate correlation shows one value that is above .3, which is concerned with the relation between conscientiousness and extraversion (.334). This, however, is below 0.7 and therefore not violating multicollinearity assumptions. This finding could be confirmed by the collinearity diagnostics in table 7, which show no violations regarding the tolerance (below 1) and the VIF (below 10).

Construct	Tolerance	VIF
SPS	.838	1.193
Extraversion	.761	1.314
Agreeableness	.855	1.170
Conscientiousness	.929	1.206
Neuroticism	.890	1.123
Openness	.811	1.233

Table 7 – Collinerativ diagnostics H.3.1.

Construct	Entrepreneurial Intent	SPS	Extraversion	Agreeableness	Conscientiousness	Neuroticism	Openness
Entrepreneurial Intent	-						
SPS	024	-					
Extraversion	030	.196*	-				
Agreeableness	.213*	128	.125	-			
Conscientiousness	120	.238*	.334**	134	-		
Neuroticism	085	.217	.036	262**	.036	-	
Openness	145	.297**	.319**	150	.124	.153	-

Table 8 - Correlation Matrix H3.1.

\* Correlation is significant at the 0.05 level (2-tailed).

\*\* Correlation is significant at the 0.01 level (2-tailed).

H3.2. refers to the effects of the individual Big Five factors on the relationship between SPS and OR. Pearson's correlation analysis showed no values above .3, which indicates low to the nonexistent correlation between the dependent variables and the moderator (table 10).

The findings could be confirmed by the collinearity diagnostics in table 9, which show no violations regarding the tolerance and the VIF.

Construct	Opportunity Recognition (Kuckertz et al., 2017)	Opportunity Recognition (Ozgen & Baron, 2007)
Opportunity Recognition	-	-
SPS	006	.117
Extraversion	037	.141
Agreeableness	.086	.025
Conscientiousness	028	.099
Neuroticism	.048	.082
Openness	085	032

Table 9 - Collinearity diagnostics H3.2.

Construct	OR1	OR2	SPS	Extraversion	Agreeableness	Conscientiousness	Neuroticism	Openness
OR1	-							
OR2	.644**	-						
SPS	006	.117	-					

Extraversion	.037	.141	.196*	-				
Agreeableness	.086	.025	138	-125	-			
Conscientiousness	028	.099	.238*	.334**	134	-		
Neuroticism	.048	.082	.217*	.036	262**	.036	-	
Openness	085	.032	.297**	.319**	150	.124	.153	-

Table 10 - Correlation matrix H3.2.

\* Correlation is significant at the 0.05 level (2-tailed).

\*\* Correlation is significant at the 0.01 level (2-tailed).

Construct	Tolerance	VIF
Extraversion	.761	1.314
Agreeableness	.851	1.175
Conscientiousness	.855	1.169
Neuroticism	.911	1.098
Openness	.844	1.184
OR (Kuckert et al., 2017)	.977	1.024

When checking the correlation of H3.3, a high correlation between OR and EI becomes distinct (.733 and .576) (table 11). In this case, OR correlates substantially with EI. This is, however, in line with the findings of literature and is not surprising to outline a statistically proven positive correlation. The other bivariate items are below .7, which indicates no relation with other independent variables. The findings could be confirmed by the collinearity diagnostics in tables 11 and 12, which show no violations regarding the tolerance (below 1) and the VIF (below 10). A correlation matrix indicated no values

above .3, which indicates low to the nonexistent correlation between

the dependent variables and the moderator (table 13).

Table 11	_	Collinearity	diagnostics	H3.3	OR?
10010 11		Conneurny	ungnosnes	115.5	UII12

Construct	Tolerance	VIF
Extraversion	.751	1.331
Agreeableness	.855	1.169
Conscientiousness	.853	1.172
Neuroticism	.909	1.200
Openness	.845	1.183
OR (Ozgen &	.962	1.040
Baron,		
2007)		

Table 12 - Collinearity diagnostics H3.3 OR1

Construct	Entrepreneurial Intent (Linan & Chen, 2009)	Extraversion	Agreeableness	Conscientiousness	Neuroticism	Openness	OR (Kuckertz et al., 2017)	OR (Ozgen & Baron, 2007)
Entrepreneurial Intent	-							
Extraversion	030	-						
Agreeableness	.213*	.125	-					
Conscientiousness	120	.334**	134	-				
Neuroticism	085	.036	262**	.036	-			
Openness	145	.319**	150	.124	.153	-		
OR (Kuckertz et al., 2017)	.733**	.037	.086	028	.048	085	-	
OR (Ozgen & Baron, 2007)	.576**	.141	.025	.099	.082	032	.644**	-

Table 13 – Correlation matrix H.3.3

\* Correlation is significant at the 0.05 level (2-tailed).

\*\* Correlation is significant at the 0.01 level (2-tailed).

### **Normality Plot & Scatterplot**

In order to check the normality assumptions of the data, normality plots come in extremely useful. Thereby, plots are more accurate than a histogram, which is not capable of picking up subtle deviations. A P-P plot plots two cumulative distribution functions against each other. When interpreting a P-P Plot, the individual plots are desired to be found as close and straight to the middle line dividing as possible, outlining a normal distribution. In case the line is shaped like an s, this indicates thick tails. An inverted-s form indicates thin tails, on the other hand (De Veaux et al., 2005).

When considering the P-P plot of EI (figure 9), a s-shape close to the centered line is visible. This indicates



a normal distribution with slightly thick tails. The scatterplot is randomly distributed, and Normal P-P Plot of Regression Standardized Residual

shows an ideal distribution of data, except for few outliers to the right. The plot does not show an obvious pattern overall (figure 8).



#### Dependent variable: OR (Kuckertz, 2017)

The P-P plot for OR1 is relatively straight, highlighting a slight s-curve

which identifies thick tails of the normal distribution. Overall, the sample appears to be normally distributed based on the P-P plot (figure 11). The scatterplot, on the other hand, is randomly diffused, and no pattern seems to become distinct (figure 10). There are, however, a couple of outliers diffusing the variance. This is supporting the normality assumptions of the variable.



#### Dependent variable OR (Ozgen & Baron, 2007)

The P-P plot for OR2 is relatively straight, highlighting the slightest, inverted s-curve which identifies thin tails of the normal distribution. Nevertheless, the plots are close to the centered line. Overall, the sample appears to be normally distributed based on the P-P plot (figure 13). The scatterplot, on the other hand, is

randomly diffused, and no pattern seems to become distinct. One outlier seems to be indicated in the plot, though. This is supporting the normality assumptions of the variable.



Figure 15 - P-P plot OR2

Additionally, the Mahalanobis distances can be used to check

for outliers. These were computed in the data file of SPSS. To use this method of checking for outliers, the critical value should be identified. This value is based on an alpha level and the number of independent variables. Following the suggestion of Tabachnick and Fidell (1989), an alpha level of .001 is used. In the case of the second group of hypotheses, two independent variables constitute for a critical value of 13.82. Table 14 shows an overview of the maximum Mahalanobis distances of all hypotheses. Based on these findings, all hypotheses show the existence of outliers. However, the maximum values of OR, ETP and EI are just slightly exceeding the critical value.

	SPS, ETP & EI	SPS, ETP & OR1	SPS, ETP & OR2	OR1, ETP & EI	OR2, ETP & EI
Max. Mahal. Distance	22.931	22.931	22.931	14.720	14.425

Table 14 - Mahalanobis distance first layer of depth

### **Group 3 moderation effect of separate Big 5 factors SPS - EI**

The P-P plot (figure 16) for the EI\_mean shows a slight s-curve, close to the centered line, from which can be concluded that thick tails are given, but normality is not violated. The scatterplot (figure 17) shows a dense form at the center, from which few outliers form. This does not indicate a distribution as random as prior scatter plots, but no linear trend was able to be identified.



## SPS - OR1

The P-P plot for OR1 (figure 18) shows a slight s-curve, but close to the centered line. This indicates normality and does not violate the assumptions. In the scatterplot (figure 19), plots are randomly distributed, which aligns with the assumptions as well. A few outliers can be detected, especially skewed to the right.



### SPS - OR2

The P-P plot for OR2 is relatively straight (figure 20), highlighting the slightest, inverted s-curve which identifies thin tails of the normal distribution. Nevertheless, the plots are close to the centered line. Overall, the sample appears to be normally distributed based on the P-P plot. The scatterplot is randomly diffused, and no pattern seems to become distinct. One major outlier could, however, be detected based on this scatterplot (figure 21).



### **OR1 - EI (+ moderator ETP)**

The P-P plot for EI is straight and indicates a normal distribution (figure 22). The plots are close to the centered line. The scatterplot is randomly diffused, and no distinct pattern becomes apparent. A couple of outliers seem to be present, however (figure 23). Overall, a normal distribution can be assumed. Normal P-P Plot of Regression Standardized Residual



Figure 225 - P-P Plot OR1-EI (+ moderator)



#### **OR2 - EI** (+moderator ETP)

The P-P plot for EI is straight, and dots are meeting the centered line (figure 24). Therefore, a normal distribution is indicated. The scatterplot (figure 25) is randomly diffused, indicating two small outliers to the right. Overall, a normal distribution can be assumed.



Figure 24 - P-P Plot OR2-EI (+ moderator)

Figure 25 - Scatterplot OR2-EI (+ moderator)

## OR1 – EI

The line of the P-P plot of EI is very much straight, which fulfills the normality assumption (figure 26). The scatterplot is very randomly spread, which indicates no pattern of concern. There are, however, few outliers (figure 27).



Figure 26 - P-P Plot OR1-EI

Figure 27 - Scatterplot OR1-EI

# OR2 - EI

The P-P plot of EI indicates a distribution of the plots close to the centered line, which suggest normality (figure 28). The scatterplot is randomly spread, and no clear pattern is identified, which is in accordance with normality assumptions. No major outliers can be detected based on this scatterplot (figure 29).



Figure 28 - P-P Plot OR2-EI

Figure 29 - Scatterplot OR2-EI

Again, an overview of the Mahalanobis values is given. Based on the 6 independent variables, the critical value is 22.46 with an alpha of .001. As visible in table 15, the assumption of outliers is violated. According to Pallant (2005), cases that have much larger values than the critical value may need to be removed from the analysis.

	SPS, Big 5 &	SPS, Big 5 &	SPS, Big 5 &	OR1, Big 5 &	OR2, Big 5 &
	EI	OR1	OR2	EI	EI
Max. Mahal. Distance	47.768	47.768	47.768	47.266	49.198

Table 15 - Mahalanobis distance second group of depth

To conclude the assumptions testing, the assumptions of normality, linearity, homoscedasticity, and independence of residuals were controlled. These aspects all refer to "*various aspects of the distribution of scores and the underlying relationship between the variables*" (Pallant, 2005, p. 149). In order to check these assumptions, the residuals scatter plots were checked.

Construct	Skewness	Std. Error	Kurtosis	Std. Error
SPS	.331	.238	468	.472
OR1 (Kuckertz et al., 2017)	.106	.238	-1.119	.472

OR2 (Ozgen & Baron, 2007)	314	.238	.291	.472
EI	.349	.238	-1.234	.472
ЕТР	890*	.238	3.576*	.472
Extraversion (mod)	.51	.238	5.780*	.472
Agreeableness (mod)	718	.238	8.381*	.472
Conscientiousness (mod)	203	.238	6.981*	.472
Neuroticism (mod)	1.652*	.238	3.921*	.472
Openness (mod)	.539	.238	1.364	.472

Table 16 - Normality testing

Skewness assesses the symmetry of the distribution (Pallant, 2005). Regarding the skewness, the rule of thumb of three times the standard error is applied. The skewness should, therefore, not be three times the std.error. This is given, except for ETP and Neuroticism, which do not fulfill the criteria (Table 16). Overall, it can be concluded that the variables are normally distributed.

The standard reference point to identify a normal distribution breaks down to a kurtosis of 3. A normal distribution has a kurtosis of exactly three (excess = 0) and is called mesokurtic. A distribution with a kurtosis that is <3 is called platykurtic. This indicates, in comparison to the normal distribution, that the tails of the distribution are shorter and thinner, the peak is often lower and broader. Lastly, a distribution with a kurtosis that is >3 is called leptokurtic. In comparison to a normal distribution, leptokurtic distributions have wider tails and a higher, sharper peak (Westfall, 2014).

Based on the results (table 15), the kurtosis level for the main construct (SPS, OR, EI) is showing platykurtic distributions. The ETP is within 3, therefore it is normally distributed. The moderator variables of the Big Five, except for openness, are well above 3, indicating leptokurtic distribution, while openness is platykurtic.

To check the independence of the residuals, a Durbin-Watson test statistic was done. The Durbin Watson test reports a test statistic, with a total value ranging from 0 to 4, where 2 identifies no autocorrelation, 0 to <2 outlines positive autocorrelation and >2 to 4 highlights negative autocorrelation. Thereby, a rule of thumb is that test statistic values in the range of 1.5 to 2.5 are still to be considered relatively normal. Values outside of this range could be cause for concern, as it is suggested that values under 1 or more than 3 are a definite cause for concern (Field 2009). For the current data, the values of the residuals are demonstrated in table 16. The first table (table 17) displays the values of the second group of hypotheses. As the Durbin-Watson statistic is around 1.5 for each residual, but certainly above 1, it can be concluded that the residuals are independent. The second table (table 18) Durbin-Watson statistic is around 1.8 for each residual, but certainly, above 1, it can be concluded that the residuals are independent.

	SPS, ETP & EI	SPS, ETP & OR1	SPS, ETP & OR2	OR1, ETP & EI	OR2, ETP & EI			
Durbin-Watson	1.533	1.538	1.523	1.575	1.411			
Table 17 - Durbin Watson main constructs								

Table 17 - Durbin-Watson main constructs

	SPS, Big5 & EI	SPS, Big5 & OR1	SPS, Big5 & OR2	OR1, Big5 & EI	OR2, Big5 & EI	
Durbin-Watson	1.827	1.815	1.803	1.611	1.483	

Table 18 - Durbin-Watson + moderator

Table 19 contains a Pearson correlation matrix between all constructs and the respective control variables. Looking at the correlation between SPS and the other variables, neuroticism seems to be correlated (p < .001) as well as the ETP which shows a negative correlation (p < .05). OR and EI show a strong positive correlation (p < .01). The variables concerning entrepreneurship constructs (OR and EI) show high correlations (p < .01) between student entrepreneurship and entrepreneurial education, but no correlation with parent entrepreneurship. OR is positively correlated with social studies, yet negatively correlated with MINT studies. Regarding EI, social studies show a weak correlation (p < .05), while no correlation with MINT studies.

Construc	ts	1	2	3	4	5	6	7	8	9	10	11	12	13	14
1.	SPS	-	-		-	-	-	-	-	-	-	-	-	-	-
2.	OR	-,006	-	-	-	-	-	-		-	-		-		-
3.	EI	-,024	,733 <sup>™</sup>	-	-	-	-	-	-	-	-	-	-	-	-
4.	Extraversion	,031	,126	,038	-	-	-	-	-	-	-	-	-	-	-
5.	Agreeableness	,019	-,101	-,077	,146		-		-	-	-	-		-	-
6.	Conscientiousness	- <mark>,07</mark> 4	,229 <sup>*</sup>	,109	,152	-, <mark>106</mark>	-	-	-	-		-	-	-	-
7.	Neuroticism	, <b>5</b> 46 <sup></sup>	-,102	-,064	-,122	-, <mark>132</mark>	-,132		-	-	-	-	-		-
8.	Openness	, <mark>12</mark> 6	,221	,086	,256	<mark>,018</mark>	, <mark>191</mark>	-,018	-	÷	-	-	-	-	-
9.	ETP	-,199`	,323	,177	,510 <sup>**</sup>	-,326**	,616 <sup>™</sup>	-,471"	,559 <sup>**</sup>	-	-		-		-
10.	Student Entrepreneurship	-,1 <mark>4</mark> 5	,278 <sup>**</sup>	,360**	-,172	-,169	,206 <sup>*</sup>	-,161	,062	,172	-	-	-	-	-
11.	Parent Entrepreneurship	-,025	,105	,210 <sup>°</sup>	-,087	<mark>,024</mark>	,007	,101	,021	- <mark>,06</mark> 5	,121	-	-	-	-
12.	Entrepreneurial Education	,070	-,378"	-,279"	-,225	,033	- <mark>,11</mark> 6	,101	-,066	-,247	,068	,043	-	-	
13.	MINT	-,073	-,276	-,126	-,122	,047	-,201	,069	-,085	-,147	-,012	-,002	, <mark>312</mark> "	-	2-
14.	Social	,083	,339"	,205	,125	,035	,222	-,092	,112	,213	-,006	,029	-,423"	-,917	_

Table 19 - Correlation coefficients control variables

\* Correlation is significant at the 0.05 level (2-tailed).

\*\* Correlation is significant at the 0.01 level (2-tailed).

### 5. FINDINGS (RESULTS)

The findings of this research include hypotheses in three groups of models which increase in depth. The hypotheses for all groups reached a total of 21 and were divided in half for the aim of this research. Please find a detailed overview of all hypotheses in Appendix 8.3.

Based on the ex-ante analyses, the OR1 scale of Kuckertz et al. (2017) was used over the OR2 scale due to the overall better results in the statistical tests.

#### The first group of hypotheses

The first group of hypotheses entails the relationship of the main constructs of this research, namely SPS, OR and EI. These hypotheses are tested by the means of a simple linear regression analysis and controlled for by entrepreneurial education, parental entrepreneurship, student entrepreneurship, and study background (MINT or Social).

#### Hypothesis 1.1: Sensory processing sensitivity is positively related to opportunity recognition ability.

The results of the regression analysis for the hypothesis do not indicate a statistically significant relationship between the dependent variable OR and the independent variable SPS (F = .004, p = .949). This indicates that the trait of SPS in human beings does not influence their opportunity recognition ability. When looking at the control variables, there was indeed a strongly positive significant relationship between student entrepreneurship (p < .05) as well as a strongly negative significant relationship between prior entrepreneurial education (p < .05) and OR. Based on the findings, there was not enough evidence to support the hypothesis. H.1.2 will be rejected.

#### Hypothesis 1.2: Opportunity recognition ability is positively related to entrepreneurial intent.

The results of the regression analysis for the third hypothesis indicate a statistically significant relationship between the dependent variable EI and the independent variable OR (F = 117.371, p < .001). The results of the R Square show that 53.3% of the variance in EI can be explained by the independent variable OR. Overall, findings are indicating that a higher level of OR will have a strong, positive influence on EI (standardized  $\beta$  coefficient = .746). When checking for the control variables, no significant relationships can be found. Based on the findings the hypothesis is accepted. Consequently, there is enough evidence to support the hypothesis.

### The second group of hypotheses

The second layer of hypotheses includes the effects of the moderator ETP on the relationship between SPS, OR and EI. A real moderator affects the strengths of the relation between the dependent and independent relationship.

# H2: The positive relationship between SPS and OR is moderated by the ETP; higher levels of ETP is strengthening the positive relationship between SPS and OR.

The results of the multiple regression analysis for the hypothesis do not indicate a statistically significant relationship between the dependent variable OR and the independent variable SPS, moderated by the ETP (F = .434, p = .649). This indicates that the trait of SPS in human beings does not influence their opportunity recognition ability and is not moderated by the ETP. The moderator effect did neither show a statistically significant relationship ( $\beta$  = -.095, p = .335). Based on the findings, there was not enough evidence to support the hypothesis. H.2.2 will be rejected.

#### The third group of hypotheses

The third group of hypotheses includes the effects of the individual Big Five as one moderator each. In this research, conscientiousness, neuroticism, and openness to new experiences will be considered. This applies

to the relationship between all three main constructs from the first group. A moderator is supposed to strengthen the relationship between the dependent and the independent variable.

# *Hypothesis 3.1.1: The negative relationship between SPS and EI will be moderated by conscientiousness. The more conscientious, the weaker the negative the relationship between SPS and EI becomes.*

The results of the multiple regression analysis for the hypothesis do not indicate a statistically significant relationship between the dependent variable EI and the independent variable SPS, moderated by the Big Five character trait conscientiousness (F = .73, p = .485). This indicates that the trait of SPS in human beings does not influence their entrepreneurial intent and is not moderated by conscientiousness. The moderator effect did neither show a statistically significant relationship ( $\beta$  = -.121, p = .239). Based on the findings, there was not enough evidence to support the hypothesis. H.3.1.3 will be rejected. Overall, it can be concluded the effect of conscientiousness does not moderate the non-significant relation between SPS and EI.

# *Hypothesis 3.1.2: The negative relationship between SPS and EI will be moderated by openness to new experiences. The more open, the weaker the negative the relationship between SPS and EI becomes.*

The results of the multiple regression analysis for the hypothesis do not indicate a statistically significant relationship between the dependent variable EI and the independent variable SPS, moderated by the Big Five character trait openness (F = 1.099, p = .337). This indicates that the trait of SPS in human beings does not influence their entrepreneurial intent and is not moderated by openness. The moderator effect did neither show a statistically significant relationship ( $\beta$  = -.152, p = .147). Based on the findings, there was not enough evidence to support the hypothesis. H.3.1.1 will be rejected. Overall, it can be concluded the effect of openness does not moderate the non-significant relation between SPS and EI.

# *Hypothesis 3.2.1: The positive relationship between SPS and OR will be moderated by conscientiousness. The more conscientious, the stronger the relationship between SPS and OR becomes.*

The results of the multiple regression analysis for the hypothesis do not indicate a statistically significant relationship between the dependent variable OR and the independent variable SPS, moderated by the Big Five character trait conscientiousness (F = .040, p = .961). This indicates that the trait of SPS in human beings does not influence their opportunity recognition ability and is not moderated by conscientiousness. The moderator effect did neither show a statistically significant relationship ( $\beta$  = -.028, p = .784). Based on the findings, there was not enough evidence to support the hypothesis. H.3.2.3 will be rejected. Overall, it can be concluded the effect of conscientiousness does not moderate the non-significant relation between SPS and OR.

# *Hypothesis 3.2.2: The positive relationship between SPS and OR will be moderated by neuroticism. The more neurotic, the weaker the relationship between SPS and OR becomes.*

The results of the multiple regression analysis for the hypothesis do not indicate a statistically significant relationship between the dependent variable OR and the independent variable SPS, moderated by the Big Five character trait neuroticism (F = .128, p = .88). This indicates that the trait of SPS in human beings does not influence their opportunity recognition ability and is not moderated by neuroticism. The moderator effect did neither show a statistically significant relationship ( $\beta$  = .051, p = .617). Based on the findings, there was not enough evidence to support the hypothesis. H.3.2.4 will be rejected. Overall, it can be concluded the effect of neuroticism does not moderate the non-significant relation between SPS and OR.

*Hypothesis 3.2.3: The positive relationship between SPS and OR will be moderated by openness to new experiences. The more open, the stronger the relationship between SPS and OR becomes.* 

The results of the multiple regression analysis for the hypothesis do not indicate a statistically significant relationship between the dependent variable OR and the independent variable SPS, moderated by the Big Five character trait openness (F = .388, p = .68). This indicates that the trait of SPS in human beings does not influence their opportunity recognition ability and is not moderated by openness. The moderator effect did neither show a statistically significant relationship ( $\beta$  = -.092, p = .382). Based on the findings, there was not enough evidence to support the hypothesis. H.3.2.5 will be rejected. Overall, it can be concluded the effect of openness to experience does not moderate the non-significant relation between SPS and OR.

# *Hypothesis 3.3.1: The positive relationship between OR and EI will be moderated by conscientiousness. The more conscientious, the stronger the relationship between OR and EI becomes.*

The results of the multiple regression analysis for the hypothesis do indicate a statistically significant relationship between the dependent variable EI and the independent variable OR, moderated by the Big Five character trait conscientiousness (F = 59.373, p < .001). This indicates that the ability of OR does influence the entrepreneurial intent of individuals. The R Square explains 54.3% of the variance in EI by OR. The moderator effect, however, did not show a statistically significant relationship ( $\beta$  = .073, p = .281). Based on the findings, there was not enough evidence to support the hypothesis. H.3.3.3 will be rejected. Overall, it can be concluded the effect of conscientiousness does not moderate the significant relation between OR and EI.

# *Hypothesis 3.3.2: The positive relationship between OR and EI will be moderated by neuroticism. The more neurotic, the weaker the relationship between OR and EI becomes.*

The results of the multiple regression analysis for the hypothesis do indicate a statistically significant relationship between the dependent variable EI and the independent variable OR moderated by the Big Five character trait neuroticism (F = 58.275, p < .001). This indicates that the ability of OR does influence the entrepreneurial intent of individuals. The moderator effect, however, did not show a statistically significant relationship ( $\beta$  = -.027, p = .692). The strength of the relationship between OR and EI does not differ greatly from hypothesis 1.3. Based on the findings, there was not enough evidence to support the hypothesis. H.3.3.4 will be rejected. Overall, it can be concluded the effect of neuroticism does not moderate the significant relation between OR and EI.

# *Hypothesis 3.3.3: The positive relationship between OR and EI will be moderated by openness to new experiences. The more open, the stronger the relationship between OR and EI becomes.*

The results of the multiple regression analysis for the hypothesis indicate a statistically significant relationship between the dependent variable EI and the independent variable OR moderated by the Big Five character trait openness (F = 58.940, p < .001). This indicates that the ability of OR does influence the entrepreneurial intent of individuals. The moderator effect, however, did not show a statistically significant relationship ( $\beta$  = -.060, p = .381). The strength of the relationship between OR and EI is only impacted slightly compared to hypothesis 1.3. Based on the findings, there was not enough evidence to support the hypothesis. H.3.3.5 will be rejected. Overall, it can be concluded the effect of openness to new experiences does not moderate the significant relation between OR and EI.

# 6. **DISCUSSION**

This research was aimed at giving insights into the relationship between sensory processing sensitivity and entrepreneurship concepts. It was assumed that HSPS would indicate different ways of interactions based on their personality when it came to entrepreneurial intent and opportunity recognition ability. Three of the Big Five personality dimensions, conscientiousness, openness, and neuroticism, were considered in more detail. Due to the extensiveness of this research, the discussion will be structured into different parts for overview purposes, starting with the discussion of the quantitative findings, and then move on to interviews conducted post-questionnaire, to identify possible gaps in the research design that were not covered and could, thus, explain the null-findings.

## 6.1 Discussion of results

## 6.1.1 Quantitative results

Overall, the quantitative research did not support the majority of hypothesis in any group of hypotheses. It was assumed that sensory processing sensitivity would be positively related to OR, and negatively related to EI. Additionally, OR was assumed to be positively related to EI. Within each of this relationship, personality constructs have been thought to enable a moderating effect. In the case of this study, the ETP was thought to moderate each of the first group of hypotheses and make the individual relationships stronger (SPS-OR, OR-EI), or weaker (SPS-EI). The moderation of the ETP constituted for the second group of hypotheses. The third group of hypotheses assumed each of the Big Five personality traits to individually moderate the relationship between the first group of hypotheses, independent of the ETP moderation. The aim of the third group, in contrast to the second, was to check which personality trait would show a significant relationship in regard to the main constructs, as the ETP is looking at a particular personality trait combination.

In the first group of hypotheses, the assumed positive relation between SPS and OR was not statistically significant, therefore H1.1 had to be rejected. According to the literature reviewed prior, the insignificant finding seems questionable, due to the fact that highly sensitive individuals have a heightened awareness towards stimuli surrounding them (Acevedo et al., 2014; Aron & Aron, 1997; Brindle et al., 2015). The insignificance may be linked to the phenomenon of information overload (Bawden & Robinson, 2009). The previous scatterplots were analyzed in order to test for possible trends, outlining a pattern for each hypothesis. However, neither the scatterplots could confirm the theory of information overload and inverted u-curve shaped models for OR ability in HSPS. Thus, the assumption of the inverted u-curve could did not find any indication either. Yet, there have to be different reasons for the insignificance between SPS and OR that the questionnaire did not cover, as literature did sufficiently hint towards the direction of a relationship.

The relationship between OR and EI (H1.2) was statistically significant. The significance is not surprising, as the relation was already validated before in previous research so that a statistically significant relationship could also be proven in this research was pleasantly coherent (Ardichvili et al., 2003; Baron, 2006; Singh et al., 1999). The strength of the relationship with a beta of .746 indicates that higher levels of OR increase the EI respectively. This supports the assumption that individuals who find it easier to recognize opportunities due to their alertness will show greater entrepreneurial intent. This may also relate to their mental structures when processing information, which seem to be trained to recognize economically valuable or entrepreneurial opportunities more easily and individuals are then able to translate them into entrepreneurial intentions. Also, individuals who are able to connect the dots (Baron, 2006) when recognizing patterns that can be translated into opportunities, seem to be more confident based on their levels of experiences that entrepreneurship would be a successful outcome when using the present opportunity.

Regarding the second groups of hypotheses, the ETP was assumed to moderate the main relationship, as found in the first group of hypotheses. As mentioned previously, the ETP mirrors an ideal depiction of an entrepreneurial personality. Therefore, it was assumed that the ETP would strengthen the positive and negative hypothesized relationship between the main constructs. However, none of the hypotheses from the second group of hypotheses could be statistically confirmed. This finding is odd, and as it can only be

hypothesized what the relation between SPS and OR as well as EI may be moderated by. With reference to information processing, possible moderators may relate to affect or cognition (Forgas & George, 2001). Thereby, affect relates to intrinsic motivation, whereas cognition relates to knowledge acquired. Risk propensity has also been found to relate to EI (Zhao, Seibert, & Lumpkin, 2010), and may provide another moderation not tested for.

The relationship between OR and EI should, however, have been moderated by the ETP. Thus, the 11-item measure for the Big Five out of which the ETP and ultimately the moderator consists, may not be an appropriate measure for the moderating effects. 11 items make for two items per Big Five, with the exception of agreeableness which was measured in three items. It seems that the Big Five, which consist out of many sub-variables (e.g. extraversion entails 17 characteristics that form the factor (Goldberg, 1993)), are too extensive to be measured in a 2-item measure. The reliability and validity of the items did not match the conditions. The questions of the 2-item measure may have targeted different directions within one Big Five factor (e.g. "I see myself as someone who is generally trusting" and "I see myself as someone who tends to find the fault with others", both measuring agreeableness), which would have decreased internal validity further. It appears to be the case that the full Big Five personality measure (e.g. IPIP or TIPI) is needed to prove true moderating power. The 11-item short personality test did, additionally, not result in an acceptable Cronbach's alpha, which probably has been the case due to the diversion in questions, when only allowing two items per factor. Consequently, the outcomes are deemed to not be representative. Therefore, it is not impossible that future research will come to different terms when repeating the trial with another sample set.

Due to the insignificance in the relationship between SPS and EI, the dependent variable of EI was changed for a proxy variable, which consisted out of 0 = no student entrepreneurship and no entrepreneurial parents and 1 = either student entrepreneurship or entrepreneurial parents or both. This was done to check whether the influence of entrepreneurship had a relationship with SPS, instead of EI which may be high or low for different reasons. When checking "entrepreneurship" in general, possible measurement errors in the EI variable could have been detected and/or avoided, if a relationship did turn out to be significant. The change in the dependent variable did, however, neither show a statistically significant relationship between both main constructs nor for the moderating effect of the ETP (Appendix 8.4). The insignificance in moderator could, again, be caused by the unreliable outcome of the Big Five measurement.

In the third group of hypotheses, each of the Big Five was hypothesized to individually moderate the main relationship. However, none of the moderators showed a statistically significant effect on the relation between the main constructs. The relation between the main concepts remained insignificant for SPS and OR, as well as significant for OR and EI. Although the relation between OR and EI remained statistically significant, just like in the first group of hypotheses, the moderators showed no statistically significant moderation between the main constructs. Hence, all the hypotheses in the third group had to be rejected. Although the measure of the Big Five as such did not achieve a satisfactory Cronbach's alpha, two of the five (extraversion and neuroticism) did attain an acceptable value at the lower end. Thus, it would have been possible to find those two factors influencing the main constructs in the way hypothesized. However, neither extraversion nor neuroticism did show a statistically significant moderation, which leads to conclude that the Big Five, individually, may not impact the relationship between the main constructs after all. An unexpected insignificance, however, was outlined by the moderation of the relation between OR and EI. As the main construct showed significance and, based on the reviewed literature, relations could be identified, it was surprising to find no moderation effect. Particularly neuroticism should have moderated the relationship in a negative way, due to the uncertain, high-risk environment entrepreneurs are put into

and the increased stress level that affects entrepreneurial intent (Zhao & Seibert, 2006). Moreover, low levels of neuroticism were one of the three crucial career success factors (Judge et al., 1999).

When checking the control variables, certain correlations did support the hypothesis, yet others showed surprising correlations. When looking at the correlation between SPS and the other variables, neuroticism seems to be correlated as well as the ETP which shows a negative correlation. That SPS and the ETP show a negative correlation can be supported by literature as well (Zhao & Seibert, 2006), yet none of the individual big five (except for neuroticism) could prove a statistically significant correlation in the direction dictated by the ETP. It is surprising that SPS is not showing a significant and positive correlation with conscientiousness, and neither a negative correlation with extraversion. This is against the assumptions of HSPS being introverted and highly conscious. This also contradicts the findings of Aron & Aron (1997). Neuroticism and SPS showed the correlation that was assumed by literature. The ETP does not show a correlation with EI, neither does EI with any of the Big Five. Based on the assumptions made prior in the literature review (e.g. Schmitt-Rodermund, 2004), the finding seems odd. The ETP should have indicated a significant correlation with any of the Big Five. This lack in correlation may indicate that the measurement for the Big Five might not have been an accurate measure, in line with the assumptions about lacking reliability made prior.

As expected, SPS is neither correlated with MINT nor social studies, due to SPS being a personality trait that is not expected to influence study preferences, also due to the random distribution of SPS in the population. The variables concerning entrepreneurship constructs (OR and EI) show high correlations between student entrepreneurship and entrepreneurial education, but no correlation with parent entrepreneurship. This finding is surprising, as parents are thought to be one of the leading influencers when it comes to entrepreneurial intent (Krueger, 1993). Interestingly, OR is positively correlated with social studies, yet negatively correlated with MINT studies. This finding is surprising, as the ability to recognize opportunities should be given independently from the study background, otherwise students with a technical background would not identify economically valuable opportunities that lead to innovation. Regarding EI, social studies show a weak correlation, while no correlation with MINT studies. This correlation is comprehensible, as social studies tend to include entrepreneurship in the curriculum (e.g. business administration), whereas MINT studies tend to have different focal points in their subjects.

# 6.1.2 Qualitative results

As the results did not show what could be hypothesized based on literature, few interviews were conducted after the analysis of the quantitative data. The aim of the interviews was to identify whether a certain factor was missing from the questionnaire that may have caused the insignificance of data. The interviews focused on highly sensitive human beings (HSPS) who have an outstanding entrepreneurial personality profile but did not make the step of becoming an entrepreneur yet.

Firstly, highly sensitive individuals were determined by their score on the questionnaire (SPS category 1, high) and their score on the ETP (score > 33) as well as no prior actions into entrepreneurship. The score for the ETP was set to at least a number of 40 first, was then, however, lowered due to the fact of highly sensitive human beings not showing a very high ETP and if so, they had already become entrepreneurially active. Four participants were contacted via email, and two agreed to be interviewed. Please find the participant profile in table 20.

	Participant A	Participant B
Gender	Male	Female
Educational Level	Bachelor	Master
Study	MINT	Social
SPS Score	Category 1 – High	Category 1 - High
ETP Score	33 – Medium High	40 - High
Entrepreneurial Status	None	None

Table 20 - Interview participants

As mentioned previously, the aim of the interviews was to find a significant element that was not tested for in the questionnaire and that may have kept highly sensitive individuals from showing a statistically significant relationship with either opportunity recognition or entrepreneurial intent. Therefore, several assumptions were made after the quantitative research had ended insignificantly. As mentioned in the literature (Ahadi & Basharpoor, 2010; Liss et al., 2008) (also see systematic literature review), SPS is known to cause greater stress levels in individuals. Due to increased, and permanently present stress levels that HSPS individuals must face, they are more likely to suffer mental illnesses (e.g. depression, anxiety). Since a mental or physical illness suffered previously was not tested for in the questionnaire, it was thought to may have influenced the outcome of the hypotheses. Furthermore, there was no control variable that tested for the overall desirability of entrepreneurship. It seems plausible that not all individuals evaluate entrepreneurship in itself as something that is desirable or worth striving for, even though they may be able to identify relevant opportunities or show increased entrepreneurial intent. This may be due to their subjectively perceived higher stress levels, implying that an entrepreneur is exposed to stress more than an average worker who does not have as much responsibility (Rauch, Fink, & Hatak, 2018). Non-entrepreneur employees also have a safer income, a safer job and a somewhat limited task they have responsibility for. Lastly, some people simply may not wish to realize themselves entrepreneurially.

These were some reasons that could be thought of, effects that were not tested for in the questionnaire due to sensitivity reasons but also due to survey fatigue. Based on the reasons, questions were formulated which were addressed to participants. Please find the list of questions attached in Appendix 8.5.

The first question asked to the participants was why, although the intent was high, no entrepreneurial action had been undertaken just yet. Participant A outlined the fact that he does not like to be responsible for a large number of people and impacting them with a bad decision he may make. Although he feels more than comfortable to take the lead in teams, an entrepreneurial activity was considered as too lonely. Furthermore, he stressed the fact that he did not feel the need to express his visions entrepreneurially, and that he was sure that he would not miss out if he did not engage in entrepreneurship. A career within an already established company seemed as promising, both personally and economically for him. Participant B outlined that the greatest obstacle of becoming an entrepreneur would be related to financials and that the stress coming along with day-to-day entrepreneurial activities is nonstop and exhausting. Additionally, she mentioned that her priorities shift towards a different direction, thus she does not feel like she wants to spend her time and energy on building a business. Both concluded that entrepreneurship was not something they strive to attain in the future and that entrepreneurship is not something desirable to them.

"I don't envision myself leading any sort of a company, trying to push it forward myself. This is due to the fact that I have the fear of making a bad decision. It is not necessarily fear of failure but just making a bad decision and having to look at the consequences rather for the people involved than for myself. I don't mind making a bad decision for myself that much but if I'm making a bad decision for others that

would be worse. Also, I don't know whether I'm exactly capable of identifying an opportunity that is a worth acting on. I don't know whether I'm capable enough of running my own company, even if it's not me alone by myself. I am still looking for that one thing worth acting on." (Participant A)

"At this moment, I don't have any intentions of becoming entrepreneurially active. I know myself very well and based on my personality I can say that the whole business environment for entrepreneurs will not be right for me. This is because I do tend to get stressed out a lot by things very fast and I get overwhelmed by many assignments or task that I have to fulfill. I don't have any intentions to be an entrepreneur right now, but in the field of job that I'm working in right now, I do like to deal with entrepreneurs. I like to implement entrepreneurial activities, strategies. I could imagine myself starting a business at one point in time maybe, right now it's just not a priority for me. I have other priorities, like my boyfriend, family, house and paying off my student loan, but if the right persons were to prove my ideas right and give me valuable tips so I would decrease the chance of failure, then that would push me into the right direction of entrepreneurship." (Participant B)

What was most striking from the interviews conducted was the fact that both participants struggled with mental health issues prior or at the time, but these issues were originated from stress caused by educational facilities (e.g. school, university).

"Based on the high amounts of stress I had in high school I was diagnosed with depression".

#### (Participant A)

The higher stress levels caused mental health issues which resulted in forms of depression, but also lead to physical health issues such as insomnia and hypothyroidism.

"I got very bad Insomnia, and this is one of the reasons why I am on antidepressants. It helps me sleep because during my studies I was stressing out so much [...] I was in the middle of the night trying to fall asleep. I lost appetite. This year, I was diagnosed with hypothyroidism, so I have to take medication for that as well. Hypothyroidism is also known to be caused by stress, so it's stress-induced. I have a lot of friends who have the same issue that it suddenly came as a result of stress. They were saying that as soon as they started studying, all those physical issues came along and suddenly they had to deal with lack serious illnesses they never had before, and they couldn't really explain as to why they were suddenly suffering. I want to say that I have at least 10 friends are suffering from hypothyroidism at the moment". (Participant B)

Research has shown that the hippocampus is one of the brain structures that has been extensively studied when it comes to the effects of stress, depression and the actions of antidepressants (McEwen, 1999, 2012). While short-term stress may improve the memory and the performance of individuals (Piefke & Glienke, 2017), long-term stress may cause serious harm to the brain areas involved. Caused by stress-related, neuropsychiatric disorders, such as recurrent stress-related illnesses, the hippocampus undergoes selective volume reduction (Bremner et al., 2000; Sapolsky, 2000; Sheline, Wang, Gado, Csernansky, & Vannier, 1996). Located within the hippocampus, the dentate gyrus is thought to contribute to the production and formation of new brain cells as well as contribute to short-term memory (Cameron, McEwen, & Gould, 1995). Production of new cells even occurs in the adult mammalian brain. One factor that potentially suppresses the generation of new cells is thought to be stress (Gould, McEwen, Tanapat, Galea, & Fuchs, 1997). But besides the obstruction of new brain cells, the formation of the hippocampus undergoes a morphological change in response to stress, as the hippocampus loses volume significantly (Magariños,

McEwen, Flügge, & Fuchs, 1996). This has declined in spatial memory or stress-related psychiatric disorders as a possible consequence (Rahman, Callaghan, Kerskens, Chattarji, & O'Mara, 2016). By the use of pharmacological treatments such as antidepressants, the structural changes in the brain can be reversed (Czéh et al., 2001). Participant A confirmed this phenomenon based on own experience, he suffered the loss of brain mass due to depression caused by stress.

"My doctor told me basically that my body produces a lot of stress hormones due to me being highly sensitive, which are ultimately responsible for motivating you in the first place. But, due to high levels of stress, brain cells get damaged. And typically, the brain would recover itself. However, as I am under constant my brain never gets the chance to recover itself. Therefore, by the time I got diagnosed, I found myself with severe brain mass reduction ". (Participant B)

Consequently, in accordance with findings in the literature, stress will increase memory and productivity, which may ultimately help to recognize opportunities better. However, due to the constant increased levels of stress, a reversed phenomenon may occur in individuals who are highly sensitive. In addition to that, the participants outlined the fact that they knew which situations triggered overarousal and that they were to avoid situations as such. Hence, avoidance of certain new, or uncertain situations may hinder to identify economically valuable opportunities. In contrast to that, both participants agreed to the fact that they believe they have a superior recognition ability than other individuals, based on the increased number of stimuli they process.

The findings show that entrepreneurship is certainly not a priority for both participants, due to a few different reasons. No engagement in entrepreneurship does not seem to be avoided due to a lack in selfconfidence or due to high neuroticism, but due to fear of failure and fear of overarching stress when other self-sustaining solutions seem equally as profitable. Priority or desirability was not tested for in the questionnaire, but according to the outcome of the interview, is advisable to include in a future study with HSPS. Therefore, it may have influenced the outcome of the study, because even though both HSPS individuals showed very high entrepreneurial intent, entrepreneurship is not desirable to them. One of the reasons why they showed high EI in the first place was that they both appeared very open to the concepts of entrepreneurship, due to studies or self-acquired knowledge and constant urge to learn. Entrepreneurial intent, however, may also be something that is genetically inherited. Genes might have direct effects on the chemical mechanisms in the brain that predispose people with that genetic composition to engage in entrepreneurial activity. Genes provide instructions for the craton of proteins out of amino acids. If a gene that codes for the creation of a particular protein is missing, then the chemical reaction that is designed to facilitate will not occur as efficiently. If that chemical reaction controls the brain activity, it can influence behavior (p.168). Therefore, arguably, EI may also be high for the individuals at hand, due to their genetic predisposition. It would explain why, while being HSPS, they show high EI unlike expected, especially after they clarified in the interview that they do not plan on engaging in entrepreneurship any time soon. The general readiness for entrepreneurship may just be something they predispose. According to White, Thornhill, and Hampson (2006), the tendency to engage in an entrepreneurial activity is influenced by the genes that predispose individual attributes (e.g. personality traits), such as the Big Five. It can be assumed that individuals, regardless of being HSPS, may inherit the ETP naturally in contrast to boiling one with certainty due to high EI (Schmitt-Rodermund, 2004).

The factor of prior illness suffered was not included in the questionnaire, and according to the participants, both mental and physical illness influenced their well-being and their performance as a student. This finding is particularly interesting, as mental ability decreases under constant stress. Therefore, it contradicts the

hypothesis drawn for this research. Due to the fact that medical papers were excluded for this research based on their scope, the implications on the hippocampus were not considered when drawing assumptions that led to the hypothesis. Hence, OR ability may suffer from high-stress levels as the short-term memory declines. This would support the information overload and inverted u-curve assumption made prior. Not all HSPS suffer from depression or other mental illnesses, but it must be kept in mind that they are more prone to these. Therefore, controlling for (mental) health appears reasonable.

# 6.2 Conclusion

To end this research where it has started, the research question of this research was "What is the impact of sensory processing sensitivity on entrepreneurial intent and opportunity recognition moderated by the entrepreneurial trait profile?". Unfortunately, none of the hypothesis with respects to SPS could hold, so the research question could not be answered by the quantitative research conducted. The systematic literature review, as well as the interviews which were conducted in the end, indicated some directions. Therefore, a relationship between SPS and OR cannot be definitely excluded or evaluated as unlikely, as indicated by literature and by the participants of the interviews. Whether entrepreneurial intent is influenced by SPS has still yet to be seen in future research. The ETP, as well as the individual Big Five, remain an interesting indicator for a moderating relationship between SPS and any entrepreneurial concept of choice, yet different moderators may contribute to the relationship in unforeseen ways.

## 6.3 Theoretical implications

The aim of this research was to close the existing gap of SPS literature regarding entrepreneurial concepts. This advanced research on SPS gave more insights into the relationship of SPS towards entrepreneurial behavior. Based on the systematic literature review, the novelty of linking entrepreneurial concepts to SPS became apparent. Assumptions are still valid that SPS will show significant relationships to some sorts of entrepreneurial concepts, as highlighted in the SLR. These concepts are sense of coherence, self-efficacy or alienation as outlined in the research by Evers et al. (2008) and may require a follow-up study. Furthermore, this research presented indications to look further into various concepts regarding the mental health of highly sensitive individuals. The amount of stress that individuals perceive may hold their great potential back from becoming entrepreneurially involved. Lastly, this research has been able to validate the positive relationship between OR and EI, thereby further validating the concepts and measurement scales used.

This research also indicated the evidence for a negative relation between stress and OR ability, which seems to be hampered based on biological reasons. Therefore, the need exists to investigate this further, while the researcher is also suggesting to not exclude biological reasoning when investigating the effects of stress.

## 6.4 Managerial implication

The findings of this research will be relevant to managers who have team responsibility and exhibit leadership, as the findings of this research will spark self-reflection and broaden awareness for different personality traits. As this research was also able to distinguish SPS from other personality traits, such as neuroticism, findings may help managers to understand their workforce better. Knowing that members of a team are highly sensitive and need different forms of support is important to team success. Additionally, the awareness of HSPS individuals is crucial in itself and should not be confused with traits of introversion or neuroticism. HSPS may be superior at OR, indicated by the interviews, and their ability may be leveraged for open innovation processes within a company. Future research linking personality and mental illness to entrepreneurship has been done by (Wiklund et al., 2018), who also suggest the leveraging power of mental illnesses, which do not always have to be seen as a drawback.

The results of this research are valid for larger society as well. When taking existing support systems into account, they should be incentives to take the results of this research into consideration to help certain individuals understand themselves better. Education on these differences should be implemented in some ways at universities as well, in order to help students', understand their personality and needs, manage their time and stress and to ultimately avoid depression or stress-related illnesses. This, of course, reflects to managers, team leaders and counselors.

# 6.5 Limitations

All academic research regarding the topic of SPS is based on one original paper published by Aron and Aron (1997). This research also builds upon the prior work dedicated by these authors, taking into consideration that the field of SPS is still relatively young and has not yet been linked to entrepreneurial or the business field of research.

The questionnaire consisted of multiple item-scale validated in the literature. Therefore, the 11-item Big Five scale by Rammstedt and John (2007) has been widely used and cited in literature prior to that. In this research, the Cronbach's alpha that the scale obtained was not acceptable. Therefore, the scale was considered in closer detail after the research had ended, to find possible flaws conducted on this side. What became apparent when trying to search for a solution was that more authors struggled with the internal consistency of that scale, even so, the original author of that research Rammstedt herself. During a revalidation study of hers in 2012 (Rammstedt, Kemper, Klein, Beierlein, & Kovaleva, 2012), the authors tried to validate the findings of 2007 by the use of a different sample. Thereby, Rammstedt et al. (2012) also encounter a very low Cronbach's alpha. After a re-test using the CAPI (computer-assisted personal interview) method on a self-selected sub-group of the original participants, the Cronbach's alphas were higher, but not all reached values above .6 (e.g. agreeableness = .49, neuroticism = .56). Rammstedt et al. (2012) conclude the validation of the original study by taking the average Cronbach's alpha of all Big Five, which is at exactly .6. Using the mean of all Big Five factors should be taken with care. As the factor analysis shows five distinct factors that make for the Big Five measurement, it is not advisable to take a mean Cronbach's alpha to justify internal reliability. Instead, each Big Five factor has to reach a sufficient internal reliability of its own, which should be at least at 0.6, however preferably larger than 0.7.

Another limitation was the exclusion of medical papers. Due to the focus on entrepreneurship and personality traits, three applicable subject areas had been selected, namely psychology, business, management and accounting and social studies due to the fact that only these fields of study are in line with the field and topic of this research. Another reason for limiting to these three subject areas was the focus, as including medical papers would have shifted the scope of the SLR and results would not have been directly linkable to the research question. However, as presented during the findings of the interviews, medical implications seem to be relevant when considering the functioning of human beings under constant levels of stress. The assumptions of this research have been made, neglecting the fact that stress will limit the ability of HSPS as it will cause mental and physical inabilities. Thus, the approaches may have to be restructured, taking physical/psychological inabilities into consideration.

# 6.6 Suggestions for future research

This research outlined that the literature on SPS lacks variety, for example, many studies focus more on children or childhood behavior/abuse. Due to the fact that there are no longitudinal studies on SPS yet and multiple authors stress the need, this research concludes to also recommend a longitudinal study on SPS. It would be highly interesting to see if and how SPS evolves over time and with age. When arguing from the information processing perspective, age diffuses the perception and information is not always processed as

much and as rapidly in elderly people. Therefore, SPS may fall under those assumptions as well, indicating that highly sensitive individuals become less sensitive with age or even do not feel as bothered by their sensitivity anymore (e.g. experience less stress and anxiousness). In accordance to this, many studies focused on children and childhood abuse and relate it to SPS, whereas a different majority took student samples as their underlying ground for assumptions due to the ease of generating these data. Thus, a sample elderly in comparison to younger people with HSPS would be interesting. with Additionally, the debate whether SPS is a unidimensional or a multidimensional construct has been theoretically cleared up by Lionetti et al. (2018). Their research found supporting evidence of three levels of SPS, namely HSPS, MSPS, and LSPS. As three statistically significant degrees of sensitivity emerge, and as these findings could also be underlined in this research, the need to research individuals who inhibit a trait on the other end of the spectrum (e.g. being very low levels of sensitive) arises consequently. Possibly, low sensitivity has different impacts on the lives of individuals who inhibit LSPS, and comparisons between LSPS and HSPS would be interesting and valuable, for both researchers theoretically and practically.

The theory of information overload still holds present for HSPS individuals. This study was not able to indicate significance between SPS and OR, which may still hold for the fact of HSPS suffering from information overload. Whether a "perfect amount of information" for HSPS exists, or whether they need less input information (initial stimulus) than others may be a topic future research could investigate.

Since a statistically significant relationship between the different concepts of this research (OR and EI) could not be linked to SPS, but according to literature it can be suspected, a repetition study with a sample set of real entrepreneurs would in insightful. To further validate findings, more interviews with HSPS entrepreneurs are recommended, as done in this study.

Studies on how mental illness affects entrepreneurial concepts are still sparse. It is suspected that mental illness may not always be an obstacle in entrepreneurship, but it may even benefit the entrepreneur in some cases. In their research suggestions, Wiklund et al. (2018) propose to research the role of mental illness in the entrepreneurial context. This research also concludes a need to research mental illness influencing entrepreneurial intent, as well as the ability to process information accordingly.

Lastly, research on brain damage on students who are HSPS due to stress would be relevant, looking into ways on how to decrease stress levels of students. This may help to teach staff to use different and improved methods while shaping the higher education landscape for the better.

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# 8. APPENDIX

# 8.1 Systematic literature review

Authors	Article Title	Year Addressed Issues Published		Problem Statement / Research goal	Methodological Philosophy	Findings	
Acevedo, B. P., Aron, E. N., Aron, A., Sangster, M. D., Collins, N. & Brown, L. L.	The highly sensitive brain: an fMRI study of sensory processing sensitivity and response to others' emotions	2016	Examination of neutral systems engaged in response to others' emotions	Extended research on SPS by examining the brain activations engaged in processing emotional social stimuli	Quantitative	Activation of brain regions involved in awareness, attention, and action planning. Other neural activations found in regions implicated in the integration of sensory information, emotional meaning making, and empathy.	
Ahadi, B., & Basharpoor, S.	Relationship between sensory processing sensitivity, personality dimensions and mental health	2010	Provides some associations between sensory processing sensitivity, big five personality dimensions and mental health.	The goal is to examine the relationship between SPS, personality, and mental health. SPS is thought to be the main factor of personal development, but this has to be tested further	Quantitative	Ease of excitation negatively related to affection and emotionality, Positive relationship between sensitivity and openness to experience, Positive relationship between sensitivity and conscientiousness. Sensitivity also directly predicted conscientiousness.	
Andresen, M., Goldmann, P., & Volodina, A.	Do Overwhelmed Expatriates Intend to Leave? The Effects of Sensory Processing Sensitivity, Stress, and Social Capital on Expatriates' Turnover Intention	2017	Entering a new country can be emotionally demanding to expatriates. SPS is considered in the context of human resource management and organizational behavior.	The study strives to reveal the effect of resources (SPS and social capital) on stress and turnover intention, to raise awareness of the trait of SPS in the field of HR and to deduce implications for expatriates	Quantitative	26.4% of expatriates show high SPS. SPS influences the levels of stress pervieced. The interpretability of results also indicates a 3-class solution, which may be interpreted in high, moderate, and low levels of SPS.	
Aron, A., Ketay, S., Hedden, T., Aron, E. N., Rose Markus, H., & Gabrieli, J. D.	Temperament trait of sensory processing sensitivity moderate's cultural differences in neural response	2010	It is explored whether a basic personality trait (sensory processing sensitivity; SPS) might moderate a previously established cultural difference in neural responses when making context-dependent vs context-independent judgments of simple visual stimuli.	This research tests the interaction of SPS with culture in predicting differences in neural response. Additionally, the study questions gene, environment and culture interaction.	Quantitative	Some categories of individuals are less influences by their cultural background than others., it is especially weaker for individuals with SPS	
Aron, E. N., & Aron, A.	Sensory-Processing Sensitivity and Its Relation to Introversion and Emotionality	1997	This research identifies a unidimensional core variable of SPS and demonstrate its partial independence form social introversion and emotionality	The authors review previous conceptualizations of this basic psychobiological difference of SPS and give their own view	Literature review	Both individual and situational differences influence the process of opportunity identification	

Aron, E.N., Aron, A., & Jagiellowicz, J.	Sensory Processing Sensitivity: A Review in the Light of the Evolution of Biological Responsivity	2012	SPS in relation to evolutionary biology. The study considers traits relevant to specific hypothesized aspects of SPS: inhibition of behavior, sensitivity to stimuli, depth of processing, and emotional/physiological reactivity	Does SPS in humans correspond to biological responsivity?	Quantitative	Considers advantages in species for SPS - uniqueness is an advantage. SPS is confused with some evolutionary traits. Also, the authors correlated SPS with s-allele of the 5- HTTPLPR polymorphism to help inconsistencies with predicting depression based on childhood environment
Bakker, K., & Moulding, R	Sensory-processing sensitivity, dispositional mindfulness and negative psychological symptoms.	2012	The study investigates the relationships between SPS, mindfulness and acceptance, and negative affect, using a cross-sectional questionnaire design	The aim of this research is to investigate the relationship between SPS, mindfulness and distress using a cross- sectional methodology in a non-clinical sample	Quantitative	Examined Sensory- Processing Sensitivity (SPS) in relation to negative affect. Investigated the moderating effect of trait mindfulness and acceptance on SPS. SPS only related to anxiety when mindfulness and acceptance were low. Mindfulness and acceptance-based treatments may be helpful for those high on SPS.
Benham, G.	The Highly Sensitive Person: Stress and physical symptoms reports	2006	Examines whether SPS is associated with self- perceived stress levels and physical health complaints	Little additional research has been done on the construct of PS, though the concepts seems to resonate with many individuals buying the books of Aron. Therefore, they aim of the study was to examine whether SPS is associated with self- perceived stress levels and physical health complaints	Quantitative	SPS is associated with greater stress and more frequent symptoms of ill health. The analysis revealed that SPS is a predictor of health, more powerful even than stress
Brindle, K., Moulding, R., Bakker, K., & Nedeljkovic, M.	Is the relationship between sensory- processing sensitivity and negative affect mediated by emotional regulation?	2015	The study examines the relationship between SPS and the feeling of distress.	The study aimed to investigate the relationships among SPS, emotional regulation, and symptoms of distress (i.e., depression, anxiety, and stress).	Quantitative	An individual's lack of access to emotional regulation strategies, greater awareness of emotion, and lack of acceptance towards feeling distressed, acted as partial mediators between sensory-processing sensitivity and symptoms of depression. Combinations of these variables also partially mediated the relationship between sensory-processing sensitivity and symptoms of anxiety and stress.
Carr, M., & Nielsen, T.	A novel Differential Susceptibility framework for the study of nightmares: Evidence for trait sensory processing sensitivity	2017	Nightmares happen due to sensitivity. Sensory processing sensitivity is proposed as a novel trait marker that underlies the unique symptoms and imaginative richness	The goal of this research is to demonstrate how sensory processing sensitivity may be reflected in the dreams and even waking imaginations of	Quantitative	Nightmare-prone individuals are sensitive and responsive to a wider than normal range of environmental influences. Training directed towards modifying emotion regulation strategies, such

			found in nightmare- prone individuals.	individuals with nightmares.		as positive psychology or mindfulness, and increasing dream awareness, such as lucid dreaming, may prove beneficial for decreasing nightmare frequency and
Evers, A., Rasche, J., & Schabracq, M. J.	High Sensory- Processing Sensitivity at Work	2008	SPS is not a one- dimensional construct. The authors relate it to coherence, alienation, self-efficacy, negative affectivity, and work stress	Some people are more easily disturbed than others - stress complaints at work, and therefore being unable to work	Quantitative	No confirmed negative relationship between meaningfulness and self- efficacy. Results confirm that HSPS does not measure a one- dimensional construct. The main lesson from tthe results is that an effective intervention should aim at boosting the sense of coherence, self-efficacy, commitment, and affective state of the persons involved. This allows them to perceive the work as more comprehensible, manageable, and meaningful, so that they can effectively influence it, commit to it, and connect with it.
Gearhart, C.C.	Sensory-Processing Sensitivity and Nonverbal Decoding: The effect on listening ability and accuracy	2014	Examines the effect of SPS on nonverbal decoding like identifying emotions from paralinguistic cues.	To investigate whether HSP'ers perform more poorly on nonverbal tasks when exposed to adverse stimulation, and better than non-HSP'ers when not exposed to stimulation	Quantitative	HSP'ers are no worse (and no better) at recognizing vocal expressions of emotions than are non- HSP'ers, regardless of whether they are exposed to conditions of stimulation or not.
Gearhart, C.C. & Bodie D.	Sensory-Processing Sensitivity and Communication Apprehension: Dual Influences on Self- Reported Stress in a College Student Sample	2012	Investigation of the influence of SPS on communication apprehension and self- reported stress levels among college students.	Examination of whether communication apprehension is a possible system of a HSP'er, by way of empirically test its relation to SPS. And to investigate the degrees to which CA and SPS relate to academic stress.	Quantitative	(1) measures of SPS and CA are moderately correlated providing preliminary self- report evidence that these two biologically based constructs may share a common origin; (2) both sensory-processing sensitivity and communication apprehension are positively associated with levels of college stress; and (3) the magnitude of the association between SPS and stress is three times that of CA and stress (18.5% versus 6.25% shared variance)
Gerstenberg, F.	Sensory-processing sensitivity predicts performance on a visual search task followed by an increase in perceived stress	2012	SPS in relation to other self-reporting scales, such as the behavioral inhibition and behavioral activation system scales, the Big Five scales, and other health-related self- report scales	Only a few studies have assessed the relation between HSPS and a behavioral test, this study aims to fill this gap.	Quantitative	SPS increases perceived stress. Results were independent of personality constructs and Big Five.

Grimen, H. L. & Diseth, A.	Sensory Processing Sensitivity: Factors of the Highly Sensitive Person Scale and Their relationships to Personality and Subjective Health Complaints	2016	Examines how SPS is related to personality traits of neuroticism, extraversion, and openness and to subjective health complaints.	The literature suggests a relationship between SPS, personality and common health complaints, this needs to be investigated by controlling for personality factor when investigating the relation between SPS and health. Furthermore, is their aim to future validate the measurement for SPS by using the Norwegian version.	Quantitative	SPS factor (EOE, LST and AES combined) is positively predicted by neuroticism and openness and negatively by extraversion. EOE and LST significantly correlated with neuroticism and AES was positively correlated with openness. EOE and LST were negatively correlated with extraversion, but the small, moderate and small respectively.
Jagiellowicz, J., Xu, X., Aron, A., Aron, E., Cao, G., Feng, T., & Weng, W.	The trait of sensory processing sensitivity and neural responses to changes in visual scenes	2011	Study examines the extent to which individual differences in SPS, are associated with neural response in visual areas in response to subtle changes in visual scenes.	The literature suggests that the way sensory information is processed is the key to the temperamental difference characterized as SPS suggests. This research is the first to examine the brain mechanisms that might underlie such a difference.	Qualitative (experiment, first HSP scale, then visual test while undergoing a fMRI)	SPS is associated with significantly greater activation in brain areas involved in high-order visual processing, when detecting minor (vs. major) changes in stimuli. These remained significant after controlling for neuroticism and introversion.
Jonsson, K., Grim, K., & Kjellgren, A.	Do highly sensitive persons experience more non-ordinary states of consciousness during sensory isolation?	2014	How do highly sensitive individuals perceive flotation tank therapy	To investigate whether or not highly sensitive persons experienced more non- ordinary/altered states of consciousness (ASC) during 45 minutes of sensory isolation in a flotation tank, than did less sensitive persons.	Quantitative	Main finding was that the highly sensitive individuals experienced significantly more ASC during flotation than did the individuals in the low sensitivity group.
Lionetti, F., Aron, A., Aron, E. N., Burns, G. L., Jagiellowicz, J., & Pluess, M	Dandelions, tulips and orchids: evidence for the existence of low- sensitive, medium- sensitive and high- sensitive individuals	2018	Finding a common ground on the measurement and construction of SPS, as well as testing established hypotheses of different authors	The goal of this research is a) to investigate whether environmental sensitivity as measured with the HSP scale is indeed a unitary concept and b) whether HSP data supports the existence of distinct sensitivity categories in the general population as well as c) whether the detected groups to differ based on personality traits and emotional reactivity	Quantitative	A confirmatory factor analysis supported a bifactor structure, which means that the HSP scale consist of both a general sensitivity construct as well as three individual subscales. Both are simultaneously valid rather than mutually exclusive. Additionally, while some people are highly sensitivity, a vast majority have medium sensitivity and a substantial minority is characterized as particularly low sensitive. It was also found that individuals differ rather in the degree of sensitivity than in the relative composition of the HSP components
Liss, M., Mailloux, J., & Erchull, M. J.	The relationships between sensory processing sensitivity, alexithymia, autism, depression, and anxiety.	2008	Relating SPS' three recently developed factors of sensory processing sensitivity - ease of excitation (EOE), low sensory threshold (LST) and aesthetic	The goal is a better understanding of the relationships among sensory processing sensitivity, alexithymia, autistic symptoms, and	Quantitative	The EOE and LST factors were related to anxiety and depression; poor social skills, attention to details, and poor communication (symptoms of autism); and difficulty describing and

		sensitivity (AES), with alexithymia, autism symptoms, anxiety, and depression.	the clinical outcomes of anxiety and depression.		identifying feelings (symptoms of alexithymia). AES was also related to increased anxiety and greater attention to details. AES was related to anxiety but not depression.
Pazda, A. D., & Thorstenson, C. A.	Extraversion predicts a 20 preference for high- chroma colors	8 Relationship between extraversion and color preference along the chroma dimension	The goal of the research is to measure preferences for colors varying along the spectral property of chroma and test whether extraversion can predict individual differences in these preferences.	Quantitative	Extraversion is related to color preferences along the chroma dimension. This association was present when controlling for the effects of the other Big Five personality traits, sensory- processing sensitivity, positive/negative affect, and sex.
Şengül-İnal, G., & Sümer, N.	Exploring the 20 Multidimensional Structure of Sensory Processing Sensitivity in Turkish Samples	7 Comparing alternative models to explore the multidimensionality of the Highly sensitive person scale (HSPS).	Aimed to examine the factorial qualities of the HSPS scale, including its factor structure, internal consistency, and potential gender differences.	Quantitative	Multidimensionality of HSPS could be confirmed via two studies, results in a four-factor ESEM solution (sensitivity to external stimuli, aesthetic sensitivity, harm avoidance and sensitivity to overstimulation) which is superior to previously reported alternative models. External validation included the Big Five.
Smolewska, K. A., McCabe, S. B., & Woody, E. Z.	A psychometric 200 evaluation of the Highly Sensitive Person Scale: The components of sensory-processing sensitivity and their relation to the BIS/BAS and "Big Five"	6 Examines the psychometric properties of the HSPS, and its association with the behavioral inhibition system (BIS) and behavioral activation system (BAS)	Re-examine the psychometric properties of Aron and Aron's (1997) 27-item HSPS with a larger sample, offering more accurate parameter estimates and a reevaluation of its factor structure. Also, this study tries to test Aron & Aron's prediction that SPS is associated with a number of personality and neurophysiological constructs.	Quantitative	HSPS is a valid and reliable measure of the construct of SPS. Results support a three-component structure consisting of Aesthetic Sensitivity (AES), Low Sensory Threshold (LST), and Ease of Excitation (EOE).
Yano, K., & Oishi, K.	The relationships among 20 daily exercise, sensory- processing sensitivity, and depressive tendency in Japanese university students	8 Investigates SPS and its three subscales to depressive tendencies and the frequency of regular physical exercise	The goal of this research is to report inter- relationships among the three sub-components (LST, EOE, AES) of SPS and bring them n relation to other psychological factors.	Quantitative	LST and EOE were positively related to depressive tendencies, AES was negatively related. Longitudinal approaches are needed to reveal the effects that physical exercise has on the relationships between LST or EOE and depressive tendencies.

# 8.2 Factor analyses of main constructs

# **Big Five**



Total Variance Explained											
Initial Eigenvalues Extraction Sums of Squared Loadin											
Component	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %					
1	2.070	18.820	18.820	2.070	18.820	18.820					
2	1.703	15.486	34.306	1.703	15.486	34.306					
3	1.560	14.178	48.483	1.560	14.178	48.483					
4	1.196	10.877	59.360	1.196	10.877	59.360					
5	1.081	9.826	69.187	1.081	9.826	69.187					
6	.716	6.511	75.698								
7	.672	6.111	81.809								
8	.659	5.992	87.800								
9	.518	4.713	92.514								
10	.462	4.202	96.716								
11	.361	3.284	100.000								

Extraction Method: Principal Component Analysis.

# SPS

#### KMO and Bartlett's Test

Kaiser-Meyer-Olkin Me	asure of Sampling Adequacy.	.747
Bartlett's Test of	Approx. Chi-Square	337.976
Sphericity	df	66
	Sig.	.000



#### Total Variance Explained

		Initial Eigenvalu	les	Extraction Sums of Squared Loadings			
Component	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %	
1	3.734	31.115	31.115	3.734	31.115	31.115	
2	1.877	15.644	46.759	1.877	15.644	46.759	
3	1.192	9.932	56.691	1.192	9.932	56.691	
4	.904	7.535	64.225				
5	.831	6.923	71.149				
6	.729	6.076	77.224				
7	.630	5.246	82.471				
8	.577	4.809	87.279				
9	.534	4.447	91.727				
10	.391	3.259	94.986				
11	.340	2.836	97.822				
12	.261	2.178	100.000				

Extraction Method: Principal Component Analysis.

#### Entrepreneurial Intent (EI)

#### KMO and Bartlett's Test



# Total Variance Explained

		Initial Eigenvalu	Extraction Sums of Squared Loadings			
Component	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	5.055	84.251	84.251	5.055	84.251	84.251
2	.355	5.916	90.167			
3	.242	4.038	94.206			
4	.142	2.367	96.573			
5	.132	2.196	98.768			
6	.074	1.232	100.000			

Extraction Method: Principal Component Analysis.

#### OR 1 (Kuckertz et al.)

#### KMO and Bartlett's Test



#### Initial Eigenvalues Extraction Sums of Squared Loadings % of Variance Cumulative % Total % of Variance Cumulative % Total Component 4.005 80.092 80.092 4.005 80.092 80.092 9.631 89.723 .482 .242 4.832 94.555 .140 2.803 97.357

100.000

Total Variance Explained

.132 Extraction Method: Principal Component Analysis.

2.643

1

2

3

4

5

# OR 2 (Ozgen & Baron)

#### KMO and Bartlett's Test





#### Total Variance Explained Initial Eigenvalues Extraction Sums of Squared Loadings

Component	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	2.079	69.300	69.300	2.079	69.300	69.300
2	.744	24.804	94.104			
3	.177	5.896	100.000			
E 1 11 14 1		1.0	1 1			

Extraction Method: Principal Component Analysis

# 8.3 Joint hypotheses in three groups of increasing depth

*Hypothesis 1.1: Sensory Processing Sensitivity is negatively related to Entrepreneurial Intent Hypothesis 1.2: Sensory processing sensitivity is positively related to opportunity recognition ability Hypothesis 1.3: Opportunity recognition ability is positively related to entrepreneurial intent.* 

Hypothesis 2.1: The negative relationship between SPS and EI is moderated by the ETP, higher levels of ETP is weakening the negative relationship between SPS and EI. Hypothesis 2.2: The positive relationship between SPS and OR is moderated by the ETP; higher levels of ETP is strengthening the positive relationship between SPS and OR. Hypothesis 2.3: The positive relationship between OR and EI is moderated by the ETP; higher levels of ETP is strengthening the positive relationship between OR and EI is moderated by the ETP; higher levels of ETP is strengthening the positive relationship between OR and EI.

Hypothesis 3.1.1 The negative relationship between SPS and EI will be moderated by extraversion. The more extraverted, the weaker the negative the relationship between SPS and EI becomes.
Hypothesis 3.1.2: The negative relationship between SPS and EI will be moderated by agreeableness. The more agreeable, the stronger the relationship between SPS and EI becomes.
Hypothesis 3.1.3: The negative relationship between SPS and EI will be moderated by conscientiousness. The more conscientious, the weaker the negative the relationship between SPS and EI becomes.
Hypothesis 3.1.4: The negative relationship between SPS and EI will be moderated by neuroticism. The more neurotic, the stronger the relationship between SPS and EI will be moderated by neuroticism. The more neurotic, the stronger the relationship between SPS and EI becomes.
Hypothesis 3.1.5: The negative relationship between SPS and EI becomes.
Hypothesis 3.1.5: The negative relationship between SPS and EI becomes.

*Hypothesis 3.2.1: The positive relationship between SPS and OR will be moderated by extraversion. The more extraverted, the stronger the relationship between SPS and OR becomes.* 

*Hypothesis 3.2.2: The positive relationship between SPS and OR will be moderated by agreeableness. The more agreeable, the weaker the relationship between SPS and OR becomes.* 

*Hypothesis 3.2.3: The positive relationship between SPS and OR will be moderated by conscientiousness. The more conscientious, the stronger the relationship between SPS and OR becomes.* 

*Hypothesis 3.2.4: The positive relationship between SPS and OR will be moderated by neuroticism. The more neurotic, the weaker the relationship between SPS and OR becomes.* 

*Hypothesis 3.2.5: The positive relationship between SPS and OR will be moderated by openness to new experiences. The more open, the stronger the relationship between SPS and OR becomes.* 

*Hypothesis 3.3.1: The positive relationship between OR and EI will be moderated by extraversion. The more extraverted, the stronger the relationship between OR and EI becomes.* 

*Hypothesis 3.3.2: The positive relationship between OR and EI will be moderated by agreeableness. The more agreeable, the weaker the relationship between OR and EI becomes.* 

*Hypothesis 3.3.3: The positive relationship between OR and EI will be moderated by conscientiousness. The more conscientious, the stronger the relationship between OR and EI becomes.* 

*Hypothesis 3.3.4: The positive relationship between OR and EI will be moderated by neuroticism. The more neurotic, the weaker the relationship between OR and EI becomes.* 

*Hypothesis 3.3.5: The positive relationship between OR and EI will be moderated by openness to new experiences. The more open, the stronger the relationship between OR and EI becomes.* 

# 8.4 Statistical outputs per hypothesis

#### Group 1:

Hypothesis 1.2: Sensory processing sensitivity is positively related to opportunity recognition ability Simple regression

	0			Model S	ummary							
						Chan	ige Statistics					
Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	R Square Change	F Change	df1	df2	Sig. F Change			
1	,006 <sup>a</sup>	,000	-,010	1,68266	,000	,004	1	101	,949			
a. F	a. Predictors: (Constant), SPS_Mean											
				Coeffici	ients <sup>a</sup>							
			Unstandardi	zed Coefficients	Standardized Coefficients			Collinear	ity Statistics			
Model			В	Std. Error	Beta	t	Sig.	Tolerance	e VIF			
1	(Constant)		3,717	1,157		3,212	,002					
	SPS_Mean		,080	,170	,042	,471	,639	,955	5 1,047			
	ENT_Proxy		,740	,541	,222	1,369	,174	,283	3,535			
	Student_En p	trepreneurshi	,970	,461	,221	2,106	,038	,674	4 1,484			
	Parents_En	trepreneurshi	-,204	,355	-,083	-,574	,567	,354	4 2,823			
	Ent_Educat	ion_2	-,859	,261	-,326	5 -3,291	,001	,756	5 1,323			
	MINT		,154	,769	,045	,200	,842	,147	6,797			

a. Dependent Variable: OR1\_Mean

Social

#### *Hypothesis 1.3: Opportunity recognition ability is positively related to entrepreneurial intent.* **Model Summary**

,826

,255

1,087

,280

,135

7,424

,898

					Change Statistics					
Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	R Square Change	F Change	df1	df2	Sig. F Change	
1	,733 <sup>a</sup>	,537	,533	1,29930	,537	117,371	1	101	,000	

a. Predictors: (Constant), OR1\_Mean

#### Model Summary<sup>b</sup>

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	R Square Change	F Change	df1	df2	Sig. F Change	Durbin- Watson
1	,769 <sup>a</sup>	,591	,561	1,26028	,591	19,586	7	95	,000	1,458

a. Predictors: (Constant), Social, Student\_Entrepreneurship, Parents\_Entrepreneurship, Ent\_Education\_2, OR1\_Mean, ENT\_Proxy, MINT b. Dependent Variable: EI\_Mean

#### Coefficients<sup>a</sup>

		Unstandardized Coefficients		Standardized Coefficients			Collinearity	Statistics
Model		В	Std. Error	Beta	t	Sig.	Tolerance	VIF
1	(Constant)	-,004	,918		-,004	,997		
	OR1_Mean	,746	,089	,657	8,416	,000	,707	1,414
	ENT_Proxy	,260	,472	,069	,550	,584	,277	3,605
	Student_Entrepreneurshi p	,727	,403	,146	1,801	,075	,657	1,522
	Parents_Entrepreneurshi p	,194	,307	,070	,629	,531	,353	2,831
	Ent_Education_2	-,157	,236	-,052	-,665	,508	,692	1,446
	MINT	,806	,665	,208	1,213	,228	,147	6,795
	Social	,612	,717	,153	,853	,396	,134	7,476

a. Dependent Variable: El\_Mean

### Group 2:

H2.2: The positive relationship between SPS and OR is moderated by the ETP; higher levels of ETP is strengthening the positive relationship between SPS and OR. Model Summary<sup>b</sup>

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	,093 <sup>a</sup>	,009	-,011	1,68380

a. Predictors: (Constant), Moderator\_ETP, SPS\_Mean

b. Dependent Variable: OR1\_Mean ANOVA<sup>a</sup>

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	2,459	2	1,230	,434	,649 <sup>b</sup>
	Residual	283,518	100	2,835		
	Total	285,977	102			

a. Dependent Variable: OR1\_Mean

b. Predictors: (Constant), Moderator\_ETP, SPS\_Mean

# Coefficie

		Unstandardize	d Coefficients	Standardized Coefficients		
Model		В	Std. Error	Beta	t	Sig.
1	(Constant)	3,394	,833		4,076	,000
	SPS_Mean	,030	,198	,016	,152	,880
	Moderator_ETP	-,166	,179	-,095	-,929	,355

a. Dependent Variable: OR1\_Mean

#### Group 3:

#### *Hypothesis 3.1.3: The negative relationship between SPS and EI will be moderated by conscientiousness. The more conscientious, the weaker the negative the relationship between SPS and EI becomes.* **Model Summary**

				Change Statistics								
Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	R Square Change	F Change	df1	df2	Sig. F Change			
1	,120 <sup>a</sup>	,014	-,005	1,90616	,014	,730	2	100	,485			
a. Pre	edictors: (Co	onstant), mo	derator_Consci	entiousness, SPS_I	Mean							
	Coefficients <sup>a</sup>											
	Unstandardized Coefficients Standardized											
Mode	1			В	Std. Error	Be	ta	t	Sig.			
1	(Const	ant)		3,457	,938			3,686	,000			
	SPS_M	ean		,011	,224		,005	,051	,959			
	modei sness	rator_Cons	scientiou	-,229	,194		-,121	-1,185	,239			
a.	a. Dependent Variable: El Mean											

Hypothesis 3.1.5: The negative relationship between SPS and EI will be moderated by openness to new experiences. The more open, the weaker the negative the relationship between SPS and EI becomes.

#### **Model Summary**

					Change Statistics					
Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	R Square Change	F Change	df1	df2	Sig. F Change	
1	,147 <sup>a</sup>	,022	,002	1,89926	,022	1,099	2	100	,337	

a. Predictors: (Constant), moderator\_Openness, SPS\_Mean

# Coefficients<sup>a</sup>

		Unstandardize	d Coefficients	Standardized Coefficients		
Model		В	Std. Error	Beta	t	Sig.
1	(Constant)	3,367	,939		3,584	,001
	SPS_Mean	,047	,227	,022	,208	,836
	moderator_Openness	-,311	,212	-,152	-1,463	,147

a. Dependent Variable: El\_Mean

*Hypothesis 3.2.3: The positive relationship between SPS and OR will be moderated by conscientiousness. The more conscientious, the stronger the relationship between SPS and OR becomes.* 

	Model Summary										
	Change Statistics										
Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	R Square Change	F Change	df1	df2	Sig. F Change		
1	,028 <sup>a</sup>	,001	-,019	1,69041	,001	,040	2	100	,961		

a. Predictors: (Constant), moderator\_Conscientiousness, SPS\_Mean

		Coeffi	cients <sup>a</sup>			
		Unstandardize	d Coefficients	Standardized Coefficients		
Model		В	Std. Error	Beta	t	Sig.
1	(Constant)	3,543	,832		4,259	,000
	SPS_Mean	,001	,199	,000	,003	,997
	moderator_Conscientiou sness	-,047	,172	-,028	-,275	,784
a. D	ependent Variable: OR1_Me	ean				

Hypothesis 3.2.4: The positive relationship between SPS and OR will be moderated by neuroticism. The more neurotic, the weaker the relationship between SPS and OR becomes.

	Model Summary										
	Change Statistics										
Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	R Square Change	F Change	df1	df2	Sig. F Change		
1	,050 <sup>a</sup>	,003	-,017	1,68893	,003	,128	2	100	,880		

a. Predictors: (Constant), moderator\_Neuroticism, SPS\_Mean

# Coefficients<sup>a</sup>

		Unstandardize	d Coefficients	Standardized Coefficients		
Model		В	Std. Error	Beta	t	Sig.
1	(Constant)	3,644	,810		4,498	,000
	SPS_Mean	-,034	,198	-,018	-,171	,864
	moderator_Neuroticism	,080	,160	,051	,502	,617

a. Dependent Variable: OR1 Mean

Hypothesis 3.2.5: The positive relationship between SPS and OR will be moderated by openness to new experiences. The more open, the stronger the relationship between SPS and OR becomes.

	Model Summary											
						Cha	ange Statisti	cs				
Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	R Square Change	F Change	df1	df2	Sig. F Change			
1	,088 <sup>a</sup>	,008	-,012	1,68457	,008	,388	2	100	,680			

a. Predictors: (Constant), moderator\_Openness, SPS\_Mean

# Coefficients<sup>a</sup>

		Unstandardize	d Coefficients	Standardized Coefficients		
Model		В	Std. Error	Beta	t	Sig.
1	(Constant)	3,405	,833		4,087	,000
	SPS_Mean	,040	,202	,021	,200	,842
	moderator_Openness	-,165	,188	-,092	-,878	,382

a. Dependent Variable: OR1\_Mean

*Hypothesis 3.3.3: The positive relationship between OR and EI will be moderated by conscientiousness. The more conscientious, the stronger the relationship between OR and EI becomes.* 

Model Summary <sup>b</sup>											
						Cha	ange Statisti	cs			
Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	R Square Change	F Change	df1	df2	Sig. F Change	Durbin- Watson	
1	,737 <sup>a</sup>	,543	,534	1,29818	,543	59,373	2	100	,000	1,624	

a. Predictors: (Constant), OR1\_Conscientiousness\_centered, OR1\_Mean

b. Dependent Variable: El\_Mean

#### Coefficients<sup>a</sup>

		Unstandardize	d Coefficients	Standardized Coefficients			Collinearity	Statistics
Model		В	Std. Error	Beta	t	Sig.	Tolerance	VIF
1	(Constant)	,537	,302		1,777	,079		
	OR1_Mean	,833	,077	,734	10,850	,000	1,000	1,000
	OR1_Conscientiousness_ centered	,088	,081	,073	1,083	,281	1,000	1,000

a. Dependent Variable: El\_Mean

Hypothesis 3.3.4: The positive relationship between OR and EI will be moderated by neuroticism. The more neurotic, the weaker the relationship between OR and EI becomes.

Model Summary <sup>b</sup>											
						Cha	unge Statisti	cs			
Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	R Square Change	F Change	df1	df2	Sig. F Change	Durbin- Watson	
1	,734 <sup>a</sup>	,538	,529	1,30475	,538	58,275	2	100	,000	1,589	
a Bro	dictors: (C	onstant) OP	1 Nouroticism co	ntorod OP1 Mo	20						

a. Predictors: (Constant), OR1\_Neuroticism\_centered, OR1\_Mean

b. Dependent Variable: El\_Mean

#### Coefficients<sup>a</sup>

		Unstandardize	d Coefficients	Standardized Coefficients			Collinearity	Statistics
Model		В	Std. Error	Beta	t	Sig.	Tolerance	VIF
1	(Constant)	,572	,303		1,889	,062		
	OR1_Mean	,829	,078	,731	10,700	,000	,991	1,009
	OR1_Neuroticism_center ed	-,031	,077	-,027	-,398	,692	,991	1,009
	enendent Variable: El Mear	<b>,</b>						

a. Dependent Variable: El\_Mean

Hypothesis 3.3.5: The positive relationship between OR and EI will be moderated by openness to new experiences. The more open, the stronger the relationship between OR and EI becomes.

#### Model Summary<sup>b</sup>

						Change Statistics						
Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	R Square Change	F Change	df1	df2	Sig. F Change	Durbin- Watson		
1	,736 <sup>a</sup>	,541	,532	1,30076	,541	58,940	2	100	,000	1,601		

a. Predictors: (Constant), OR1\_Openness\_centered, OR1\_Mean

b. Dependent Variable: EI\_Mean

#### Coefficients<sup>a</sup>

		Unstandardize	d Coefficients	Standardized Coefficients			Collinearity	Statistics
Model		В	Std. Error	Beta	t	Sig.	Tolerance	VIF
1	(Constant)	,564	,302		1,871	,064		
	OR1_Mean	,840	,077	,740	10,851	,000	,987	1,013
	OR1_Openness_centere d	-,081	,092	-,060	-,879	,381	,987	1,013

a. Dependent Variable: El\_Mean

# **8.5 Interview questions**

- 1. Why are you, besides being high in EI, not an entrepreneur?
- 2. According to the results of our research, you have high entrepreneurial intent. Can you tell me why you would want to become an entrepreneur? What is, in your opinion, desirable about entrepreneurship? Which kind of company would you want to set up (which direction would you move towards)?
- 3. What is holding you back?
- 4. At the beginning of the interview, I explained the concept of SPS to you: Do you see yourself in that? Do you relate?
- 5. Everyone compares themselves to others do you tend to feel more stressed or anxious in certain situations. Can you give examples? Can you tell me something about the way in which you experience stress? (Individuals with SPS are way more prone of having illnesses that are a side-effect of processing more stimuli.)
  - i. Depression? Did you, as a student, ever feel depressed?
  - ii. Did you suffer any previous mental illnesses? (or do you still?)
- 6. How would you picture the emotional life of an entrepreneur? // Do you expect a higher stress level when you would be an entrepreneur?
- 7. About OR: Do you believe you can identify relevant opportunities? If not: Why is that? Do you lack self-esteem? Or is it that you don't think your ideas are relevant?