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The relationship between Individual Entrepreneurial Orientation and the Behavioural Activation/Inhibition System

Thesis

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ABSTRACT

Some academics have been curious about the relationship between the Behavioural Inhibition System/Behavioural Activation System (BIS/BAS) and entrepreneurial outcomes. However, there is no literature on the link between BIS/BAS and Individual Entrepreneurial Orientation (IEO). Thus, the primary objective of this paper is to bridge the gap between the two active literatures on BIS/BAS and IEO. To achieve this goal, the paper relied on two measures that are, the human motivational system and entrepreneurial behaviour using data from student surveys at Erasmus University in the Netherlands and conducting Ordinary Least Square (OLS) regression analyses. First, our results suggest that the Behavioural Activation System's Drive (BAS–D) has a positive significant association with Risk-taking and Proactiveness but not Innovativeness. Second, the Behavioural Activation System's Fun Seeking (BAS-FS) is significantly and positively associated with Innovativeness and Risk-taking, while significantly and negatively associated with Proactiveness. Third, the Behavioural Activation System Reward Responsiveness (BAS-RR) relationship with individual IEO dimensions was insignificant. Fourth, BIS sensitivity was significantly and negatively associated with Innovativeness but not Risk-taking and Proactiveness. The findings offer significant indication for a link between BIS/BAS and IEO and may assist future study on this area by gathering panel data or using non-self-report methodologies.

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1. Introduction

Entrepreneurs and new ventures have been considered to be an important source of innovation and economic growth for a long time (Schumpeter, 1934; Brandstätter, 2011). This belief has not changed over the years: based on the analysis of the 2020/2021 Global Report of the Global Entrepreneurship Monitor (GEM), entrepreneurship will play a key role in the worldwide economic recovery after the crisis of COVID-19, just like it did after the 2008 financial crisis (Bosma et al., 2021). In 2020, half of Europe's GDP wasaccounted by 25 million small and medium enterprises (SMEs) that employed more than 100 million people (European Commission, 2020). The economic relevance of SMEs explains why both researchers and policymakers place a high focus on entrepreneurship study and knowledge (Sikalieh et al., 2012).

The traditional definition of entrepreneurship is the founding of a new organization (Kollmann et al., 2007), however, many other interpretations have been given like exploration of opportunities (Kirzner, 1973) or the process of creating "new combinations" (Schumpeter, 1934). According to Wood et al. (2004), *"entrepreneurship is the ability to channel creative innovations into ventures that have value, as well as the ability to create and sell new ideas and build new business ventures".* Other authors believe that entrepreneurship is rather about searching for opportunities and processes that uncover and develop opportunities (Shane & Venkataraman, 2001).

It has been a long-standing study issue to investigate what drives entrepreneurs and whether their traits have any impact on the outcomes of their ventures. By now the literature has spanned many fields and created multiple concepts and methods related to the analysis of entrepreneurial characteristics (Kerr et al., 2017). The academic works related to the topic extend to several disciplines, amongst which economics, psychology and management studies.

Kerr et al. (2017) reviewed the literature on the personality traits of entrepreneurs. They began by looking at basic personality qualities such as the Five Factor Model (FFM), self-efficacy and innovativeness, locus of control, and the drive for accomplishment. Furthermore, they investigated entrepreneurs' risk attitudes, ambitions, and aspirations. Overall, they found common results across studies, as well as many disagreements that prove that entrepreneurship is heterogenous in nature (Kerr et al., 2017, p.: 1). Moreover, there are many ways to studying entrepreneurial behaviour: first, the characteristics of entrepreneurs and how they compare to other

groups, second, how entrepreneurs react to risks, and third, what general aims and ambitions do entrepreneurs bring to their endeavors (Kerr et al., 2017).

Next to these traits, literature has recently shown the importance of a biologically based system of personality: the Behavioural Inhibition System (BIS) and Behavioural Activation System (BAS). This interest emerged from Vogelsang (2015) and Lumpkin and Dess (1996) suggesting a link between disinhibition and entrepreneurship. Psychology literature has theorized and empirically shown that the roots of disinhibition can largely be traced to these two psychophysiological systems. The BIS/BAS system is based on Gray's Reinforcement Sensitivity Theory (RST) (Gray, 1982). BIS is sensitive to stimulation associated with punishment and threat posed by novelty. It is related to anxiety, risk assessment, uncertainty and avoidance (Lerner et al., 2018). BAS is sensitive to potential reward; it is related to excitement, goal drive and novelty seeking (Nigg, 2000).

Lerner et al. (2018) investigated the relationship between BIS and BAS sensitivity and entrepreneurial activity and performance. They concluded that BIS was negatively related to venture performance. According to Greenen et al. (2016), BAS Reward Responsiveness (BAS-RR) has a negative correlation with entrepreneurial intent, but BAS Fun Seeking (BAS-FS) has a positive relationship. Furthermore, they concluded that entrepreneurial experience is adversely connected to BAS-RR but positively related to BAS-D.

Among other surveys that are trying to catch the behaviour of entrepreneurs, one is the Individual Entrepreneurial Orientation (IEO) concept (Krauss et al., 2005; Kollmannet al., 2007; Bolton & Lane, 2012) that has been developed from Miller's (1983) Entrepreneurial Orientation (EO) theory originally aimed to capture a firm-level strategic orientation. Entrepreneurial Orientation consists of three dimensions: Innovativeness, Proactiveness and Risk-taking (Miller, 1983). Innovativeness refers to the entrepreneurial act of inventing a novel concept for a product or a process and putting it into action (Fagerberg, 2013). Risk-taking is an inherent character of the ability to carry out business activities in the presence of uncertainties. Finally, Proactiveness denotes the behaviour of not being constrained by situational forces, of identifying and acting on opportunities, of showing initiative, acting, and persevering until significant change occurs (Knight, 1964).

Although the relationship of IEO and different personality traits have already been studied (e.g. Lumpkin & Erdogan, 2004; Vantillborgh et al., 2015), just like the connection of BIS/BAS

and certain entrepreneurial aspects (e.g. Geenen et al., 2016; Lerner et al., 2018; Leung et al., 2020), there is no research to date linking the concepts of BIS/BAS and IEO. However, there are many studies that hint at a connection between the two. This paper attempts to complement the literature on the relationship between BIS/BAS and entrepreneurship by bridging the gap between two active literatures on BIS/BAS and IEO. The goal is to provide insights into the individual level motivations and study on a biopsychological level why people behave entrepreneurially. Entrepreneurship is defined by unpredictability and novelty, as well as a plethora of external indications of both threat and reward. Thus, our research intends to answer the following question: What role does the BIS/BAS play in explaining IEO?

Two measurements are necessary to comply with this: one to assess the human motivational system and the other to measure entrepreneurial behaviour. Thus, this paper uses the two major components of Grey's (1990) aforementioned theory, namely BIS and BAS as well as the Individual Entrepreneurial Orientation scale, which was designed to assess individuals' Proactiveness, Innovativeness, and readiness to take risks. The paper draws on data from a survey of 182 students from various university departments. The pre-defined hypotheses are then tested using the Ordinary Least Squares (OLS) regression approach.

The rest of this paper is divided into the following sections. First, the concept of EO and IEO and the subscales of IEO is introduced. Second, we reviewed the RST and two underlying systems, the BIS and the BAS, connect them to the IEO subscales and define the hypotheses. Third, the description of the data and the methodology used are provided. Finally, results are interpreted, discussion and conclusion are presented, and the implications and the limitations of the paper are discussed at the end.

2. Literature overview

2.1 Entrepreneurial Orientation

Entrepreneurial Orientation (EO) was first conceptualized by Miller (1983, 2011) to demonstrate how the size, structure, management, and other attributes of an organization influence the nature of entrepreneurship and its drivers. In his original work, Miller (1983) assessed entrepreneurship using three variables, namely, Risk-taking, Innovation and Proactiveness – as described, “a subset of the variables used to describe strategy making” (Miller, 2011). EO has consequently been defined in many ways: Covin and Wales (2012) describe it as “the driving force

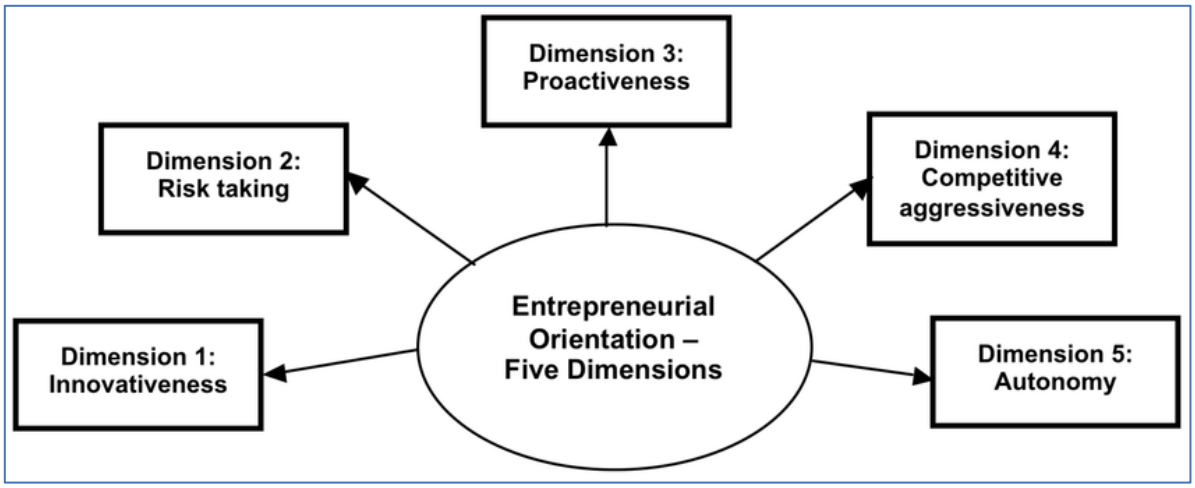
behind the organizational pursuit of entrepreneurial activities", while Lumpkin and Dess (1996) emphasize the decision-making tendency of an organization leaning toward entrepreneurial activities. Covin and Wales (2012) described the many conceptualizations of EO based on the definitions they gathered, from which the two most relevant must be highlighted.

First, the aforementioned concept of Miller (1983) according to which EO is a construct of three variables, Risk-taking (i.e. *"taking bold actions by venturing into the unknown, borrowing heavily, and/or committing significant resources to ventures in uncertain environments"* (Rauch et al., 2009)), Innovativeness (i.e. *"the predisposition to engage in creativity and experimentation through the introduction of new products/services as well as technological leadership via R&D in new processes"* (Rauch et al., 2009)) and Proactiveness (i.e. "*an opportunity–seeking, forward–looking perspective characterized by the introduction of new products and services ahead of the competition and acting in anticipation of future demand"* (Rauch et al., 2009)).These three criteria must positively covary and be on a high level in order for a firm to be classified as entrepreneurially oriented. Practically, this implies that EO is not present in the firm if any of the three criteria is missing or at a low level.

Second, this concept has been extended by Lumpkin and Dess (1996) with two major changes. First, they argued that EO is a construct of five dimensions. To the original three dimensions, they added "competitive aggressiveness" and "autonomy to describe". As Rauch et el. (2009) defines "*competitive aggressiveness is the intensity of a firm's effort to outperform rivals and is characterized by a strong offensive posture or aggressive responses to competitive threats. Autonomy refers to independent action undertaken by entrepreneurial leaders or teams directed at bringing about a new venture and seeing it to fruition."*. Second, according to the authors (Lumpkin & Dess, 1996), these dimensions need not positively covary. Thus, firms that are strong in three of the dimensions, but slack in the other two, still can be entrepreneurially oriented. Figure 1 shows the five-dimension model's elements.

Covin and Wales (2012) summarizing the difference of the two concepts stated that while Miller (1983) describes how EO looks like, Lumpkin and Dess (1996) specify where to look for EO. According to both concepts EO is a continuous variable on which every firm can be plotted between conservative (low end) and entrepreneurial (high end) (Covin & Slevin, 1998; Barringer & Bluedorn, 1999).

Figure 1: Dimensions of EO



Source: Antonites and Mathebula, 2012. p. 5.

For several years EO has been recognized by researchers as a firm-level construct, determining a company's performance (e.g.: Grande et al. 2011, Gupta & Gupta, 2015). Koe (2013) found that the five dimensions of EO model had a positive impact on the performance of state companies. Dada and Watson (2013) considered EO as a holistic construct that is related to financial and non-financial performance of franchise system. EO was also shown to positively affect Hungarian SME's brand performance and market performance (Reijonen et al. 2015).

2.2. Individual Entrepreneurial Orientation

In recent years a new way of using EO has been brought up: as an individual level construct, also described as individual EO (IEO) (Robinson & Subberud, 2014).

Several studies have focused on the assessment of individuals' desire and intention to become entrepreneurs (for an extended list see Bolton and Lane (2011)), but there was no scale to measure behaviours related to entrepreneurial orientation of individuals who may or may not be entrepreneurs, or with other words: how entrepreneurial an individual is (Bolton & Lane, 2011). Bolton and Lane (2011) filled this gap by developing a survey to measure the five dimensions suggested by Lumpkin and Dess (1996). Research showed that only Miller's (1983) original three dimensions were valid and reliable as a measure of IEO and that these dimensions are suitable to characterize entrepreneurs and differentiate them from non-entrepreneurs (Bolton & Lane, 2011; Vantilborgh et al., 2015).

This new perspective showed that IEO is a multi-dimensional construct which consists of the same elements as EO. Bolton (2012) proved that IEO and business success are strongly connected. Most of the recent studies focused on the IEO-performance relationship, though it could be interesting to research the IEO's relationship with individual's attitude and behaviour. Based on this literature, this study focuses on IEO using the three original dimensions: Proactiveness, Innovativeness and Risk-taking. The next section highlights some key findings related to the three dimensions.

2.3. The three dimensions of (I)EO

2.3.1. Innovativeness

Innovation is the practice when a new idea of a product or a process is carried out in practice (Fagerberg, 2013). In the last 60 years studies on innovation became more and more important as researchers started to admit that innovation is key driver of social, technological, and economic change (Fagerberg et al., 2012). Innovation has many forms and categorizations. For instance, one can differentiate product and process innovation. Other dimensions can be the size of the innovation (radical or incremental) or its source (adaptation or generation) (Fagerberg, 2013). Joseph Schumpeter, one of the first and most influential scholars of innovation, investigated whether innovations are more likely in small or large businesses. In his early work, he suggested that SMEs are the primary sources of innovation. While in his later work he admitted that innovative project teams are working in large enterprises and innovation can occur there, too. Innovativeness is the tendency itself, that a firm is willing to change the status quo and improve its technologies and practices (Lumpkin & Dess, 1996). According to Romero and Martínez-Román (2012), innovative activities of SMEs are influenced by 3 factors: first, the external environment factors, like the education system or the political stability of the country of operation; second, the characteristics of the organization where the innovative activities are taking place, such as the size or industry of the firm; third, personal traits and characteristics.

One important distinction that must be emphasized is the difference between Creativity and Innovativeness. While Creativity is the creation of original ideas, innovation and Innovativeness also includes the implementation and the adoption of those ideas (Cromie, 2000). Entrepreneurs are more innovative than non-entrepreneurs (Koh, 1996) and have higher scores on creativity test compared to other professional groups (Cromie, 2000). Innovativeness and creativity also have a

positive relationship (Mironet al., 2004), although Steel et al. (2011) argue that it can be linked to the first stage of innovation, invention, when the idea is not yet commercialized.

"Firm innovativeness is the propensity of firms to create and/or adopt new products, processes and business systems" (Knowles et al., 2008). According to Knowles et al. (2008), an innovative firm adopts innovations and the more innovations a firm adopts, the more innovative it is. As per Hurley and Hult (1998), Innovativeness is the openness to new ideas as an aspect of a firm's culture. Furthermore, Foxall (1984) defined two aspects of firm Innovativeness: technical and behavioural progressiveness. Later Hovgaard and Hansen (2004) identified three aspects of Innovativeness: product, process and business systems. The new element was the business system innovation that included all the innovations related to the internal and external operations of the business.

Besides firm-level Innovativeness, Innovativeness has been researched on the individual level from several perspectives. Based on the definition of Lumpkin and Dess (1996), Bolton and Lane (2012) defined Innovativeness of an individual level as one's tendency to develop new idea, experiments and innovation that can result in new products, services or technological processes. Several personality traits and characteristics have been linked to one's level of Innovativeness. For example, Suliman and Al-Shaikh (2007) suggested that there is a link between emotional intelligence and readiness to create and innovate. Moreover, Georgsdottir and Getz (2004) discussed its relationship with psychological flexibility, while Rauch and Frese (2008) showed that positive emotions are facilitating innovation. Zibbaras et al. (2011) also examined the relationship with dysfunctional traits and found that Innovativeness is positively related to arrogance, manipulative, dramatic and eccentric behaviour, and innovative people were less cautious, perfectionist and dependent.

A plethora of recent empirical research has focused on Attention-Deficit Hyperactivity Disorder's (ADHD) potential benefits. It is a neurodevelopmental condition with two types of symptoms: attention deficit and hyperactivity-impulsivity. Most individuals with ADHD experience both symptoms, however they might present separately (American Psychiatric Association, 2013). The literature suggests that BIS/BAS and its accompanying Reinforcement Sensitivity Theory can serve as a foundation for further study on the relationship between diseases like ADHD, bipolar disorder, or depression and entrepreneurship. According to Antshel (2018), there is a positive relationship between subclinical levels of ADHD and some manifestations of

entrepreneurship. Nonetheless, research on the specific link between ADHD and EO is scarce, Studies suggested that people with ADHD feel comfortable in a flexible and independent environment (Biederman et al., 2005), are good at multitasking and flourish when they have the opportunity to be creative, innovative and independent (Wismans et al., 2020). This is consistent with the findings of Shirokova et al. (2022) who looked at different sub-dimensions of EO (Innovativeness, Proactiveness, and Risk-taking) and found that managers with hyperactivity/impulsivity ADHD symptoms had higher levels of Innovativeness, Proactiveness, and Risk-taking, whereas managers with inattention ADHD symptoms had the reverse effect.

Another prominent and well-studied link is that of Innovativeness and the Five Factor Model (FFM) of personality. In that perspective, Steel et al. (2011) found Innovativeness to be related to higher levels of Openness, Conscientiousness and Agreeableness. Others reported that high level of Extraversion is also positively associated with higher innovation capability (Hsieh et al., 2011; Weele, 2013) and entrepreneurial intention (Eastman et al., 2001; Koe, 2016). Moreover, Gáll (2005) described the qualities of a successful innovator in her article entitled "Innovation for People," which supported Steel's findings. According to the article, a successful innovator is a risk-taker who is open to new ideas, is future-oriented, thinks in terms of innovation and systems, is human-centered, optimistic, and has a good sense of humor. Additionally, an outstanding communication experience is also necessary for an innovator's success. If the environment is favorable, the invention has a good chance of long-term success (Gáll, 2005).

2.3.2. Risk-taking

Risk has been defined in a variety of ways, including the likelihood of loss, the variability of possible outcomes, the uncertainty of achievement, and the variance between predicted and actual results (Kozubíkováet al., 2017). According to Zinn (2017), current societies have been characterized as risk societies – in which dealing with risk is an ordinary daily life experience. As suggested by Vasvári (2015), Risk-taking is an inherent part of human life while it also drives innovation and development. The prerequisite for the existence of risk is uncertainty, as stated by Renn (1992). It is vital to note, however, that perfect certainty does not exist. Based on the definition of Knight (1964), risk is a quantifiable uncertainty or more precisely, risk is probable uncertainty. However, it is critical to mention that several types of risks exist, for instance, “venturing into the unknown” that can be personal, social or psychological risk, or “borrowing

heavily", depending on the method of classification and the field of research. From the EO perspective, Risk-taking could be evaluated from the firm-level and individual-level.

On the firm-level, risk taking can be related to risk-return, trade-off, the probability of a loss, or tolerance of uncertainty (Linton, 2019). The definition depends mostly on the field of research and profession, but in economics, business and finance, the above-mentioned examples are commonly used and well suited for the purpose of this paper. From a firm-level perspective, risk management relies on the ability of the company to recognize and treat risks effectively. The initial premise of corporate finance is that corporate management's goal is to maximize the market value of corporate owners' capital through risky investments. Ideally, corporate risk management seeks to optimize, the impact of these risk exposures on the value of corporate and equity capital. Its mission is to design a risk management strategy that offers a clear management approach to all uncertainties, in line with the overriding corporate goal of maximizing shareholder value (Fleisch, 2009).

At the individual level, the IEO survey of Bolton and Lane (2012) defines Risk-taking as the venturing into the unknown, the money and time investment and "showing courage in risky situations". Generally, entrepreneurs are assumed to take more risks, and risk-tolerance is a trait that distinguishes them from non-entrepreneurs since they are exposed to significant uncertainty (Rauch & Frese, 2007; Stewart & Roth, 2001). Although more risk-tolerant people are more likely to become entrepreneurs (Niess & Biemann, 2014), Xu and Ruef (2004) suggested that nascent entrepreneurs are more risk-averse compared to non-entrepreneurs. They argued that a large number of individuals start businesses for non-pecuniary motivations such as autonomy and identity fulfilment. Moreover, Brockhaus (1980) found that Risk-taking may not be a quality of entrepreneurs.

Even if Risk-taking would not be a characteristic of entrepreneurs, much research found that entrepreneurially-oriented organizations (Miller, 1983; Lumpkin & Dess, 1996; Covin & Slevin, 1998) and individuals have it (e.g.: Bolton & Lane, 2012; Vantillborgh et al., 2015). Nigel et al. (2005) showed that risk-takers score high on Extraversion and Openness, and low on Neuroticism, Agreeableness, and Conscientiousness of the FFM model. They concluded that there are three types of risk-takers as follows: stimulation seekers, goal seekers and risk adapters, although the last two they called only risk bearers.

Risk-taking propensity is heavily reliant on the environment and the type of decision. For instance, if the decision is important or unimportant, or actual or fictitious (Dahlbäck, 1990). Another perspective is the age or stage of life at which risk behaviour is examined. Indeed, Gullone and Moore (2000) studied the case of adolescents aged between 11 and 18 using the Adolescent Risk Questionnaire (ARQ) and the FFM model. ARQ distinguishes 5 factors of risk as follows: thrill-seeking risks, rebellious risks, reckless risks and antisocial risks. They found that those who participated in positive risks, such as thrill-seeking, were more extraverted. Moreover, Zuckerman and Kuhlman (2001) found that Risk-taking in health, such as engagement in smoking, drinking, drugs, sex, driving and gambling, is related to impulsive sensation seeking, aggression and sociability. Additionally, Zaleśkiewicz (2001) proposed a dual model of economic Risk-taking, in which stimulating risk is motivated by the need for excitement and emotional arousal, while instrumental risk is taken to achieve a specific goal. The latter is more characterized by analytical information processing. Furthermore, Zaleśkiewicz (2001) found that those who are prone to take instrumental risk are more likely to take risk in venturing and investment. Their personality traits were linked to orientation toward the future, the tendency to think rationally, impulsivity, and sensation seeking. On the other hand, stimulating risk seems to be less connected to entrepreneurial behaviour, as it was shown to be related to recreational, ethical, health, and gambling risks-taking and linked to personality traits like paratelic (activity orientated and pleasure seeking) orientation, arousal seeking, impulsivity, and strong sensation seeking (Zaleśkiewicz, 2001).

2.3.3. Proactiveness

At the firm-level, Proactiveness is considered as an advantageous strategy in accordance with Lieberman and Montgomery (1988). Proactivity *"is the initiative by anticipating and pursuing new opportunities and by participating in emerging markets"* (Lumpkin & Dess, 1996. p. 146). A firm's Proactiveness can have a significant impact on its environment such as a new product or technology can bring long-term changes, recognizing the need of a market before the competitors. From the EO perspective, Miller (1983) emphasizes the speed in the definition of Proactiveness, and defines the phenomenon as coming up with an innovation first. High proactivity has been linked to entrepreneurship in several ways.

Bateman and Grant (1993) developed a proactive personality scale and described a proactive person as someone who is not constrained by situational pressures, identify and act on opportunities, show initiative, take action, and persevere until significant change occurs. In

contrast, a non-proactive person cannot or does not identify opportunities and doesn't take action to seize them. Looking at the definition of entrepreneurship and venturing, one can find very similar attributives to proactive behaviour. Starting a new business can be understood as an act to embrace an opportunity and influence the environment (Vantilborgh et al., 2015). According to other viewpoints, it is considered as a first-mover advantage strategy (Lieberman & Montgomery, 1988) that is manifesting in the act of initiation of developing new products, technology, processes or services and not just reacting to the business environment and adopting competitor strategy (Miller & Friesen, 1978). Proactive entrepreneurs are always actively looking for new opportunities to utilize full market potential (Kickul & Gundry, 2002).

At the individual-level, there is scant literature available regarding personality traits associated with proactive behaviour. Nonetheless, it is crucial to point out that Seibert et al. (2006) concluded that proactive personality is positively linked to innovation, political knowledge, and career initiative. Likewise, Bjørkelo et al. (2010) found that on the FFM model dimensions, Extraversion and Agreeableness are positively associated with proactivity, despite the fact that they measured proactive behaviour on workplace whistleblowing.

2.4. Reinforcement Sensitivity Theory & the Behavioural Inhibition /Activation Systems

Studying humans and human behaviour is a centuries-old science. While some fields focus on the biological aspects of the behaviour such as how the human brain works in different situation, what is happening biologically and how did these interactions develop through centuries; other fields, namely psychology, scrutinize "the mind and behaviour" and "traits, that characterize an individual or a group" (APA Dictionary of Psychology). On one side, these studies help to detect and resolve clinical situations; on the other side, a deeper understanding of human behaviour contributes significantly to other scientific fields like economics. In fact, economists use behavioural and motivation theory to study how human interactions and activity derive from purely rational behaviour, and why people are motivated to engage in certain economic activities while declining others.

Among research on human and non-human behaviour, there is a school of thought that divides motivation into two categories namely, approaching positive outcomes and avoiding negative ones (Schneirla, 1959; Berkman et al., 2009). Based on earlier research, the Reinforcement Sensitivity Theory (RST) has become one of the most influential and researched

theories of human neurophysiology-based personality (Cooper et al., 2007). More precisely, RST consists of two central constructs namely, the Behavioural Inhibition System (BIS) and the Behavioural Activation System (BAS), which are sensitive to environmental cues of punishment and reward, respectively (Carver & White, 1994; Gray, 1990; Gray & McNaughton, 2000). In practice, this implies that people with high BAS sensitivity experience positive affect and have a goal-striving behaviour in the presence of cues of reward, while people with low BAS sensitivity experience no or lower levels of positive affect to such cues. In contrast, those who have high BIS sensitivity experience high level of anxiety in the presence of cues of punishment, while people with low BIS sensitivity experience no or lower levels of anxiety to such cues.

BIS and BAS refer to conditioned cues, but Grey (1990) also hypothesized a third system that is responsible for the behaviour in response to unconditioned punishment and non-reward: the Fight-Flight system. This system is assumed to be in charge for two extreme negative emotions namely, panic and rage. As entrepreneurship is found to be a planned, intentional behaviour (Kearney et al. 2013; Krueger et al. 2000), the Fight-Flight system is out of the scope of this research.

The relevance of RST, as well as the reason for its prevalence, is that RST links the nervous system to behavioural theories and personality (Corr, 2004). Since its inception, BIS/BAS has fascinated the curiosity of researchers. However, its first version measured the two system (BAS and BIS) separately using unsophisticated methodologies (Carver & White, 1994). Due to the lack of a fully adequate measure, Carver and White (1994) developed a survey to assess BIS and BAS sensitivity. The scale is a self-report measure including 24 questions. Through the validation process of their measure, Carver and White (1994) found that there are four factors underlying BIS/BAS. While BIS is a unidimensional measure; BAS can be divided into three sub-scales namely, BAS-Drive (BAS-D), BAS-Fun Seeking (BAS-FS), and BAS-Reward Responsiveness (BAS-RR). There are some studies suggesting that BIS also can be divided into two sub-scales, Anxiety and Fear (Beck et al., 2009; Heymet al., 2008), while Poythress et al. (2008) argue that dimensionality depends on the surveyed population.

Recently, some scholars have been interested in linking BIS/BAS to entrepreneurial outcomes. For example, Baker et al. (2017), found BAS to be significantly associated to (a) global liking of vocational activities, (b) entrepreneurial desire, and (c) social and entrepreneurial self-efficacy. The BIS was shown to be significantly inversely associated to realistic interest but not to

realistic self-efficacy. Others have related BIS/BAS to entrepreneurial intention and action (Lerner et al., 2018; Geenen et al., 2016). However, there is currently no literature on the relationship between BIS/BAS and IEO. Therefore, the primary goal of this paper is to bridge the gap between the two active literatures on BIS/BAS and IEO. This study adheres to the original, unidimensional BIS, and three subscale BAS approach, with the subscales presented in the following section from the standpoint of entrepreneurship, and more specifically, individual entrepreneurial orientation perspective. Below the BIS/BAS subscales will be introduced. Using prior literature on behavioural patterns, attitudes and personality traits associated with the BIS/BAS subscales, hypotheses on how they connect to IEO dimensions are formulated.

2.4.1. BAS-D and IEO

BAS-D describes an individual's persistence to achieve goals (Carver & White, 1994). BAS-D is associated with high reward sensitivity (Smillie & Jackson, 2006) and high Functional Impulsivity (FI) (Leone & Russo, 2009). The latter is part of Dickman's (1990) distinction of two types of impulsivities: the aforementioned FI that relates to positive outcomes for the individual who are enthusiastic, highly active and productive risk-takers, while Dysfunctional Impulsivity (DI) relates to negative outcomes for the individual, and to being careless and inattentive with deficits for the ability of planning. The BAS-D scale includes items like "When I want something, I usually go all-out to get it" and "If I see a chance to get something I want, I move on it right away".

Lerner et al. (2018) more explicitly found that BAS-D is positively related to entrepreneurial actions, while Geenen et al. (2016) found a similar association with entrepreneurial intention. According to Koe (2016), two factors of IEO - namely Proactiveness and Innovativeness - are associated with higher level of entrepreneurial intention.

2.4.1.1.BAS-D and Innovativeness

Several studies have investigated the relationship between BAS-D and FFM and Innovativeness and FFM, however no direct link between the two have been studied, yet. Four out of five factors of the FFM show the same correlation with Innovativeness as with BAS-D. Both Innovativeness and BAS-D have been found to be positively correlated with Extraversion as shown in Hsieh et al. (2011), Weele (2013), Smith and Boeck (2006) and Ali (2019). Similarly, Steel et al. (2011), Smith and Boeck (2006) and Ali (2019) have concluded the existence of a positive relationship between Innovativeness and BAS-D, from one side, and Conscientiousness from

another side. Likewise, Innovativeness and BAS-D have been proved to be positively correlated with entrepreneurial intention (Eastman et al., 2001; Koe, 2016; Geenen et al., 2016). However, Agreeableness is positively related to Innovativeness but negatively related to BAS-D (Steel et al., 2011; Smits & Boeck, 2006). Some studies have found that both BAS-D and Innovativeness are negatively related to Neuroticism and Agreeableness (Smits & Boeck, 2006; Rauch & Frese, 2008; Ali, 2019). The former is not surprising, as Neuroticism is described as anxiety (Cattell, 1957) and negative emotionality (Tellegen, 1985). A BAS-D sensitive person prioritizes one's own goals and not others' (Smits & Boeck, 2006). However, Agreeableness is positively related to Innovativeness but negatively related to BAS-D (Steel et al., 2011; Smits & Boeck, 2006).

Another study found that creativity can be positively linked to BAS-D. Kim and Kwon (2017) linked both Adjective Checklist Creative Personality Scale and all subfactors of Everyday Creativity Scale (ECS) positively to high BAS-D sensitivity. Latter seems highly relevant, as ECS' subfactors capture traits highly related to Innovativeness, like flexibility, that reflects to "*the ability to produce novel and unique ideas based on flexible thinking (e.g. I make something new by combining things that seem irrelevant to each other)*", problem-solving that measures the willingness to generate a number of alternatives (e.g. I think of something from various perspectives before doing), and freedom-seeking that capture the tendency to pursue diverse experiences (e.g. I make a lot of new attempts in my life). Results of the study show that there is a relationship between BAS-D and traits that are generally linked to entrepreneurs and entrepreneurial personality.

Based on the afore-mentioned evidence, BAS-D is expected to positively relate to being innovative, leading to the following hypothesis:

Hypothesis 1a (H1a): the Behavioural Activation System's Drive factor is positively associated with Innovativeness

2.4.1.2. BAS-D and Risk-taking

"Positive" Risk-taking (such as instrumental risk) is positively associated with orientation toward the future, rational thinking and impulsivity (Zaleśkiewicz, 2001). Orientation toward the future can be easily connected to the definition of BAS-D, which is the "persistence to obtain a goal", although the latter is not necessarily connected to rational thinking. Because BAS-Drive is associated to the tenacity in achieving one's objectives, persons with a higher BAS-D may be more willing to take risks in order to achieve their goals, such as establishing a business.

The FFM can also be used as an indicator of the expected relationship between Risk-taking and BAS-D. Extraversion is found to be positively correlated with Risk-taking, while Agreeableness is related negatively to Risk-taking, which indicated a positive relationship between Risk-taking and BAS-D (Joseph & Zang, 2021; Smits & Boeck, 2006; Nigel et al., 2005). As mentioned earlier, BAS-D was shown to be positively correlated with Extraversion, Conscientiousness, entrepreneurial intention but negatively related to Agreeableness.

Finally, in their study, Demaree et al. (2008) found that people with higher overall BAS scores are more willing to take higher risk, and this phenomenon is largely driven by BAS-D and BAS-FS.

Based on these findings, the following hypothesis is formulated:

Hypothesis 1b (H1b): the Behavioural Activation System's Drive factor is positively associated with Risk-taking

2.4.1.3. BAS-D and Proactiveness

Based on the proactive personality definition of Grant (1993), perseverance is a common characteristic of both Proactiveness and BAS-D. It therefore may be that being high in BAS-D is a prerequisite of being proactive as an entrepreneur. This common characteristic is supported by the studies concluding that both BAS-D and proactive people are more intended to become an entrepreneur (Geenen et al., 2016; Crant, 1996). Markman et al. (2005) reported that entrepreneurs outperform non-entrepreneurs in persistence, which is a key component of the BAS-D.

Moreover, studies have shown that both dimensions are positively related to the Extraversion scale of FFM (Bjørkelo et al., 2010; Smits & Boeck, 2006). While the literature described so far hints towards the importance of BAS-D for Proactiveness, there are studies that show that proactive people tend to be more Agreeable, while the opposite is true for people with strong BAS-D (Bjørkelo et al., 2010).

Considering we are interested in Proactiveness in an entrepreneurial sense, since the proactive personality character is thought to be a person with high self-belief and self-efficacy, and both characteristics have been positively correlated with entrepreneurs and are characteristics of people with high BAS-D level, the following hypothesis is developed:

Hypothesis 1c (H1c): Behavioural Activation System's Drive factor is positively associated with Proactiveness

2.4.2. BAS-FS and IEO

Based on the definition of Carver and White (1994), individuals with high levels of BAS Fun-Seeking, desire new rewards and spontaneously approach potentially rewarding events. Items on this scale include statements like "I will often do things for no other reason than that they might be fun" and "I crave excitement and new sensations".

Previous research has pointed out several characteristics shared by entrepreneurs, that could be related to fun-seeking, such as being ready to quickly identify, seize and implement new opportunities (Schumpeter, 1934; Ardichvili et al., 2003). Entrepreneurs and non-entrepreneurs are differentiated by their inclination to adopting new experiences, which is associated with higher BAS-FS sensitivity (Zhao & Seibert, 2006; Segarra, Poy, López & Moltó, 2014). As is the case for the other factors, no prior research studied the direct connection between BAS-FS and IEO subscales. Thus, as previously, we are making suggestions based on indirect relationships present between BAS-FS and IEO and intuitive reasoning.

2.4.2.1. BAS-FS and Innovativeness

There are several findings that hint at a relationship between BAS-FS and Innovativeness. First, Openness factor of FFM is positively related to both BAS-FS and Innovativeness. Second, innovative people tend to be less cautious and less perfectionist (Zibarras et al., 2011), which may be characteristics that are in line with the BAS-FS related items, like "doing things only for fun" and "craving for new excitements". Entrepreneurs that are excited about the opportunity to start and run their own business would gain the most from the attribute "Openness". Finally, a positive relationship between BAS-FS score and entrepreneurial intention (Geenen et al., 2016), and at the same time between entrepreneurial intention and Innovativeness is found (Koe, 2016).

Individuals with high level of BAS-FS are approaching potentially rewarding events spontaneously that implies an open-minded approach. This open-minded approach is a prerequisite to be innovative, thus this study developed the following hypothesis:

Hypothesis 2a: (H2a): the Behavioural Activation System's Fun Seeking factor is positively associated with Innovativeness

2.4.2.2. BAS-FS and Risk-taking

As mentioned earlier, Fun Seeking behaviour is considered to have a significant relationship with the Risk-taking behaviour of entrepreneurs. Studies showed that BAS-FS is

related to high Openness and Extraversion (Smits & Boeck, 2006; Segarra et al., 2014), both Functional and Dysfunctional Impulsivity (Leone & Russo, 2009) and engagement in risky health behaviours, like drinking alcohol and smoking (Franken & Muris, 2006; Voigt et al., 2009). (Joseph & Zang, 2021; Nigel et al., 2005; Smits & Boeck, 2006; Segarra et al., 2014). Both Risk-taking and fun-seeking individuals proved to be impulsive and excitement-seeking (Zuckerman & Kuhlman, 2001, Zaleśkiewicz, 2001; Carver & White, 1994). Ultimately, Demaree et al. (2008) revealed that individuals with substantially greater BAS scores are more inclined to accept greater risks, with BAS-FS playing a large role in this relationship. This suggests that business owners that have greater risk tolerance are those who believe in their potential to succeed.

Based on these arguments, this study developed the following hypothesis:

Hypothesis 2b: (H2b): the Behavioural Activation System's Fun Seeking factor is positively associated with Risk-taking

2.4.2.3. BAS-FS and Proactiveness

Grant (1993) identified a proactive person as someone who is taking action and initiative, identifies opportunities and is not constrained by situational forces. While fun-seeking individuals are willing to take action, this is motivated by the spur of the moment, whim and excitement. Both proactive personality and higher BAS-FS sensitivity predicts high entrepreneurial intention (Crant, 1996; Geenen et al., 2016) and Extraversion (Bjørkelo et al., 2010; Smits & Boeck, 2006; Segarra et al., 2014).

Although motivation for Fun Seeking is spontaneous while entrepreneurial activity considered to be planned, the personality characteristics and intentions shows similar relationships with BAS-FS and Proactiveness. Not to be constrained by the situational forces can be not only a trait of Fun Seeking personality, but also someone who is proactive. Proactive individuals also pursue their goals no matter what the circumstances are. Therefore, the relationship between the two variables was hypothesized as follows:

Hypothesis 2c (H2c): Behavioural Activation System's Fun Seeking factor is positively associated with Proactiveness

2.4.6. BAS-RR and IEO

While BAS-D and BAS-FS are related to seizing opportunities and finding the joy in the process, BAS-RR reflects the sensitivity to the occurrence of rewards (Carver & White, 1994; Geenen et al., 2016). The relevant five items on the scale focus on the excitement and the energizing

effect of reward, as well as positive outcomes and success. For example, “It would excite me to win a contest” and “When I’m doing well at something, I love to keep at it” (Carver & White, 1994).

Results of research on the relationship of entrepreneurship and reward are highly controversial. Several studies found that reward is the primary driver of starting a new venture, and entrepreneurial success cannot be measured only with financial success (Kuratko et al., 1997; Schumpeter, 1934). Other researchers found no relationship between BAS-RR, entrepreneurial intention and nascent entrepreneurial behaviour (Geenenet al., 2016; Lerner et al., 2018).

2.4.6.1 BAS-RR and Innovativeness

When talking about the relationship between Innovativeness and BAS-RR, three key findings must be emphasized. First, while Innovativeness is positively associated with entrepreneurial intentions (Koe, 2016), individuals with high entrepreneurial intention, have higher immunity to any kind of reward (Geenen et al., 2016). Second, Moiso and Leimpala (2008) found that in environment where creativity is more appreciated, recognition can be more effective than financial reward alone.

Third, entrepreneurs are starting a new business in the belief that the expected reward (both monetary and psychic) will be higher than using their time for any other option of opportunity exploitation, i.e. the value of exploitation of entrepreneurial opportunities exceeds the opportunity cost for alternative use of their time (Shane, 2003). Those people, who have higher opportunity costs - people with higher human capital (i.e. are more educated, have wider network of connections, etc.) - can justify their decision for entrepreneurial activity if they are increasing the expected utility of exploiting opportunities by innovative behavior, as taking more chances comes with higher return (Li et al., 2018). According to Fernandez and Pitts (2011), rewards are more successful than penalties in producing long-term changes in behaviour, according to research on operant conditioning and behaviour modification, particularly whenever the behaviour comprises basic repetitive tasks. Personal effort is the product of the expectation that a degree of effort would result in an output, the expectation that the outcome will lead a reward, and the value associated to that reward, according to expectancy theory. This is in line with the findings of Sanders et al. (2018) who suggest that managers may be able to counteract certain hurdles to innovation by using performance-based incentives. These findings show that when performance-based awards are implemented and conveyed in a way that employees understand, they can drive creative behaviour.

Based on these studies, one can assume that BAS-RR and Innovativeness has a positive significant relationship.

Hypothesis 3a (H3a): Behavioural Activation System's Reward Responsiveness factor is positively associated with Innovativeness

2.4.6.2.BAS-RR and Risk-taking

According to the investment theory, higher risk yields higher return (Bowman, 1980). Previous research reported that entrepreneurs are less risk-aversive than non-entrepreneurs (Stewart & Roth, 2001; Rauch & Frese, 2007; Niess & Biemann, 2014). This could imply that BAS-RR is positively associated with Risk-taking, with higher risks resulting in higher rewards. Alternatively, FFM-related research reveals various connections. While Risk-taking is negatively associated with Neuroticism and Conscientiousness (Nigel et al., 2005), no relationship between Neuroticism and BAS-RR has been documented, while a positive relationship between Conscientiousness and BAS-RR has been reported (Segarra et al., 2014). Interestingly, higher Extraversion predicts higher Risk-taking (Joseph & Zang, 2021; Nigel et al., 2005) and higher BAS-RR (Smits & Boeck, 2006; Segarra et al., 2014).

While the relationships with the FFM are not all the same for the two concepts, this study still expects a positive link between BAS-RR and Risk-taking, as people driven by rewards may take more risks to acquire higher rewards, which may make them suited to become an entrepreneur. Therefore, this study suggests a positive relationship between BAS-RR and Risk-taking, hence the following hypothesis:

Hypothesis 3b (H2b): Behavioural Activation System's Reward Responsiveness factor has a positive association with Risk-taking

2.4.6.3. BAS-RR and Proactiveness

Although Extraversion has been identified as a trait of both proactive (Bjørkelo et al., 2010) and BAS-RR sensitive people (Smits & Boeck, 2006; Segarra et al., 2014), other studies have shown no connection between Proactivity and reward. Grant's (1993) definition of proactive personality does not describe expectation for reward, and Parker et al. (2010) also found in their Model of Proactive Motivation that Proactiveness is goal-oriented. As a result, no relationship is expected between BAS-RR and Proactiveness.

2.4.7. BIS and IEO

Individuals who are highly BIS sensitive react anxiously to cues such as non-reward and punishment. It serves as a conflict detection system, helping in the avoidance and assessment of risk, as well as the consequences of negative or painful outcome (Fowles, 1980, 1988; Gray, 1982, 1987; Gray & McNaughton, 2000). Individuals with high BIS sensitivity exhibit vigilance and anxiety (Fowles, 1988; Gray, 1994; Kimbrel et al., 2012).

Previous studies found that BIS is not related to entrepreneurial intention (Geenen et al., 2016) or entrepreneurial action (Lerner et al., 2018). However, it was found to have a negative relationship with venture performance (Lerner et al., 2018). To establish a new firm, nascent entrepreneurs must take initiative, investigate and explore opportunities, and maintain these actions at a later stage in order to maintain business performance. At this point, BIS sensitivity might undermine desire to take risks in pursuit of new opportunities and innovation (Lerner et al., 2018).

FFM model research concluded that BIS sensitivity is positively associated with Neuroticism and Agreeableness and negatively associated with Extraversion (Smits & Boeck, 2006; Keiser & Ross, 2011). These personality traits correlate in the opposite way with all three subscales of IEO. BIS emphasizes actions like avoidance and assessment, which are: (1) typical reactive rather than proactive actions; (2) also suggest risk-avoidance rather than Risk-taking; and (3) FFM provides proxies for personality traits that are antagonistic to IEO traits. Therefore, we assume that all IEO subscales will be negatively related to the BIS subscale.

With respect to Innovativeness, this study predicts that higher level of BIS sensitivity, i.e showing avoidance bahvior, will be linked to a lower level of innovation, which underpins the following hypothesis:

Hypothesis 4a (H4a): Behavioural Inhibition System sensitivity is negatively associated with Innovativeness

The BIS is a system for conflict detection, risk assessment, and appraisal. Individuals' avoidance or withdrawal reflexes are triggered when they are exposed to anxiety-related cues such as punishment, non-reward, and novelty. Based on the risk-avoidant characteristics of the BIS, the following hypothesis can be formulated:

Hypothesis 4b (H4b): Behavioural Inhibition System sensitivity is negatively associated with Risk-taking

A proactive person is someone who is not constrained by the situational forces, identifies opportunities and acts on them, shows initiative, takes action, and perseveres until meaningful change occurs. As described above, BIS relates to avoidance behaviour and is rather reactive than proactive (Geenen et al., 2016). Therefore, BIS sensitivity can stop the entrepreneur or the firm from acting in time before the competitors. Based on this reasoning, it is hypothesized that:

Hypothesis 4c (H4c): Behavioural Inhibition System sensitivity is negatively associated with Proactiveness

2.5. Summary of hypotheses

The combination of the BIS/BAS factors and the IEO subscales result in 12 different hypotheses to test. I marked all the hypotheses with a number and a letter, where (1) is related to BAS-D, (2) to BAS-FS, (3) to BAS-RR and (4) to BIS, while (a), (b) and (c) are related to Innovativeness (a), Risk-taking (b) and Proactiveness (c), respectively. Summary of the descriptions of these hypotheses can be found in Table 1.

As there is no prior evidence on the relationship of the RST and IEO dimensions, this paper formulates the hypotheses based on the literature on indirect relationships and intuitive reasoning. FFM model is a well investigated issue, both regarding BIS/BAS and entrepreneurship, and hence it serves as a mediator in the majority of situations. Entrepreneurial intent is another highly researched indication that has contributed to formulating assumptions. We assumed some of the relationships based on the definitions of the phenomenon or indicators.

Table 1: Expected relationships of the IEO and the BIS/BAS factors

Coded as	Dependent Variable	Variable of Interest	Association
H1a	Innovativeness	BAS-D	BAS-D sensitivity is positively associated with Innovativeness
H1b	Risk-taking	BAS-D	BAS-D sensitivity is positively associated with Risk-taking
H1c	Proactiveness	BAS-D	BAS-D sensitivity is positively associated with Proactiveness
H2a	Innovativeness	BAS-FS	BAS-FS sensitivity is positively associated with Innovativeness
H2b	Risk-taking	BAS-FS	BAS-FS sensitivity is positively associated with Risk-taking
H2c	Proactiveness	BAS-FS	BAS-FS sensitivity is positively associated with Proactiveness
H3a	Innovativeness	BAS-RR	BAS-RR sensitivity is positively associated with Innovativeness
H3b	Risk-taking	BAS-RR	BAS-RR sensitivity is positively associated with Risk-taking
-	Proactiveness	BAS-RR	No relationship expected
H4a	Innovativeness	BIS	BIS sensitivity is negatively associated with Innovativeness
H4b	Risk-taking	BIS	BIS sensitivity is negatively associated with Risk-taking
H4c	Proactiveness	BIS	BIS sensitivity is negatively associated with Proactiveness

3. Methodology

3.1. Data

The dataset used was originally collected by Bernosteret al. (2018) among students from Erasmus University of Rotterdam in the Netherlands between May 2015 and April 2016. Students may complete the survey through three different university recruitment systems: economics department's system, the psychology department's system and a system available for students of all faculties. Overall, 182 students participated in the survey, but in the final dataset, we dealt with 150 observations due to missing values.

In the final sample, 55% of the answers were provided by females and 45% by males. At the time, 127 of them were studying at the bachelor's level, while 23 were studying at the master's level. Only 32% of students are enrolled in entrepreneurial courses. The youngest student is 18 years old while the most senior is 30 years old, the average age is 20.6 (SD=2.05). More than 90% of the participants are between the age of 18 and 23. Only two of them identified themselves as non-Dutch (Afghan and Surinamese). The "convenience sampling" technique yields a homogenous sample in terms of participation. From one side, the results can be generalized only to the sampled group and general conclusions cannot be deducted. From the other, socio-demographic variables

are not causing a lot of statistical "noise" and the results accurately reflect the true effect of the variables of interest (Bornstein et al., 2013).

Table 2: Descriptive Statistics

	Mean	Standard deviation	Minimum	Maximum
Age	20.64	2.06	18	30
Sex (1=female)	0.55	0.49	0	1
Education (1=master)	0.15	0.36	0	1
Never taken course in entrepreneurship	0.68	0.47	0	1

Note: Sex = 1, if female and 0 if male; Education = 0 if Bachelor student and 1 if Master student; Course on entrepreneurship = 0 if student have participated in course on entrepreneurship, and 1 if student have not participated in course on entrepreneurship

3.2. Dependent variables

The survey is based on the original EO questionnaire (Miller, 1983) and the five factors of Lumpkin and Dess (1996), but developed to fit better to individuals by Bolton and Lane (2011). The study uses the IEO measures, specifically the subscales of the measures, as dependent variables. Participants in the Dutch-language questionnaire had to indicate on a 5-point Likert-scale from "totally disagree" to "totally agree", to what extent they agreed with ten different statements. As shown in Table 4, three of the 10 statements were designed to assess Risk-taking, four were designed to assess Innovativeness, and three were designed to assess Proactiveness.

Table 3: Survey questions of the IEO subscales

RISK-TAKING	• I like to undertake daring activities by venturing into unknown territory. • I am willing to invest a lot of time and / or money in something that could pay off. • I tend to show courage in risky situations.
INNOVATIVENESS	• I like to try new things often that are different, but not necessarily risky. • In my work I generally prefer a unique working method rather than tried and tested methods. • When learning new things, I prefer my own approach rather than doing it the way everyone else does. • I favour an experimental and original approach to problem solving rather than methods that others generally use.
PROACTIVENESS	• I usually consider future problems, needs or changes. • I tend to plan ahead in my work. • In my work, I prefer to take the lead and set things in motion rather than adopt a wait-and-see attitude.

The final Risk-taking index (Risk), Innovativeness index and Proactiveness index are calculated by adding the points from the related questions. Thus, the Risk-taking index and Proactiveness index have scales ranging from 3 to 15, while the Innovativeness index has a scale ranging from 4 to 20. In the case of Innovativeness and Proactiveness indices, the observed extreme values don't reach the minimum. Means and standard deviations are shown in Table 5

Table 4: Mean and Standard Deviation of Dependent Variables

	Mean	Standard Deviation	Theoretical		Observed	
			Min	Max	Min	Max
Innovativeness index	13.827	2.432	4	20	7	20
Risk-taking index	10.287	2.159	3	15	3	15
Proactiveness index	11.267	1.958	3	15	5	15
Overall IEO	35.380	4.929	10	50	23	50

3.3. Independent variables

To measure BIS/BAS sensitivity, the study uses the survey developed by Carver and White (1994). The survey includes 24 questions that participants can answer on a 4-point Likert-scale ranging from "totally disagree" to "totally agree". Seven of the questions pertain to BIS, four to BAS-D and BAS-FS, and five to BAS-RR. The survey additionally contains four filler items that do not contribute to any of the factors but are meant to disguise the true purpose of the test for the subjects as shown in Table 7. Question two and 22 are reverse-scored, therefore these were reversed back in the final dataset.

Like the IEO factors, final BIS/BAS indicators are the summed points of the relevant items. Thus, BAS-D and BAS-FS can have values ranging from four to 16, BAS-RR can have values ranging from five to 20, and BIS can have values ranging from seven to 28. No observed participant showed the lowest possible points on any of the scales; nevertheless, BAS subscales are reaching the maximum. The standard deviation is relatively low for all subscales, which is most likely due to the homogeneity of the sample, as observed in Table 6.

Table 5: Mean and Standard Deviation of Independent Variables

	Mean	Standard Deviation	Theoretical Min	Theoretical Max	Observed Min	Observed Max
BAS-D index	11.893	1.950	4	16	6	16
BAS-FS index	11.147	2.106	4	16	7	16
BAS-RR index	16.980	1.804	5	20	12	20
BIS index	19.367	2.735	7	28	11	25

Table 6: Survey Items and Order in Survey

Items	**Order in survey**
BAS Drive	
I will go beyond my limits to get the things I want.	3
If I want something I will usually do everything I can to get it.	9
If I see the opportunity to get something I want, I will grab it right away.	12
If I am planning something, I will not let anything stop me.	21
BAS Fun Seeking	
I am always willing to try something new if I think it will be fun.	5
I often do things just for fun.	10
I often do things on a whim.	15
I long for excitement and sensation.	20
BAS Reward Responsiveness	
If I do something right, I would like to continue.	4
When I get what I want, I feel excited and energized.	7
If I see an opportunity somewhere, I immediately get enthusiastic.	14
If I won a game I would be very excited.	23
When I experience something nice, it clearly affects me.	18
BIS	
I rarely feel fear or nerves, even when something unpleasant is in store for me.	2
Criticism or scolding hits me quite a bit.	8
I feel worried or upset when I think or know that someone is angry with me.	13
I get a little stressed when I think something bad is about to happen.	16
I feel concerned when I think I have performed poorly.	19
I experience few fears compared to my friends.	22
I sometimes worry about making mistakes.	24
Filler items	
Family is the most important thing in a person's life.	1
Clothes are important to me.	6
I often have little time to do things.	11
I often wonder why people do the way they do.	17

3.4. Control variables

The relationship of age and sex has been proven several times, both with regard to entrepreneurship (Levesque & Minniti, 2006; Minniti & Nardone, 2007) and the BIS/BAS scale (Pagliaccioet al., 2016). Therefore, the study treats these two variables as control variables in all analyses.

3.5. Methodology

This study has three dependent variables. Table 3 shows the range of these subscales that can be handled as continuous variables (Johnson & Creech, 1983; Norman, 2010; Sullivan & Artino, 2013; Zumbo & Zimmerman, 1993). Therefore, we use Ordinary Least Squares (OLS) regression to test the 12 hypotheses with the following general model:

$$IEO_{ij} = ß_1 + ß_2 BISBAS_i + ß_3 Controls_i + \varepsilon_i$$

Where IEO_i is one of the IEO factors(j), *BISBAS* is the set of BIS and BAS subscales, and *Controls* are the control variables described above. Correlation analyses between the independent variables will be conducted in order to exclude the possibility of multicollinearity. Additionally, the models need to be checked with Ramsey RESET test to ensure that they are not misspecified. In contrast to the hypotheses' formulation procedure in the literature review section, the models will be set up based on the IEO factor, thus one model may be used to analyse hypotheses "across their letter index", as Table 4 shows. In practice, this means that overall, three different models will be estimated with stepwise approach, meaning that for each dependent variable overall six models will be estimated. First, a model only with the control variables (Age and Sex), second, four models with the control variables and each BIS/BAS factors individually, and finally, the complete model with all the BIS/BAS factors and the controls.

Table 7: Independent variables (rows) and dependent variables (columns) and the code of their reflecting hypotheses

	Innovativeness (a)	Risk-taking (b)	Proactiveness (c)
BAS-D (1)	H1a	H1b	H1c
BAS-FS (2)	H2a	H2b	H2c
BS-RR (3)	H3a	H3b	H3c
BIS (4)	H4a	H4b	H4c
Controls	Included in every model, no related hypothesis		

4. Results

4.1. Correlation Analysis

A correlation analysis was performed to evaluate the strength of the linear relationship between the variables under consideration. Correlation analysis reveals a medium to strong positive correlation between the BAS factors, and against intuitive expectations, also between BIS and BAS factors. The relationship between BAS-RR and BAS-D is the highest (0.52); while the correlation between BIS and BAS-D and BAS-FS was weak and positive (0.079 and 0.084, respectively). Furthermore, the correlation between BAS-FS and BAS-RR was positive and medium (0.36), whereas the correlation between BAS-FS and BIS was positive and weak (0.08). Moreover, the correlation between BAS-RR and BIS was medium and positive (0.40).

The strength of the correlation between IEO and BIS/BAS factors proved to be weak to medium. The relationship between Innovativeness and BAS-D (0.213) and BAS-FS (0.359), Risk-taking and BAS-D (0.339) and BAS-FS (0.376), and Proactiveness and BAS-D (0.356) were all positive and medium strength. BAS-RR shows a positive and weak correlation with all the IEO factors, namely Innovativeness (0.076), Risk-taking (0.176) and Proactiveness (0.112). Furthermore, there is a negative relationship between BIS and IEO factors (Innovativeness (-0.183), Risk-taking (-0.153) and Proactiveness (-0.049)) and BAS-FS and Proactiveness (-0.086), however, all of these correlations are quite weak.

Control variables Age and Sex are correlated weakly with all the IEO and BIS/BAS factors, except the relationship between Sex and BIS, which is positive and medium strong.

Table 8: Correlation Analysis

	BAS-D	BAS-FS	BAS-RR	BIS	Innovativeness	Risk-taking	Proactiveness	Age	Sex
BAS-D	1								
BAS-FS	0.318	1							
BAS-RR	0.522	0.363	1						
BIS	0.079	0.084	0.401	1					
Innovativeness	0.213	0.359	0.076	-0.183	1				
Risk-taking	0.339	0.376	0.176	-0.153	0.502	1			
Proactiveness	0.356	-0.086	0.112	-0.049	0.293	0.215	1		
Age	0.094	0.147	0.072	-0.009	0.090	0.052	-0.029	1	
Sex	0.054	0.018	0.169	0.268	0.002	-0.186	0.061	-0.014	1

Note: BIS = Behavioural Inhibition System, BAS-RR = Behavioural Activation System's Reward Responsiveness, BAS-FS = Behavioural Activation System's Fun Seeking, BAS-D = Behavioural Activation System's Drive factor

4.2. Regression Analysis

To test the hypotheses of this study, regression analyses wre conducted. Since this study had three dependent variables, the regression analyses were conducted separately for each of them– Innovativeness, Risk-taking and Proactiveness. The results are presented and discussed below.

4.2.1. Innovativeness

This section evaluates H1a, H2a, H3a, and H4a of the study regarding how each of the independent variables affected Innovativeness. As presented in Table 10, while there is a significant link between BAS-D and Innovativeness in Model 2, not including the other BIS/BAS subdimensions ($\beta = 0.258$, SE=0.099, $p < 0.05$) this result becomes insignificant in the full model ($\beta = 0.173$, SE = 0.119, $p > 0.05$). The findings indicate that there is a positive and significant relationship between BAS-FS and Innovativeness ($\beta = 0.398$, SE = 0.100, $p < 0.001$). Moreover, there is a negative but insignificant relationship between BAS-RR and Innovativeness ($\beta = -0.0605$, SE = 0.143, $p > 0.05$). Concerning the case of BIS, the results indicate that there is a negative and significant relationship between BIS and Innovativeness ($\beta = -0.195$, SE = 0.0789, $p < 0.05$). The variables "sex" and "age" were considered as control variables in the study, and none was found to have a significant relationship with Innovativeness. For the overall model, it was found that the adjusted R-square was 0.159 which implied that 15.9% of the variation in Innovativeness is explained by the four independent variables included in the model. According to these findings, H2a and H4a failed to be rejected while we reject H1a and H3a.

Table 9: Regression Analysis Results for Innovativeness

	Innovativeness					
	(1)	(2)	(3)	(4)	(5)	(6)
BAS-D		0.258* (0.099)				0.173 (0.119)
BAS-FS			0.408*** (0.099)			0.398*** (0.100)
BAS-RR				0.096 (0.120)		-0.060 (0.143)
BIS					-0.175* (0.0736)	-0.195*
Age	0.107 (0.089	0.084 (0.085	0.046 (0.083	0.100 (0.089)	0.105 (0.089)	0.0340 (0.083)
Sex	0.016 (0.401)	-0.0393 (0.393)	-0.018 (0.376)	-0.042 (0.410)	0.275 (0.414)	0.270 (0.386)
Constant	11.62*** (1.831)	9.059*** (2.090)	8.350*** (1.746)	10.15*** (2.440)	14.90*** (2.265)	11.30*** (2.462)
N	150	150	150	150	150	150
R-sq	0.008	0.050	0.130	0.013	0.044	0.192
adj. R-sq	-0.005	0.031	0.112	-0.007	0.025	0.159

Note: Standard errors in parentheses; * p<0.05, ** p<0.01, *** p<0.001; BIS = Behavioural Inhibition System, BAS-RR = Behavioural Activation System's Reward Responsiveness, BAS-FS = Behavioural Activation System's Fun Seeking, BAS-D = Behavioural Activation System's Drive factor

4.2.2. Risk-taking

This section evaluates the association between the independent variables and Risk-taking, in response to evaluating H1b, H2b, H3b, and H4b. The results in this regard are presented in Table 11. The findings indicate that there is a positive and significant relationship between BAS-D and Risk-taking ($\beta = 0.277$, SE = 0.110, $p < 0.05$). With reference to BAS-FS, the results indicate that there is a significant and positive relationship between BAS-FS and Risk-taking ($\beta = 0.313$, SE = 0.0873, $p < 0.001$). While Model 4 indicates that there is a positive and significant relationship between BAS-RR and Risk-taking when all the other BIS/BAS factors are excluded (ß = 0.252, SE = 0.103, $p < 0.05$), this association becomes insignificant in the complete model ($\beta = 0.0362$, SE = 0.102, $p > 0.05$). The results also indicate that there is a negative and insignificant relationship between BIS and Risk-taking ($\beta = -0.131$, SE = 0.0800, $p < 0.05$). It was found that, while "age" has a negative insignificant relationship ($\beta = -0.0235$, SE = 0.0777 $p > 0.05$), "sex" has a negative significant relationship ($\beta = -0.716$, SE = 0.305, $p < 0.05$) with Risk-taking. The value for the

adjusted R-squared was 0.229, which implies that 22.9% of the variation in Risk-taking was caused by the independent variables. Based on these findings we fail to reject H1b and H2b while H3b and H4b are rejected.

Table 10: Regression Analysis Results for Risk-taking

	Risk-taking					
	(1)	(2)	(3)	(4)	(5)	(6)
BAS-D		0.386*** (0.093)				0.277* (0.110)
BAS-FS			0.390*** (0.082)			0.313*** (0.087)
BAS-RR				0.252* (0.103)		0.036 (0.102)
BIS					-0.087 (0.079)	-0.131 (0.080)
Age	0.051 (0.076	0.017 (0.068)	-0.006 (0.079)	0.035 (0.074)	0.051 (0.078)	-0.023 (0.077)
Sex	-0.801* (0.349)	-0.884** (0.323)	-0.834* (0.320)	-0.956** (0.338)	-0.672 (0.356)	-0.716* (0.305)
Constant	9.663*** (1.608)	5.831** (1.742)	6.541*** (1.780)	5.811** (2.167)	11.30*** (2.160)	6.308** (2.254)
N	150	150	150	150	150	150
R-sq	0.037	0.157	0.178	0.080	0.048	0.260
adj. R-sq	0.024	0.140	0.162	0.061	0.029	0.229

Note: Standard errors in parentheses; * p<0.05, ** p<0.01, *** p<0.001; BIS = Behavioural Inhibition System, BAS-RR = Behavioural Activation System's Reward Responsiveness, BAS-FS = Behavioural Activation System's Fun Seeking, BAS-D = Behavioural Activation System's Drive factor

4.2.3. Proactiveness

In this section, the last four hypotheses were evaluated (H1c, H2c, H3c, and H4c) by investigating the effect of the independent variables on Proactiveness. The results are presented in Table 12. The findings indicated that there is a positive and significant relationship between BAS-D and Proactiveness ($\beta = 0.439$, SE = 0.113, $p < 0.001$). Model 3 indicates that there is an insignificant relationship between BAS-FS and Proactiveness ($ß = -0.078$, SE = 0.077, $p > 0.05$), this relationship is significant and negative in the complete model where all BIS/BAS factors are included ($\beta = -0.193$, SE = 0.0727, $p < 0.01$). Additionally, it was found that there is a negative but insignificant relationship between BAS-RR and Proactiveness ($\beta = -0.020$, SE = 0.128, $p > 0.05$).

For BIS, the results indicated that there is a negative but insignificant relationship between BIS and Proactiveness ($\beta = -0.0552$, SE = 0.0699, $p < 0.05$). Sex and age were not found to have significant relationship with Proactiveness. Upon evaluating the R-squared, the adjusted R-squared was found to be 0.146 which implied that 14.6% of the variation in Proactiveness was explained by the four independent variables included in the model. These findings fail to reject H1c whereas H2c, H3c and H4c are rejected.

Table 11: Regression Analysis Results for Proactiveness

	Proactiveness					
	(1)	(2)	(3)	(4)	(5)	(6)
BAS-D		0.361***				0.439***
		(0.088)				(0.113)
BAS-FS			-0.078			-0.193**
			(0.077)			(0.072)
BAS-RR				0.116		-0.020
				(0.093)		(0.128)
BIS					-0.051	-0.055
					(0.061)	(0.069)
Age	-0.026	-0.059	-0.015	-0.034	-0.027	-0.036
	(0.082)	(0.079)	(0.080)	(0.082)	(0.083)	(0.075)
Sex	0.238	0.159	0.244	0.166	0.313	0.252
	(0.321)	(0.296)	(0.320)	(0.330)	(0.348)	(0.312)
Constant	11.69***	8.108***	12.32***	9.912***	12.65***	10.21***
	(1.695)	(1.879)	(1.835)	(2.172)	(1.991)	(2.072)
N	150	150	150	150	150	150
R-sq	0.005	0.132	0.012	0.016	0.009	0.180
adj. R-sq	-0.009	-0.114	-0.009	-0.005	-0.011	0.146

Note: Standard errors in parentheses; * p<0.05, ** p<0.01, *** p<0.001; BIS = Behavioural Inhibition System, BAS-RR = Behavioural Activation System's Reward Responsiveness, BAS-FS = Behavioural Activation System's Fun Seeking, BAS-D = Behavioural Activation System's Drive factor

To give a clear overview of the results, it was considered important to summarise the results in a single table as shown in Table 13.

Table 12: Summary of the Regression Results

Dependent variable	Innovativeness	Risk-taking	Proactiveness
BAS-D	0.173	0.277*	0.439***
	(0.119)	(0.110)	(0.113)
BAS-FS	0.398***	0.313***	-0.193**
	(0.1000)	(0.0873)	(0.0727)
BAS-RR	-0.0605	0.0362	-0.0203
	(0.143)	(0.102)	(0.128)
BIS	-0.195*	-0.131	-0.0552
	(0.0789)	(0.0800)	(0.0699)
Age	0.0340	-0.0235	-0.0364
	(0.0827)	(0.0777)	(0.0756)
Sex	0.270	-0.716*	0.252
	(0.386)	(0.305)	(0.312)
Constant	11.30***	6.308**	10.21***
	(2.462)	(2.254)	(2.072)
N	150	150	150
R-sq	0.192	0.260	0.180
adj. R-sq	0.159	0.229	0.146

Note: Standard errors in parentheses; * p<0.05, ** p<0.01, *** p<0.001; BIS = Behavioural Inhibition System, BAS-RR = Behavioural Activation System's Reward Responsiveness, BAS-FS = Behavioural Activation System's Fun Seeking, BAS-D = Behavioural Activation System's Drive factor

5. Discussion

This section discusses the results obtained in the previous section regarding the objectives and hypotheses of this study, and also in reference to the previous literature. Before the discussion of these findings, Table 14 presents a summary of all the hypotheses of the study, the finding and an indication whether each hypothesis was rejected or not. It is noted that for the hypothesis which were expected to have a positive or negative relationship, only those with significant relationship were not rejected.

Table 13: Summary of Hypothesis

Hypothesis	Relationship		Expected Relationship	Beta Coefficient	Std. Error	Decision
H1a	BAS-D	Innovativeness	positive	0.173	-0.119	Reject
H1b		Risk-taking	positive	0.277*	-0.11	Accept
H1c		Proactiveness	positive	0.439***	-0.113	Accept
H2a	BAS-FS	Innovativeness	positive	0.398***	-0.1	Accept
H2b		Risk-taking	positive	0.313***	-0.087	Accept
H2c		Proactiveness	positive	-0.193**	-0.073	Reject
H3a	BAS-RR	Innovativeness	positive	-0.0605	-0.143	Reject
H3b		Risk-taking	positive	0.0362	-0.102	Reject
H3c		Proactiveness	positive	-0.0203	-0.128	Reject
H4a	BIS	Innovativeness	negative	-0.195*	-0.079	Accept
H4b		Risk-taking	negative	-0.131	-0.08	Reject
H4c		Proactiveness	negative	-0.0552	-0.07	Reject

5.1. BAS-D and IEO

Considering the effect of Behavioural Activation System's Drive dimension (BAS – D), which is related to the persistence of an individual to achieve the goals (Carver & White, 1994), this study found BAS-D to be significantly and positively associated with Risk-taking and Proactiveness, but not with Innovativeness. Therefore, hypothesis 1a (**H1a)** which stated that *"the Behavioural Activation System's Drive factor is positively associated with (IEO) Innovativeness"* was rejected. This result contradicts most of the findings in the literature, but they are in line with the findings of Smits and Boeck (2006), Rauch and Frese, (2008) and Ali (2019) who concluded that, both BAS-D and Innovativeness are negatively related to neuroticism and Agreeableness. The results supported hypothesis 1b **(H1b)**, which stated that BAS – D is positively associated with Risk-taking. These results support the view that impulsivity in positive risk situations could be associated with high level of BAS-D (Leone et al., 2009). This is also consistent with the findings of Nigel et al. (2005), who observed that Risk-taking and BAS-D move in the same direction. Hypothesis 1c **(H1c)**, which indicated that BAS-D factor is positively associated with Proactiveness, was supported. In fact, Proactiveness was found to be most strongly associated with BAS-D. This finding was in line with Seibert et al. (2001), Geenen et al., (2016) and Crant, (1996) who proposed that proactive people are more likely to become entrepreneurs and achieve more

success not only in their venture but across all industries and organisations. Thus, we can argue that persistence of an individual to achieve the goals is associated to the property of Proactiveness behaviour of an entrepreneur.

We may infer that BAS-D is a crucial attribute for one's entrepreneurial orientation because it is connected to both Risk-taking and Proactiveness. Individuals with higher BAS-D scores are more inclined to become effective entrepreneurs since EO is critical for engaging in entrepreneurship, persevering in accomplishing ultimate goals, and succeeding. This is in line with the findings of Geenen et al. (2016) who concluded that variations in BAS-D sensitivity reflect individual differences in the persistence with which they pursue desired goals. In entrepreneurship studies, a person's willingness and/or aptitude to persevere - to steadfastly follow a desired course of action despite setbacks - is frequently seen as a significant element of entrepreneurial behaviour.

5.2. BAS-FS and IEO

BAS-FS involves individuals being personally attracted to the desires of Fun Seeking and being attracted to rewarding events as suggested by Carver and White (1994). On the effects of BAS-FS, it was found that there existed a significant relationship between BAS-FS and all three subdimensions of EO. Considering specific relationships, BAS-FS was found to be positively and significantly associated with Innovativeness which is consistent with the findings of Koe (2016). Hence, our findings support Hypothesis 2a **(H2a).** Similarly, Hypothesis 2b **(H2b)** was confirmed proving that the BAS-FS factor is positively associated with Risk-taking. It implies that those with a higher Fun-seeking proclivity are more likely to take entrepreneurial risks, such as starting a business. This is consistent with the results of Geenen et al. (2016) indicating that interpersonal variations in BAS-FS sensitivity involve both, a desire for fresh rewards and a readiness to pursue a potentially rewarding event on the spur of the moment. The cornerstone of an entrepreneur's job is to identify and implement new possibilities. According to recent research, entrepreneurs are more open to new possibilities and prefer search for alternatives. This implies that openness to new perceptions and harboring great aspirations may be common characteristics of entrepreneurs. The assumption that entrepreneurs are faster and more eager than others to capture an advantage as they uncover it or as it exposes itself reflects the tendency of high BAS-FS persons to take more risks.

The third hypothesis **2c (H2c)** which stated that "*Behavioural Activation System's Fun Seeking factor is positively associated with Proactiveness"* was rejected. The examined literature

revealed opposing results, showing that a fun-seeking entrepreneur will prefer to make changes by spotting possibilities and taking action, a personality trait correlated with strong entrepreneurial Proactiveness (Crant, 1996; Geenen et al., 2016). However, our findings show that Fun-seeking behaviour isn't linked to a higher level of proactivity, but quite the opposite. Higher level of Fun-seeking can be linked to lower level of Proactiveness. The findings imply that when it comes to entrepreneurial activities, fun-seeking entrepreneurs operate rationally in a planned and systematic way rather than acting impulsively on the spur of the moment. Furthermore, this finding might point to the physiological foundation of two forms of drive underpinning proactive behaviors of a fun-seeking individual. Extrinsic drive refers to making anything as it contributes to a desirable consequence, while intrinsic drive refers to doing things because they are fundamentally fascinating or delightful.

Among the three dependent variables considered, BAS-FS encourages innovative and Risk-taking behaviors while discouraging proactive behavior. That is, persons with a stronger inclination for fun are more prone to embrace entrepreneurial risks, such as establishing a firm. In addition, this suggests that openness to new views may be typical qualities of entrepreneurs. The belief that entrepreneurs are more innovative than others in terms of coming up with new ideas and putting them into action reflects the proclivity for high BAS-FS individuals to behave creatively.

5.3. BAS-RR and IEO

This section explored the relationship between BAS–RR associations and the three dependent variables. BAS–RR was considered as an aspect of how sensitive individuals are towards rewards – in terms of excitement, positive and success that emanates from rewards (Geenenet al., 2016). From the results, hypothesis 3a **(H3a)** was rejected that "*BAS-RR factor is positively associated with Innovativeness."* The results indicated an insignificant relationship. No relationship was found between BAS-RR and Risk-taking, therefore hypothesis 3b **(H3b)** stating that "*BAS-RR factor has a positive relationship with Risk-taking*" was also rejected. This lack of a relationship is not in line with the argument that in entrepreneurship, reward is the primary driver of starting a new venture and high rewards increases the risk appetite of the entrepreneur (Kuratko et al., 1997). Based on the results, there was no significant relationship found between BAS-RR factor and Proactiveness. This is in line with the findings of Grant (1993), who did not explicitly establish a connection between BAS-RR and Proactiveness. These findings are in contrast with

that of Bjørkelo et al. (2010) who established a connection between BAS-RR and Proactiveness through Extraversion.

Hence, we reported an insignificant relationship between BAS-RR from one side, and Innovativeness, Risk-taking and Proactiveness from the other. This shows that at the level of young entrepreneurs, entrepreneurial incentives are sufficiently unexpected and reward responsiveness is not connected with a larger tendency to act.

5.4. BIS and EO

The BIS sensitivity relationship with the various dependent variables was evaluated, where BIS sensitivity is related to how sensitive an individual is towards risk, in terms of vigilance and anxiety (Gray, 1994; Kimbrel et al., 2012). According to the results, hypothesis 4a **(H4a)** was accepted. The hypothesis stated that "*BIS sensitivity is negatively associated with Innovativeness".* Thus, higher sensitivity levels of risk assessment, anxiety and negative outcomes are associated with lower level of Innovativeness. These results were in line with that of Geenen et al., (2016) and Lerner et al. (2018) who indicated that BIS is not associated with entrepreneurial intention or entrepreneurial action. Hypothesis 4b **(H4b)** which indicated that "*BIS sensitivity is negatively associated with Risk-taking"* was rejected, because the relationship found to be insignificant. Finally, Hypothesis 4c **(H4c)**, "*BIS sensitivity is negatively associated with Proactiveness",* was also rejected. According to Lerner et al. (2018), a potentially opposing synchronous connection could be present, obscuring a broader cumulative nascent-stage impact. Thus, BIS may be adversely associated with some entrepreneurial activities while being positively associated with others that aim to recognize and control downside risks, like business planning and prototype testing. Entrepreneurs must engage in a variety of entrepreneurial activities in the early stage in order to make their businesses more tangible to themselves and outsiders. Once the brand is operating, the entrepreneur expects to constantly engage in both opportunity exploitation as well as new opportunity growth to maintain firm performance. Greater BIS sensitivity may block the latter, limiting desire to accept risks and resulting in weaker entrepreneurial behavior.

We discovered that persons with high sensitivity levels of risk assessment, anxiety, and negative outcome inclination to perceive opportunities, start change, or take activities. Whereas no relationship reported between BIS and Risk-taking. The BIS scale takes into account anxiety and fear. Anxiety includes concerns about social comparison and loss; both of which are related

to conflict and ambiguity. Fear is tied to the fight/flight feedback mechanism, which has been identified as the root cause of fear and a hazard response system that mediates defensive aggressiveness (fight) or escape reactions (flight) when energized by unconditioned unpleasant stimuli (Geenen et al., 2016). We suggest that an individual's BIS score and entrepreneurial intent would be adversely linked due to the enormous hurdles connected with launching a new enterprise and the uncertainty surrounding entrepreneurial activity.

5.5. Limitations & Further research

There are some limitations to the current study that might be addressed in future research. First, because the assessments are self-report scores, there is the possibility of common-method variance, which is actively being debated in the literature. Thus, gathering supplementary data obtained through additional methodologies, would undoubtedly be valuable in prospective studiesin attempt to test the robustness of our findings. Nevertheless, we believe that our results are extremely useful as a cornerstone, notably since we adopted known suggestions for lowering variance in acquiring them.

Second, because our study was designed in a cross-sectional fashion, the data only capture a snapshot during one moment in time. A panel design would be required to identify intra-personal shifts across times. Nonetheless, the cross-sectional data obtained for this study allow us to discover significant associations as a first move.

Third, no conclusions about causality could be formed. Yet, the findings offer significant indication for a link between BIS/BAS and IEO. As a consequence, the findings may assist future study on this area. Lastly, recent advances in the formulation and assessment of approach and avoidance behaviours point to interesting future expansions of this study. Scientists have recently hypothesised that, rather than combining reward desire and reaction to rewards into a unified measure (BAS-RR), it may be necessary to disentangle reward interest and reactivity to rewards since they may actually occur at various phases of approach. Using a restructured BAS-RR scale and contrasting the outcomes to our observations, might reveal far more precise perspectives into the drivers of IEO.

6. Conclusion

The purpose of this research was to investigate the relationship of individual entrepreneurial orientation and the behavioral activation/inhibition system. Ultimately, this study provides several contributions. It adds a fresh viewpoint to the literature on entrepreneurial motivation and behavior. Our main goal was to give an insight whether individuals' levels BIS/BAS sensitivity, a biopsychological measure of motivation, is associated with entrepreneurial behavior. Thus, the study rested on testing two measures namely, the human motivational system and entrepreneurial behavior. From the results and discussion of the results, this study observed that BAS–D has a positive significant association with Risk-taking and Proactiveness but not Innovativeness. The findings on the BAS-FS indicated that it is significantly and positively associated with Innovativeness and Risk-taking, while significantly and negatively associated with Proactiveness. Moreover, the BAS-RR relationship with individual IEO dimensions were insignificant and BIS sensitivity was significantly and negatively associated with Innovativeness but not Risk-taking and Proactiveness.

Based on our findings, five claims can be summarized as follows. First, the persistence of an individual to achieve the goals would be positively linked with the entrepreneurial Risk-taking and Proactiveness. Second, individuals who view an entrepreneurial chance to satisfy their own demands for enjoyment and are drawn to rewarding activities, will be more inventive; such an opportunity can trigger a higher risk-appetite towards it. Third, we conclude that Fun Seeking entrepreneur will tend to initiate changes by identifying opportunities and taking actions, a character that is associated with high entrepreneurial spirit. Fourth, the entrepreneurs' sensitivity towards rewards is not significantly related to their Innovativeness, Risk-taking or Proactiveness. Fifth, sensitive entrepreneurs towards risk and punishment, in terms of vigilance and anxiety, can significantly discourage their Innovativeness.

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