Closing in on social anxiety

*Investigating social anxiety, personality, affectivity, and social distance*

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Abstract

Feeling anxious in social interactions is common among adults, and when the anxiety is impairing it could be diagnosed as social anxiety disorder. This thesis aimed to investigate the relationship between excessive social anxiety, personality, affective measures, and social distance. Experiments were conducted with virtual reality, VR, in a student sample (N=40), screened for low/high social anxiety. The personality dimensions neuroticism, extraversion and conscientiousness were significant predictors of low/high social anxiety group. The underlying personality facets competence, assertiveness, anxiety, depression, self-consciousness, vulnerability as well as behavioural inhibition (BIS) and trait anxiety could differentiate low and high social anxiety group, however, social distance could not. Although, the VR-experimental data did show that women preferred to have a larger social distance to male avatars than men, and that conscientiousness affected the preferred distance as well.

Keywords: Social anxiety, Big Five personality traits, BIS/BAS, trait anxiety, social distance, virtual reality.
# Table of content

**Introduction** .......................................................................................................................... 5  
Social anxiety disorder .................................................................................................................. 5  
  *Symptoms and characteristics.* ............................................................................................... 6  
  *Prevalence and treatment.* ..................................................................................................... 7  
  *Origins and heredity.* ............................................................................................................. 7  
  *Comorbidity.* .......................................................................................................................... 8  
Personality and social anxiety disorder ...................................................................................... 8  
  *Current research on personality.* ......................................................................................... 10  
Affective measures ...................................................................................................................... 11  
  *Trait anxiety.* ......................................................................................................................... 12  
  *Behavioural Inhibition System and Behavioural Approach System.* ............................... 12  
  *Current research on affectivity.* .......................................................................................... 13  
Social distance and its relation to social anxiety ....................................................................... 14  
  *Gender and social distance.* .................................................................................................. 15  
  *Personality and social distance relation to social distance.* ............................................. 15  
Aims and research questions of the present thesis ................................................................... 16  
  *Hypotheses.* .......................................................................................................................... 16

**Method** .................................................................................................................................. 17  
Participants .................................................................................................................................. 17  
Material ......................................................................................................................................... 18  
  *Liebowitz Social Anxiety Scale.* ......................................................................................... 18  
  *Revised NEO Personality Inventory.* .................................................................................. 18  
  *Trait Anxiety.* ........................................................................................................................ 18  
  *Behavioural Inhibition System and Behavioural Approach System.* ............................... 19  
  *Montgomery-Åsberg Depression Rating Scale.* ................................................................. 19  
  *Distance measurement in the virtual reality context.* ...................................................... 19  
  *Instruments not used in the thesis.* ..................................................................................... 21  
Procedure ...................................................................................................................................... 22  
Design .......................................................................................................................................... 23  
  *Confounding variables controlled for.* ............................................................................... 23  
Statistical analyses ...................................................................................................................... 23  
Ethical aspects .............................................................................................................................. 24

**Results** .................................................................................................................................... 25  
Could low/high social anxiety groups be discriminated based on personality traits or affective measures? .................................................................................................................. 26  
  *Personality dimensions.* ....................................................................................................... 26
Personality facets ........................................................................................................ 27
Affective measures ........................................................................................................ 29

Does low and high social anxiety groups differ in social distance, independent of gender? ........................................................................................................................................ 30

Is social distance associated with social anxiety symptom severity or personality/affective measures? ........................................................................................................ 32

Discussion ...................................................................................................................... 34
Demographic variables and prevalence ........................................................................ 34
First research question .................................................................................................. 35
  Personality dimensions .............................................................................................. 35
  Personality facets ...................................................................................................... 36
  Affective measures .................................................................................................... 36
Second research question .............................................................................................. 38
Third research question ................................................................................................. 40
Limitations and implications ......................................................................................... 41
Conclusion ..................................................................................................................... 42
References ..................................................................................................................... 44
Introduction

Imagine you are about to perform an important speech in front of a big crowd, and that you did not have much time to prepare. Would you feel your blood rushing to your face, making you sweat and feeling your heart beating out of your chest? Would you fear that you would stutter, freeze or embarrass yourself? If so, would you go through with your speech or avoid the situation all together? Imagine that you feel these unpleasant emotions whenever you are about to make a phone call, eat in public, or go to a party. These types of reactions can be an everyday experience when you have social anxiety disorder.

Social anxiety is described as a state in which an individual experiences fear of social events or social situations such as meeting strangers or making conversation with others. This is due to an apprehension of embarrassment or a fear of being negatively evaluated by others in social situations (American Psychological Association [APA], 2009; American Psychiatric Association [APA], 2013). Individuals with social anxiety have a tendency to expect more negative and fewer positive social events, which can be explained by a cognitive bias towards threatening and negative social information (Kimbrel, Nelson-Gray, & Mitchell, 2012). Accordingly, social anxiety implies concerns about one’s role, status and behaviour in social interactions (APA, 2009), and furthermore the anxiety can interfere with interpersonal relationships (Alden & Taylor, 2004). The ramification of social anxiety may lead to withdrawal from social situations and social encounters such as parties, conversation with strangers, or dating. It is essential not to equate social anxiety with social skill since it is possible to be socially competent but still experiencing anxiety prior to social interaction, as well as being socially awkward without having social anxiety (Leitenberg, 1990).

If the social anxiety is more elevated causing an impairment in the functioning of everyday life, he or she may meet the diagnostic criteria for social anxiety disorder (SAD), also termed social phobia¹, rather than solely social anxiety (APA, 2009).

Social anxiety disorder

Social anxiety and SAD are existing on the same continuum but they appear to have different grades of severity. While social anxiety affects the individuals’ functioning negatively in social situations (Leitenberg, 1990), SAD has a significant impairment on the affected individuals’ everyday life (Bandelow & Stein, 2004). This is expressed either through extreme interaction anxiety or persistent performance anxiety (APA, 2009) where speaking in front of others is the

¹ The term social anxiety disorder will be used in this thesis instead of social phobia.
most common social fear for adults (Grant et al., 2005; Furmark et al., 1999; Leitenberg, 1990). SAD is furthermore associated with a number of negative consequences such as a lower socioeconomic status, due to unemployment or lower educational level (APA, 2013).

The functioning of SAD could moreover be categorised into different subtypes, generalised and non-generalised SAD, which in the current Diagnostic and Statistical Manual of Mental Disorders, fifth edition (DSM-5) was replaced by “performance subtype” as the only diagnostic specifier (APA, 2013). This subtype describes individuals with circumscribed anxieties, e.g. of speaking or acting in front of others. When assessing SAD with instruments like the Liebowitz Social Anxiety Scale (LSAS; Liebowitz, 1987), individuals are rated on their levels fear or anxiety, as well as their avoidance of a variety of social performance and interactional situations.

**Symptoms and characteristics.** The symptoms of SAD can be differentiated on three categories - somatic, cognitive, and behavioural. Furthermore, the symptoms appear to coexist where the cognitive symptoms affect the somatic symptoms as well as behavioural functioning (APA, 2013; Marteinsdottir, Furmark, Tillfors, Fredriksson & Ekselius, 2001). The somatic symptoms describe the physical effects of SAD, the most common being anomalous perspiration. The cognitive symptoms could also be termed as emotional ones since they describe the state of affection that the diagnosed individual experiences, for example unpleasant emotions about social situations or difficulties in concentration (Bandelow & Stein, 2004) as well as negative thinking before, during and after problematic situations (Hirsch & Clark, 2004).

As stated, it appears as if the cognitive and the somatic symptoms together affect how individuals diagnosed with SAD later form their behavioural patterns (APA, 2013; Marteinsdottir et al., 2001). This is supported by Bandelow and Stein (2004) claiming that when individuals are faced with a situation causing social anxiety, their behavioural symptoms may include impairment in speaking, avoidance of eye contact, restlessness or even temporary immobility. The cognitive and somatic symptoms may then affect the behavioural patterns. What is characterised as the most impairing behavioural symptom, however, is the avoidance of feared social situations (Bandelow & Stein, 2004; Leitenberg, 1990). This avoidance further interferes with the ability to gain experience of social interactions, which often is required to build social confidence (Bandelow & Stein, 2004). The avoidant behaviour is, moreover, considered to be a maintaining factor for anxiety in individuals with SAD (Rinck et al., 2010).
Prevalence and treatment. SAD is argued to be one of the three most common psychological disorders with an estimated lifetime prevalence of 5-12% (Fernandes et al., 2018). The prevalence for university students is believed to be equal to the general prevalence (Schry, Roberson-Nay & White, 2012). In Sweden, however, studies have shown that the point-prevalence is around 15% (Furmark et al., 1999; Mörtberg, Reuterskiöld, Tillfors, Furmark & Öst, 2017). Even though the prevalence could change depending on the sample, the diagnosis appears to affect women to a higher extent than men (Fernandes et al., 2018; Grant et al., 2005; Mörtberg et al., 2017). Although, some studies do not replicate higher prevalence of SAD in women (Bienvenu et al., 2004).

Even though the prevalence of SAD is relatively high, the statistics regarding help-seeking shows that the prevalence of seeking treatment is rather low in Western societies. According to the APA (2013), only 50% of the individuals suffering from SAD seek treatment at some point in their life, and it may take around 12-20 years for the individual to seek treatment after their first experience of symptoms (APA, 2013; Grant et al., 2005). High levels of anxiety and avoidant behaviour pattern in SAD patients are claimed to be contributing factors for the prolonged treatment-seeking (Grant et al., 2005).

Origins and heredity. The emergence of SAD usually become evident in childhood or the onset of adolescence (Bandelow & Stein, 2004; Bienvenu et al., 2004; Fernandes et al., 2018; Grant et al., 2005; Marteinsdottir et al., 2001). According to the DSM 5 (APA, 2013), 75% of individuals who develop SAD do so between the ages of 8 to 15. Moreover, research has shown that between the ages of 15 to 23, the risk of developing SAD rapidly declines, which indicates that onset of the disorder when reaching adulthood is rare (Grant et al., 2005).

A single cause of SAD has, however, not been demonstrated and it is therefore suggested that a combination of biological and psychological factors have impact on the disorder, where SAD is believed to be hereditary to considerable extent (Bandelow & Stein, 2004). Although, the hereditary factor is more explanatory for the generalised subtype than the performance subtype (APA, 2013). Moreover, both personality traits and behavioural inhibition could predispose individuals to SAD (APA, 2013; Bienvenu et al., 2004), and are genetically influenced (McCrae & Costa, 1997; APA, 2013). These genetically influenced traits could also mediate how susceptible the individual may be are to environmental stressors affecting SAD (APA, 2013; Bandelow & Stein, 2004).
**Comorbidity.** Decreased well-being and overall lower quality of life is associated with SAD (APA, 2013; Grant et al., 2005; Stein & Kean, 2000), which further on could have an impact on comorbidity. It is proposed that a correlation between social anxiety and mood disorders exists, where self-reported levels of social anxiety have a positive correlation to self-reported depression as well as to general worry (Schry et al., 2010). Furthermore, SAD shows high comorbidity with a number of psychological disorders, for example with bipolar disorder (APA, 2013; Grant et al., 2005), although the most common comorbidity for SAD is other anxiety disorders (Grant et al., 2005) and major depressive disorder (APA, 2013; Ohayon & Schatzberg, 2010). Other anxiety disorders have been demonstrated to be especially high for university students (Schry et al., 2012). It is furthermore common that SAD precedes the comorbid disorder, such as major depressive disorder, e.g. the social isolation that stems from SAD may subsequently result in major depressive disorder (APA, 2013).

Some gender differences may exist regarding comorbidity. For instance, women with SAD demonstrate to a higher extent various social fears as well as depressive- or anxiety disorders. Men with SAD instead demonstrate various conduct disorders and self-medication with alcohol or illicit drugs to a higher extent than women (APA, 2013).

**Personality and social anxiety disorder**

As mentioned, personality traits may predispose individuals to SAD, although the conditions have not been agreed upon (see for example: Bienvenu et al., 2004; Kotov, Gamez, Schmidt, & Watson, 2010; Spinhoven, Does, Ormel, Zitman, & Penninx, 2013). This might be due to high comorbidity with other personality disorders (Spinhoven et al., 2013).

The leading theory within personality research is that personality consist of a set of traits which are ordered hierarchically, ranging from general characteristics to more specific facets (Kotov et al., 2010). These general characteristics, called dimensions, have reached consensus amongst researchers and are called “the Big Five” (Kotov et al., 2010; Larsen, 2017), while the smaller subunit traits are still debated (Kotov et al., 2010). The five dimensions are openness to experience, conscientiousness, extraversion, agreeableness, and neuroticism. Before the existence of these factors were agreed upon, many researchers had their own models and even if they also had five dimensions, the labelling and/or the meaning of one of the factors could differ (McCrae & Costa, 1985). The model by Costa and McCrae (1992), called Revised NEO Personality Inventory (NEO PI-R), that is now the most widely used (Larsen, 2017; Soto &

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2 Openness to experience will from here on be referred to as openness.
have in addition to the five dimensions, six underlying facets for each dimension. The facets can explain the individual differences between two people who have the same score in a dimension, and provide a clearer conceptual basis for the five dimensions (Costa, McCrae & Dye, 1991). The dimensions will be explained in the next section by presenting their facets, and a chart of the Big Five can be viewed in Appendix A.

**Openness** is linked to being open for new information and being less prejudiced (Larsen, 2017). Fantasy (O1) indicate a vivid imagination with a tendency to daydream. Aesthetics (O2) is a sensitivity to art and beauty. Feelings (O3) refer to feeling own emotions strongly and to give them an important meaning. Actions (O4) include the will to try new things such as traveling or tasting different foods. Ideas (O5) refers to curiosity and valuing knowledge. Values (O6) indicate a liberal standpoint in values and being open-minded toward others’ decisions (McCrae & Costa, 2003).

**Conscientiousness** is characterised both by commitment to work and moral cautiousness. Competence (C1) refers to aspects of viewing oneself as capable, accomplished and intelligent. Order (C2) include being organised and keeping one’s environment tidy. Dutifulness (C3) is the strong adherence to rules and principles of moral. Achievement striving (C4) indicate a pursue for excellence. Self-discipline (C5) refers to perseverance and the ability to fulfil a task despite distractions. Deliberation (C6) entails being cautious, planning and thoughtfulness (Costa et al., 1991).

**Extraversion** is characterised by a preferred high quantity of social stimulation (Larsen, 2017). Warmth (E1) refers to friendliness and a cordial interactions style. Gregariousness (E2) refers to sociability and a desire to interact with others. Assertiveness (E3) entails the inclination of taking charge as well as expressing one’s standpoint. Activity (E4) refers to the preference of being busy and acting vigorously. Excitement seeking (E5) involves looking for an environment that is stimulating in an exciting perspective. Positive emotions (E6) refers to the disposition of happy feelings (McCrae & Costa, 2003).

**Agreeableness** is characterised by interpersonal behaviour with focus on the quality of the interaction i.e. acting compassionate. Trust (A1) refers to viewing others as having benevolent intent. Straightforwardness (A2) refers to being direct in the communication rather than hiding information. Altruism (A3) indicate actions of selflessness and concern for others but this facet also includes simple courtesy and consideration. Compliance (A4) refers the tendency to cooperate when faced with conflict, and can be viewed meek and mild. Modesty (A5) indicate that the person does not have an inflated view of themselves. Tender-mindedness
(A6) refers to the tendency of regarding the aspect of sympathy when making judgments and decision (Costa et al., 1991).

**Neuroticism** measures how prone an individual is to experience unpleasant emotions, thoughts and actions. Anxiety (N1) indicate nervousness and a tendency to worry about what could go wrong. Angry hostility (N2) is feelings of irritability and ill-temperedness which can make an individual hard to get along with. Depression (N3), as a facet, is the disposition to experience sadness, hopelessness, and loneliness. Self-consciousness (N4) refers to feelings of shame and the tendency to feel inferior to others. Impulsiveness (N5) entail giving in to temptations and a tendency to engage in risky behaviours. Vulnerability (N6) indicates an inability to deal with stress in an adequate manner, such as reaction with panic or depending on others (McCrae & Costa, 2003).

The Big Five personality traits are also affected by cultural factors, and influence how these characteristics are manifested, e.g. an individual with high agreeableness will strive to be polite according to the rules of etiquette in their society which may differ from other cultures. High neuroticism can also take different shapes depending on culture, e.g. anxiety towards computer viruses in Americans, or towards ghosts in Navahos (McCrae et al., 2000).

The estimated heritability for the five dimensions ranges from 31%, for conscientiousness, to 41% for openness, while the other three dimensions have around 35% heritability (Vukasović & Bratko, 2015). The facets also show high heritability (Jang, McCrae, Angleitner, Riemann, & Livesley, 1998). Shared environmental effects, e.g. growing up in the same family or attending the same school, do not affect the development of the traits. The non-shared environment, however, does have an effect on the traits. This means that the environment, which is unique to children in the same family, e.g. getting more attention from a parent or having different classmates, impacts the development of the traits (McCrae et al., 2000). About 60 % of an individual’s personality traits appears to be determined by these environmental factors (Vukasović & Bratko, 2015). The traits are evidently universal, and are relatively stable in adults, with some indication that university students differ from an older population (McCrae & Costa, 1997).

*Current research on personality.* The personality traits that show the strongest relationship with SAD are neuroticism and extraversion, where a high score of neuroticism and/or low score of extraversion could indicate SAD. Moreover, conscientiousness appear to have a negative correlation with SAD, however, the relationship is not as strong as for neuroticism and extraversion (Bienvenu et al., 2004; Glinski & Page, 2010; Kaplan, Levinson, Rodebaugh,
Menatti, & Weeks, 2015; Klein, Kotov, & Bufferd, 2011; Kotov et al., 2010; Spinhoven et al., 2013). Furthermore, low agreeableness could possibly be associated with SAD (Spinhoven et al., 2013), although, the results are ambiguous.

On facet level, the research has been less extensive, but results point to that not all facets for a dimension have a relationship with SAD. The relevant facets appear to be competence (C1; Bienvenu et al., 2004; Kaplan et al., 2015), achievement striving (C4), self-discipline (C5), warmth (E1), gregariousness (E2), assertiveness (E3; Bienvenu et al., 2001; Bienvenu et al., 2004), activity (E4), excitement-seeking (E5), positive emotions (E6; Bienvenu et al., 2004), trust (A1; Bienvenu et al., 2004; Kaplan, 2015; Glinski & Page, 2010), anxiety (N1), angry hostility (N2), depression (N3), self-consciousness (N4), vulnerability (N6; Bienvenu et al., 2001; Bienvenu et al., 2004).

Comparisons with clinical groups of other mood and anxiety disorders show that SAD differ from the other anxiety groups on two facets, with higher scores on self-consciousness (N4) and lower on assertiveness (E3; Rector, Bagby, Huta, & Ayearst, 2012), indicating that these facets might be the most specific in individuals with SAD.

It is not clear what causes these differences in personality. One possibility is that personality has an impact in the development of SAD, and another is that the personality changes due to having SAD. Alternatively, there may be a shared cause underlying SAD as well as associated personality traits. Although, in a study by Spinhoven et al. (2013), participants who have had treatment for SAD exhibited higher scores on conscientiousness and agreeableness than their previous scores two years prior. It was, however, still a small difference between them and the healthy controls. Their level of neuroticism and conscientiousness had also changed but the difference was still large or moderate in comparison to the controls. This could indicate that the traits were stable in the individuals and therefore not caused by SAD.

Research regarding the dimensions of Big Five and their relationship to SAD are relatively clear, however, on the facet-level results are ambiguous and in need of further research.

**Affective measures**

Personality appears to be derived from aspects of affectivity, extraversion is for instance connected to positive affectivity and neuroticism to negative affectivity. Two other concepts affiliated to negative affectivity are trait anxiety and the Behaviour Inhibition System (BIS), while the Behaviour Approach System (BAS) is related to positive affectivity. Moreover, it has been argued that the Big Five dimensions are broader constructs than trait anxiety (Bruk-Lee,
Khoury, Nixon, Goh & Spector, 2009), BIS and BAS, while these affective measures are closer to the core of the biological mechanisms of behaviour (Carver, Sutton, & Scheier, 2000).

**Trait anxiety.** A reason for the assumption that trait anxiety is related to neuroticism is due to the fact that trait anxiety is argued to be relatively stable (Bruk-Lee et al., 2009; Cattell & Scheier, 1958), and that it reflects the characteristic level of anxiety an individual has (Colman, 2015; Julian, 2011). Furthermore, it is argued that trait anxiety refers to the tendency to perceive stressful situations as threatening and that the response to this is elevation of state anxiety (Ha, Lim, Shin, & Oh, 2011; Spielberger, Gorsuch, Lushene, Vagg & Jacobs 1983). State anxiety is thus considered to be a manifestation of a particular state that could fluctuate over time (Cattell & Scheier, 1958; Spielberger, 1966). Moreover, trait anxiety and state anxiety appear to have a positive correlation, and it has been argued that an individual with trait anxiety is more predisposed to reactions of state anxiety compared to others (Spielberger, 1966), and that the stronger the trait anxiety is, the more likely it is that the reaction of state anxiety will have an intense increase in a threatening situation (Spielberger et al., 1983). Trait anxiety is also regarded as a dimension which implicates that individuals could experience variations in the anxiety (Heeren, Bernstein, & McNally, 2018; Spielberger et al., 1983). To measure trait anxiety, the State Trait Anxiety Inventory- trait portion (STAI-T; Spielberger, Gorsuch & Lushene, 1970) was created, and it is to this date considered to be a well-established measurement (Julian, 2011).

**Behavioural Inhibition System and Behavioural Approach System.** Gray (1982) argued that there are two core systems responsible for regulating behaviour, both with different neural substrates. One is called BIS, which mediates responses to fear and conditioned frustration. BIS resolves conflicts in competing goals by inhibiting behaviour, increasing arousal and assessing threatening information in potentially dangerous situations. It is proposed to be the source of feelings of anxiety and the personality trait neuroticism (Kimbrel et al., 2012). As previously mentioned, BIS is assumed to predispose individuals to SAD (APA, 2013).

The other system, BAS, is the underlying factor for reward-seeking behaviour and impulsivity (Kimbrel et al., 2012), and is furthermore assumed to be related to extraversion (Carver & White, 1994). These two systems are suggested to be independent from each other and individuals can have variations in system sensitivity. Thus, one system can be dominate over the other or they can be balanced, although the balance can exist on every level of intensity, e.g. both systems as low or high in sensitivity (Carver et al., 2000). BIS and BAS can be
assessed by Carver and White’s (1994) BIS/BAS scales where BAS is split into three subscales: reward responsiveness, drive and fun-seeking.

**Current research on affectivity.** Modern research on trait anxiety argues that it is not physiological threats that are perceived as the most catastrophic, it is rather anticipations of failure or degradation of self-esteem (Horikawa & Yagi, 2012), which could be interpreted as an indication that individuals suffering from SAD would as well score high on trait anxiety since fear of embarrassment is a prominent symptom in the disorder (APA, 2013). Trait anxiety has also been linked to decreased life- and job satisfaction (Bruk-Lee et al., 2009; Watson & Clark, 1984), in similarity to SAD (APA, 2013; Grant et al., 2005; Stein & Kean, 2000). When investigating the relationship between trait anxiety and SAD, there is supporting evidence that socially anxious individuals have a higher score of trait anxiety compared to individuals without social anxiety (Amir, Beard & Bower, 2005; Fonzo et al., 2015). Furthermore, the STAI-form could be used as a predictor for SAD (Hishinuma et al., 2001).

Regarding the relationship between BIS and SAD, research has shown that individuals with SAD have a higher score on BIS than healthy controls (Bruijnen, Young, Marx, & Seedat, 2019; Kimbrel, Mitchell & Nelson-Gray, 2010; Kimbrel et al., 2012; Morgan et al., 2009). The association regarding BAS and SAD is, however, unclear since research point in different directions. One possibility is that a low BAS is associated with SAD, with consideration to BAS being related to extraversion and, as stated, low extraversion is related to SAD. This is supported by findings of Kimbrel et al. (2012) and Kimbrel et al. (2010), who also suggest that low BAS is an additional risk factor of developing SAD (Kimbrel, 2008). However, Morgan et al. (2009) propose that it is only a low score on the subscale fun-seeking that act as a risk factor for developing SAD. These results were not replicated by Bruijnen et al. (2019), i.e. no association was found between BAS and SAD, thus leaving the relationship uncertain.

There is more to social anxiety than the association to personality and affectivity, it also affects behavioural patterns and cognition. Researchers have studied the cognitive consequences of the disorder, where focus have been on attentional and judgemental bias for social threat stimuli and how social information is interpreted and remembered (Heinrichs & Hofmann, 2001). For instance, individuals with SAD appear to have information-processing biases when they reflect upon social events that they will participate in, during participation, and after leaving such an event, i.e. they will process it differently and perceive it as more negative than other individuals (Hirsch & Clark, 2004). A less explored cognitive measure in
relation to social anxiety is the distance one prefers towards others; as will be presented in the next section.

**Social distance and its relation to social anxiety**

Social interactions have many dimensions to it, where the primary is acting according to social norms. Limited research has been conducted regarding individuals’ physical distance to others in interactions, and where the personal space might be threatened, in relation to SAD. The term personal space refers to “... a type of nonverbal communication, the reference point of a cognitive spatial map or a measurement technique of psychological distance” (Hayduk, 1978, p.118). However, the concept of personal space has been further developed, and a new expansion of the concept is interpersonal space. The term interpersonal space refers to the space individuals keep between themselves and others (Iachini, Ruggiero, Ruotolo, Schiano di Cola, & Senese, 2015; Leroy, Rocca & Gosselin, 2014). Interpersonal space could be thus considered similar to the concept of social distance, since social distance refers to the space individuals keep between themselves and others when engaging in a communicative interaction with them (Leroy et al., 2014). Interpersonal space and social distance are therefore treated as the same construct in the present thesis.

Due to the fact that individuals suffering from SAD tend to have a fear of being negatively evaluated (APA, 2009; 2013; Bandelow & Stein, 2004), it could be assumed that these individuals also would have a larger interpersonal space, i.e. social distance, than the general population. The question of social distance in relation to SAD has not been extensively investigated. However, some research on the subject have been conducted but with fairly ambiguous results regarding factors such as the effect of gender (see for example: Perry, Rubinsten, Peled, & Shamay-Tsoory, 2013; Rinck et al., 2010; Wieser, Pauli, Grosseibl, Molzow & Mühlberger, 2010).

Modern research on this topic has mostly been conducted through virtual reality (VR) devices (Rinck et al., 2010; Wieser et al., 2012), being a helpful tool since it provides a realistic scenario. It has been shown that even though the participants are aware of the fact that they are in a virtual scenario, the instant responses and behaviour patterns are similar to what they would have been in a real-world scenario (Dotsch & Wigboldus, 2008). Using VR-devices in research on social distance is furthermore argued to have high ecological validity (Wieser et al., 2010).

Findings concerning the relationship between social anxiety and social distance indicates that individuals with high scores on social anxiety have a larger personal distance to an avatar compared to individuals with lower scores on social anxiety (Perry et al., 2013; Rinck
et al., 2010) with large effect size even in small samples (Rinck et al., 2010). An interesting aspect concerning social distance is whether or not SAD has an effect on close-up conditions or if it mostly concerns conditions when another individual crosses the line for the perceived personal space. Wieser et al. (2010) proposed that social anxiety was associated with reactions to violations of personal space at a further away distance but not when the avatar was at a close-up condition. This result could therefore suggest that social anxiety does not play a role when the avatar or real-life individual is at a closer distance, due to the fact that it is more common to feel discomfort at that condition regardless of the level of social anxiety.

**Gender and social distance.** One of the findings that could be considered unclear is whether or not gender and SAD have an interaction effect on social distance. One study found support for the notion that women suffering from SAD tend to have a larger social distance, especially when it is a male approaching them. This could therefore indicate that women with high social anxiety are more fearful of social encounters with the opposite sex (Wieser et al., 2010). In another study, the results demonstrated that there were no differences in social distance depending on the gender of the avatar (Rinck et al., 2010). The results regarding an interaction between gender and SAD might solely be due to gender differences concerning social distance, and not the anxiety itself. In samples with individuals without social anxiety, women preferred a greater distance toward approachers than did men (Iachini, Coello, Frassinetti & Ruggiero, 2014; Miller, Chabriac, & Molet, 2013) and both genders allowed female approachers closer than male approachers (Iachini et al., 2014; Iachini et al., 2016). One study also showed an interaction with women preferring male approachers at a further distance (Miller et al., 2013).

**Personality and affective measures relation to social distance.** Personality has also been linked to differences in social distance. However, the results from these studies have varied significantly and it is therefore difficult to talk about a clear correlation, especially since personality have been measured with older personality instruments (Gifford, 1982). Modern research argues that neuroticism show a positive correlation with social distance, making the social distance larger when having high scores on neuroticism (Iachini et al., 2015).

When assessing affective measures such as BIS/BAS and their relation to personal space, it has been proposed that there are no differences in preferred personal space on a stop-distance task (Wagels, Radke, Goerlich, Habel, & Votinov, 2017). Furthermore, association between trait anxiety and social distance has been demonstrated. Individuals with high scores
of trait anxiety preferred to have a larger social distance than individuals with low scores of trait anxiety (Iachini et al., 2015).

Aims and research questions of the present thesis

Although the research on Big Five dimensions in relation to social anxiety has yielded fairly consistent results, the research on Big Five facets is more limited and results more ambiguous. It is also not clear if personality-SAD relations are better conceptualised with other affective measures like trait anxiety, BIS and BAS. This thesis therefore aimed to investigate the relationship between excessive social anxiety, personality, and affective measures in order to deepen the understanding of social anxiety. Since SAD affects behavioural patterns, this thesis aimed to see how this can be manifested in a systematic difference in social distance. The research regarding social anxiety in relation to social distance is limited, especially concerning the use of VR. Therefore, the present thesis also aimed examining social distance in relation to social anxiety and if social distance can be better explained by Big Five personality dimensions or affective measures screened for low/high social anxiety. To these ends, groups of individuals with either low or high social anxiety were screened for in a student sample (N=40).

The research questions were: (1) could low/high social anxiety groups be discriminated based on personality traits and affective measures? (2) Do low and high social anxiety groups differ in social distance, independent of gender? (3) Is social distance associated with social anxiety symptom severity or personality traits?

Hypotheses. The hypotheses for the first research question were that the high social anxiety group would score lower on the dimensions conscientiousness and extraversion, and higher on neuroticism than low social anxiety group. On facet level, it was hypothesised that high social anxiety group would score lower on C1, C4, C5, all extraversion facets, A1, and higher on N1, N2, N3, N4, N6 in comparison to the low social anxiety group. Concerning the affective measures, a high score on trait anxiety and BIS, and a low score on BAS was hypothesised to be associated with high social anxiety. Regarding the second research question, it was hypothesised that the high social anxiety group will have a larger social distance than the low anxiety group and that women will have a larger social distance toward male avatars than men. The third research question was treated as explorative, without a directed hypothesis, since the research on that topic is limited.
Method

Participants

An online screening was conducted in order to recruit participants both with low and high scores of social anxiety measured with the self-report version of the Liebowitz Social Anxiety Scale (LSAS-SR; Liebowitz, 1987; Fresco et al., 2001). To advertise for the study, flyers with a link to the online screening instruments, were put up around billboards in several campuses of Uppsala University. The information did not disclose that social anxiety would be studied, but rather that the relationship between personality traits and emotional responses would be investigated.

A total number of 144 individuals (101 women, 42 men, 1 chose not specified, mean ±SD age = 24.63 ±4.74 years, range 18-47) completed the online screening (see Procedure below) including the LSAS-SR scale (M=50.34, SD=20.38), in which 40 were selected to participate in the experiments based on their LSAS-SR score. According to Rytwinski et al. (2009) the ideal cut-off score when screening for generalised SAD is ≤30 and ≥60 on the LSAS-SR. This study, however, used a score of ≤30 for the low social anxiety group and a score of ≥70 for the high anxiety group to increase the likelihood for generalised SAD among the high scorers. The recruitment was continuous, and participants were chosen if their score was within the cut-off. When 20 participants of each group had conducted the experiments, as outlined below, the screening was closed. In total, the screening was open for about seven weeks.

Of the qualified participants from the screening, n=8 chose to not continue with the study and therefore other participants (n=8) took their place. Thus N=40 completed all assessments in the study, n=20 in the high social anxiety group (10 women/men, mean ±SD age = 26.65 ±5.99 years, range 20-39; LSAS-SR mean ±SD: 83.00 ±12.72, range 70-116) and n=20 in the low social anxiety group (13 women, 7 men, mean ±SD age = 25.3 ±6.96 years, range 19-47; LSAS-SR mean ±SD: 19.6 ± 4.60, range 11-29).

Regarding educational levels, in the high social anxiety group n=2 participants reported a secondary education, n=8 university education of three years and n=10 university education of more than three years. In the low social anxiety group, n=8 participants reported a university education of three years and n=12 reported a university education of more than three years. The participants were mainly students (n=33) and represented 22 different fields of study, law being the most common (n=5) in this sample.
Three cinema vouchers were given as compensation for their participation in the study which also included two more experiments conducted on the same occasion. One participant chose to receive course credit instead of cinema vouchers.

Material

Liebowitz Social Anxiety Scale. To measure social anxiety, the Swedish version of LSAS-SR was used which is highly correlated to the clinician administered version of the scale (Rytwinski et al., 2009). The scale consists of 24 social situations, such as “eating in public”, “meeting unfamiliar people” and “participating in small groups”, with ratings of fear (0-3 min-max) and avoidance (0-3 min-max) on each. A cut-off score of 30 and 60, for non-SAD and generalised SAD cases respectively, appears to reflect the best balance between specificity and sensitivity both in the clinician administered and the self-report version of the scale (Rytwinski et al., 2009). As mentioned, this study used 30 and 70 points as the cut-off scores to minimise the risk of including performance subtype of SAD. The instrument had a high internal consistency in this thesis, with $\alpha=0.91$.

Revised NEO Personality Inventory. NEO PI-R (Costa & McCrae 1992; Costa & McCrae, 2003) is the most widely used hierarchical Big Five measurement (Soto & John, 2009). It assesses the Big Five traits and their six respective facets for each dimension with 240 items where each facet has eight items. The format is a 5-point Likert-scale with answer ranging between “Absolutely disagree” (0) to “Absolutely agree” (4) and it takes approximately 40 minutes to answer. Examples of the statements answer are “I am easily frightened”, “I feel I am capable of coping with most of my problems” and “if I do not like people, I let them know it”. The Swedish version of NEO PI-R used in this study had satisfactory internal consistency for the five dimensions; openness ($\alpha=0.61$), conscientiousness ($\alpha=0.79$), extraversion ($\alpha=0.77$), agreeableness ($\alpha=0.80$), neuroticism ($\alpha=0.92$).

Trait Anxiety. To measure trait anxiety, the Swedish version of Spielberger State-Trait Anxiety Inventory (trait portion; STAI-T) was used in this study. The instrument was originally created by Spielberger et al. (1970) and has been widely used to assess clinical anxiety but it is also claimed to be a successful screening tool, especially for university students. The scale consists of 20 items with statements such as “I feel well rested”, “I lack self-confidence” and “I try to avoid dealing with crisis and difficulties”. The scales format is a 4-point Likert scale with answers ranging from “Almost never” (1) to “Almost always” (4). The total amount of time
required for filling out the form is approximately six minutes. The scale had a high internal consistency in the present thesis (α=0.94).

**Behavioural Inhibition System and Behavioural Approach System.** In order to measure individual differences in BIS and BAS, a scale developed by Carver and White (1994) was used. The scale has 20 items on a 4-point Likert scale ranging from “Very true for me” (4) to “Very false for me” (1) with statements such as “I love adventure and new experiences”, “I am worried to make mistakes” and “when I want something, I will do what it takes to get it”. The scale consists of four subscales where one subscale measures BIS with seven of the items, and three subscales measures BAS with the remaining 13 items. BAS subscales differentiate between drive, fun-seeking and reward responsiveness. The instrument had a high internal consistency of $\alpha=0.83$ for both the BIS and total BAS scale in the present thesis.

**Montgomery-Åsberg Depression Rating Scale.** A Swedish self-report version of Montgomery-Åsberg Depression Rating Scale (MADRS-S; Svanborg & Åsberg, 1994), developed from Montgomery and Åsberg (1979), was used in this study to control for underlying depressive symptoms since the instrument is successfully used as a screening instrument (Sagen et al., 2009). It consists of 9 items with questions concerning, for example, reported sadness, concentration difficulties and pessimistic thoughts. The instructions are to answer the questions based on the mood of the three previous days. The scale ranges from 0 to 6 (min-max) on each item, and a score of 0-12 corresponds to “essentially at ease”\(^3\), 13-19 to mild depression, 20-34 to moderate depression and over 35 is considered to be severe depression (Svanborg & Åsberg, 1994). The instrument had furthermore a high internal consistency in this thesis, with $\alpha=0.84$.

**Distance measurement in the virtual reality context.** The used VR-context was created by Jörgen Rosén (Dept. of Psychology, Uppsala University), and its design was adopted from Adolphs, Kennedy, Gläscher, and Tyszka (2009). The VR-context contained a 3D environment created in Unity (version 5.6.3, Unity Technologies, San Francisco, CA), and consisted of a large city scenery including multiple skyscrapers, stores, sky, trees, red-lights, a road, a crossing road, and a pavement (as shown in Figure 1). The context was presented in a first-person perspective through an Oculus Rift virtual reality headset (Oculus VR, Irvine, CA). The stimuli appeared on a pavement, walking towards the subject. Stimuli consisted of four different 3D

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\(^3\) Authors’ translation of “väsentligen obesvärad”.
avatars, two males and two females (see Figure 2). All avatars were around 1.8 metres tall and had a neutral facial expression. Stimuli were presented via custom built software for Unity game engine (version 5.6.3, Unity Technologies, San Francisco, CA) and each stimulus was presented four times. The order in which the avatars appeared differed between two sequences.

During the VR-experiment, the primary measurement was the tolerable social distance (expressed in units which is equivalent to metres) towards an approaching virtual avatar. The virtual avatar started at a distance of 8 units, which represented 8 metres, and approached the subject with a velocity of 0.3 u/s which was equal to 0.3 m/s. When pressing a response button, the left button on a computer mouse, the avatar stopped walking and the participants could thus place the avatar at a distance they felt comfortable having a conversation.

*Figure 1*. Design of the initial virtual context when initiating the experiment before a virtual avatar appeared.
Figure 2. Design and stimuli for the social distance experiment. (A) showing both male and female avatars at a further away distance. (B) showing both male and female avatars at a closer distance.

Instruments not used in the thesis. In addition, Alcohol Use Disorders Identification Test (AUDIT; Bergman, Källmén, Rydberg, & Sandahl, 1998), Karolinska Scales of Personality (KSP; Schalling & Edman., 1993), and Big Five Inventory (BFI; John & Srivastava, 1999) was included in the study but not used in the present thesis, since the instruments were not of interest for the research questions.
Procedure

The study commenced with an online screening where the potential participants signed up and completed the LSAS-SR scale as well as the BFI scale (John & Srivastava, 1999). When participants were selected for further assessment, based on their low/high LSAS-SR score, they were instructed to complete another online survey, containing the instruments BIS and BAS, STAI-T, AUDIT and MADRS-S, before arriving to the experiment session.

Information about the study was given before every survey began and in the beginning of the experiment session both verbally and in writing, in accordance with established ethical guidelines for research on humans. The participants were informed that their participation was voluntary and that they could discontinue the study at any time without further explanation. In addition, they gave their permission to store their personal information according to the General Data Protection Regulation (GDPR), and that the information was not to be disclosed to unauthorised persons. A signed informed consent form was obtained from all participants selected to take part in the experiment.

Prior to the social distance experiment, participants conducted two experiments that were not included in this study and those took about an hour to complete. The first consisted of fear conditioning with faces as conditioned stimuli and electric stimulation as unconditioned stimuli. The second experiment was an approach-avoidance experiment which included unpleasant pictures taken from the International Affective Picture System (IAPS). For the social distance experiment, participants were randomised into one of two avatar sequences, which regulated the order that the virtual avatars would be presented to the participant.

Before the experiment started, the participants were instructed to put on the VR-headset. They were then informed that they would see avatars in a virtual environment walking towards them and they were instructed to stop the walking avatar by pressing the response button when they felt that the avatar was at a comfortable distance to have a conversation. The participants were seated down during the experiment to minimise the risk of nausea moving around in a virtual environment. This part of the experiment lasted for approximately three minutes.

When the experimental session was finished, the participants were thanked for their participation and given two paper-and-pencil personality forms (NEO PI-R and KSP) to be filled out at home and returned in a pre-stamped envelope. Upon return, participants were compensated with three cinema vouchers or course credits.
Design
The present thesis was a single-blind study, where the researcher could be aware of the participants group belonging prior to the experiment. Furthermore, an experimental between-group design was used with low/high social anxiety group (based on LSAS-SR scores during screening), gender of the participant, gender of the avatar, and personality dimensions as independent variables. However, low/high social anxiety group was treated as a dependent variable when examining Big Five personality dimensions as predictors for group belonging. Other dependent variables were social distance, Big Five personality facets (NEO PI-R), trait anxiety (STAI-T), and BIS/BAS.

Confounding variables controlled for. The participants were randomised into different avatar sequences for the experiment and it was conducted in the same manner for all participants. Furthermore, mail-correspondence as well as written and verbal instructions was conducted in a standardised manner to minimise experimenter-effects. All participants were given the same information, both before filling in the surveys and before the experiments, and were not disclosed on the reason why they qualified to the experiments in order to avoid expectancy-effects. Moreover, age, gender and level of education were confounding variables controlled for, and comorbid depressive symptoms was controlled through MADRS-S.

Statistical analyses
The data analyses were carried out with IBM SPSS Statistics version 22. In order to answer the research questions, a number of different statistical analyses were performed. The first part of the first research question was examined through a logistic regression analysis to establish the relationship between Big Five personality dimensions and low/high social anxiety group. Due to intercorrelations for the Big Five personality facets and the affective measures, independent samples t-test were conducted instead to investigate their potential relationship to social anxiety group belonging. To investigate the association between low/high social anxiety group, social distance, gender of the avatar, and gender of the participant for the second research question, a three-way repeated measures analysis of variance (ANOVA) was conducted. The third, and final, research question was examined through a multiple linear regression analysis to establish the relationship between social distance and personality. Due to non-significant results regarding social anxiety in previous research question, that variable was excluded from this analysis. As mentioned above, because of intercorrelations for the affective measures, Pearson
Correlations were used to investigate the effect of BIS, BAS, trait anxiety, and depressive symptoms on social distance.

Chi² tests were conducted to control for gender of the participant and level of education as confounding variables to social anxiety group belonging. Furthermore, independent samples t-tests were performed to control for avatar sequence on the VR-experiment and age as confounding variables to anxiety group belonging.

Regarding the level of significance, a p-value of <.05 was considered statistically significant in the present thesis. However, the level of significance was corrected using Bonferroni adjustments of α<.0026 (.05/19) for the facets in the first research question, α<.007 (.05/7) for the affective measures in the first research question, and α<.006 (.05/8) for the affective measures in the third research question. The effect size was reported as Cohen’s $d$ for comparisons of means, where values over .2 equates to a small effect size, values over .5 to a medium effect size, and values over .8 to a large effect size. For Pearson $r$ correlations, the effect size was measured in the strength of the correlation. A correlation of .1 corresponds to a small effect, .3 to a medium effect, and .5 to a large effect (Borg & Westerlund, 2007).

**Ethical aspects**

The collected data was handled with confidentiality and coded anonymously so that personal information could not be traced to a specific individual. Moreover, the results were presented on group-level. All data was, as previously mentioned, stored according to General Data Protection Regulation (GDPR). Regarding the other two experiments included in the study, involving unpleasant stimuli, the participants were informed that they could discontinue with the study at any time without giving an explanation.

Considering that social anxiety could be a sensitive subject, and that half of the sample had elevated levels of social anxiety, potentially without knowing they reach the clinical cut-off score for generalised SAD, it could be considered unethical not to disclose that information. The same reasoning regards depressive symptoms as well. Although, this was not a study administered by clinicians, thus, not authorised to make a clinical judgment.
Results

Regarding the prevalence for social anxiety, the percentage of individuals in the screening sample (N=144) with a score of 60 or higher was 29.2%, and 17.4% had a score of 70 or higher. Intercorrelations between the personality dimensions and between the other affective measures used in the study are given in the Appendix B–Table 1. No statistically significant results were found when controlling for avatar sequence on VR-experiment, age, gender and level of education as confounding variables to social anxiety group belongingness (p>.05). However, a significant difference between low/high social anxiety group was found in relation to depressive symptoms (p=.002) and was therefore controlled for in further analysis and in addition added to the affective measures. An outlier was detected for social distance (see Figure 3) and was therefore removed from further analyses regarding social distance.

*Figure 3. Boxplot showing an outlier deviating more than three standard deviations from the mean value, marked with asterisk.*
Could low/high social anxiety groups be discriminated based on personality traits or affective measures?

**Personality dimensions.** A logistic regression analysis was conducted to investigate the relationship between the Big Five personality dimensions and low/high social anxiety. The dependent variable was low/high social anxiety groups and the independent variables were the Big Five, i.e. openness, conscientiousness, extraversion, agreeableness, and neuroticism. The total model containing all predictors was statistically significant, \(
\chi^2 (5)=28.52, \ p<.001,\)
indicating that the model could successfully distinguish between the groups. In total, the model explained 68% (Nagelkerke R Square) of the variance in personality traits and correctly classified 80% of cases. Multicollinearity was assessed and deemed to be a non-issue since VIF varied between 1.112 and 2.616. Three of the independent variables made an independent contribution to the model: conscientiousness, extraversion and neuroticism (see Table 1 and Figure 4). Elevated neuroticism was a predictor for high social anxiety, indicated by positive OR, while lower levels of extraversion and conscientiousness (negative OR) predicted high social anxiety. Conscientiousness, extraversion and neuroticism remained significant predictors of low/high social anxiety group also when including MADRS-S in the statistical model and MADRS-S was itself not significant (\(p<.05\)). Neither openness nor agreeableness made a statistically significant contribution to the model when controlling for other predictors. Descriptive statistics for all Big Five dimensions are given in Appendix B - Table 2.

**Table 1. Logistic regression for social anxiety group and Big Five dimensions.**

<table>
<thead>
<tr>
<th></th>
<th>(\beta)</th>
<th>S.E</th>
<th>Wald (\chi^2)</th>
<th>df</th>
<th>(p)</th>
<th>O R</th>
<th>95% CI for O R</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Lower</td>
</tr>
<tr>
<td>Openness</td>
<td>0.04</td>
<td>0.04</td>
<td>1.33</td>
<td>1</td>
<td>.249</td>
<td>1.05</td>
<td>0.97</td>
</tr>
<tr>
<td>Conscientiousness</td>
<td>-0.08</td>
<td>0.04</td>
<td>4.15</td>
<td>1</td>
<td>.042</td>
<td>0.92</td>
<td>0.85</td>
</tr>
<tr>
<td>Extraversion</td>
<td>-0.09</td>
<td>0.04</td>
<td>5.56</td>
<td>1</td>
<td>.018</td>
<td>0.92</td>
<td>0.85</td>
</tr>
<tr>
<td>Agreeableness</td>
<td>-0.05</td>
<td>0.03</td>
<td>1.85</td>
<td>1</td>
<td>.174</td>
<td>0.96</td>
<td>0.89</td>
</tr>
<tr>
<td>Neuroticism</td>
<td>0.05</td>
<td>0.02</td>
<td>4.80</td>
<td>1</td>
<td>.029</td>
<td>1.05</td>
<td>1.01</td>
</tr>
<tr>
<td>Constant</td>
<td>14.89</td>
<td>6.96</td>
<td>4.58</td>
<td>1</td>
<td>.032</td>
<td></td>
<td>2933845.69</td>
</tr>
</tbody>
</table>
Figure 4. Differences in mean score across high and low social anxiety groups for the statistically significant Big Five dimensions. Error bars show 95% confidence intervals.

**Personality facets.** To further investigate the group differences in personality traits, independent samples t-tests were made on the facets for the dimensions that yielded statistically significant results in the logistic regression, i.e., conscientiousness, extraversion and neuroticism, and the facet A1: Trust. The reason for including A1, even though the dimension agreeableness was not significant, was due to it being hypothesised to be associated with social anxiety and it had shown statistically significant in previous research. In order to avoid mass significance, the level of significance was corrected using Bonferroni criterion of $\alpha<.0026$ (0.05/19). The facets were the dependent variables and the grouping variable was low/high social anxiety group. The facets that had a statistically significant difference between low and high social anxiety groups were C1: Competence, E3: Assertiveness, N1: Anxiety, N3: Depression, N4: Self-consciousness, and N6: Vulnerability (see Figure 5 and Table 2). Effect sizes were large for these facets.
Table 2. Mean score and standard deviations for Big Five facets for low and high social anxiety groups.

<table>
<thead>
<tr>
<th>Variable</th>
<th>M Low Social Anxiety</th>
<th>SD Low Social Anxiety</th>
<th>M High Social Anxiety</th>
<th>SD High Social Anxiety</th>
<th>t (38)</th>
<th>Cohen's d</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>C1: Competence</td>
<td>25.15</td>
<td>3.96</td>
<td>20.2</td>
<td>5.61</td>
<td>5.61</td>
<td>0.56</td>
<td>&lt;.001*</td>
</tr>
<tr>
<td>C2: Order</td>
<td>19.9</td>
<td>5.55</td>
<td>17.4</td>
<td>4.84</td>
<td>1.52</td>
<td>0.48</td>
<td>.137</td>
</tr>
<tr>
<td>C3: Dutifulness</td>
<td>24.55</td>
<td>3.46</td>
<td>21.75</td>
<td>4.45</td>
<td>2.22</td>
<td>0.70</td>
<td>.032</td>
</tr>
<tr>
<td>C4: Achievement Striving</td>
<td>17.3</td>
<td>5.18</td>
<td>17.85</td>
<td>5.22</td>
<td>-0.33</td>
<td>0.10</td>
<td>.74</td>
</tr>
<tr>
<td>C5: Self-discipline</td>
<td>19.4</td>
<td>5.35</td>
<td>14.35</td>
<td>6.91</td>
<td>2.59</td>
<td>0.82</td>
<td>.014</td>
</tr>
<tr>
<td>C6: Deliberation</td>
<td>20.45</td>
<td>4.98</td>
<td>19.35</td>
<td>6.45</td>
<td>0.60</td>
<td>0.19</td>
<td>.55</td>
</tr>
<tr>
<td>E1: Warmth</td>
<td>21.4</td>
<td>6.25</td>
<td>20.05</td>
<td>4.9</td>
<td>0.76</td>
<td>0.24</td>
<td>.452</td>
</tr>
<tr>
<td>E2: Gregariousness</td>
<td>17.8</td>
<td>5.63</td>
<td>13.6</td>
<td>5.78</td>
<td>2.33</td>
<td>0.74</td>
<td>.025</td>
</tr>
<tr>
<td>E3: Assertiveness</td>
<td>18.45</td>
<td>4.3</td>
<td>12.25</td>
<td>5.67</td>
<td>3.90</td>
<td>1.23</td>
<td>&lt;.001*</td>
</tr>
<tr>
<td>E4: Activity</td>
<td>17.25</td>
<td>4.41</td>
<td>15.2</td>
<td>3.32</td>
<td>1.66</td>
<td>0.53</td>
<td>.105</td>
</tr>
<tr>
<td>E5: Excitement Seeking</td>
<td>16.85</td>
<td>5.78</td>
<td>16.1</td>
<td>5.69</td>
<td>0.76</td>
<td>0.24</td>
<td>.452</td>
</tr>
<tr>
<td>E6: Positive Emotions</td>
<td>21.75</td>
<td>6.18</td>
<td>17.85</td>
<td>6.82</td>
<td>1.90</td>
<td>0.60</td>
<td>.066</td>
</tr>
<tr>
<td>A1: Trust</td>
<td>21.95</td>
<td>4.21</td>
<td>19.5</td>
<td>4.55</td>
<td>1.77</td>
<td>0.56</td>
<td>.085</td>
</tr>
<tr>
<td>N1: Anxiety</td>
<td>13.00</td>
<td>6.29</td>
<td>22.8</td>
<td>4.36</td>
<td>-5.73</td>
<td>1.81</td>
<td>&lt;.001*</td>
</tr>
<tr>
<td>N2: Angry Hostility</td>
<td>11.70</td>
<td>6.57</td>
<td>11.75</td>
<td>6.17</td>
<td>-1.68</td>
<td>0.10</td>
<td>.102</td>
</tr>
<tr>
<td>N3: Depression</td>
<td>13.25</td>
<td>7.17</td>
<td>23.1</td>
<td>5.61</td>
<td>-4.84</td>
<td>1.53</td>
<td>&lt;.001*</td>
</tr>
<tr>
<td>N4: Self-consciousness</td>
<td>12.45</td>
<td>5.17</td>
<td>20.75</td>
<td>7.37</td>
<td>-4.17</td>
<td>1.32</td>
<td>&lt;.001*</td>
</tr>
<tr>
<td>N5: Impulsiveness</td>
<td>14.00</td>
<td>6.17</td>
<td>18.05</td>
<td>5.79</td>
<td>-1.88</td>
<td>0.39</td>
<td>.068</td>
</tr>
<tr>
<td>N6: Vulnerability</td>
<td>9.9</td>
<td>5.91</td>
<td>16.2</td>
<td>5.65</td>
<td>-3.45</td>
<td>1.09</td>
<td>&lt;.001*</td>
</tr>
</tbody>
</table>

Note. * Significant after Bonferroni adjustment.
Figure 5. Group differences in mean score for the statistically significant Big Five facets. Error bars show 95% confidence intervals.

Affective measures. Independent samples t-tests were conducted separately for the other affective measures (including depressive symptoms), as dependent variables, with a Bonferroni criterion set to α<.007 (0.05/7) and social anxiety group as grouping variable. Results are given in Table 3. A significantly higher mean value for BIS, with large effect size, was noted in the high social anxiety group while no differences on the BAS-scales were found. Moreover, the high social anxiety group had higher levels of depressive symptoms as measured with MADRS-S and trait anxiety as measured with STAI-T, again with large effect sizes. Intercorrelation analysis revealed large correlations between these measures (see Appendix B - Table 1), hence logistic regression analysis was not used because of multicollinearity issues.
Table 3. Mean score and standard deviations for affective measures between low and high social anxiety groups.

<table>
<thead>
<tr>
<th>Variable</th>
<th>Low social anxiety</th>
<th>High social anxiety</th>
<th>t(38)</th>
<th>Cohen's d</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>BIS</td>
<td>17.40 4.20</td>
<td>23.50 3.86</td>
<td>-4.78</td>
<td>1.51</td>
<td>&lt;.001**</td>
</tr>
<tr>
<td>BAS: Total</td>
<td>37.35 5.70</td>
<td>36.55 5.83</td>
<td>0.44</td>
<td>0.14</td>
<td>.663</td>
</tr>
<tr>
<td>BAS: Drive</td>
<td>10.50 2.40</td>
<td>9.90 2.08</td>
<td>0.85</td>
<td>0.27</td>
<td>.402</td>
</tr>
<tr>
<td>BAS: Fun seeking</td>
<td>11.00 2.56</td>
<td>10.65 2.25</td>
<td>0.46</td>
<td>0.15</td>
<td>.649</td>
</tr>
<tr>
<td>BAS: Reward responsiveness</td>
<td>15.85 2.16</td>
<td>16.00 3.06</td>
<td>-0.18</td>
<td>0.06</td>
<td>.859</td>
</tr>
<tr>
<td>MADRS-S*</td>
<td>7.40 4.85</td>
<td>14.15 7.65</td>
<td>-3.33</td>
<td>1.05</td>
<td>.002**</td>
</tr>
<tr>
<td>STAI-Tb</td>
<td>35.05 8.26</td>
<td>50.45 9.87</td>
<td>-5.35</td>
<td>1.69</td>
<td>&lt;.001**</td>
</tr>
</tbody>
</table>

Note. *Montgomery-Åsberg Depression Rating Scale, self-report, bState-Trait Anxiety Inventory (trait portion).
**Significant after Bonferroni adjustment

Does low and high social anxiety groups differ in social distance, independent of gender?

A three-way repeated measures analysis of variance (ANOVA) was conducted to examine if there were differences in social distance depending on social anxiety group belonging and gender. Low/high social anxiety group and gender of the participant were used as independent between-subject variables. The gender of the avatar was an independent within-subject variable, and the dependent variable was the measured social distance. No statistically significant main effect of social anxiety group was detected ($F(1,35)=.16, p>.05$), with no significant interaction between social anxiety group and gender of the participant ($F(1,35)=.79, p>.05$), see Appendix B - Table 3 for means and standard deviations. There was, however, statistically significant main effects for gender of the avatar and gender of participants with an interaction effect between the two in social distance (see Table 4).

Table 4. Significant main effects and interaction effect for social distance.

<table>
<thead>
<tr>
<th>Variable</th>
<th>$F(1,35)$</th>
<th>$p$</th>
<th>$\eta^2_p$</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gender of avatar</td>
<td>24.95</td>
<td>&lt;.001</td>
<td>.416</td>
</tr>
<tr>
<td>Gender of participant</td>
<td>4.46</td>
<td>.042</td>
<td>.113</td>
</tr>
<tr>
<td>Gender of avatar* Gender of participant</td>
<td>11.50</td>
<td>.002</td>
<td>.247</td>
</tr>
</tbody>
</table>

Considering the mean distances for gender of the avatar, the male avatars were placed with a larger distance than the female avatars. Women preferred all avatars at a further distance than did men, and women placed male avatars further away than female avatars (see Table 5 and Figure 6). However, when further examining the differences in gender of the avatar with independent samples t-tests, no statistically significant results was found between men and women regarding the female avatar ($p>.05$).
Table 5. *Means and standard deviations for social distance.*

<table>
<thead>
<tr>
<th>Variable</th>
<th>Total</th>
<th>Men</th>
<th>Women</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>$M$</td>
<td>$SD$</td>
<td>$M$</td>
</tr>
<tr>
<td>Male avatars</td>
<td>2.38</td>
<td>0.48</td>
<td>2.16</td>
</tr>
<tr>
<td>Female avatars</td>
<td>2.18</td>
<td>0.37</td>
<td>2.10</td>
</tr>
<tr>
<td>Average distance to an avatar</td>
<td>2.29</td>
<td>0.42</td>
<td>2.13</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>2.41</td>
</tr>
</tbody>
</table>

*Figure 6.* Gender differences in mean social distance depending on gender of avatar.

A follow up independent samples t-test was conducted to see if women’s distance to male avatars was significantly different from men’s distance to female avatars. This was made through computing a new variable with the average score on social distance to the character of the opposite gender as the dependent variable and the grouping variable was gender. The results showed a statistically significant difference between women ($M=2.55$) and men ($M=2.10$) in preferred social distance to the opposite sex ($p=.004$, Cohens’ $d=0.99$).
Is social distance associated with social anxiety symptom severity or personality/affective measures?

Since social distance was not associated with social anxiety, as outlined above, a multiple linear regression analysis was conducted with the Big Five personality dimensions as independent variables and average social distance as dependent variable, in order to clarify a potential relationship. Investigations showed a significant Pearson $r$ correlation between the early and late trials in the social distance experiment ($r=.818$, $p<.01$), indicating that the average social distance measure was sufficient for the statistical analysis.

While the full regression model was not statistically significant ($F(5,33)=1.09$, $p>.05$, adjusted $R^2=.013$) conscientiousness was a statistically significant predictor of social distance (see Table 6), indicating a possible positive relationship between social distance and conscientiousness (see Figure 7).

Due to intercorrelations between the affective measures, Pearson $r$ correlations were used instead of regression analysis to investigate the relationship between social distance and affective measures. Since the analysis had seven variables a Bonferroni adjustment of $\alpha<.006$ was used. The correlations did not yield statistically significant results (range $r= -.155 - .080$, all p-values $> .007$).

<table>
<thead>
<tr>
<th></th>
<th>S.E</th>
<th>$\beta$</th>
<th>$t$</th>
<th>$p$</th>
<th>95.0% Confidence Interval for B</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Lower</td>
</tr>
<tr>
<td>Openness</td>
<td>0</td>
<td>0.000</td>
<td>0.09</td>
<td>.931</td>
<td>-0.009</td>
</tr>
<tr>
<td>Conscientiousness</td>
<td>0</td>
<td>0.007</td>
<td>2.08</td>
<td>.045</td>
<td>0.000</td>
</tr>
<tr>
<td>Extraversion</td>
<td>0</td>
<td>0.000</td>
<td>0.04</td>
<td>.969</td>
<td>-0.007</td>
</tr>
<tr>
<td>Agreeableness</td>
<td>0</td>
<td>0.002</td>
<td>0.63</td>
<td>.530</td>
<td>-0.005</td>
</tr>
<tr>
<td>Neuroticism</td>
<td>0</td>
<td>0.001</td>
<td>0.29</td>
<td>.775</td>
<td>-0.005</td>
</tr>
<tr>
<td>Constant</td>
<td>0.74</td>
<td>1.38</td>
<td>.177</td>
<td>-0.482</td>
<td>2.513</td>
</tr>
</tbody>
</table>
Figure 7. Scatterplot showing data points for individual scores on conscientiousness and average social distance.
Discussion

The aim of the present thesis was to investigate excessive social anxiety in the perspective of personality traits and affective measures in order to deepen the understanding of social anxiety. Moreover, it aimed to examine how social anxiety is related to social distance and if social distance could be better explained by social anxiety, personality traits or affective measures.

For the first research question, it was hypothesised that the high social anxiety group would score lower on the personality dimensions conscientiousness and extraversion, and higher on neuroticism than low social anxiety group. On facet level, it was predicted that high social anxiety group would score lower on C1, C4, C5, all extraversion facets, A1, and higher on N1, N2, N3, N4, and N6 than low social anxiety group. Regarding the affective measures, it was hypothesised that a high score on trait anxiety and BIS, and a low score on BAS would be associated with high scores of social anxiety. For the second research question, it was assumed that the high social anxiety group would have a larger social distance than low social anxiety group, and that women would have a larger social distance toward male avatars than men. Since the third research question was treated as explorative, no hypothesis was formulated.

Results showed that high social anxiety, in the student sample, was associated with lower values on the Big Five dimensions conscientiousness and extraversion as well as the facets competence and assertiveness. Additionally, high social anxiety was associated with higher values on the dimension neuroticism, higher values on the facets anxiety, depression, self-consciousness, vulnerability and also higher values on the affective measures BIS, trait anxiety and depressive symptoms. There was no significant relationship between social anxiety and social distance, however, women preferred male avatars at a further distance. Furthermore, high conscientiousness appeared to affect the preferred distance as well, making it larger.

Demographic variables and prevalence

When investigating the possible effects of avatar sequence on the VR-experiment, age, gender, and level of education as confounding variables, no statistically significant results were found, indicating these variables did not predict social anxiety group belongingness. However, depressive symptoms were a statistically significant confounding variable and will be discussed below (see section Affective measures).

The prevalence of SAD in this sample was 17.4%, indicating that the prevalence in this study was somewhat higher than what has previously been noted in the general population, where the prevalence is around 15% (Furmark et al., 1999; Mörtberg et al., 2017), and
contradicting Schry et al. (2012) who stated the prevalence for university students were equivalent to the general public. Considering that the high social anxiety group had an even distribution of women \((n=10)\) and men \((n=10)\) in this sample, makes it contradict previous studies arguing that SAD is more common for females than males (Fernandes et al., 2018; Grant et al., 2005; Mörtberg et al., 2017). Although, other studies have not been able to detect any gender differences regarding SAD (Bienvenu et al., 2004) and could therefore support the findings made in this thesis. However, the lack of gender effect could be a consequence of the selected student sample.

It is worth mentioning that the cut-off score in present thesis was set to 70 instead of 60, which is the ideal cut-off score for generalised SAD (Rytwinski et al., 2009). If a cut-off score of 60 had been used instead, the prevalence would have increased and therefore differed more from the general population prevalence. The reason for creating a low and high social anxiety group was due to minimising the risk of potentially including individuals with the performance subtype.

When analysing the data for social distance, an outlier was detected. Since the outlier deviated considerably from the rest of the participants, and keeping that data would skew the results, it was removed from the social distance analyses. The reason for choosing to discard the outlier’s data was due to significant differences from the rest of the data on all of the social distance measures.

**First research question**

*Personality dimensions.* The first research question was “Could low/high anxiety groups be discriminated based on personality traits or affective measures?” and the results confirmed the hypothesis on the dimensional level. The Big Five personality traits that independently predicted high social anxiety group, according to logistic regression analysis, were low conscientiousness, low extraversion, and high neuroticism, which is in line with previous research (Bienvenu et al., 2004; Glinski & Page, 2010; Kaplan et al., 2015; Klein et al., 2011; Kotov et al., 2010; Spinhoven et al., 2013). The model could correctly identify 80% of the cases and explain about 68% of the variances, making it a good model even though there are other variables affecting social anxiety that are not included.

The ability of these personality dimensions to correctly predict social anxiousness was independent of depressive symptoms, and solely the depressive symptoms could not predict high social anxiety in this model. Moreover, it can be noted that conscientiousness had overlapping confidence intervals between the two groups, which can be interpreted as the
difference not being as large as the ones for extraversion and neuroticism. This could possibly be due to that there are fewer C-facets associated with SAD than E- and N-facets, according to previous research (Bienvenu 2001; Bienvenu et al., 2004).

**Personality facets.** Regarding the personality facets, C1: competence, E3: assertiveness, N1: anxiety, N3: depression, N4: self-consciousness, and N6: vulnerability, discriminated between the low and high social anxiety groups, in the direction of their respective dimension. The significance was in line with the hypothesis for each of the facets as based on previous research findings (Bienvenu et al., 2004; Kaplan et al., 2015; Rector et al., 2012), although, several of the hypothesised facets did not reach statistical significance in this sample. A possible reason for this could be that university students differ somewhat in personality from older adults (McCrae & Costa, 1997), conceivably making the differences between low and high anxiety group small. Another explanation could be type II errors (Goodwin & Goodwin, 2013) due to a small sample and a conservative Bonferroni-adjusted alpha value, which increases the risk of failing to reject the null hypothesis. Two hypothesised facets, E2: gregariousness and C5: self-discipline, would have yielded a statistically significant result with an unadjusted alpha value of .05. The research that the hypotheses were based upon had larger samples overall and larger numbers of participants with SAD, i.e. \( n=42 \) in Bienvenu et al. (2001) and \( n=89 \) in Bienvenu et al. (2004). This could explain why the present thesis, having a smaller sample, could not replicate all of their findings, implying that the non-significant facets had too small effect sizes to be detected. Despite of the small sample, this thesis yielded several statistically significant results, which could be due to the large effect sizes for the significant facets (Cohen’s \( d>1.02 \)). Considering that two of the facets (E3: assertiveness and N4: self-consciousness) are, according to Rector et al. (2012), the most characteristic of social anxiety disorder, it is reassuring that those were detected as significant in this sample.

**Affective measures.** As hypothesised, the affective measures BIS and trait anxiety were more elevated in the high than the low social anxiety group, concurrent with previous research (Amir et al., 2005; Bruijnen et al., 2019; Kimbrel et al., 2010; Kimbrel et al., 2012; Morgan et al., 2009). BIS and trait anxiety were highly correlated with each other, as well as with the Big Five dimension neuroticism. Given that these variables concern feelings of anxiety, the findings are not very surprising but nonetheless meaningful since the connection between affectivity and social anxiety has been less researched. Due to the high comorbidity between SAD and other anxiety disorders (Grant et al., 2005), it is a limitation that this thesis did not control for that.
Moreover, BAS did not differ between the low and high social anxiety groups, which was contradicting the hypothesis, i.e. it was proposed that BAS would be lower in the high social anxiety group. One explanation for this non-significant result could be found in a study by Mörtberg, Tillfors, Zalk, and Kerr (2014). They suggested that there are different subgroups for SAD where individuals adopt different strategies for coping with their social anxiety, either inhibiting themselves or becoming more impulsive in their interactions and that these two groups do not differ in levels of social anxiety. Since BAS is supposedly the underlying factor of impulsivity it could be assumed that some individuals with SAD have a high BAS. The BAS group could therefore be hard to detect, since low socially anxious individuals also can have a high BAS, in addition to that the inhibition strategy appears to be the most common for SAD (Mörtberg et al., 2014).

Level of depressive symptoms was one of the control variables that yielded significant results and was more present in the high social anxiety group. Consequently it was controlled for in following analysis and added to the affective measures. This is consistent with previous knowledge of SAD being comorbid with major depressive disorder (APA, 2013; Ohayon & Schatzberg, 2010), although the mean score in the high anxiety group was in the range for mild depression. Moreover, depressive symptoms were highly correlated with BIS and trait anxiety. These findings made it somewhat difficult to interpret whether the general results from this thesis mainly stem from social anxiety or from depressive symptoms. However, considering that it is common that SAD precedes major depressive disorder, e.g. becoming depressed due to social withdrawal (APA, 2013), and that the depressive symptoms were mild, it is reasonable that the findings are predominantly related to social anxiety. Furthermore, depressive symptoms did not predict high social anxiety group in the logistic regression model when controlling for the other Big Five dimension. Thus, depressive symptoms did not interfere with the personality results in this thesis.

Taking the collected results for the first research question into account, the characteristics for individuals with SAD is that they view themselves as less capable, less inclined to express their opinion and to take charge, have a tendency to worry about what could go wrong, feel loneliness and hopelessness, interpret themselves as inferior to others and reacts to stress with panic or a dependency on other (McCrae & Costa, 2003). Moreover, they perceive stressful situations as threatening (Spielberger et al., 1983) and their behaviour inhibition system is highly sensitive, which means that they are more attuned to the possibility of threats and punishments (Carver et al., 2000).
Second research question

When investigating whether or not there was a difference in social distance depending on social anxiety group belonging, the results showed no statistically significant differences in social distance between low/high social anxiety groups. This could be interpreted as contradicting the hypothesis and to what previous research has shown, i.e. that individuals with social anxiety tend to have a larger social distance (Perry et al., 2013; Rinck et al., 2010). Although, another study found that social distance could be explained by social anxiety, however, not solely. The distance could also be explained by a general reaction of feeling that one’s personal space is violated when another individual comes to close (Wieser et al., 2010). Moreover, an individual’s preferred personal space can differ depending on cultural origins. Høgh-Olesen (2008) found that individuals from two Nordic countries had a significantly larger interpersonal space than individuals from Southern Europe. This thesis used a Swedish sample and the feeling of a violation of one’s personal space could potentially be at a further away distance than initially believed for this sample, thus making the results non-significant due to the fact that the participants reacted to violations of personal space independent of their group belonging.

The lack of a significant results should not solely be discarded as a power problem since Rinck et al. (2010) found large effect sizes despite a low sample (N=23). Instead, a possible explanation for the results is that the VR-setting itself may not be the best suitting for investigating social distance since it is an avatar approaching the participant instead of the participant approaching an avatar. This designed setting could therefore be perceived as threatening independently of social anxiety group belonging because it is an unknown character approaching the participant, hence placing it further away. A different explanation could be that the setting did not allow for any typical interaction due to its design where the task was to place the avatar at a comfortable conversation distance but without actually having a conversation, thus possibly making it non-threatening for individuals with SAD. In relation to this, there was no real risk of embarrassment in front of the avatar for the participant which otherwise is a significant part of SAD (APA, 2013). Furthermore, the setting did not have any actual performance involved, something that also is a part of SAD (APA, 2009).

Moreover, differences in calibration of the VR-glasses could have influenced the results since the calibration could alter the perceived height of the avatar. Therefore, in the cases that the VR-glasses were altered and calibrated, the height of the avatar might have changed and made the impression of it being taller. This in turn, could have made the perception of it more threatening than initially and therefore leading it to being placed further away. Taken this into account, the non-statistically significant results might be due to flaws in the design since the
setting could either have been perceived as threatening independent of group belonging, or not threatening enough for the high social anxiety group, making the differences limited. It is therefore possible that if the experiment was designed in a manner that instead let the participant approach the avatar, similar to the study made by Rinck et al (2010), a higher ecological validity could have been obtained, thus, the distances could have differed more between the social anxiety groups, possibly yielding statistically significant results.

Concerning the second part of the second research question, i.e. if social distance is independent of gender, the results showed statistically significant main effects for gender of the avatar and gender of the participant. Overall, male avatars were placed at a further distance in addition to women preferring a larger social distance than men. This is in line with the hypothesis and previous research showing that women, both with and without SAD, tend have a larger social distance towards a male avatar than men (Miller et al., 2013; Wieser et al., 2010).

These main effects, however, seems to rather be explained by the fact that women preferred the male avatar further away than men and that there was not a statistically significant results for the female avatar. The results, thus, indicates that the interaction effect between gender of the avatar and gender of the participants is more relevant than solely the main effects. Moreover, women’s preferred distance towards male avatars was larger than men’s preferred distance to female avatars, indicating that it might be a conflict when women and men approach each other.

Regarding the interaction effect of social anxiety and gender of the participant, the analysis did not yield any statistically significant results. This is contradictory to a previous study noting an interaction between social anxiety and gender in relation to social distance. However, the sample in that study (n=162) was larger (Wieser et al., 2010) than the sample of present thesis (N=40) which could have affected the results to be more statistically significant. Although, the mean differences in social anxiety scores between low and high groups were smaller than in this thesis, indicating that the interaction effect of social anxiety and gender in relation to social distance needs to be further investigated, preferably in a larger sample, to obtain clearer results.

The VR-session used in the present thesis lasted for a rather short period of time, approximately around three minutes, which could be considered problematic since there is a risk of the participants not having enough time to learn how the experiment works. This may have led to irregular placing of the avatar, hence making the results inconsistent. In addition to the VR-experiments, there were two other experiments conducted in the same session and were the first in order. These other two experiments had fear eliciting elements to them which
furthermore could have implicated the VR-results. Unfortunately, the order could not be
counterbalanced due to practical reasons. Moreover, it is possible that the participants could
have experienced fatigue effects during the VR-experiment since, all together, the experimental
session lasted for about 80 minutes.

Third research question
Since social distance appeared to not be associated with social anxiety in the second research
question, it was assumed that social distance could possibly have an association to personality
traits or other affective measures. The results showed that even though the total model was not
statistically significant, conscientiousness proved to be a statistically significant predictor for
social distance in the regression analysis, indicating a positive relationship between the two
variables. The explained variance was however 13%, suggesting that there are more variables
not included in this thesis contributing to social distance other than conscientiousness.
Moreover, this question was treated as explorative since the research on social distance is
limited, and combined with both personality and SAD, there are to this date no other studies
conducted on this topic. Even though the result regarding conscientiousness could be
considered somewhat uncertain due to its low explained variance, it may still be relation to be
evaluated in future research.

The other affective measures, investigated in this thesis, were not significantly
associated with social distance, i.e. that neither BIS, BAS, MADRS-S, nor trait anxiety affected
the distance measure. Regarding BIS and BAS, these results are in line with another study
proposing that there are no differences in interpersonal space pending on BIS/BAS scores
(Wagels et al., 2017), while the null-finding regarding distance and trait anxiety contradicted
previous research stating that trait anxiety indeed has an effect on social distance (Iachini et al.,
2015). The sample chosen to investigate this relationship is, however, problematic since it is
based on low and high scores on LSAS-SR, causing restrictions of range on Big Five personality
dimensions, i.e. the sample does not have the variation in personality that a normal population
would have (Borg & Westerlund, 2007). In this case, the present thesis should have used a more
widespread and preferably larger sample to enable further regression analyses.

For the sample used in present thesis, it appears as if neither personality traits, affective
measures, nor social anxiety can predict social distance but as previously stated, the used VR-
setting might not be optimal for investigating social distance. If more interactive VR-settings
were to be used, then maybe effects of personality, affective measures, and/or social anxiety
would be detected.
Limitations and implications

A general limitation for the present thesis, also affecting generalisability, is that the individuals in the high anxiety group were not clinically diagnosed with SAD. As a precaution, the used cut-off score was set to 70 points on the LSAS-SR for the high anxiety group, which could be an indication that if these individuals were to be clinically assessed they would likely be diagnosed with SAD (Mayo-Wilson et al., 2014). The cut-off score of 70 can be further justified by viewing the high prevalence in the screening sample and that raising the cut-off score gave a closer result to the normal population prevalence (Fernandes et al., 2018; Furmark et al., 1999; Mörtberg et al., 2017). As previously mentioned, it appears as if students may experience higher levels of social anxiety, in contrary to previous research (Schry et al., 2012), indicating that these results might not generalise to the general public. On another note, since the results regarding personality and affective measures were along the lines of previous findings, validity is implied.

Another methodological limitation in present thesis is the use of introspective self-report scales. Demetriou, Ozer and Essau (2015) argued that the primary disadvantage with self-report scales is that participants might not answer truthfully, particularly if the question concerns sensitive subjects. This is something worth noting since the instruments used in the present thesis could be considered to include sensitive questions. Furthermore, it could be worth noting that the self-report questionnaires postulate an ability of self-perception, to be able to answer the questionnaires correctly. However, since the sample in the present thesis were adults, it is reasonable to assume that they have the acquired ability of self-perception. Moreover, questions could be interpreted in different ways, hence making the answers differ accordingly, even though the participants are referring to the same thing. It is therefore difficult to ensure that the questions were interpreted in the same way for every question. Although, it is considered to be a strength that the instrument used in present thesis are well established and that the aim of the study was not disclosed to the participants to minimise the risk of influencing their answers.

The results of the study contribute to deeper knowledge on social anxiety and social distance in their respective areas. In regard to the personality traits, these results may encourage an increased focus for the characteristic facets when describing social anxiety since not all facets of a significant dimension were relevant, potentially adding BIS and trait anxiety to convey a more correct image of the disorder. This would further help to detect of social anxiety at an earlier stage and suitable preventions can be initiated. It would be interesting to study how SAD and personality converge over time, and if there are specific personality facets that have a higher influence for the development of SAD.
In regards to women preferring males at a further distance, it would be interesting to see if women feel that men, in general, violate their preferred distance since the two genders appear to have a conflict in the preferred distance to each other. Moreover, future research should focus on more variable types of avatars e.g. clothes, body structure, ethnicity, and age in the VR-setting. A more interactive VR-world might also be better when studying social distance in relation to social anxiety. Furthermore, to enable a broader picture of the association between personality traits, affective measures and social distance, future research should investigate this matter with a randomly selected sample from a normal population to better understand how Big Five personality traits relate to social distance, and especially if the findings on conscientiousness could be replicated.

Conclusion
Social anxiety has many dimensions to it, and the present thesis showed that socially anxious and non-anxious individuals differ markedly on several personality dimensions, facets, and affective measures. However, differences in social distance could not be demonstrated with the VR-paradigm used. More knowledge about social anxiety can be gained through the use of VR as a tool to stage realistic scenarios, in order to measure cognitive biases like social distance. Considering social anxiety is highly common in adults, many could be suffering without knowing why they react the way they do, or how to handle the unpleasant emotions. Studies like this helps closing the knowledge gap about social anxiety, one step at a time.
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Appendix

Appendix A
List of Big Five personality dimensions and appurtenant facets.

<table>
<thead>
<tr>
<th>Dimensions</th>
<th>Facets</th>
</tr>
</thead>
<tbody>
<tr>
<td>Openness</td>
<td>O1: Fantasy</td>
</tr>
<tr>
<td></td>
<td>O2: Aesthetics</td>
</tr>
<tr>
<td></td>
<td>O3: Feelings</td>
</tr>
<tr>
<td></td>
<td>O4: Actions</td>
</tr>
<tr>
<td></td>
<td>O5: Ideas</td>
</tr>
<tr>
<td></td>
<td>O6: Values</td>
</tr>
<tr>
<td>Conscientiousness</td>
<td>C1: Competence</td>
</tr>
<tr>
<td></td>
<td>C2: Order</td>
</tr>
<tr>
<td></td>
<td>C3: Dutifulness</td>
</tr>
<tr>
<td></td>
<td>C4: Achievement Striving</td>
</tr>
<tr>
<td></td>
<td>C5: Self-discipline</td>
</tr>
<tr>
<td></td>
<td>C6: Deliberation</td>
</tr>
<tr>
<td>Extraversion</td>
<td>E1: Warmth</td>
</tr>
<tr>
<td></td>
<td>E2: Gregariousness</td>
</tr>
<tr>
<td></td>
<td>E3: Assertiveness</td>
</tr>
<tr>
<td></td>
<td>E4: Activity</td>
</tr>
<tr>
<td></td>
<td>E5: Excitement Seeking</td>
</tr>
<tr>
<td></td>
<td>E6: Positive Emotions</td>
</tr>
<tr>
<td>Agreeableness</td>
<td>A1: Trust</td>
</tr>
<tr>
<td></td>
<td>A2: Straightforwardness</td>
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<tr>
<td></td>
<td>A3: Altruism</td>
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<tr>
<td></td>
<td>A4: Compliance</td>
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<tr>
<td></td>
<td>A5: Modesty</td>
</tr>
<tr>
<td></td>
<td>A6: Tender-mindedness</td>
</tr>
<tr>
<td>Neuroticism</td>
<td>N1: Anxiety</td>
</tr>
<tr>
<td></td>
<td>N2: Angry Hostility</td>
</tr>
<tr>
<td></td>
<td>N3: Depression</td>
</tr>
<tr>
<td></td>
<td>N4: Self-consciousness</td>
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<tr>
<td></td>
<td>N5: Impulsiveness</td>
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<tr>
<td></td>
<td>N6: Vulnerability</td>
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</table>
Table 1: Pearson correlations for affective measures and Big Five dimensions.

<table>
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<tr>
<th>Scale</th>
<th>M</th>
<th>SD</th>
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<th>2</th>
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<th>9</th>
<th>10</th>
<th>11</th>
<th>12</th>
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<tbody>
<tr>
<td>1. LSAS</td>
<td>51.3</td>
<td>33.46</td>
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<td>2. BIS</td>
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<td>3. BAS: Total</td>
<td>36.95</td>
<td>5.7</td>
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<td>4. BAS: Drive</td>
<td>10.2</td>
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<td>5. BAS: Reward</td>
<td>10.83</td>
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<td>6. MADRS</td>
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<td>7. STAI-T</td>
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<td>8. STAI-P</td>
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<tr>
<td>9. Openness</td>
<td>11.83</td>
<td>2.79</td>
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<tr>
<td>10. Conscientiousness</td>
<td>12.63</td>
<td>2.72</td>
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</tr>
<tr>
<td>11. Extraversion</td>
<td>11.83</td>
<td>2.89</td>
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<tr>
<td>12. Agreeableness</td>
<td>11.83</td>
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<tr>
<td>13. Neuroticism</td>
<td>11.83</td>
<td>2.89</td>
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</tr>
</tbody>
</table>

Note. *Correlation is significant at the 0.05 level.* **Correlation is significant at the 0.01 level.

1. Liebowitz Social Anxiety Scale, self-report.
3. State-Trait Anxiety Inventory (trait portion).

5. BAS: Pleasure Seeking
6. BAS: Reward Dependence
7. MADRS: Severity
8. STAI-T: Trait Anxiety Inventory (state portion)
9. Openness
10. Conscientiousness
11. Extraversion
12. Agreeableness
13. Neuroticism

* Correlation is significant at the 0.01 level.
* Correlation is significant at the 0.05 level.
Table 2. *Mean and standard deviations for Big Five dimensions between low and high social anxiety groups.*

<table>
<thead>
<tr>
<th>Variable</th>
<th>Low social anxiety</th>
<th>High social anxiety</th>
<th>t(38)</th>
<th>Cohen’s d</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>Openness</td>
<td>115.15 16.80</td>
<td>121.25 23.00</td>
<td>-0.96</td>
<td>0.30</td>
<td>.334</td>
</tr>
<tr>
<td>Conscientiousness</td>
<td>126.75 17.66</td>
<td>110.90 24.94</td>
<td>2.32</td>
<td>0.73</td>
<td>.026*</td>
</tr>
<tr>
<td>Extraversion</td>
<td>113.50 23.81</td>
<td>94.35 18.77</td>
<td>2.82</td>
<td>0.89</td>
<td>.008**</td>
</tr>
<tr>
<td>Agreeableness</td>
<td>126.45 17.49</td>
<td>126.40 26.96</td>
<td>0.01</td>
<td>0.002</td>
<td>.994</td>
</tr>
<tr>
<td>Neuroticism</td>
<td>74.90 30.99</td>
<td>115.95 28.05</td>
<td>-4.39</td>
<td>1.39</td>
<td>&lt;.001**</td>
</tr>
</tbody>
</table>
Table 3. Mean score and standard deviation for social distance, anxiety group and gender.

<table>
<thead>
<tr>
<th>Variable</th>
<th>Low Social Anxiety</th>
<th>High Social Anxiety</th>
<th>Total (n=19)</th>
<th>Men (n=10)</th>
<th>Women (n=9)</th>
<th>Total (n=20)</th>
<th>Men (n=7)</th>
<th>Women (n=13)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Male Avatar</td>
<td>2.36 (0.42)</td>
<td>2.36 (0.42)</td>
<td>2.36 (0.42)</td>
<td>2.21 (0.37)</td>
<td>2.13 (0.45)</td>
<td>2.21 (0.37)</td>
<td>2.21 (0.37)</td>
<td>2.13 (0.45)</td>
</tr>
<tr>
<td>Female Avatar</td>
<td>2.37 (0.51)</td>
<td>2.14 (0.41)</td>
<td>2.24 (0.42)</td>
<td>2.23 (0.50)</td>
<td>2.21 (0.42)</td>
<td>2.23 (0.50)</td>
<td>2.23 (0.50)</td>
<td>2.21 (0.42)</td>
</tr>
</tbody>
</table>

Table 4. Correlations between social distance facets of conscientiousness.

<table>
<thead>
<tr>
<th>Social Distance Facet</th>
<th>C1: Competence</th>
<th>C2: Order</th>
<th>C3: Dutifulness</th>
<th>C4: Achievement Striving</th>
<th>C5: Self-Discipline</th>
<th>C6: Deliberation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Social Distance</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Female Avatar</td>
<td>1.00 (0.00)</td>
<td>0.190</td>
<td>0.142</td>
<td>0.099</td>
<td>0.244</td>
<td>0.356*</td>
</tr>
<tr>
<td>Male Avatar</td>
<td></td>
<td></td>
<td></td>
<td></td>
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<td></td>
</tr>
</tbody>
</table>

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