



THE NEUROBIOLOGY UNDERLYING PERSONALITY TRAITS AND CONFLICT BEHAVIOR

Examining the similarities in brain regions between
Agreeableness, aggression and dominating conflict style

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Abstract

Conflicts are part of our everyday life and the field of psychology describes how specific personality traits relate to specific conflict styles. However, the question remaining is why these relations exist? Recently, personality neuroscience has begun pinning down the neurobiology of personality traits, providing a deeper understanding of the human behavior. The present thesis utilizes the Five Factor Model (FFM; Costa & McCrae, 1990) of personality to investigate the neurobiology underlying the inverse relation between the specific personality trait of Agreeableness and dominating conflict style (a conflict management style characterized by aggressiveness, authoritarianism and/or need for dominance). Agreeableness overlaps both empathy and aggression which can work as each other's opposites in explaining conflict behaviors. The goal of the thesis was to investigate whether the inverse relation between Agreeableness and dominating conflict style can be explained by brain regions. Brain regions such as the medial prefrontal cortex and regions involving anterior cingulate appear to be the most prominent neurobiology describing the relation. Serotonin is the neural substance involved in most cortical and subcortical brain structures and it also regulates the suppression of aggression, making it an important substance both within Agreeableness and the preference for dominating conflict style. The thesis will sum up with a discussion including some limitations within the research and further aspects such the consequences of the findings will be discussed.

Keywords: Personality, Agreeableness, Dominating conflict style, RWA/SDO, Aggression, Neurobiology

The Neurobiology underlying Personality Traits and Conflict Behavior

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1. Introduction

Conflict defines as “interactive process manifested in incompatibility, disagreement, or dissonance within or between social entities (i.e., individual, group, organization, etc.)” (Afzalur Rahim, 2002 p. 207) and interpersonal conflicts are defined as conflicts that occur when individuals perceive that others are preventing them from attaining their goals. According to Antonioni (1998), the goal of a conflict outcome is to satisfy one’s needs or interests. The behavioral patterns of an individual determine what type of conflict style one would prefer (Moberg, 2001). The early view regarding different approaches of handling conflicts was that the use of a particular style depends on the conflict situation (Antonioni, 1998). However, an individual with the tendency to use a dominating style in most conflicting situations, does not have the flexibility to simply switch style purely to handle the situation better (Antonioni, 1998). Thomas (1992) was early to acknowledge the possibility that an individual’s personality factors determine flexibility in handling conflict situations. Most of the early research on the matter focused on personality traits rather than on a valid and substantial model of personality structure and therefore there were many inconsistencies among the results (Antonioni, 1998).

The development of the Big Five model (also called Five Factor Model; FFM) contributed to a new way of looking at personality (McCrae & Costa, 1987; Peabody & Goldberg, 1987). The Big Five categorizes the majority of traits within five broad domains, typically labeled Extraversion, Neuroticism, Agreeableness, Conscientiousness, and Openness to Experience (DeYoung, 2010). Interpersonal conflicts are a part of our daily lives and one of the most important sources of distress in daily life (Antonioni, 1998). Existing literature seems to explain this influence on individual’s personality or situational factors (Park & Antonioni, 2007). The increased knowledge between personality and conflict behavior can be useful in coaching to educate individuals regarding why and how their personality is associated with a particular style of handling conflicts (Park & Antonioni, 2007). Among the Big Five, Agreeableness is the most relevant personality dimension in conflict research since its main motive is to maintain positive relations with others (Park & Antonioni, 2007).

Agreeable people are cooperative, warm, understanding and sympathetic and agreeable people tend to avoid conflicts and or use a collaborative (integrating) style of handling the situation (Antonioni, 1998; Park, & Antonioni, 2007). The opposite pole of

Agreeableness is Antagonism, which relates to being harsh, insincere, unsympathetic and aggressive and relates to the dominating style of handling conflicts (Park & Antonioni, 2007). The dominating style entails having a high concern for self and low concern for others and identifies as having a win-lose orientation where one's own profit is the only outcome (Afzalur Rahim, 2002). The interest of this thesis is to investigate why this relation exists by investigating the neurobiology underlying Agreeableness and conflict style. The fields of personality psychology and social psychology contributed to the scientific field by describing the human behavior. Neuroscience has added to a missing gap in science where they offer an explanation to human behavior by investigating neurobiological underpinnings of individual differences.

Previous research has investigated the relationship between the Big Five personality factors and conflict management styles to see how they correlate. However, the question remaining is why personality factors tend to predispose individuals to specific styles of conflict management. Based on neuroscientific research regarding concepts such as personality and aggression, this thesis tries to provide an explanation of why aggressive people tend to use a dominating conflict style, by looking at similarities within the brain of the two concepts.

The knowledge about the connection between personality factors and conflict management style is significant for many practitioners and can be assessed to help individuals within their workspace, promotions, and coaching for increased well-being. For individuals in general, this knowledge is sufficient for their increased understanding of themselves and can possibly increase their self-acceptance, thus making it possible for individuals to regulate their behavior to use a certain conflict style. The investigation and profound understanding of the biology of these factors can be integrated to other societal issues and debates, such as gender differences in earning or the equal amount of men and women at the workplace. Besides increased understanding, this thesis provides additional literature that connects the personality factors to conflict style by neurobiological evidence. Thus, starting to fill in the gap of why they connect rather than how.

1.1 Present Study Aims

The aim of this thesis is to investigate the neurobiology underlying the personality trait Agreeableness and the dominating conflict style. To accomplish this aim, the thesis will focus

on pinning down the neurobiology of Agreeableness where factors such as empathy and aggression are prominent factors that further explain the inverse relation. Right-Wing Authoritarianism (RWA) and Social Dominance Orientation (SDO) are the key attitudes in conflict behavior and are measured as a proxy between one's personality and one's conflict style. The primary focus will be on SDO since it correlates higher with Agreeableness. The goal is to examine if the inverse relationship between Agreeableness and the dominating conflict style can be explained by similarities in brain regions. The thesis will sum up with a discussion including some limitations within the research and further aspects such the consequences of the findings will be discussed, where I argue for the ability to describe societal gender issues on a biological level. The present thesis utilizes the Five Factor Model (FFM; Costa & McCrae, 1990) of personality to investigate the neural bases between Antagonism and dominating conflict style.

2. Personality and Conflict Attitudes

This chapter will begin with presenting a research background of personality psychology continued with an explanation of the Cybernetic Big Five Theory which is one of the most elaborative theories about personalities. Lastly, the main neural substances involved with personalities will be presented.

The field of personality psychology has contributed tremendous knowledge regarding the human behavior by describing how individuals behave in certain contexts and how individuals differentiate (DeYoung & Gray, 2009). The starting fuel for human neuroscience was the interest in explaining why individuals differ in the way that they do and investigation of the neurobiological underpinnings of individual differences started to arise (DeYoung & Gray, 2009). Personality neuroscience has two main goals, firstly to understand the neural substances of personality and secondly, to better understand how genetic and environmental factors can throughout development have such impact on creating relatively stable traits of brain functioning that produce personality (Allen & DeYoung, 2017). The main aim for personality neuroscience is to look at the neurobiological explanations and previous research about the Big Five has provided helpful guidance in developing theories of the psychological functions underlying each of the Big Five dimensions that later developed into neurobiological hypothesis (Allen & DeYoung, 2017).

Personality psychology focused on providing a structural description of personality traits (DeYoung & Gray, 2009). Personality traits are relatively stable traits such as one's thoughts, feelings, and behaviors, which are fundamental parts of one's personality and distinguish individuals from each other (Fleeson, 2001; Zillig, Hemenover, & Dienstbier, 2002). Personality psychologist has researched on traits for decades due to their explanation of what defines the individual person. Trait personality generalizes how people with similar traits are likely to act and react in different situations (McCrae & Costa, 1999). Over several decades, the Big Five model (also known as Five Factor Model; FFM) has worked as a structural model for personalities, categorizing small numbers of broad traits into five major traits: Extraversion, Neuroticism, Agreeableness, Conscientiousness and Openness to Experience (Costa & McCrae, 1990). However, the Big Five does not capture everything about personalities and other factors influencing personality are characteristic adaptation and life stories. Characteristics adaptation are motives, goals, plans, etc. that are able to change over a lifetime. Life stories are personal stories that give meaning and identity in one's life and reflects the development of personality. These two factors are a part of describing the individual's responses to his or her particular life circumstances (DeYoung, 2010; McAdams & Pals, 2006).

The most elaborative theory that has been associated with the Big Five is the Cybernetic Big Five Theory (CB5T) (DeYoung, 2015). The CB5T is the most elaborative explanatory theory about why individuals differ in emotion, motivation, cognition, and behavior and therefore a complementary theory of the Five Factor model that only explains how individuals differ in these aspects (DeYoung, 2015). The fundamental assumption about CB5T is that any theory about personality must be based on cybernetics; the study of goal-directed and self-regulated systems that receives feedback from sensory mechanisms in the brain, indicating the degree of which one is moving towards their goals (DeYoung, 2015). CB5T defines personality traits as "probabilistic descriptions of relatively stable patterns of emotion, motivation, cognition, and behavior, in response to classes of stimuli that have been present in human cultures over evolutionary time" (DeYoung, 2015 p. 35). According to Allen and DeYoung (2017), these patterns are influenced by genetic and environmental factors. The cybernetic mechanisms allow individuals to evaluate their goals, feel motivated and to select and carry out the right actions to move towards their goals (Allen & DeYoung, 2017). The brain is an integrated system with various mechanisms carrying out cybernetic functions (e.g.

responding to reward or threats). The CB5T relies on a conceptual model known as the “MIMIC” approach that posits two types of psychological functions, *multiple causes* and *multiple indicators* that affect the cybernetic functions (DeYoung, 2015). Multiple indicators affect facets of the personality dimension and cause the specific trait to be expressed in different ways, whereas multiple causes create the variation among many parameters for any given trait, making individuals more or less sensitive to cybernetic functions (e.g. responding to reward or threats). These functions end up creating individual differences in personality (DeYoung, 2015; Allen & DeYoung, 2017)

According to Allen and DeYoung (2017), the advantage of the CB5T is its explanation of personality as a hierarchical structure that ranges from lower-order traits to higher-order traits to metatraits. The metatraits (Stability and Plasticity) are the two biological higher-order factors above the Big Five (Allen & DeYoung, 2017). According to biological studies, serotonin influences Stability by stabilizing information processing in several brain-systems and maintains ongoing cybernetic functions so no disruptions will occur and ongoing goals are still at the focus (DeYoung, 2010; DeYoung, 2015). Stability includes the variance of Conscientiousness, Agreeableness and low Neuroticism in which each of the domains reflects a different type of stability: Conscientiousness reflects motivational stability, Agreeableness reflects social stability, and low Neuroticism reflect emotional stability (Allen & DeYoung, 2017). Studies have shown that increased serotonergic function reduce responsiveness to negative emotional stimuli, decreases aggression and increases cooperativeness, whereas reduced serotonergic function impairs performance on tasks with emotional elements, increases expression of aggression and less cooperativeness is displayed (Spoont, 1992; Carver, Johnson, & Joormann, 2008). According to Spoont (1992), serotonergic neurons have a very widespread pattern in the brain and can, therefore, influence many levels of information processing making serotonin well poised to influence the personality traits within Stability.

Dopamine influence Plasticity and represents exploration: the creation of new goals, interpretations and strategies and the domains included are Openness to Experience and Extraversion (Allen & DeYoung, 2017). Dopamine is not as widespread in the brain as serotonin, however; it influences most subcortical and frontal cortical structures that motivates an individual to explore (DeYoung, 2013). The domains involved in plasticity reflects different types of plasticity: Openness to Experience reflects cognitive exploration, is

sensitive to the reward value of information, whereas Extraversion reflects behavioral exploration, and is sensitive to specific rewards (Allen & DeYoung, 2017).

According to DeYoung (2010), the metatraits are important because they emphasized the prioritization of two of the major needs of any cybernetic system that must survive in any environment, mainly to move toward goals consistently (Stability) and to generate interpretations, strategies, and goals in order to adjust to the environment (Plasticity).

2.1 Conflict Management

This section presents a general background to conflict management styles and the literature regarding the relation between personality and conflict management styles. It continues with an in depth description of the dominating conflict style and explains how it inversely relates to Agreeableness. The continuing section will explain how Agreeableness is viewed as the key trait in conflict behavior.

Conflicts are a part of our everyday life and human health, stress and general well-being are affected both in private and in working life by the presence of conflict. However, in some contexts, conflicts are considered necessary for stimulus and development (Axelson & Thylefors, 2013). The literature regarding conflict is quite consistent in the notion that conflict are neither good nor bad, they just are. The consequence of a conflict depends on how it is handled and in what context it occurs. Already in the 1920s, social workers and organizational theorists described conflict management styles as *dominant*, *compromising*, *integrative*, *avoiding* and *oppressive*. The view that conflict strategies could be good for cooperation and/or for competition came a few decades later (Axelson & Thylefors, 2013). Conflict management asks questions such as; how much power do I have? How much power do others have? To what extent am I ready to be affected by the outcome of this conflict?

Thomas (1992) identified a conflict-handling pattern of five conflict management styles based on two dimensions: assertiveness (concern for oneself) and cooperativeness (concern for others). Competing (dominating) style is high assertiveness and low cooperativeness, avoiding style is low on both assertiveness and cooperativeness, accommodating (obliging) style is high cooperativeness and low assertiveness, compromising style is equally as much assertiveness as cooperativeness and lastly, collaborating (integrating) style is high assertiveness as well as cooperativeness. Not only does the appropriate conflict style depend

on the context of which it occurs in, personality aspects of an individual are equally as important.

The literature regarding the relationship between personality and conflict management style has been limited. However, it is suggested that individuals who are more prone to aggressiveness such as authoritarianism, have a harder time resolving conflicts (Antonioni, 1998). Studies have found a relationship between an aggressive personality and a dominating style of handling conflict (Antonioni, 1998). Low Agreeableness contains characteristics such as egocentrism, toughness, persistence and aggression and previous research has connected low agreeable people to the preference of power assertion tactics as conflict resolution style (Gadke, Tobin & Schneider, 2016; Graziano, Jensen-Campbell, & Hair, 1996). The dominating style of handling conflicts is considered as the authoritarian style since it involves characteristics such as ignoring the needs of the other person and being guilt free (Afzalur Rahim, 2002) and based on recent research it can be explained by the preference for having dominant groups in the society. Individuals low in Agreeableness are less concerned with maintaining the harmony with others, therefore it comes naturally to them to put their desires and opinions first without the concern about being too harsh. The dominating style contains high concern for self and low concern for others and is identified with a lose-win orientation where the individual adopts a behavior where one's own profit is considered the only possible outcome (Afzalur Rahim, 2002). By adopting this competitive behavior, the individual often ignores the needs and expectations of the other person. The dominating style has recommendations for when it is more or less appropriate to adapt. According to Afzalur Rahim (2002), the dominating style can be appropriate when the actual issue is important for oneself or perhaps harmful for the other person, it can also be appropriate when fast decisions are required. Situations, where the conflict style is less appropriate, is when the conflict situation seems complex and everyone involved tend to have very strong opinions, which most often does not resolve the conflict. It is not profitable when the issues are not important to either one involved in the conflict (Afzalur Rahim, 2002).

Despite the difficulties in understanding the association between stable individual differences in personality and preference for conflict style, the majority of research has presented results using the five-factor model as a foundation. Attitudes such as RWA and SDO seems to give support for the choice of conflict on a psychological disposition level, which will be discussed more thoroughly later on in the thesis. Agreeableness and SDO both

place importance on social attitudinal status and interpersonal relations and factors such as empathy, emotional regulation and tough-mindedness are in common in both aspects. According to Antonioni (1998), the resolution of a conflict becomes increasingly difficult if one or more personalities possesses characteristics such as aggressiveness, authoritarianism or need for dominance, which further suggests an inverse relation between low Agreeableness, SDO and the use of a dominating style of handling conflict.

2.2 Agreeableness – The Key Trait in Conflict Behavior

Among the Big Five dimensions, Agreeableness correlates the most with processes and outcomes during conflicts and at the same time, it is the least well understood out of all personality dimensions (Jensen-Campbell & Graziano, 2001; Park & Antonioni, 2007). Early research was only able to speculate regarding interpersonal conflicts (Graziano et al., 1996) and in most recent years theories regarding social behaviors have evolved and dimensions like Agreeableness has been easier to understand (Jensen-Campbell & Graziano, 2001). From an evolutionary perspective, characteristics such as altruism and cooperativeness were beneficial in society since they rarely led to conflicts (Jensen-Campbell & Graziano, 2001). Thus, Agreeableness allowed individuals to receive advantages for survival. Since Agreeableness has the largest amount of variance in descriptions of the self and others and its main motive is to maintain positive relations with others, it is also the personality dimension most closely associated with processes and outcomes related to aggression (Gleason, Jensen-Campbell & South Richardson, 2004).

Agreeableness is an interpersonal characteristic involving cooperation, consideration, generosity and trustworthy and a dimension associated with avoiding conflicts, forgive transgressors and has been associated with collaborative style such as the integrative style (Antonioni, 1998; Park & Antonioni, 2007). Low Agreeableness characterizes with egocentrism, toughness, persistence, and aggression and it is associated with the dominating style (Antonioni, 1998). Graziano et al. (1996) investigated the relation between Agreeableness and conflict using a multimethod study of college students. In their first study, individuals low in Agreeableness preferred a power assertion tactic (i.e., physical action, criticism, threats, and manipulation) as a more effective choice of handling conflicts as oppose to individuals high in Agreeableness (Graziano et al., 1996). The first study also showed that individuals low in Agreeableness used different resolution tactics depending on

the relationship with the other person. In the second study from Graziano et al. (1996), individuals low in Agreeableness perceived more conflicts in their interaction with other people and that they trigger more conflicts from their partners. The link between Agreeableness and conflict behavior are mediated by differences in social perceptions that guides individuals towards patterns of wanted outcomes (Jensen-Campbell & Graziano, 2001). Agreeable people are motivated to maintain a good relation with other people, which generates them to interpret a situation with less negative effect, resulting in a more constructive way of handling a conflict, as opposed to low agreeable people (Jensen-Campbell & Graziano, 2001).

Thus, we might have a comprehensive understanding of how Agreeableness associates with conflict styles, both on the positive and negative pole of the dimension. However, the question whether the preference for a certain conflict style is based on personality traits or if they can be regarded as an attitudinal approach has been debated.

According to Park and Antonioni (2007), motivation, cognition, and affective states are processes that influence one's personality to choose conflicting strategies (e.g. people with different personalities can have different motivations to how they value the outcome of a conflict to be and therefore use different conflict strategies). Previous research that tried to explain conflict styles by personality variables, often neglected conceptual distinctions (Moberg, 2001), providing an unclear view regarding the possible connection. Moberg (2001) suggests that it is important to clarify the concept of conflict style preference by defining the related constructs of attitude and intention and distinguish them from trait and disposition. Mischel (1999) presented a four-level conceptualization of dispositions: (1) Psychological processing level (a characteristic set of cognition, affects, and behavioral strategies), (2) Behavioral level (direct observable behavior), (3) Biochemical-genetic level (biochemical and neurological functioning), and (4) Perceived personality level (observed judgment to the perception and labeling of personality by self and others). Thus, when studying an individual's preference based on one's personality traits, the perceptual (4) view of disposition is of interest (Moberg, 2001).

There exist different views on the differences between traits and attitudes. According to Moberg (2001), individuals can have different attitudes towards conflict styles and the choice of action depends on how the individual wants a certain outcome to be. Moberg (2001) argues that both attitudes and traits are stable dispositions, however, traits are characteristics that

cause a behavioral pattern to occur whereas attitudes are directed toward specific targets (e.g. objects, a person or a certain behavior) (Moberg, 2001). Moberg (2001) continues to argue that one's intention is represented by two components, one's attitude and one's willingness to follow through with the perceived expectations of others (e.g. an employee might handle a certain conflict with a colleague in a specific way due to the concern for the supervisors expectations on one's action).

According to Duriez and Soenens (2006), it is misleading to consider any (relatively) stable individual differences to express personality traits since there is a difference between traits and stable individual differences, such as values and attitudes. In fact, they differ in several ways; traits are consistent dispositions that describes what people are like and will most often be used apologetically, whereas values and attitudes are consistent goals that describe what an individual considers important (Duriez & Soenens, 2006). A person might value and desire certain traits without them being actual traits of a person. Duriez and Soenens (2006) continue to say that one's traits are more likely to bring one's values and attitudes in line with one's behavior than the opposite.

The common denominator is that traits are considered stable dispositions of an individual and one's attitude towards a behavior is often goal-directed towards a specific object, regulated by one's wish to satisfy someone else or because it is valuable to oneself depending on one's personality. Although the slightly different perception of attitudes being a disposition or not, it is still a prominent conceptual framework to examine individual's preferences for conflict styles, considering that attitudes are mostly goal-directed which is mainly what personalities within Stability are regulated by (Allen & DeYoung, 2017).

The attitudinal component of personality and conflict will further be discussed later in the thesis. I will now continue with presenting research regarding the representation of Agreeableness in the human brain.

2.3 The Neural Basis of Agreeableness

This section involves an in depth investigation regarding the brain systems of social information processing and more specifically, discuss the role of serotonin in the Big Five personality dimension Agreeableness. The purpose of this discussion is to provide the reader with knowledge regarding the neurobiology of the main concepts within Agreeableness. This

is the first step in the attempt to present a possible neurobiological explanation of the inverse relation between Agreeableness and the dominating conflict style.

The long biological theorizing about personality dimensions has mainly focused on dimensions such as Extraversion and Neuroticism due to their inverse relation to reward and punishment and unfortunately, that has left the nature of the remaining Big Five dimensions in a knowledge gap, especially Agreeableness (DeYoung & Gray, 2009). However, the consideration of its grouping within the metatrait Stability has been a starting point to further understand the neurobiology regarding Agreeableness and recent years has presented increasing valid research. Agreeableness is associated with brain systems involved in social information processing such as empathy, theory of mind and perception of biological motions and intentions of others (DeYoung & Gray, 2009).

Agreeableness is a trait within the metatrait Stability, thus associated with the serotonin transporter gene which has been connected to the ability to suppress aggression (Montoya, Terburg, Bos & Van Honk, 2012), and reduced serotonergic functions has shown to impair one's emotional regulation and increase aggressive and impulsive behavior (Spoont, 1992; Carver et al., 2008). The 5-HTTLPR gene codes for the serotonin transporter and is modulated by short and long allele versions, which affects the serotonin transporter protein (5-HTT) expression and function (Chiao, 2010). The gene consists of two alleles, the short S-allele include less 5-HTT resulting in higher concentration of serotonin in the synaptic cleft and is therefore associated with increased negative emotion, heightened anxiety, harm avoidance and increased amygdala response to negative stimuli (Chiao, 2010). The second allele, the long L-allele has shown to better transport the 5-HTT (Chiao, 2010). In a review article regarding the role of the serotonin transporter, they present a study where they investigated monkeys living in more tolerant societies (Canli & Lesch, 2007). The study presented results showing that those monkeys expressed a relaxed dominance and expressed higher degrees of conciliation after a conflict, and usually carry the L-allele version of the 5-HTT gene (Canli & Lesch, 2007). In essence, the 5-HTTLPR gene in a weak sense can be interpreted as the puppet master of Agreeableness, where the variation on the 5-HTTLPR gene has a central role in the expression of the personality trait.

Studies have investigated the genetic influence on the serotonin transporter gene 5-HTTLPR to determine the contribution it has on personality domains such as Agreeableness and Neuroticism (Jang et al., 2001). Recent studies on the serotonin transporter have

suggested that the neurotransmitter has a great impact on the personality dimensions (Jang et al., 2001). As previously mentioned, the expression of the serotonin transporter depends on the presence of either the short S-allele or the long L-allele. Results from the Jang et al. (2001), estimated that the serotonin transporter gene directly affects up to 10% of the total covariance of Agreeableness and Neuroticism. Due to the small percentage of the heritability of serotonin, the actual role of the serotonergic system in the trait Agreeableness can be debated. This raises the awareness of the other 90% of the covariation that supports the hypothesis that personality is influenced by several genes (Jang et al., 2001). The serotonergic system plays such a modulatory role in personality by producing nerve cells in several brain areas which in turn contains several types of different serotonin receptor (Jang et al., 2001). Humans only have one serotonin transporter that affects all of the synapses in these areas; therefore Jang et al. (2001) suggested that future studies that try to identify which genes are associated with personality traits should evaluate several traits simultaneously to determine whether associations between brain regions and traits represent specific shared genetic influences.

Furthermore, the neuroscience research regarding empathy, theory of mind and perception of other individual's gestures, has provided a relatively comprehensive picture of the neurobiology of Agreeableness (DeYoung & Gray, 2009). Some of the most prominent brain regions associated with these types of social information processes include the left and right lateral prefrontal cortex (Haas, Omura, Constable & Canli, 2007), medial prefrontal cortex and temporoparietal junction (Mars et al., 2012), as well as the mirror neuron system that include insula and anterior cingulate cortex as well as medial cingulate cortex (Chiao, Mathur, Harada & Lipke, 2009; Lamm, Decety, & Singer, 2011). Emotional regulation is an important feature within Agreeableness that causes an individual to have a stable emotional control. One small fMRI study showed that left dorsolateral prefrontal cortex is associated with emotion regulation and Agreeableness seems to predict activation in the right lateral prefrontal cortex when individuals are facing stimuli that signal potential threat or conflict. (Haas et al., 2007).

DeYoung and Gray (2009) present studies where fMRI measures of empathy present positive activity in the mirror neuron system (neurons that respond similarly when watching someone else perform a task and when performing it oneself). The mirror neuron system include regions of the medial prefrontal cortex and superior temporal sulcus when

experiencing empathy for others (DeYoung & Gray, 2009), as well as insula and anterior cingulate cortex regions while watching someone else in pain (Chiao et al., 2009; Lamm et al., 2011). Theory of mind is an attributing state of understanding the mental state of others and an important aspect of empathy (Mars et al., 2012). More specifically, the temporoparietal junction (TPJ) and the medial frontal cortex (MFC) are two brain areas that are regarded as the role for mentalizing as well as theory of mind (Mars et al., 2012).

According to Allen and DeYoung (2017), MRI studies have reported various results where some studies did not find any association of regional brain volumes with Agreeableness (Bjørnebekk, Fjell, Walhovd, Grydeland, Torgersen & Westlye, 2013), whereas others have found associations, however not consistent (DeYoung, Weisberg, Quilty & Peterson, 2013). Both of the latter studies reported a negative correlation of Agreeableness with a region of the posterior superior temporal gyrus and sulcus, which is a part of the default mode network (also known as default network; DMN) and necessary for interpreting the actions and intentions of others. Another study found the same effect in the left hemisphere and one in the right, making the results of the studies inconsistent (Allen & DeYoung, 2017).

Other neurotransmitters that are likely to be involved in Agreeableness include testosterone and oxytocin (DeYoung & Gray, 2009; Allen & DeYoung, 2017). Oxytocin is involved in processes of social bonding and as for human males, increased oxytocin have shown to increase their ability to identify others' emotional states (DeYoung & Gray, 2009). Levels of testosterone are linked to aggression and higher levels of testosterone have been associated with low Agreeableness (DeYoung & Gray, 2009). These existing results raise an important question regarding sex differences within personality traits, which will be discussed shortly later on in the thesis.

To summarize the chapter regarding the neurobiology of Agreeableness, there seem to be certain brain regions related to some of the prominent features of Agreeableness. Empathy, theory of mind and one's ability to perceive the intention of others all seem to represent neural substrates within the mirror neuron system that is a part of the default mode network (Allen & DeYoung, 2017). The DMN was previously hypothesized to involve functions of a resting brain state, however, recently the default network has shown to be active during other social cognition tasks as well, such as theory of mind and empathy (Mars et al., 2012). According to several studies, the DMN is regarded as the obvious neural substrates for Agreeableness (Allen & DeYoung, 2017).

The thesis will continue presenting the neural substrates within the DMN later on, as regions within the network relate to the explanation of why individuals low in Agreeableness tend to have a prejudice attitude towards outgroups that later affects their choice of conflict style. However, the thesis will first continue presenting two ideological variables regarded as mediating attitudes between one's personality and the preference for a specific conflict style.

2.4 RWA/SDO – The Key Attitudes in Conflict Behavior

Studies regarding prejudice are studies about individual's negative attitudes towards one or several groups besides your own and therefore profitable research to investigate when examining different attitudes (Ekehammar & Akrami, 2003). According to Ekehammar & Akrami (2003), some people tend to be more or less prejudice than others and it has two major explanations. Social psychology explains prejudice due to differences in people's group membership, influenced by theories and research on social cognition, social identity and self-categorization (Ekehammar & Akrami, 2003). Personality psychology explains prejudice due to differences in people's personalities and as a function of internal attributes of the individual (Ekehammar & Akrami, 2003). According to a study made by Ekehammar & Akrami (2003), generalized prejudice was significantly related to the Big Five personalities Openness to Experience and Agreeableness, meaning that a person low in Openness to Experience and low in Agreeableness are more likely to display prejudice towards others (Ekehammar & Akrami, 2003). Before going into the connection between personality traits and prejudice, it is important to understand the underlying theories about the personality traits that concern prejudice. The Authoritarian personality theory is the main theory regarding prejudice and present factors within the individual's personality like conventionalism, authoritarian submission, and aggression are widely used within the personality approach. Two ideological variables have been examined in studies looking at the relation between individual differences and prejudice, namely RWA and SDO (Ekehammar & Akrami, 2003; Ekehammar, Akrami, Gylje & Zakrisson, 2004).

RWA and SDO are regarded as dispositional factors of an individual to act prejudice (Duriez & Soenens, 2006). People with high-RWA tend to favor traditional values, are submissive to authority figures and can be expected to act aggressively towards outgroups that violate norms (Akrami & Ekehammar, 2006). SDO is argued to be a general attitude towards intergroup relations, which reflects how an individual prefers different groups to be equal or

hierarchical (Akrami & Ekehammar, 2006). Thus, people who are high in SDO desire to maintain and increase the differences between social statuses, which are usually defined along gender and/or racial lines (Akrami & Ekehammar, 2006; Heaven & Bucci, 2001). RWA and SDO measure two kinds of authoritarian personality, “submissive” and “dominant”.

However, there have been speculations whether RWA and SDO are basic personality dimensions or if they are attitudes mediated by personality traits. The view that RWA and SDO are a part of an individual’s basic personality dispositions that make them more prone to generalized prejudice (tendency to act prejudice towards any outgroup) and ethnocentrism have long been accepted (Altemeyer, 1998) however, this view has also received much criticism (Sibley & Duckitt, 2008). In a critical review article by Sibley and Duckitt (2008), they present several studies showing that the items of the RWA and SDO scales refer to social attitudes and beliefs and that they express basic values of a broad ideological nature. Results showed stronger correlations between the RWA and SDO scales and other measures of social attitudes and values, rather than with behavior (Sibley & Duckitt, 2008). According to Sibley & Duckitt (2008), if the view is correct about RWA and SDO measuring social ideological attitudes rather than personality traits or disposition, they could be considered mediators that are influenced by one’s personality on prejudice. Other researchers have supported this view as well (Duriez & Soenens, 2006; Heaven & Bucci, 2001). As previously mentioned in the text, Duriez and Soenens (2006) believe that traits are consistent dispositions whereas attitudes as consistent goals that describe what an individual perceives important. Therefore, one’s personality will most likely affect whether an individual tends to behave in accordance with either RWA or SDO, meaning that RWA and SDO are rather a result of specific personality traits.

Asendorpf and Van Aken (2003) argues for the distinction between *core personality traits* that are based on genetic differences and/or childhood experiences and *surface traits* that are based on personality characteristics that are easily influenced by social and environmental factors and may change over time. The five-factor model is widely accepted as core personality factors due to their substantial heritability coefficients and is assumed to take place prior to RWA and SDO (Asendorpf & Van Aken, 2003). Studies that supported the previous assumption, have examined the relation between the Big-Five factors to RWA and SDO, where the results implied that RWA and SDO exist in between the Big-Five personality factors and prejudice behavior (Akrami & Ekehammar, 2006; Ekehammar et al., 2004; Duriez

& Soenens, 2006). Consistent with the assumption that RWA and SDO are mediated by one's personality.

The approaching view that RWA and SDO are mediators between one's personality and the behavior outcome is what Duckitt (2001) explains as a dual-process motivational (DPM) approach. This approach explains prejudice as one's personality being influenced indirectly, with its effects mediated through RWA and SDO, which are social attitudes rather than personality dimensions (Duckitt, 2001). When summarizing some of the most relevant studies regarding the fundamental role of RWA and SDO; these factors are regarded as some of the most important influential predictors of prejudice rather than specific personality traits. The reason why SDO and Agreeableness correlate higher is that they are both concerned with interpersonal relations with others peers.

Despite there being a lack of empirical studies on the relation between personality and SDO, two studies have found that SDO is negatively correlated with Agreeableness (Heaven & Bucci, 2001; Ekehammar & Akrami, 2003). Personality dimensions Openness to Experience and Agreeableness were both related to general prejudice and results show that these results were fully mediated by RWA and SDO (Duriez & Soenens, 2006; Ekehammar et al., 2004). According to Ekehammar et al. (2004), these are not surprising results since Openness to Experience include components of nonconformity (behavior or thinking that is different from most people) and unconventionality (behavior that differs from most people in society) and both have shown to be inversely related to authoritarianism. All these characteristics, as well as the dimension's positive relation to social and political values, imply a negative relation to prejudice. Agreeableness includes components of tendermindedness, altruism, nonhostility, empathy and prosocial behavior, which are negatively related to prejudice as well (Ekehammar et al., 2004). The study made by Ekehammar et al. (2004), showed that Agreeableness affected prejudice through SDO and three of the other personality factors (Extraversion, Conscientiousness, Openness to Experience) affected prejudice through RWA, concluding that RWA appears to be more associated with the personality factors than SDO.

Thus, SDO is considered an attitudinal approach towards prejudice and according to limited research, Agreeableness is the personality dimension most related to SDO since aspects within Agreeableness such as empathy, tendermindedness, altruism and prosocial behavior is negatively associated with prejudice. According to Jensen-Campbell & Graziano

(2001), the link between Agreeableness and conflict behavior are mediated by differences in social perceptions meaning that a person low in Agreeableness have a greater tendency for SDO to mediate the individual to assess a certain conflict style. Since low Agreeableness should predict SDO and therefore prejudice, people low in Agreeableness are more concerned with hedonistic goals (such as money, happiness etc.). When that self-interest is disrupted by other peoples interest and desire, a low agreeable person will display minimal concern and act quite ruthless (Sibley & Duckitt, 2008), most certainly applying a dominating style of handling the conflict.

2.5 Cooperation and Politeness

The previous section described how RWA and SDO could be viewed as the main attitudes to investigate when discussing conflict in this thesis. More specifically, this thesis has demonstrated that Agreeableness and SDO are inversely correlated due to their similarities of social attitudinal status and their importance of interpersonal relations as well as their association between empathy, tendermindedness, altruism and prosocial behavior. Therefore, it is the purpose of this section to investigate the neurobiology underlying SDO. Serotonin and empathy are the central concepts in this section as they are prominent concepts when discussing prejudice and the preference for social hierarchies.

Agreeableness entails two main aspects, Cooperation (reflecting ones empathy, sympathy and carrying for others) and Politeness (respect for others' needs and desires as well as the tendency to avoid aggression) (DeYoung, Weisberg, Quilty & Peterson, 2013). When measuring the relation between Agreeableness and empathy, empathy reflects Compassion, and measures of aggression reflect low Politeness (DeYoung et al., 2013). Given the fact that empathic concern is inversely related to the preference for social hierarchy (e.g. Ekehammar et al., 2004), it is possible that neural regions associated with empathy underlie the preference for human social hierarchy. As presented earlier, serotonin relates inversely to aggression (Montoya et al., 2012) and by investigating the neurobiology of empathy, one will receive a prominent suggestion for the neurobiology of prejudice and an explanation to its inverse relation the dominating conflict style.

The idea that some social groups are superior to others is one of the oldest and most controversial beliefs in human history, and social dominance hierarchy can be seen throughout all the animal kingdom (Chiao et al., 2009). Chiao et al. (2009) writes:

Because of the near ubiquitous presence of social hierarchy across species and cultures, it is plausible that the human ability to successfully navigate hierarchical social interaction arises from adaptive mechanisms in the mind and brain that support the emergence and maintenance of social hierarchies within and across social groups. (p. 175)

To simplify this statement, Chiao et al. (2009) mean that the reason why individuals accept and function in societies where hierarchical social interactions occur can be explained due to mechanisms in our brain that support this idea. The mechanisms involved can possibly be explained by empathy.

Individuals with strong empathic concern and care and feel for other people's emotions tend to prefer an equal society rather than a hierarchical one. Chiao et al. (2009) argue that the extent to which a person is able to experience empathy may guide their preference for several aspects such as politic ideology, social hierarchy and most relevant to this thesis, intergroup conflicts. By investigating the neurobiological grounds for SDO, it can provide an explanation of why conflict styles can be viewed as an attitudinal approach guided by the mechanism in the brain. Empathy has shown to relate to different neural networks including anterior insula (AI), anterior cingulate cortex (ACC), lateral cerebellum and brainstem (Hein & Singer, 2008; Chiao et al., 2009). AI and ACC are two regions thought to represent the autonomic and affective dimension of pain and especially the subjective experience of feeling empathy when perceiving pain in others. (Chiao et al., 2009). These regions have previously been demonstrated in this thesis as regions of the mirror neuron system (Chiao et al., 2009; Lamm et al., 2011) and are associated with the ability to share and feel concern for the pain of others; suggesting a neurobiological basis for social attitudes (Chiao et al., 2009). Chiao et al. (2009) presented results where individuals who preferred an equal society showed heightened empathic neural responses in ACC and AI, as opposed to those individuals who preferred a hierarchal society. The 5-HTTLPR gene is also relevant when discussing prejudice since it is associated with social hierarchy in human and non-human primates (Chiao, 2010). One study where they looked at monkeys that lived in better tolerant societies, presented a relaxed dominance and higher degrees of conciliation after a conflict (Canli & Lesch, 2007), because of carrying the L-allele version of the 5-HTT gene (Canli & Lesch, 2007). Essentially, the variation in the expression of the 5-HTT is associated with preference of social hierarchy

across species and cultures, suggesting the importance of genetic factors underlying social hierarchy.

Individuals high in RWA tend to perceive the world more dangerous and are more likely to have a negative attitude towards out-groups that seem to be violating traditions and social norms. Individuals high in SDO tend to have a negative attitude towards out-groups involving lower and minority status. More studies have investigated the genetic contribution regarding RWA and found about 40%-60% variance, thus in principle account for the genetic variance in generalized prejudice and discrimination towards others (Kandler, Lewis, Feldhaus & Riemann, 2015). This could possibly explain the higher correlation between RWA and big five personalities as presented earlier (Ekehammar et al., 2004). It seems as so that contextual and situational factors influence SDO more than genetic factors. According to Kandler et al. (2015), no studies have investigated the genetic and environmental variation in SDO, only a few facets and constructs have been found to be heritable (e.g. ethnocentrism, attitudes towards equality and acceptance of inequality) with a small percentage ranging from 18%-27% (Kandler et al., 2015).

To summarize the research regarding RWA and SDO, when studying the relation between conflicts and personality types, concepts such as RWA and SDO appears to be relevant aspects to investigate since they are considered to be mediators between one's personality and preference for conflict style. SDO is the dimension most inversely correlated to Agreeableness since it arguably is an attitudinal dimension regarding social interpersonal relation, much as Agreeableness. Besides aggression being a common denominator between SDO and Agreeableness, empathy is also a central common denominator. Neural bases such as AI and ACC are associated with empathy and are regarded as the underlying neural explanation for human social hierarchy. AI and ACC are regions involved in the mirror neuron system and can be viewed as a part of the default network as previously suggested in the thesis. The 5-HTTLPR gene plays a part in the prejudice spectra where heightened levels of the S-allele, meaning increased serotonin in the synaptic cleft, is correlated with a higher tendency for having a prejudice attitude towards outgroups. Due to limited research, it is not possible to draw any conclusion regarding the genetic variation in SDO since previous research has only investigated specific factors within SDO.

3. Aggression – The Link Between Personality and Conflict Behavior

This chapter will present a general research overview of aggression and its inverse relation to the Big Five personality traits. It will continue describing the neurobiology of aggression and lastly summarize how aggression is the common denominator between Agreeableness and its inverse relation to the dominating conflict style.

Aggression can be seen as a latent trait (i.e., aggressiveness), but the term aggression is mostly used to indicate an action (i.e., behavior) that is directed toward another person (Hyatt, Zeichner & Miller, 2018). The five-factor model is a prominent and useful theory to investigate the link between personality and aggressive behavior (Bettencourt, Talley, Benjamin & Valentine, 2006). A study made on the relation between personality traits and behavioral aggression in provoking in neutral conditions presented results where the trait aggressiveness was closely aligned with FFM dimension Agreeableness (Bettencourt et al., 2006) and several meta-analyses have linked facets of low Agreeableness (straightforwardness, compliance and altruism) to aggression and antisocial behavior (Hyatt et al., 2018). On the opposite pole of Agreeableness is Antagonism and is characterized by low trust for others, lack of emotional expression and being unattached interpersonally (Bettencourt et al., 2006; DeYoung, 2010). This can be explained by the low levels of serotonin that is associated with aggression and other factors such as empathy that can describe the inability to express emotions towards others (Bettencourt et al., 2006; DeYoung, 2010). Thus, the trait Antagonism relates to a range of negative behaviors, including different variations of aggression (Bettencourt et al., 2006).

A recent meta-analysis investigated basic traits and specific personality disorder constructs (e.g. psychopathy) and their relatedness to aggressive responding in a laboratory setting (Hyatt et al., 2018). Even though the meta-analysis was based on limited research regarding the link between low Agreeableness and laboratory aggression, they found a small but significant relation with laboratory aggression (Hyatt et al., 2018). There are two principles that explain why Antagonism is important when understanding the construct of aggression. Firstly because of the significant relation between the personality trait and aggression and secondly because Antagonism is a core feature in both psychopathy and narcissism which are both strongly associated with aggression (Hyatt et al., 2018). Based on

the well-documented inversed relations between personality traits and aggression, Hyatt et al. (2018) believe that aggressiveness is largely captured by low Agreeableness.

Researchers have tried to map out the angry brain by investigating the neural circuitry guiding anger, angry rumination and aggressive personality (Denson, Pedersen, Ronquillo & Nandy, 2009). They present medial prefrontal cortex (mPFC) and dorsal anterior cingulate cortex (dACC) as the two neural regions underlying anger. The dACC is associated with a number of negative emotions such as social distress and distress associated with physical pain, whereas mPFC has primarily been associated with rumination involving thinking and regulating one's affective state (Denson et al., 2009). The brain region responsible for memory decoding, known as hippocampus was also activated during rumination and functioned as a response to provocation since memories from the past can enhance the present experience (Denson et al., 2009).

This leads to the question of why some individuals are more prone to aggression than others are. To answer this question, Denson et al. (2009), divided aggression into two types of personalities. Individuals who tend to frequently express aggression as a response to interpersonal provocation, as well as impulsive aggression and revenge characterizes the first dimension, *general aggression*. General aggression generates an immediate anger response and is associated with increased activity in the left dACC following provocation since dACC relates to the subjective experience of anger (Denson et al., 2009). The second dimension, *displaced aggression*, respond to insults with rumination instead of immediately taking it out on the other person (Denson et al., 2009). Individuals high in displaced aggression harm innocents and an increased level of abuse toward romantic partner has been correlated with this personality. According to Denson et al. (2009), brain regions activated during rumination are mPFC and the hippocampus since the regions involve thinking about the experience and as individuals become angry based on provocation, they start to ruminate about the anger they are experiencing. Angry rumination involves components of self-reflection, social cognition, negative affect and emotional regulation that help us to regulate the negative emotions (Denson et al., 2009). These components are also associated with low Agreeableness and brain regions involved in these mental functions are mPFC, the lateral PFC, the insula and the cingulate cortex (Denson et al., 2009). These brain regions have also shown to be associated with the ability to experience empathy, theory of mind and process social information (Haas

et al., 2007; DeYoung & Gray, 2009; Chiao et al., 2009; Lamm et al., 2011; Mars et al., 2012) which are significant components of high Agreeableness.

Concluding that the following neural pathways underlying anger are considered to be dACC and mPFC (Denson et al., 2009). Angry rumination activated primarily mPFC that involves aspects of awareness and regulation of negative moods. Broadly relevant to this thesis, the mPFC is also activated during empathy and understanding the mental state of others (DeYoung & Gray, 2009; Mars et al., 2012), both of which are components less active in dominating style of handling conflicts (Afzalur Rahim, 2002). Empathy has also shown to be associated with the insula and anterior cingulate cortex, regions that are involved in affective components of pain (Denson et al., 2009; Hein & Singer, 2008; Lamm et al., 2011) and when experiencing anger, the dACC activates because of both social stress and experienced physical pain.

To summarize, the aggressive attributes within low Agreeableness is what predisposes one to increased negative emotions, less empathy and less concern towards others and their needs, decreased ability to regulate negative emotion and less concern regarding interpersonal relations. A consequence of this attribution could be that an individual low in Agreeableness will more likely have an attitude towards intergroup relation where one prefers groups' differences to be hierarchical (Akrami & Ekehammar, 2006). The preference for some groups having a dominant role in society can partly describe why people low in Agreeableness behave in a dominating way when they experience conflicts, due to their belief that dominance resolves issues regarding social statuses and their lack of consideration of possibly detriment the interpersonal relation with the other person.

Agreeableness is a trait based on both the individual's biological heritage and socialization processes, therefore low Agreeableness can be considered to be a developmental product of a less normative socialization. The strong relation between low Agreeableness and SDO (Ekehammar & Akrami, 2003) can support this suggestion. By understanding variables and the neurobiology of aggression, we have a better understanding of why prejudice is both a result of one's personality as well as a mediating factor towards the use of a conflict style. Social dominance orientation is a result of a very tough-minded personality that correlates negatively with Agreeableness (Ekehammar et al., 2004). As presented earlier, SDO is mediated by personality traits and later influence one's attitude towards a behavior. Behaviors

relevant in this thesis is a specific conflict style, where SDO can be regarded as a proxy for the use of a dominant management style.

3.2 The Biology/Evolution Behind Conflict Behavior

Since research has only shown significant inverse relations between variables such as Agreeableness, aggression and conflict style, it is not possible to draw any conclusions and state any facts. However, based on the findings and similarities in brain regions associated with all the mentioned variables, one can still propose a potential neurobiological basis for the link between personality traits and conflict management. The finding and similarities will be presented in this section of the thesis. The neurobiological factors that underlie conflict behavior can be traced back to simple traits of one's personality. In this case, Agreeableness is the personality trait at focus and the resulting conflict style is the dominating style.

Important aspects of Agreeableness is warmth, trusting, cooperative, and the motive to maintain positive relations with others (Park & Antonioni, 2007). Therefore, components such as empathy, emotion-regulation and theory of mind are important for individuals high in Agreeableness and have shown to be somewhat less active for individuals low in Agreeableness. Empathy has been associated with brain regions such as mPFC (Chiao et al., 2009; Denson et al., 2009; DeYoung & Gray, 2009) and the mirror neuron system such as insula and anterior cingulate cortex (Hein & Singer, 2008; Chiao et al., 2009; Denson et al., 2009; Lamm et al., 2011). Emotion regulation is associated with lateral PFC (which is also active when threats or conflicts emerges) (Haas et al., 2007) and mPFC (Chiao et al., 2009; Denson et al., 2009). The ability to understand the mental state of others (also known as theory of mind) is associated with brain regions such as mPFC and TPJ (Denson et al., 2009; DeYoung & Gray, 2009; Mars et al., 2012) as well as regions within the mirror neuron system such as the insula and anterior cingulate cortex (Mars et al., 2012). Once again pointing out that most of these regions are a part of the default network that is involved in decoding the mental states of others.

These brain regions are most considered to be involved with the personality dimension Agreeableness. These regions have also shown to be associated with the trait aggressiveness, which further explains prejudice on a dispositional level, and therefore provide a biological explanation to why individuals low in Agreeableness tend to use a dominating style when faced in conflict situations.

Since Agreeableness is a personality trait within the metatrait Stability, it is to a great extent regulated by serotonin levels in the brain, which helps to stabilize information processing, maintaining ongoing cybernetic functions and focus on the ongoing goal (Allen & DeYoung, 2017). Serotonin neurons project from the raphe nuclei in the brainstem and affect most cortical and subcortical brain structures, meaning that it has a broad range of influencing many personality traits. As for Agreeableness, serotonin helps to stabilize social stability in order to maintain social harmony (e.g., making it possible to suppress aggressive impulses and other socially disruptive emotions; Montoya et al., 2012) (Allen & DeYoung, 2017). Areas such as dACC and mPFC are areas connected to subcortical areas such as the amygdala, suggesting that the central serotonergic system is involved in those regions as well (Carver et al., 2008; Allen & DeYoung, 2017).

Due to the decreased serotonin levels expressed in areas such as mPFC and dACC, individuals low in Agreeableness experience less empathy for other individuals and a result of that could be to act prejudice towards outgroups and therefore adopt a dominating style of handling conflicts. However, to say that serotonin is the only crucial factor for the expression of Agreeableness would not be true since the exact processes and the extent that serotonin operates in the nervous system is complex and not fully understood yet (Carver et al., 2008).

3.3 Gender, and Societal Consequences

To summarize this chapter, I will provide some insight in the gender and societal consequences that could possibly be explained by some of the findings presented in this thesis.

Besides serotonin as the main substance regulating Agreeableness, additional substances such as oxytocin and testosterone have shown to be involved as well (DeYoung & Gray, 2009; Allen & DeYoung, 2017). Testosterone is linked to aggression and higher exposure to testosterone is associated with decreased Agreeableness (Allen & DeYoung, 2017; Montoya et al., 2012). One study presented results saying that masculine individuals are associated with the use of the dominating conflict style more than feminine individuals (Brewer, Mitchell & Weber, 2002). The explanation for this inverse relation can be explained by the increased levels of testosterone in the body of men, therefore they have a greater tendency for aggressive behaviors (Montoya et al., 2012) and are more likely to use a dominate conflict style. Oxytocin is involved in social bonding and attachment and studies have presented

results where human males received an increased ability to identify others' emotional state when being induced with increased oxytocin (DeYoung & Gray, 2009). Oxytocin has been found to moderate empathy, however, due to the difficulties in judging the exact oxytocin level, researchers suggest that further research is needed to investigate its true effect (Allen & DeYoung, 2017). Consequences of increased aggressiveness such in the trait Antagonism, is related with poor health, occupational functioning (work conditions) and other external disorders (Hyatt et al., 2018) and can therefore explain some societal consequences.

A recent study looked at sex differences in personality with one of the largest public samples to date (Kajonius & Johnson, 2018). According to the study, women scored significantly higher than men did in Agreeableness as well in facets such as anxiety, vulnerability, openness to emotion, altruism and sympathy (Kajonius & Johnson, 2018). The predispositions that women have for facets such as empathy and anxiety as well as their tendency to be more vulnerable in regard to the heightened male sexual aggression, seems to have played an important role in human evolution (Kajonius & Johnson, 2018).

Gender differences have several consequences in our modern day society and some of the most current and debated questions are the equality between women and men in the workplace. It is clear to state that sex differences exist but more interesting is to investigate why. Being high in Agreeableness, you tend to be more polite and prefer to avoid conflicts and studies have shown that people high in Agreeableness are paid less than those low in Agreeableness (Mueller & Plug, 2006). More specifically, Agreeableness was the big five trait that had the most influence on gender differences in earnings where among men, an advantage in earning was associated with Antagonism. It is clear evidence-based that more women are Agreeable than men are (Kajonius & Johnson, 2018) and this might be one component out of several factors to why a pay gap exists between men and women. Those individuals (majority being men) who are low in Agreeableness are better at negotiation since they are not disturbed by the inconveniences that potentially occurs when discussing one's salary, whereas those high in Agreeableness (majority being women) are afraid of causing a conflict and are worse at being assertive about their needs and demands.

The profound inverse relation between low Agreeableness and aggression can present great societal costs such as partly explaining differences in payments between men and women.

4. Discussion

The aim of this thesis was to present the possible neurobiology underlying the personality trait low Agreeableness and dominating conflict style. Since Aggression and empathy being the main concepts that describe the link between low Agreeableness and dominating style are highly complex and consists of different networks interacting with each other in the brain, it is difficult to draw conclusions or state any fact based on the evidence. However, when summarizing evidence from the studies presented here, a number of patterns start to emerge.

As presented in the thesis, studies showed that the mPFC and the TPJ are important brain regions that regulate factors such as empathy and theory of mind (Mars et al., 2012) and mPFC is also a prominent region involved with angry rumination (Denson et al., 2009). Regions involved within the mirror neuron system such as insula and anterior cingulate cortex regulates factors such as feeling empathy while watching someone else in pain (Chiao et al., 2009; Lamm et al., 2011) and have been suggested to be a part of the neurobiological basis for social attitudes, such as being prejudice towards outgroups. Anterior cingulate cortex, more specifically, the dACC has been associated as one of the prominent brain regions associated with aggressive personality and regulates negative emotions such as social distress and subjective experience of pain (Denson et al., 2009). Another brain area, the left dorsolateral prefrontal cortex is involved in emotion regulation which is an important aspect of Agreeableness (Haas et al., 2007). These brain regions can all be found within the default mode network that has been associated within a variety of contexts, including understanding the mental state of others (Allen & DeYoung, 2017)

Brain regions such as mPFC and regions involving anterior cingulate cortex seem to be the most prominent neurobiology describing the inverse relation between personality trait such as low Agreeableness and dominating conflict style since they both involve many facets within Agreeableness as well as aggression such as empathy, theory of mind and emotional regulation. The differences in activation within these regions can explain why individuals low in Agreeableness have increased negative emotion, feel less empathy and less concern regarding the interpersonal relation with other. Emotion regulation is also an important area to consider since bad emotion regulation can result in an increased aggressive behavior (DeYoung, 2010). A consequence of these traits can be that an individual low in

Agreeableness will most likely have a prejudice attitude towards outgroups (Akrami & Ekehammar, 2006). The expression of the personality trait Agreeableness depends on multiple indicators and causes that interfere with factors such environmental and genetics (Allen & DeYoung, 2017). The CB5T explains serotonin as the biological stability substance that makes sure that individuals in Agreeableness can maintain social stability (Allen & DeYoung, 2017). Studies have shown that increased serotonergic function leads to better responsiveness to negative emotional stimuli, decreased aggression and increased cooperativeness, all of which describes individuals high in Agreeableness. However, decreased serotonergic function is associated with impaired emotional regulation, increased aggression, less cooperativeness (Spont, 1992; Carver et al., 2008) and it can also be a factor explaining the preference for social hierarchies across species and cultures since prejudice is related to empathy (Canli & Lesch, 2007; Chiao, 2010). The serotonergic system works broadly throughout cortical and subcortical structures such as the dACC and the mPFC (Carver et al., 2008) and can explain why individuals low in Agreeableness experience less empathy toward other individuals, resulting in an increased prejudice attitude towards outgroups. Besides adapting a prejudice attitude, the inverse relation between serotonin and aggression is also a predictor of the use of adapting a dominating style of handling conflicts.

It is important to clarify that the inverse relations that are explained in this thesis are not as simple as they may appear to be and there are several factors that can contribute to the findings that has not been mentioned. There are many questions regarding interpretation and explanations of the metatraits (DeYoung, 2015). In this thesis, the metatraits are represented as the main traits at the top of the hierarchical personality structure, mainly represented by the serotonergic and dopaminergic systems that represent Stability and Plasticity. However, a problem with the hierarchical structure is that even though each lower-level trait correlates, they do not correlate perfectly (DeYoung, 2015). For example, an individual that score high in Agreeableness might score high on some of its lower facets but not all of which are related to that trait. Thus, others can achieve the same score on the given trait (e.g. Agreeableness) based on different facets. This is problematic since it means that all traits below the highest level of the hierarchy have both shared and unique valid variance, resulting in possibly misunderstanding interpretations about the relation between personalities and other construct such as conflicts.

Furthermore, the basic premise of CB5T is that personality trait and characteristic adaptations provides a complete description of psychological individual differences. Characteristic adaptations has not been discusses in a broader sense in this thesis because they are more complicated to measure than traits and there does not exist much research about the subject within personality research. As explained early in the thesis, the metatraits emphasize the prioritization of the two major needs of the cybernetic system that are crucial for survival in any environment where Stability helps us to move towards our goals and Plasticity provides the ability to evaluate strategies and goals in order to adjust to the environment. However, a fundamental problem within any cybernetic system is entropy, the concept describing the amount of uncertainty and disorder within a system (DeYoung, 2015). Humans are profoundly adaptive to extreme stimuli such as order and chaos. To handle these extremes, mechanism in the brain begins to operate when we encounter these uncertainties. In this thesis the metatraits has primarily been connected to the serotonergic and dopaminergic systems however, they are trait terms referring to the stability and plasticity of one's goals, interpretations and strategies, that are stable or unstable, plastic or rigid (DeYoung, 2015). Once again, pointing to the fact that interpretations and explanations of metatraits can be problematic in research context. The metatraits has a broader role in human behavior besides regulating specific mechanism in the brain as they are involved with how humans adapt to different life circumstances. To receive a broader and perhaps a more correct view of the relation between personalities and conflict management styles, research needs to incorporate characteristic adaptations as well since they are an important aspects in the explanation of why humans behave differently in certain situations. In general, the developmental psychology of characteristic adaptation is a fertile field for future research that will most likely benefit from increasing the focus of this concept and integrating it with research on traits (DeYoung, 2015).

4.1 Methodological Implications, Limitations and Future Direction

Neuroscience is a field with great varieties of technologies that allow researchers to explore specific details of the structure and function of the human brain. Although the great contributions of improved neurobiology techniques and personality measurement, it has cost one of the largest methodological problems in the field. Many studies have used samples that are far too small for good research in individual differences (Allen & DeYoung, 2017). To further increase the power of smaller samples, extreme groups are recommended where the

participants are very high and low in the trait that is being measured, resulting in a larger effect on the results. However, that tactic can prevent the surface of other meaningful variables within that trait that might covariate in specific ways. Therefore, that tactic is only useful when a single, clear hypothesis is being tested.

The use of fMRI is one of the most common used techniques to measure brain activity during task performance and the use of it has allowed researchers to map out major networks of the brain such as the default mode network (Allen & DeYoung, 2017). Due to its limitation in presenting relative levels of neural activity rather than more exact makes is difficult to draw absolute conclusions regarding the brain regions most relevant to a specific function. Therefore, the result presented in this thesis such as measures of positive activity in the mirror neuron system during measures of empathy (DeYoung & Gray, 2009) can only be interpreted as positive relations and no causations can be drawn. These studies base their conclusions on temporal synchrony between different parts of the brain.

Beyond small samples and methodological difficulties, another limitation is the wide variety in the use of different methods that researchers employ. This might contribute to the great existing of bias within the neuroimaging literature. A consequence of this can be the existence of type II error – that is, failure to detect real effects as significant. This can explain the inconsistent results regarding the regional brain volumes in Agreeableness (Bjørnebekk et al., 2013; Kapogiannis et al., 2013), where differences in the software package for MRI analysis can lead to different results (Allen & DeYoung, 2017).

Most often, the preference for a conflict style is believed to be consistent throughout any conflict setting, and most studies often examine the conflict strategies that are generally used and not strategies used in a specific conflict setting (Moberg, 2001). To increase the understanding and the relation between personality traits and preference for conflict style, future research should investigate how different types of conflict affect the choice of conflict style in relation to their personalities (Park & Antonioni, 2007). Studies have suggested that further research should examine lower facets of each personality dimension to different types of conflict management styles since it would provide further understanding to the complex nature of the personality-style relation (Moberg, 2001). Since there are multiple indicators and causes that affect different facets of a trait to be expressed in different ways (DeYoung, 2015), future research should do more studies on the lower hierarchal levels of a personality trait.

There are clear guidelines for future research investigating the relation between personality and conflict where it would be profitable to use larger extreme groups with participants differentiating on the extreme poles of one personality dimension and test them in several conflict situations. More studies are also needed on the facet levels of personality traits. The future of personality neuroscience is very bright and with constantly evolving methods of measurements, we will receive an even clearer picture of the biological parameters that make the variation within each trait. In this thesis, I focused on the relation between personalities and conflict, however, when two individuals are in a conflict, the outcome is also affected by situational factors. Future research should therefore try to incorporate such factors to gain a better understanding of the process of conflicts.

4.2 Consequences

At this point, the consequences of variation in the big five personality traits have been studied extensively as they matter for many life outcomes, in academic and industrial success, in relationships as well in physical and mental health (Allen & DeYoung, 2017). As I mentioned at the beginning of the thesis, we know to a great extent how these factors correlate with personality traits but the knowledge regarding why they correlate are not equally as researched. The research literature presented in this thesis contributes to the existing gap regarding why individuals with a certain personality tend to use a specific type of conflict style. Presenting aggression as the common denominator between personality dimension Agreeableness and the dominating conflict style by highlighting the neurobiological similarities is a prominent way to go about in future research. The ability to explain gender differences in earning from a neurobiological perspective is what I believe to be a nuanced approach to study societal issues. Even though differences in personalities is not the only component affecting the inequality in earnings, and factors such as sexism is, of course, a contributing factor to some extent, I do believe that it is incomprehensible not to acknowledge the fact that there are biological differences that can affect the outcome of one's earning.

Overall, conflict is a constant factor in our everyday life and has even been shown to one of the most important sources of distress in our daily life. However, not all interpersonal conflict have negative consequences. In fact, I would say that the concept of conflict is more neutral than negative since the outcome of it depends on several factors, one's personality being a big impact factor. Aggression is not necessarily a bad thing, in fact, it can be

extremely necessary in life. For individuals who are more predisposed to aggressiveness, the knowledge about how and why the trait expresses itself can be very helpful. For example, if an individual low in Agreeableness tends to lose important and meaningful relationships due to their dominating way of handling conflicts, they might benefit tremendously by learning that the biological cause of that might be aggression and further on learning different methods or techniques to regulate their aggressiveness so that they can retain good relationships. As for an individual high in Agreeableness, learning to integrate aggression in a sophisticated way can help them to present their point in negotiation regarding payment or increase their confidence when faced with difficult conflicting situations.

This thesis suggests a potential explanation for how dispositional factors interact with ones preference for conflict style.

5. Conclusion

The neurobiology underlying the inverse relation between the personality trait Agreeableness and the dominating conflict style is suggested to be the mPFC and the anterior cingulate cortex. Serotonin is the neural substance involved in most cortical and subcortical brain structures, regulating personality traits such as Agreeableness and as well regulating the suppression of aggression. These brain regions are suggested to be involved with factors such as empathy, theory of mind and emotional regulation and largely capture both Agreeableness and aggression. By examining SDO as the main mediator to predict a prejudice attitude, I received results explaining prejudice on a dispositional level since it involves similar factors and where aggression plays a central role. This further provides a biological explanation to why individuals low in Agreeableness tend to use a dominating style when faced with conflict situations. Besides providing this explanation, the thesis goes on to explain possible societal consequences based on these findings.

6. References

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