The biology of leadership

The relation between leadership, psychopathy and hormones

Master thesis Economics and Business
8th of August 2012

Name student: Ricardo Westendorp
Student number: 294819rw
Supervisor: Wouter van den Berg

PREFACE

Around October, 2011, I started looking for a subject to graduate on, when a neuro-economical subject, involving the connection of leadership to psychopathy and hormones, crossed my path. I had to jump into it, because this subject matched the field I am interested in. Now, 8 months later, I present you my final work and I have enjoyed working on it. I have to be honest, this product would not have been able to be written if it wasn't for the help of certain people. Therefore, I would like to use this section, to show my gratitude to some people, that helped me along the way.

First of all, I thank the Erasmus School of Economics, for providing the financial support for this research. This research would definitely not have been possible, without the financial support of the ESE. Secondly, I would like to thank my supervisor, Wouter van den Berg, who has supported me, guided me and who has contributed intellectually. I would also like to thank Kashin Hau, who has made great contributions to the construction of the leadership questionnaire. Also, I would like to thank Sarstedt, who provided 500 saliva tubes. I am very thankful for the help of my parents. A great contribution has been made by my parents, Wim Westendorp and Linda Westendorp, who put in much effort to contact their network to find respondents. It would have been impossible to finish my thesis within this time schedule, if it wasn't for their help. Last, but not least, I would like to thank all respondents that have participated in my research.

I hope you read this thesis with the same pleasure I had writing it.

Ricardo Westendorp

7th of August, 2012

ABSTRACT

The relations between leadership, psychopathy and hormone levels are examined. A sample of 86 males is used to examine these relations. This research is based on a leadership questionnaire, a psychopathy questionnaire and saliva samples. The leadership questionnaire consists of 9 factors: Intelligence, creative thinking, empathy, charm, agreeableness, risk taking, need for achievement, need for affiliation and taking charge. The psychopathy questionnaire consists of the factors boldness, disinhibition and meanness. T-test analyses show that leaders score significantly different on most leadership factors compared to the control group. Bivariate correlation analyses show correlations between all leadership factors and psychopathy (with the exception of the leadership factor intelligence), which indicates that leadership and psychopathy are related. Additionally, leaders score significantly higher on the psychopathy factor boldness. The literature indicates that leaders should have higher testosterone levels and lower cortisol levels compared to the control group. The results of the saliva study suggests the exact opposite, leaders have a significantly higher cortisol level. This finding is probably the result of high stress levels. There are little significant results for testosterone, which is probably caused by high stress levels.

TABLE OF CONTENTS

1. INTRODUCTION

Galton (1869) described leadership as an unique property of extraordinary individuals, who are capable of changing the history. Today, we define leadership more broadly. Trait based research still sees leadership as a set of unique characteristics, possessed by a certain part of the population (Lord et al., 1984). Central in the definition of leadership is that an individual possesses certain characteristics which cause people following a leader and improved group effectiveness. Leadership consists of leadership performance, leadership emergence and leadership development (Zaccaro, 2004). Throughout the history, numerous leaders have done great things and have changed the lives of many followers, for example in war, politics or culture. Bass (1990) reports that leadership is one of the oldest preoccupations known. There are many stories of great leaders that have done marvellous things for society. On the other hand, there are also numerous stories of leaders that have done immoral or unethical deeds. Individuals tend to follow great leaders, even when led into immoral or unethical directions.

In business, leaders give direction, innovate, take risks, manage and lead organizations, companies or departments. Therefore leaders have a crucial position within a company and leaders are responsible for a great deal of the successes of companies. One of the most popular approaches of leadership is the trait based approach, which is an approach of leadership research that tries to find the leadership characteristics that are responsible for leadership emergence, leadership effectiveness and leadership development.

Lately, the ethics of business have been discussed to a great extent, as a result of events during the credit crisis. Business commentators have noted that the amount of business scandals have grown to an epidemic proportion and that well performing companies have been brought down singlehandedly by immoral behaviour of specific leaders (Singh, 2008). This raises some questions. Firstly, what drives these leaders to act the way they act and secondly, how can these individuals reach positions in companies, where they have the power to influence the company and third parties involved in such a negative way. Allio (2007) states that the modern society is suffering from poor leadership in both the public and private sector. To answer these questions and find an explanation for Allio's statement, the focus has to be on the core of leadership, on the leadership characteristics or traits.

Hare is one of the leading researches in the subject of corporate psychopaths. Hare and Babiak (2006) argue in their book "*Snakes in Suits: When psychopaths go to work"* that a significantly higher percentage of psychopaths is to be found in top management positions of companies. Both Hare and Babiak (2006) and Boddy (2009) report that a great deal of the traits related to psychopathy are also related to leadership emergence and leadership development and related to negative leadership effectiveness. When rationally analyzing the events prior to the 08's credit crisis and the events during the credit crisis, similarities between psychopathy and the behaviour of top management can be found. Examples of that psychopathic behaviour are extreme optimism and risk taking in for example the situation of Lehman Brothers. Another example, is the reaction of Goldman Sachs's CFO, David Viniar, on the internal emails about the Timberwolf I transaction.

Timberwolf I is a transaction between Goldman Sachs and investors of which employees internally communicated that the transaction was *"A shitty deal"*. The investors were greatly disadvantaged by the transaction, the e-mails show that Goldman Sachs was aware of the fact that the transaction was unethical and immoral. David Viniar reacted, that it is very unfortunate to have such statements of employees on e-mail. This reaction shows callousness and lack of empathy. This is just one example, out of many. Therefore it is interesting to scrutinize the relation between leadership traits and psychopathy traits.

Recent research has shown a relation between several psychopathic personality traits and hormones (Terburg, 2009), but also between hormone levels and the job performance of salesmen (Coates, 2008). Terburg describes a relation between psychopathy, cortisol and testosterone. Terburg reports that psychopaths have a significantly lower cortisol to testosterone level than non-psychopaths. Coates, on the other hand, relates job performance of salesmen and personality traits to the cortisol to testosterone ratio. The finding of Hare, Babiak and Boddy combined with the finding of Terburg and Coates, suggest that there could be a relation between leadership and the cortisol to testosterone ratio.

The sketched situation raises several questions. Firstly, what are the main leadership traits, what traits are more present in leaders in comparison to followers? Secondly, are there relations between psychopathy and leadership, are psychopathy traits more present in leaders, than in followers? Thirdly, is there a biological difference between leaders and followers, do leaders have different hormone levels compared to followers. These questions will be answered during this thesis. This thesis will discuss the most influential trait based research and the most influential traits will be tested. Secondly, the relation between leadership and psychopathy will be shown by comparing scores on both leadership traits and psychopathy traits. Thirdly, the relationship between psychopathy, leadership, cortisol and testosterone will be examined. This leaves us with four research questions:

- What are the main leadership traits?
- Do leaders show more psychopathic traits than non leaders?
- Are there correlations between leadership traits and psychopathy traits?
- Is leadership influenced by hormones and what is the role of psychopathy in this influence?

The relevance of this thesis is, that it provides a better insight in how leadership works, on a psychological level and on a biological level. This thesis provides a better insight in the differences between leaders and followers on a trait level, which can be used for recruitment, promotions within companies or the training of future or current leaders. The information about corporate psychopathy can serve to make corporate recruitment more aware of the corporate psychopaths that are applying and it can make employees in any level of an organization more aware of psychopathic co-workers. This insight can serve to identify corporate psychopaths and could bring up ideas of how to deal with corporate psychopaths. A significant relation between hormones and leadership will probably not be used for recruitment, due to ethical

boundaries. The information could very well be used to give insight in one's own leadership skills and to develop itself on that level.

This thesis will first discuss the leadership traits, as found in the literature, the work of some the leading researchers in this particular field will be used (Stogdill, 1948; Kirckpatrick et al., 1991, Judge et al., 2002). Secondly, psychopathy will be explained, both the clinical version of psychopathy and the corporate version of psychopathy, including the suggestion of certain similarities between psychopathy and leadership. This section will be based on the work of Hare et al. (1991, 2006), the American Psychiatric Association (2000) and Boddy (2010). Additionally to the psychopathy section, the biology of psychopathy will be discussed (Johnson, 1992; Terburg, 2011; Coates, 2008). A quantitative research will be done based on the theories of psychopathy, hormones and leadership. This quantitative research includes a measurement of leadership traits, psychopathy traits, cortisol levels and testosterone levels. Following, the methodology of the research will be discussed in detail, followed by the result of the research. The interpretation and the possible underlying theory will be discussed in the discussion.

2. LITERATURE REVIEW

This thesis tries to find proof for the relation between leadership and psychopathy and the relation between leadership and hormones. To do so, three subjects have to be clear: leadership, psychopathy and the influence of hormones on (psychopathic) behaviour. The literature review will start with explaining, why a trait based approach of leadership is valid and it will describe the most important traits of trait based leadership research. Secondly, psychopathy will be described and the similarities between psychopathy and leadership will be made clear. Thirdly, the relationship between hormones and psychopathic behaviour and leadership will be described.

2.1 LEADERSHIP

There has been much development in leadership research since the 19th century. One of the most important types of leadership research is trait based leadership research. This approach of leadership tries to explain leadership through traits. The literature review on leadership will first explain what research is done in the past and what evidence there is for the validation of the use of the trait based approach. Then, the most important traits will be described and discussed. Thirdly, the most important leadership styles will be described, using some of the traits.

2.1.1 DEVELOPMENT OF LEADERSHIP RESEARCH

Leadership research started with trait research by Carlyle in 1841 and Galton in 1869 (Zaccaro, 2004). Carlyle described the talents, skills and physical characteristics of typical heroes, people that come to power in politics, war and religion. Carlyle based his findings on qualitative research. Galton (1869) reported that leadership abilities are inheritable, people from successful families are more likely to become successful than

people from other families. Galton also reported that the traits that are needed for successful leadership are inheritable, which implies that the traits are not capable of mutating (Zaccaro, 2007). Both Carlyle and Galton did not look at environmental factors influencing leaders. It could very well have been the case, that growing up in a successful family is an important factor in become a successful leader, because of nurture factors and not inheritability. Galton and Carlyle both agreed on the fact that leadership is an ability of extraordinary people, that are capable of enormous change. This is probably the result of their study cases, which included leaders in politics, religion and even prophets. This first form of trait research fuelled trait based research, which was ongoing until the late 1940's.

In the 1940's, trait based approach was considered as insufficient to explain effective leadership. The focus of research shifted to a more situational approach (Bird, 1940; Stogdill, 1948; Mann, 1959). Stogdill (1948) reported: "the evidence suggests that leadership is a relation that exists between persons in a social situation, and that persons who are leaders in one situation may not necessarily be leaders in other situations" (p. 65). Stogdill and Mann were the first to come up with a situational approach. They both defined leadership as leadership emergence and did not focus on leadership effectiveness or leadership development. There was found proof, that some traits are responsible for successful leadership emergence in some situations. On the other hand, some of the traits that are responsible for leadership emergence in one situation could be responsible for failure in others in other situations (Stogdill, 1948). However, Stogdill and Mann did find reoccurring traits that are responsible for leadership emergence across situation. This is proof of the fact that Stogdill and Mann did partially accept the trait based approach, even though it was interpreted differently in the years after (Lord et al. 1986). The traits that Stogdill (1948) found to be responsible for effective leadership across situations were intelligence, alertness, insight, responsibility, initiative, persistence, self-confidence and sociability. Mann (1959) found several different traits in his research, the traits that he found to be responsible for effective leadership across situations are intelligence, masculinity, adjustment, dominance, extraversion and conservatism. Baron et al. (1987) had a slightly more extreme vision on trait based research, they stated, "The conclusion . . . that leaders do not differ from followers in clear and easily recognized ways, remains valid." The Fiedler Contingency Model (Fiedler, 1971, 1987) is one of the first situational leadership models. The model measures the orientation of the leader; task oriented or relationship oriented. The model works with favorability and orientations. A situation is considered favorable, when there is a good leader-member relation, a highly structured task and a high leader position power. A situation with a bad leader-member relation, a higly unstructured task and a low leader position power is considered unfavorable. A task oriented leader is needed in both extremely favorable and unfavorable situations. A relationship oriented leader is preferred in situations with intermediate favorability. The rejection of the trait based approach of effective leadership and the acceptation of the situational model was widely spread and influential. The rejection echoed in most of the organizational psychology works of the following 30 to 40 years (Zaccaro, 2007; Baron et al., 1987; Blum et al., 1956; Ghiselli et al., 1955; Muchinsky, 1983). The influence of situation is still researched, but more as a moderator of traits. It is still of interest which traits are of influence cross-situational and which traits are situation specific. Individuals with a specific set of expertise and skills can be very successful leaders in

one situation, but poor leaders in other situations, according to the situational approach. On the other hand, some traits could be the cause of certain expertise in skills and could be influencing leadership from a dimension higher than the observable skills and expertise (Zaccaro, 2007).

In the 1980's the rejection of the trait based approach was challenged (Zaccaro et al., 1983; Lord, et al., 1986). Meta-analysis made it possible to quantitatively research leadership more effectively, which made the rejection of the trait based approach questionable. Additionally, the articles of Stogdill and Mann were misinterpreted (Lord et al. 1986). Firstly, Stogdill and Mann only tested on leadership emergence and not on leadership performance. Secondly, both Stogdill and Mann stated that there are traits that are important in every leader, which is basically still in line with the trait based approach. The re-introduction of the trait based approach was reinforced by the emergence of theories of charismatic leadership and transformational leadership, which are theories of leadership that include personality traits (Burns, 1978; Bass, 1985). Another reason why the rejection was questioned was the development and consensus on the research of personality (Judge, 2002). For example, the Big Five Theory and the MBTI theory have found great support in the 1980's (McCrea et al., 1987; Myers-Briggs et al., 1985). Quantitative trait research had better results, because of better methods to test personality traits. Lately, there has been found much empirical evidence for the trait based approach (Judge et al., 2002, 2004; Peterson et al., 2003; Mumford, 1991; McCauley, 1990; Zaccaro, 2001).

Although, there is found much proof for the trait based approach, there is still much research to be done. It is one step to know that personality traits have influence on leadership, the biggest and most valuable step is to find out through what processes and in what situations traits have influence on leadership (Peterson et al., 2003). It is important to keep in mind that it is possible that traits do not individually influence leadership and that the focus needs to be on the influence of multiple types of traits and interaction effects between these traits should be considered (Zaccaro, 2007), even interaction effects with situational factors (Fiedler, 1987, Zaccaro, 2004, 2007). Zaccaro (2004, 2007) is one of the first to come up with a model, that describes how individual traits influence leadership, through situational effects and interaction effects of the individual traits. A great share of research has only used personality traits, like the Big Five, but cognitive abilities, motives and social skills should be included in a model that determines effective leadership (Zaccaro, 2004, 2007). One of the biggest restrictions in leadership research is that it is unknown which traits have influence on which leadership criteria (Zaccaro, 2007). For example, it is not clear what factor has a positive influence on leadership effectiveness, leader emergence or leader development.

2.1.2 LEADERSHIP TRAITS

As shown in the previous chapter, research has shown many relations between traits and effective leadership. Quantitative trait research has really started in the 1904, by Terman. Many of his findings are still accurate. Terman researched leadership in school children and he found that verbal fluency, intelligence, low emotionality, daring, congeniality, goodness and liveliness are important traits for children to position

themselves as leaders (Zaccaro, 2004). This chapter describes the most important leadership traits, divided into three dimensions.

- Cognition
- Social Cognition
- Motivation

This chapter gives you insight in the three most important dimensions of leadership, cognition, social cognition and motivation. The dimensions will be explained as well as their underlying factors.

COGNITIVE ABILITIES

Cognition is the way a person understands things and how his or her response is in the form of actions. Cognitive abilities are somebody's brain based skills, that determine how well that individual performs a task. The complexity of the task is indifferent in this definition. In leadership, two cognitive traits are important, intelligence and creative thinking.

Intelligence

Intelligence is one of the most important characteristics in the modern western society. There have been found many relations between intelligence and socio-economic factors (Herrnstein et al., 1994). Herrnstein et al. have found relations between intelligence and job performance, income, employment, poverty, high school dropout rate, out of wedlock parenthood, divorce rates, permanent subvention, amount of children, mothers mean age at birth and mean weeks of employment. Also, the population itself recognizes the importance of intelligence in leadership. The Gallup Poll, that was held before the United States elections of 2000, has shown that 90% of the voters in the U.S. responded that the capability to understand complex issues is extremely important for determining who to elect.

Most researchers are positive that intelligence has an influence on leadership. One of the main arguments why intelligence is important for leadership is that leaders have to gather, interpret and integrate enormous amounts of information (Kirkpatrick, 1991). Leaders face tasks such as developing strategies, monitoring the environment, motivating employees and solving complex problems on a daily basis. There is a great deal of cognitive ability and intelligence needed for these processes. Fiedler and Garcia (1987) argue that the tasks that leaders face on a daily basis have high similarities with intelligence tests. Lord et al. (1984, 1986) have found that intelligence was the most prototypical trait for leadership out of 59 traits. The 59 traits included traits like intelligence, honesty, charisma and kindness. They found that intelligence is a critical trait that must be possessed to a certain degree by all leaders to be effective. Kirkpatrick (1991) reports that a follower wants its leader to be more capable, than him or herself, a leader that is perceived intelligent gains authority through intelligence. Krikpatrick's finding is in line with the theory on sources of power of French and raven (1959). French and raven report that being more cognitively skilled, or being an expert is one of the 5

sources of power, called expert power. Lord et al. (1986) performed a meta-analysis to be able to determine the relation between several traits, including intelligence, and leadership. They researched five traits in their meta-analysis, intelligence, extroversion, conservatism, masculinity, adjustment and dominance. The biggest correlation found by Lord et al. is the one between leadership emergence and intelligence, 0.50. Judge et al. (2004) find a correlation of 0.27 between leadership performance and intelligence. They also further divided intelligence into perceived intelligence and objective intelligence. Perceived intelligence has a correlation of 0.60 with leadership emergence, whereas objective intelligence has a correlation of 0.19 with leadership emergence, which is in line with the findings of Kirkpatrick (1991) and French and Raven (1959). The leader has expert power, as long as the follower perceives its leader as more intelligent.

Situational influences should be considered too. Schmidt et al. (2000) find that intelligence has the biggest influence on general job performance, with an overall validity of 0.51, this influence is the biggest in complex jobs. Fiedler (1987) states that intelligence is less effective in situations, where leaders experience high levels of stress. This is caused by the stressful relationships with followers. Intelligence is more effective in situations with low amount of stress, because more cognitive capacity is available for use in non-stressful situations. The same was found by Judge et al. (2004), intelligence had a positive non-zero correlation in low stress situations, whereas intelligence did not have a significant correlation with leadership in stressful situations. One of Judge's other findings was that intelligence has a significant correlation with intelligence in situations where leaders are directive, whereas no significant correlation was found in situations where leaders are more participative. In summary, most researchers have found a significant influence of intelligence on leadership and the influence of intelligence differs across situations.

Creative thinking

Creativity is mostly associated with artists, painters, musicians or writers. Creativity can be defined as creating something new, that is appropriate for a task (Plucker et al., 2004; Sternberg, 1999; Sternberg et al., 2002). Kaufman (2011) has built a conceptualized model that defines creativity, and allows creativity to be seen as a leadership trait. The model consists of (1) novelty recognition, (2) observational learning and (3) innovation. Novelty recognition is divided into basic novelty recognition and novelty seeking. The amount of cognitive complexity increases with every step, from 1, novelty recognition, to 3, innovation. Creativity can best be explained by the concept of convergent and divergent thinking (Kraft, 2005). Convergent thinking aims for a single correct solution to a problem, whereas divergent thinking does not follow conventional thought patterns and creates multiple solutions. Creativity is clearly a product of divergent thinking. A series of investigations in the 70's and 80's (Chusmir, 1986; DeVeau, 1976; Sinetar, 1985) has shown a relation between divergent thinking and leadership performance. Recent studies have found proof for the relation between creativity and leadership (Mumford & Connelly, 1991; Mumford et al., 1991, 2000, 2002). A changing environment that provides ill-defined problems, calls for leaders that are able to come up with a solution to a problem. This solution is often new to the individual and requires the capability to come up with new ideas or to modify

existing knowledge or solutions to be suitable for new situations. This process is called creative problem solving. Divergent thinking is highly important in this process (Mumford, 1991).

SOCIAL COGNITION

Social cognition is one of the most important predictors of effective leadership according to Zaccaro (1999, 2002) and Zaccaro et al. (1991). Social cognition refers to the capability of a leader to understand the feelings, thoughts and behavior of others and itself, the selection of the best fitting responses in social situations and being charismatic and charming. This definition includes to three different factors of social cognition. The first factor is the ability of social understanding of the psychological dynamics of other's social information as well as the identification of that social information, which will be referred to as empathy. Empathy is a combination of several factors of emotional intelligence (Mayer and Caruso, 2002). Mayer and Caruso report that these factors of emotional intelligence are important in leadership and in building a company. This finding is supported by Zaccaro (2004), who connect emotional intelligence to social intelligence and social cognition. The second factor is the ability to display behavior that is desired by others, which is described in many different ways in research. This factor is defined as agreeableness or likability (Borgatta, 1964; Conley, 1985; Hakel, 1974; John, 1989; Lorr et al., 1978; McCrae et al., 1985; Noller et al., 1987; Norman, 1963; Smith, 1967), but is also defined as friendliness, social conformity or love (Barrick, 1991). Traits that are included in this factor are tolerant, good natured, flexible, trusting, courteous, forgiving, cooperative and soft-hearted (Barrick, 1991). Judge et al. (2002) find a significant negative relation between leadership emergence and agreeableness and a positive relation between agreeableness and leadership effectiveness. The third factor of social cognition is charm or charisma, which has proved itself to be of great importance, since the introduction of transformational and charismatic leadership (Weber, 1922; Bass, 1985). Charm and charisma are the base of these two leadership styles. Weber describes charm as "exceptional sanctity, heroism or exemplary character of an individual person". In other words, it is the attractiveness that inspires devotion in others. In the description of the cognition dimension, the 5 sources of power theory of French and Raven (1959) has been introduced. Social cognition is the source of a second power described in the theory of French and Raven, which is referent power. Referent power refers to the capability to administer to another ones feelings and to make the follower feel approved and accepted. The leader acts like a role model and relies on its charm and admiration.

MOTIVATION

Recent research has shown the influence of several motive-states on leadership. The different motive states are: taking charge or the need for power, need for achievement, need for affiliation (Zaccaro, 2004) and risk taking (Lawrence et al., 2008). Taking charge or the need for power is defined as the need for a good status and reputation and the power to affect others (Winter, 1987). The need for achievement is defined as the need for long term involvement, striving to reach some standard of excellence and trying to accomplish unique goals (McClelland, 1958). The need for affiliation is the need to get close relations with others, to maintain these relations or restore them (Winter, 1987). There are significant differences in the need for power and the need for achievement between leaders and non-leaders (Chusmir, 1986). Chusmir also reports that males have

significantly more need to take charge and a greater need for achievement, compared to females. McClelland (1958) reports that entrepreneurs have a significantly higher need for achievement. Research has shown that a certain combination of motive-states creates a profile of an effective leader. An effective leader is more likely to have a high need for power, a high need for responsibility and a low need for affiliation (Cummin, 1967; Varga, 1975; McClelland et al., 1976; Winter, 1987; McClelland et al., 1982). House et al. (1991) also found proof that need for achievement is more likely to be high in effective leaders. A previous chapter describes the significant influence of creativity on leadership, there has been found proof that creativity is correlated with the need for achievement in men and the need for affiliation in women (Chusmir, 1986). So it could be that the influence of certain motive-states on leadership goes through creativity or the other way around. Another motivational driver is risk taking. Entrepreneurial leaders are more likely to take risk than regular managers, this is tested in a gamble task (Lawrence et al., 2008). One of Lawrence's findings is that risk taking decreases with age. Based on that, Lawrence reports that managerial leaders take risk, comparable to the normal population, whereas a group of entrepreneurial leaders with a mean age of 51 takes risk like 17 to 27 year olds of the normal population. Gupta et al. (2004) report that an entrepreneurial leadership style is needed, in a the rapidly changing economical environment, with much uncertainty about the direction of the developments. This requires adaptability and innovative thinking from a leader. Risk taking is one of the most important factors in executing innovative ideas (Javidan, 2003; Howell et al., 1990). Howell et al. reported that the best technological innovators take more risk than less performing innovators. Bass (1985), reports that transformational leadership is the best leadership style. One of the characteristics of transformational leadership is challenging the status quo, which is translated from the risk taking trait of charismatic leadership (Javadian, 2003).

2.1.3 LEADERSHIP STYLES

As stated in the chapter about the development of research in the field of leadership, the introduction of leadership styles have had a big impact on leadership research. It helped with the reintroduction of leadership traits. Weber (1922) classified leaders into three categories, bureaucratic leaders, traditional leaders and charismatic leaders. The theory about charismatic leadership had the most influence in leadership research. Charismatic leadership is described by Weber as: "resting on devotion to the exceptional sanctity, heroism or exemplary character of an individual person, and of the normative patterns or order revealed or ordained by him". The charm and charisma of these leaders is the reason why employees follow their leaders, with little or no questions asked. Some examples of the leaders described by Weber are Adolf Hitler, Mahatma Ghandi and Jesus Christ. Weber mainly focuses on the charisma and charm. Later research revealed other processes that made the charismatic leadership style successful. The other processes that make charismatic leadership successful are: attending to the needs and demands of the follower and creating a psychological bond between the leader and the follower (Burns, 1978), risk taking, challenging followers, encouraging followers and providing a clear vision to followers (Javidan, 2003). This last approach has led to the introduction of transformational and transactional leadership by Burns, where transformational leadership is

highly similar to charismatic leadership. This approach was followed by Bass (1985), who described the distinction between transactional and transformational leadership, which is still used today.

Bass (1985) was one of the first researchers to introduce the distinction between transactional and transformational leadership and eight dimensions of leadership behavior covering those two leadership styles. The introduction of these eight dimensions refueled the trait approach of effective leadership. The dimensions are described table 1.

(1) Contingent reward: This dimension relates to the degree in which a leader uses rewards and punishments to motivate its followers and to influence the amount of effort they put in their jobs. The effort of individuals will eventually influence the results of the group. This extrinsic motivation is the core of transactional leadership, as opposed to the more intrinsic motivation of transformational leadership.
(2) Active management by exception: This dimension relates to the degree in which a leader watches and searches for deviations from the rules and the standards and the degree in which corrective actions are taken to make followers act according to the rules and standards.
(3) Passive management by exception: This dimension relates to the degree in which a leader intervenes when standards are not met or when rules are not followed.
(4) Laissez-faire: This dimension relates to the degree in which a leader delegates responsibilities and avoids making decisions.
(5) Individualized Consideration: This dimension relates to the degree in which a leader acts like a coach or a mentor, in which degree a leader attends to the needs of growth and development of its followers and in which degree a leader consults its followers.
(6) Intellectual Stimulation: This dimension relates to the degree in which a leader stimulates followers to share ideas, be creative and think divergent. It also relates to the degree in which a leader challenges the status quo in an organization and assumptions, it relates to the degree in which learning is experienced as valuable and the degree in which unexpected situations are seen as opportunities.
(7) Inspirational Motivation: This dimension relates to the degree in which a leader has a clear vision of the future, which is based on values and ideas and the level of clearness, powerfulness and preciseness with which the vision is communicated to the followers. It relates to the degree in which a leader uses persuasive language and symbolic gestures to inspire followers, build confidence and stimulate enthusiasm.
(8) Idealized Influence: This dimension relates to the degree in which a leader provides a vision and a sense of mission, the degree in which a leader is a role model for ethical behavior, the degree in which a leader gains respect and instills pride.

Table 1: Transformational en transactional leadership dimension (Bass, 1985)

TRANSACTIONAL LEADERSHIP

Bass (1985) was one of the first to describe two different leadership styles. Few leaders depend exclusively on legitimate power (French and Raven, 1959). Legitimate power is the power that a leadership position or title gives a leader over its followers and is one of the five sources of power described by French and Raven. Two types of motivation are used to lead followers. The first is extrinsic motivation, the second is

intrinsic motivation. Extrinsic motivation is the motivation used in the transactional leadership style, this means that a leader engages a transaction with its followers. Leaders explain what is required from the followers and what will be the reward if succeeded or the punishment if not succeeded. The ability to reward and promising these rewards is the fourth source of power of French and Raven described in this thesis, out of the power sources five in their theory, called reward power. The ability to punish is the fifth source of power, called coercive power. Table 1 describes 8 dimensions of transactional and transformational leadership. Four of these eight dimensions play an important role in transactional leadership: Contingent reward, management by exception (both passive and active) and laissez-faire. The higher a leader scores on these dimensions, the more transactional the leadership style is. Contingent reward is the most important of those dimensions. The most central sources of power in this leadership style are coercive and reward power.

TRANSFORMATIONAL LEADERSHIP

Transformational leadership is mainly about stimulating the intrinsic motivation of followers. This intrinsic stimulation includes attending to the needs of growth and development, stimulating the intellect, inspiring, using charisma and acting as a role model to stimulate the desired performance of followers. Transformational leadership is about lifting or transforming followers into better selves. Both the mission and the purposes of the group are clear for every group member, while the breadth and depth of the interests of every individual group member are expanded. Followers are encouraged to look beyond their self-interest and to act in a way that is beneficial for the group or the whole organization. One of the main traits of a transformational leader is its charisma or its charm. Charismatic leaders have a lot of power and influence over their followers, because the followers identify with charismatic leaders, want to be alike and have a high level of trust and confidence in their leaders. A charismatic leader motivates and inspires followers to contribute much effort, by making them interested in achieving great accomplishments. The higher a leader scores on the dimensions individualized consideration, intellectual stimulation, inspirational motivation and idealized influence, the more transformational a leader is. The most central source of power in this leadership style is referent power and to a smaller extent expert power (French and Raven, 1959).

TRANSFORMATIONAL VERSUS TRANSACTIONAL LEADERSHIP

Bass (1990) describes the difference between transactional and transformational leadership, he also reports the benefits of transformational leadership over transactional leadership. The first benefit is that transformational leaders are seen as more effective and satisfying by its followers and other colleagues. Managers that are evaluated as good performers by their superiors are more often transformational leaders than transactional leaders (Bass et al., 1997). One of the most important findings of Bass on the difference between transactional and transformational leadership is that the four dimensions related to transformational leadership are responsible for followers exerting more effort into their jobs (Bass, 1990). Bass measured the amount of extra effort exerted by followers compared to the leaders score on the 8 dimensions of

transactional and transformational leadership. The result is that the leaders that score high on intellectual stimulation have 82% of following employees that exert extra effort into their jobs. The group of leaders that have a low score on intellectual stimulation have only 24% of followers that exert extra effort into their jobs. The same results have been found for charisma (idealized influence) and individualized consideration. 78% of the followers of leaders that have a high score on charisma exert extra effort into their jobs, whereas 24% of the followers of leaders that have a low score on charisma exert extra effort into their jobs. The results for individual consideration are nearly identical to those of charisma. The same research has been done on transactional leadership. A high score on contingent reward resulted in 60% of followers exerting extra effort into their jobs, whereas a low score on contingent reward resulted in 31% of followers exerting extra effort into their jobs. Comparable results were found for management by exception. The amount of followers exerting extra effort is significantly lower for high scores on transactional dimensions compared to transformational dimensions. Yukl (1999) sees the two leadership styles as distinct, but not mutually exclusive, which means that a certain leader can be transformational in one situation and transactional in another situation. This type of approach is according to situational leadership theories.

LEADERSHIP STYLES AND LEADERSHIP TRAITS

Barling (2000) has found a significant relation between social cognition and transformational leadership. Three groups of leaders, divided based on their social intelligence score, were tested on their score on the four dimensions of transformational leadership and the constructive transactions dimension of transactional leadership. Constructive transactions is a construct that contains contingent reward, passive and active management by exception. The three groups showed significantly different scores on all 5 dimensions in an univariate and multivariate analysis, with the socially most intelligent leaders having the highest scores on transformational dimensions. When testing the four dimensions of transactional leadership individually, only contingent reward had a significant result. This means that emotional intelligence or social cognition is related to transformational leadership and the contingent reward dimension of transactional leadership. Mandell (2003) has done a similar research, including both women and men, to test the difference between genders in the influence of emotional intelligence on transformational and transactional leadership. Mandell did a regression analysis to test the influences and also found that emotional intelligence has a positive influence on transformational leadership, but also that females are more likely to be transformational leaders than men. There is empirical evidence that there is a relation between social cognition and transformational leadership.

2.1.4. HYPOTHESIS 1

This chapter has described 3 dimensions of leadership, cognition, social cognition and motivation. It is interesting to know to what extent the dimensions with their underlying factors are present in leaders compared to non-leaders. If the dimensions and their factors are constructed correctly, then leaders should score significantly higher on them, with the exception of agreeableness. As reported, agreeableness has both a

positive and a negative influence on leadership, therefore a direction of the effect can not be hypothesized. The need for affiliation is lower in leaders according to the theory.

Hypothesis 1: The mean scores of leaders on intelligence, creative thinking, charm, empathy, need for achievement, taking charge and risk taking are significantly higher than the mean scores of the control group. The mean score of leaders on agreeableness is significantly different from the control group and the mean score of leaders on the need for affiliation is significantly lower than the control group.

2.2 PSYCHOPATHY

The reason why psychopathy is discussed in this thesis is because there are many similarities between psychopathy traits and the traits of effective leadership described earlier (Babiak and Hare, 2006). This chapter will first discuss what psychopathy is, to be able to report the similarities between effective leadership and psychopathy. Additionally, the biological mechanism behind psyhopathy will be explained, to be able to understand the influence of hormones on psychopathy and leadership.

2.2.1 WHAT IS PSYCHOPATHY?

Psychopathy is an antisocial personality disorder (APD). An APD is "...a pervasive pattern of disregard for, and violation of, the rights of others that begins in childhood or early adolescence and continues into adulthood." (American Psychiatric Association, 2001). There are two types of APDs, sociopathy and psychopathy. There is a thin line between the two different types of disorders. The only difference between sociopathy and psychopathy is the origin of the disorder. A sociopathic disorder is a result of environmental factors, whereas the cause of psychopathy is biological (Hare, 1991), the difference is nurture versus nature. Factors that play a role in the development of psychopathy and the factors that are the origin of sociopathy are parental neglect, poverty, delinquent peers and extremely low or extremely high intelligence. Factors that are responsible for psychopathy are biological. The most important biological factors are genetic predisposition, hormone ratios, low serotonin levels, abnormalities in the frontal and temporal lobes and abnormalities in the functioning of the amygdala (Gregory, 2012). DSM IV treats psychopathy the same as sociopathy, and therefore the two subtypes can't be diagnosed using the DSM standards. DSM only gives guidelines for diagnosing APD. The main APD traits according to the DSM are disrespect to social norms, lying, conning, impulsiveness, aggressiveness, making risky choices, irresponsibility and lack of remorse. Hare (1991) has created a test, to measure psychopathy, the Psychopahty Checklist and the Revised Psychopathy checklist (PCL and PCL-R), the PCL-R is much more detailed than the DSM IV criteria. A number of 20 traits are central in the PCL-R, some of them are similar to the DSM-IV criteria, others are slightly different or additional. The 20 traits are briefly described, because together they form a solid reflection of psychopathy.

There are four different types of psychopathy traits according to Hare (1991). Interpersonal, affective, lifestyle and antisocial. The cluster of interpersonal traits is a cluster with traits that are related to interpersonal

contact. The first interpersonal trait is glibness or superficial charm, psychopaths come across charming on the surface (Cleckley, 1982). Psychopaths are very agreeable and they make a distinct positive impression on people. They are easy to talk to, they appear friendly, completely normal, happy and well adjusted. They come across genuine and it is hard to notice their true nature. The second interpersonal trait is grandiose sense of self-worth. Grandiose sense of self-worth or self-importance is a narcissistic trait. Psychopaths often think they are superior compared to others and have a great sense of entitlement. They have the feeling that others exist to take care of them and see others as weak, inferior and easy to deceive. The third interpersonal trait is pathological lying. Psychopaths are often spreading lies to a pathological extent. They mix their lies with truth to prevent themselves from getting caught. When questioned, the truth in their stories is used to keep themselves out of trouble. Pathological lying is a result of a lack of guilt. The lack of guilt is the cause of the fact that they are able to switch quickly from telling the truth to telling a lie. The fourth interpersonal psychopathy trait is conning or manipulation. Psychopaths are good at hiding their true intentions from the ones they try to manipulate or con. It is often hard to recognize a psychopath, even for experts. They use much mental energy to analyze potential victims and they use their charms to form a good first impression. They analyze a victims value and try to learn how to influence their victims most efficiently.

The second cluster of traits is the cluster of affective traits and describes internal affective processes of the psychopaths. The first affective trait of psychopathy is lack of remorse or guilt. Thoughts about manipulating, hurting or using others are mostly over won by our conscience. The feeling of guilt or remorse is less or not present with psychopaths. This results in antisocial behavior, in behavior that a normal person would not show. The second affectionate trait is shallow affect. Shallow affect is in line with lack of remorse or guilt. Shallow affect means that a person experiences less emotions than others. Psychopaths have less emotional reactions on occurring events. The third affective trait is callousness or lack of empathy. Psychopaths lack empathy. It is possible that they lack in emotional understanding in general. They do not see people as persons, but more as obstacles, targets or objects to use. Psychopaths think that everybody is as unemotional as they are, which often results in antisocial behavior. The fourth affective trait is parasitic lifestyle. A three step system is often used by psychopaths to exploit victims. At first the victims utility, weaknesses and strengths will be investigated (assessment). When these three points are clear, manipulation will be used to siphon of resources (manipulation). After the manipulation, the victim has lost its value and the victim gets abandoned (abandonment). The fifth affective trait of psychopathy is failure to accept responsibility for actions. Avoiding the acceptance of responsibility for things that have gone wrong is a trait commonly observed in psychopaths. They have a wide range of excuses such as blaming others, faith and circumstances.

The third type of psychopathy traits is lifestyle related. The first trait in this cluster is need for stimulation. Psychopaths need more stimulation than a normal person to prevent getting bored. This often results in risky behavior. The main difference with a normal person that searches for novel stimulation is that the risks are carefully examined. The lack of examining the risks can result in an unfortunate outcome of a situation. The second lifestyle trait is promiscuous sexual behavior. A common feature of psychopaths is that

they have a callous relationship with their partners and switch partners often to avoid a long-term, genuine and emotional relationship. This trait is closely related to the third lifestyle trait, which is short-term marital relationships**.** The fact that psychopaths have many short-term marital relationships is a direct result of the parasitic lifestyle (Assessment - Manipulation – Abandonment). The fourth lifestyle trait is the lack of realistic long term goals. Psychopaths mostly lack practicable goals in their life. Therefore they can be recognized by hopping jobs often, although they claim to have well defined goals and achievements. The fifth lifestyle trait is impulsivity, psychopaths act more impulsive, which is caused by a different level of activity in the two systems that regulate behavior, BIS and BAS. BIS and BAS will be explained in more detail in a following chapter. The sixth trait is irresponsibility. Examples of irresponsibility are driving unsafe, excessively loaning money, failing to pay bills and more. Nearly everybody is irresponsible at some aspects of their lives, the main difference with psychopaths is that they are structurally irresponsible, in all aspects of their lives.

The fourth type of traits is antisocial. This includes poor behavioral control, early behavioral problems, juvenile delinquency, revocation of conditional release and criminal versatility. The first trait, the poor behavioral control of psychopaths is an outcome of several personality traits such as the affective traits, need for stimulation and grandiose sense of self-worth. The second trait, early behavioral problems is closely related to poor behavioral control and somewhat distinguishes psychopathy from sociopathy. To be diagnosed as a psychopath, the behavioral problems should have occurred in an early stage of life, before the age of 15, in the form of a conduct disorder. The third trait, juvenile delinquency, is a result of early behavioral problems. The early behavioral problems can result in juvenile delinquency, which is often the case with psychopaths. The antisocial behavior is the cause of the fourth trait, revocation of conditional release. As a result of both the affective traits and the antisocial traits, conditional release is likely to be revocated by court, because of other felonies. A characteristic of the felonies is that they are versatile, which is the fifth antisocial trait described by Hare: criminal versatility. The felonies committed by psychopaths are more versatile, than felonies committed by the rest of the criminal population. This is a result of the affective traits and impulsivity.

American Psychiatric Association is one of the leading organizations in creating guidelines for the diagnosis of psychological disorders, their guidelines for diagnoses are bundled in their book DSM-IV (Diagnostic and Statistical Manual of Mental Disorders). Hare on the other hand is one of the leading researches in psychopathy and his checklists to diagnose psychopathy (the PCL and the PCL-R) are used by many psychologists. The problem is that the DSM-IV, PCL and PCL-R are to be used by experts and can't be used by individuals that would like to test themselves. That is the reason why this research will use the 56 item questionnaire of C.J. Patrick (2010), which is based on the DSM-IV, the PCL and the PCL-R. The questionnaire measures three factors, boldness, disinhibition and meanness. Boldness is defined as low anxiousness, venturesomeness, the nexus of high dominance and high amounts of self confidence. Boldness measures the following traits: optimism, intrepidness, courage, dominance, persuasiveness, tolerance for uncertainty, self confidence, resilience and social assurance. Disinhibition refers to tendencies toward irresponsibility, impulsiveness, boredom, theft, anger or hostility and oppositionality. Disinhibition measures the following

traits: impatient urgency, problematic impulsivity, dependability, irresponsibility, planful control, theft, alienation, boredom proneness and fraud. Meanness reflects tendencies toward predatory aggression, callousness or lack of empathy, excitement seeking and cruelty. Meanness measures the following traits: empathy, physical aggression, relational aggression, destructive aggression, excitement seeking and lack of honesty. As you can see, the three factors and the measured traits of Patrick are highly similar to the DSM-IV criteria and include most of the 20 traits described by Hare, with the exception of some, including superficial charm.

2.2.2 THE CORPORATE PSYCHOPATH

One of the first events that showed the start of the 00's credit crisis is the fall of a large financial services firm in September 2008. The fall of this firm was a result of subprime mortgage tranches in their portfolio, which rapidly lost value in 2007 and 2008, combined with a high leverage (1 to 30) and a high short term debt ratio (Zingales, 2008). Loads of subprime mortgages have been securitised by other investment companies, this was done to provide the fallen financial services firm with an improved liquidity which allowed them to acquire new subprime mortgage portfolios. Subprime mortgage relates to a mortgage, where there is a higher probability that there will be difficulties with the repayment of the mortgages. The firm in this case did not only pollute their own portfolios with that type of mortgages, but also the portfolios of investors, who assumed that the portfolios at sale had less risk. Additionally, the consumer was provided with risky products, which are still causing many consumers difficulties, because their debt is too high to repay. The process of investing in subprime mortgage obligations was to be observed on a large scale in the international financial sector, ranging from investment banks to insurance companies. Normally this would not have been possible because of credit rating agencies, but the firm in this case managed to manipulate these ratings because of their position in the market. Zingales (2008) states that the collapse of this firm was an unlucky draw of a consciously made gamble. The bankruptcy of this financial services firm is just one case, but more similar situations occurred all over the world.

The main point to be learned from the fall of this firm is that the leaders of this firm and comparable companies have made risky decisions and manipulated the market to enhance their own performance. Additional, they have sold obligations, knowing that the value of the obligations was lower than perceived by the investor, thereby bringing other investors at risk by their decisions. To summarize this case, we have seen some traits that are the core of the fall of this organization. The traits that could be connected to the behaviour of the management of this firm are, firstly, the need for stimulation and opportunism, because of the high risks that have been taken. Secondly, manipulation, because of manipulating credit rating agencies. Thirdly, callousness, lack of empathy, ego-centrism, ruthlessness, shamelessness because of knowingly securitizing high risk mortgage portfolios to buyers that are not aware of the content of these portfolios. And finally, ambition, because of the constant need to grow and to increase profits. The traits described above are the same traits as

the ones of corporate psychopathy, described by Boddy (2010). This report does not diagnose any individual as a psychopath, but tries to show the resemblance between leadership and corporate psychopathy in general.

Hare is probably one of the most specialized researchers in the field of successful or corporate psychopathy. Babiak and Hare (2006) and Boddy et al. (2010) have found some similarities between traits connected to leadership and psychopathy. Table 2 summarizes these similarities between effective leadership, leadership emergence and psychopathy. The first trait that can be mistaken is a psychopaths superficial charm. A psychopath can be seen as charming, friendly, charismatic and likable because of its superficial charm (Boddy, 2010; Babiak and Hare., 2006). There is a thin line between superficial charm and charm, the main difference is the source of the charm. Superficial charm is fake and performed at the surface, to be able to manipulate victims, whereas regular charm is sincere. Secondly, emotion management is very important (Mayer, 1997), a leader who can't handle emotionally laden situations without having hindering stress is not very suitable for a leadership function. A leader who is extremely stressed before and firing a follower, is not able to focus on his other activities. This emotion management can be mistaken for the callousness and lack of empathy of psychopaths (Hare, 1991). Another trait that is easily mistaken, is the need for power or taking charge (Winter, 1978), whereas Zaccaro (2004) names the same factor the need for dominance. Dominance in certain levels is harmless or even beneficial, except for when it is used by psychopaths to dominate and control others to get what is wanted (Babiak and Hare, 2006). Fourthly, manipulation is very hard to detect. Bass (1990) writes about the mediocre results of transactional leadership, not its ineffectiveness and finds proof for extra effort exerted by employees when actively using contingent rewards. Contingent rewards can very well be mistaken for the manipulation of psychopaths. The line between manipulation and normally influencing a person is very thin. But a manipulator mostly uses manipulation to benefit from it, whereas that is not the case with normal influencing (Babiak et al. 2006). Additionally, psychopaths are masters in hiding their manipulative behaviour (Babiak and Hare, 2006; Hare, 1991; Boddy, 2010). A fifth trait that is easily to be mistaken is ambition or need for achievement. Boddy (2010) describes that psychopaths are very eager to reach the top. The difference between healthy ambition and a psychopaths ambition is the sheer dedication to reach senior management functions. Additionally, the ego-centrism and self-serving behaviour of psychopaths can be mistaken for ambition. The sixth similarity concerns a leadership dimension, social cognition. Psychopaths are experts in identifying peoples personalities and in acting according their environment, they are often called social-chameleons (Babiak, 2006; Boddy, 2010). This can very easily be confused with the characteristics of empathy and agreeableness. The big difference between the chameleon-like ability and social cognition is that psychopaths are masters in finding and exploiting weaknesses and vulnerabilities of people, whereas the source of empathy and agreeableness is more sincere (Babiak, 2006). Also, risk taking and novelty seeking (related to creativity) look very similar to the behaviour that is the result of the need for stimulation of psychopaths. Lawrence (2008) describes that one of the strengths of an entrepreneur is that the entrepreneur dares to take healthy risks. This is correlated with a high testosterone to cortisol ratio. The big difference between the need for stimulation (Hare, 1991) of psychopaths and healthy risk taking, is that psychopaths take too much risk, which can result badly. Recruiters are often looking for energetic employees (Boddy, 2010), this

energy can be mistaken for impulsiveness (Hare, 1991) of psychopaths, which can result in badly thought through decisions. Stogdill (1974) described confidence as one of the most important leadership traits that can be found across situations. There is a thin line between confidence and the grandiose sense of self-worth (Boddy, 2010; Hare, 1991; Babiak et al., 2006), the difference is hard to detect, because the two traits are much alike.

Effective Leadership	Successful psychopathy
Charisma / charm	Superficial charm
Emotion management	Callousness / lack of empathy
Taking charge	Dominance
Reward power / coercive power	Manipulation
Need for achievement	Sheer dedication to reach senior functions
Need for achievement	Ego-centric
Social Cognition	Social chameleon
Novelty seeking	Need for novel stimulation
Energetic	Impulsive
Confident	Grandiose sense of self-worth

Table 2: Similarities between leadership and psychopathy

Babiak and Hare (2006) prove that there is a higher percentage of psychopaths in leadership positions compared to the normal population. The most recent research (Boddy, 2009) shows that 3,5% of the top management is psychopathic compared to 1% of the juniors in organizations. Cangemi and Pfohl (2009) challenge these percentages and expect them to be much higher based on their experience, not on research. Psychopathic traits result in behaviour as not responding to criticism, acting risky or unwise, unlikely to nurture future talent, not creating a harmonious team and incurring the loss of talented employees (Boddy, 2010). The big question is: "How do psychopaths get positions as leaders?".

HOW DO PSYCHOPATHS END UP ON HIGH ORGANIZATIONAL POSITIONS

Boddy (2009) and Cangemi and Pfohl (2009) have researched how successful psychopaths get themselves into high organizational positions. There are two important stages, that explain why there are more psychopaths at higher positions, recruitment and promotion. Let's start with corporate recruitment. Corporate recruitment fails to identify corporate psychopaths. This problem lies in the nature of psychopaths and the type of people that corporations are looking for. Corporate recruitment is often looking for someone who is charming, energetic and fast moving. Psychopaths are able to present themselves as such. One of the psychopathy traits is superficial charm, which is easily mistaken for charm. Psychopaths are good at telling nice stories about themselves because they are self-centred en ego-centric (Boddy, 2010). They can behave as social-chameleons who blend in everywhere and can find connection to anybody (Babiak and Hare, 2006). This results in a distinctive, good first impression. They present themselves as of good ability and emotionally well adjusted and appear to be persuasive and nice to be around with (Hare, 1999). They come across intelligent and successful. Babiak and Hare (2006) show that more psychopathic offenders are from low social classes and have a lack of verbal intelligence, whereas the prevalence of psychopathy is equal in all socioeconomic classes. This indicates that psychopaths, who do not find themselves among the offenders are more intelligent, than the offending part of the psychopathic population. This is the reason why corporate psychopaths do not match the delinquency criteria, which are easily to discover by recruitment, by for example a criminal record. All these factors result in an impression where psychopaths appear very suitable for a job, which increases the odds that

they will be hired for a specific job. That is the point where the second stage starts and where psychopaths start to work themselves up on the organizational ladder.

As described before in the paragraph about psychopathy, psychopathic behaviour can be divided into four categories. Interpersonal, affective, lifestyle and antisocial. All categories, except for the antisocial category, play a role in the process corporate promotions. The interpersonal behaviour contains superficial charm, manipulation and deceitfulness. Psychopaths are paradoxically likable (Taylor et al., 2003) and are good at telling people what they want to hear (Babiak and Hare, 2006). Co-workers and superiors are deceived by the superficial charm of the psychopaths (Glenn et al., 2011). The deceitfulness and manipulation are traits that are not quickly noticed, but these traits can help a person to get a promotion (Mahaffey et al., 2006), co-workers are used and deceived by psychopaths. The affective traits of psychopathy are reduced guilt and emotional responsiveness. This results in less negative emotions when a way up the organizational ladder is manipulated. For example, getting someone fired to be able to move up, could result in less increased stress, less guilt or less emotional response compared to non-psychopaths. The lifestyle trait, stimulation seeking can be linked to the need to move up in an organization and need for achievement. The stimulation and achievement in that case would be status and money. Boddy (2010) describes that psychopaths have a sheer, single minded dedication to reach senior levels in organizations.

2.2.3. HYPOTHESIS 2 AND 3

Boddy (2010) and Hare and Babiak (2006) describe the relation between psychopathy and leadership. They suggest that leaders are more psychopathic, than non- leaders. This suggestion is the base for Hypothesis 2, leaders are expected to score higher on boldness, disinhibition and meanness. Hare and Babiak (2006) introduce some similarities between leadership traits and psychopathy traits, Hypothesis 3 is based on this introduction. There should be a correlation between leadership traits and psychopathy factors. Charm, taking charge and creative thinking are expected to be positively correlated with boldness. Agreeableness, empathy and the need for affiliation should be negatively correlated with meanness. Risk taking and need for achievement should be positively correlated with meanness, whereas risk taking should also be correlated with disinhibition.

Hypothesis 2: The mean scores of leaders on boldness, disinhibition and meanness are significantly higher, than the mean scores of the control group on psychopathy factors.

Hypothesis 3: Charm, taking charge and creative thinking are positively correlated with boldness. Agreeableness, empathy and need for affiliation are negatively correlated with meanness. Risk taking and need for achievement are positively correlated with meanness and risk taking is also positively correlated with disinhibition.

2.2.4 PSYCHOPATHY AND BIOLOGY

Several researches have shown a relation between cortisol, testosterone and psychopathy (Terburg, 2009; Glenn, 2011). To specify the relation between hormones and psychopathy, the mechanisms behind the two hormones will be described. The hypothalamus-pituitary-adrenal axis (HPA axis) and the hypothalamus-pituitary-gonadal axis (HPG) are responsible for the production of cortisol and testosterone (Terburg, 2009; Johnson et al., 1992). The HPA axis is activated during stressful and uncertain situations. The HPA axis influences the fight-or-flight system of the body and is meant to physically prepare the body for threat or stress. The physical results of HPA activation are increased hearth-rate, perspiration, increased startle reflexes, widened pupils and decreasing the activity in the digestive system. Activation of the HPA system is responsible for a moving towards a flight reaction. The start of the activation of the HPA axis is that arginine vasopressin (AVP) and corticotrophin-releasing hormone (CRH) are released in the hypothalamus (Johnson et al., 1992). The hypothalamus is a part in the brain that is mainly responsible for the organization of behaviour that is important for the survival of an individual, such as eating, fighting, fleeing and fornicating. The release of CRH and AVP starts the production and excretion of the adrenocorticotropic-hormone (ACTH) by the pituitary gland or hypophysis. The pituitary gland is responsible for the excretion of hormones, including cortisol and testosterone. Functions of other excreted hormones are temperature regulation, the activity of the thyroid, growth, the production of urine and ovulation and estrogen production in females. The pituitary gland is divided into two different compartments, the anterior pituitary and the posterior pituitary. The anterior pituitary is responsible for the excretion of ACTH. The excretion of ACTH is responsible for the facilitation of glucocorticoids in the adrenal gland. Glucocorticoids are steroid hormones, among which the most important one is cortisol. The adrenal gland is located on top of the kidneys and is responsible for the production of hormones.

The HPG system is involved in reproduction and the immune system and is responsible for the production of testosterone, it also influences the fight-or flight system (Terburg, 2009). Testosterone is responsible for moving towards the fight reaction (approaching). When activated, gonadotropin releasing hormone (GnRH) is excreted into the hypothalamus, the nucleus praeopticus to be specific (Johnson et al., 1992). From there it is transported to the pituitary gland, the posterior pituitary. GnRH is responsible for the production and excretion of the follicle-stimulating hormone (FSH) and the luteinizing hormone (LH). FSH is responsible for regulating pubertal maturation, reproductive processes, growth and development of the body, whereas LH is responsible for the production of testosterone in males. LH and FSH are transported to the gonads, where they start the production of testosterone. The gonads are the testicles in males and the ovaries in females. Testosterone influences the HPA axis functioning by decreasing the functioning of AVP, which results in less cortisol production. On the other hand, cortisol decreases the functioning of GnRH, FSH, LH and the production of testosterone in the gonads, which results in among others less testosterone production.

Coates et al. (2008) and Terburg, 2009) describe that situational factors such as successes, stress and uncertainty have an influence on cortisol and testosterone. These situational factors are especially important in leaders, because they are almost constantly present. This could muddle the insight in the baseline hormone

levels of leaders, when measuring hormone levels. As stated before, stress results in higher cortisol levels, which trigger the flight reaction. Coates (2008) relates high cortisol levels to decreased job performance, which is a result of cortisol paralizing the minds critical abilities (Goleman and Boyatzis, 2008).

Ressler (2004) states that a good balance in motivational behaviour between avoiding danger and approaching goals is needed to survive. Arnett (1997) argued that psychopathy is the result of an imbalance in this motivational behaviour. This imbalance is a result of an over activity of the BAS and an under activity of the BIS (Gray, 1987). The BIS is the behavioural inhibition system, which controls the avoidance of stimuli. The BIS is driven by punishment, it stops an individual of behaving in a certain way, if that behaviour might be followed by punishment. The BAS is the behavioural activation system. The BAS is driven by rewards, it encourages an individual to behave in a certain way, if that behaviour might be followed by a reward. Arnett (1997) states that psychopaths show less autonomic arousal in situations of punishment, psychopaths show less skin conductance in these situations in comparison to "normal individuals". Arnett connects this to a lower BIS activity. Additionally, psychopaths show more autonomic arousal in situations of reward, psychopaths have a higher heart-rate compared to normal individuals. Arnett connects this to a higher BAS activity.

The BIS and BAS approach is the psychological version of the biological HPA axis and HPG axis approach or the testosterone / cortisol approach. As already stated, the HPA and the HPG axis are both involved in the fight-flight system. A higher sensitivity to punishment could very well be an explanation of the relation between high cortisol levels and higher levels of anxiety and anxious depressions (Johnson et al., 1992). Testosterone influences the HPA axis by reducing the functioning of AVP. The reduced functioning that results in a lower cortisol level could be the explanation of the reduced autonomic arousal in stressful situations that Arnett (1997) found in psychopaths, such as lower hard heart-rate, and less skin conductance. Even stronger evidence of the connection between BIS / BAS and HPA axis / HPG axis lies in the stimulated gene expression in the amygdala. Testosterone stimulates the AVP gene expression, which is related to reward sensitivity (DeVries et al., 1995), whereas cortisol stimulates the CRH gene expression, which is related to punishment sensitivity (Schulkin, 2003). Testosterone is also found to be related to dominance (Archer, 2006), aggression (Blair, 2004) and anti-social behaviour such as law breaking, difficulties on the job, violent behaviour, marriage failure, alcohol abuse and drug use (Mazur et al., 1998). Multiple researchers have found a relation between cortisol levels and psychopathy (Holi et al., 2006; Cima et al., 2008). There has been found much correlation between psychopathy traits and testosterone and/or cortisol. Stålenheim et al. (1998) found a correlation between the anti-social and impulsive behaviour of psychopathy and testosterone in young males. Glenn at al. (2011) did not find a relation between testosterone and cortisol and psychopathy on an individual hormone level, they did find a relationship between the testosterone to cortisol ratio and psychopathy, which proves the interrelatedness of the HPG axis and the HPA axis.

2.2.5. HYPOTHESIS 4 AND 5

The previous chapter has described relations between hormones and psychopathy. This indicates that there might be a relation between hormones and leadership. Hypothesis 4 and Hypothesis 5 test whether that relation is present. Hypothesis 4 relates to the expected difference in hormone levels between leaders and a control group. Hypothesis 5 questions if there is a relation between hormones and leadership factors.

Hypothesis 4: Leaders have a lower cortisol level, a higher testosterone level, a lower cortisol to testosterone ratio, a higher AUC_gT and AUC_iT value, a lower AUC_gC and AUC_iC value and lower AUC_gCT and AUC_iCT compared to the control group.

Hypothesis 5: Cortisol, testosterone and C/T have a significant influence on the scores on leadership factors creative thinking, agreeableness, charm, empathy, need for achievement, taking charge, need for affiliation and risk taking.

3. METHODOLOGY

This study tries to find a relation between leadership and psychopathy and leadership and hormones. Two groups of respondents were selected from the researcher's network, leaders and non-leaders. Each subject was tested on leadership factors, psychopathy factors and testosterone and cortisol levels.

Sample

96 males were asked to participate in the study. The non-response was 12.5%, resulting in 85 participants. 52 of the participants are leaders (60.7%), with a mean age of 46.98 (*SE* = 0.951) and 33 of the participants are non-leaders (39.3%), with a mean age of 32.97 (*SE* = 1.846). The difference in age is significant ($t(83) = -7.266$, $p < 0.01$). Of the sample, 54.8% has a MBO degree or lower, the other part of 43.2% has a HBO degree or higher. Running a Chi-square test, shows that leaders are significantly higher educated, than the control group ($\chi^2 = 32.501$, $p < 0.001$). The leaders are found in the network of Ricardo Westendorp and are selected on the size of the company, and the amount of followers. Only leaders in companies with more than 15 employees were selected. The mean years of leadership experience among the leaders is 17.9 years (*SE* = 1.10) and the mean amount of followers is 14.46 followers (*SE* = 2.09), the non leaders have no leadership experience and no followers in their corporate environment. Most of the leaders are also the CEO of the company. The non-leaders have randomly been selected and mostly include working individuals, with the exception of a few students. 84.8% of the respondents are married or living together with their partner, the other part of the sample is living by themselves (11.8%), alone with their kid(s) (2.4%) or with their parents (1.2%). The leader group members are significantly more often married or living together with their partner, compared to the control group ($\chi^2 = 20.382$, $p < 0.001$), according to a Chi-square test.

Procedure

The leaders have been asked to fill in a questionnaire with 128 items and collect saliva at 5 fixed time points at a day. The questionnaire is to be filled in online, using the questionnaire tool from Qualtrics.com. A

total of 83 items is used in the analysis. The saliva tubes were to be returned by post. The respondents have been tested on a 83 items that measures both leadership performance and psychopathy and 5 Salivette tubes to measure testosterone and cortisol levels during the day.

Instruments: Questionnaire

A survey has been created, where 25 items measure leadership factors and 58 items measure psychopathy. Leadership is measured by a 7-point Likers scale, whereas psychopathy is measured by a 4-point Likert scale. An example of one of the leadership items is (translated from Dutch): "*I often understand how others feel"*. This item would have a 7-point Likert scale as an answering scale, varying from "*I strongly disagree"* (1) to *"I strongly agree"* (7). Leadership exists of 3 dimensions, including a total of 9 factors. An example of a psychopathy item is (translated from Dutch): *"I have hurt people, to see them suffer"*. This question is measured by a 4-point likert scale, varying from *"Very true"* (1) to *"Very untrue"* (4). Psychopathy consists of 3 factors.

Reliability

The three leadership dimensions are cognition, social cognition and motivation, as seen in the literature review. Cognition consists of 2 factors, (1) intelligence and (2) creative thinking. Social cognition consists of 3 factors, (3) agreeableness, (4) empathy and (5) charm. Motivation consists of 4 factors, (6) need for achievement, (7) need for affiliation, (8) taking charge and (9) risk taking. The intelligence factor is based on 2 items, which have a significant correlation ($r = 0.859$, $p < 0.01$). The creative thinking factor is based on 4 items, Cronbach's alpha for this scale is 0.811, thus demonstrating good reliability. All alpha's or correlations can be viewed in table 3. Running a exploratory factor analysis on the cognition cluster shows two factors, dividing the two intelligence items in one factor and the 4 creative thinking items in the other factor, with a minimum factor loading of 0.561. The factor analysis shows the relatedness of the items per factor and it shows that there is enough distance between the two factors, meaning that the factors measure something different. The agreeableness factor consists of 2 items, Cronbach's alpha for this scale is 0.683, which is very close to the required value of 0.7. The agreeableness scale will still be used, even though the reliability of this scale is marginally under the required value, because factor analysis of the cluster shows that agreeableness is a separate factor. The empathy factor consists of 4 items, Cronbach's alpha for this scale is 0.883, which indicates good reliability. The charm factor consists of 3 items, Cronbach's alpha for this scale is 0.718. Running

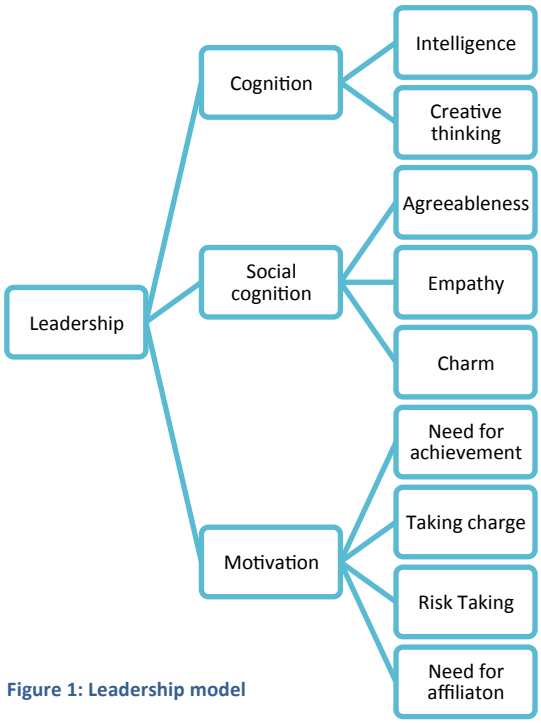

Figure 1: Leadership model

a factor analysis on the social cognition cluster results in three factors. Factor analysis on the social cognition dimension validates the use of the three factors of the social cognition dimension,. Three factors come forward, dividing the items of the three social cognition factors in separate factors, with a minimal factor loading of 0.321. Next, is the motivation dimension. Need for achievement is a 3 item scale, Cronbach's alpha for this scale is 0.708, indicating good reliability. Taking charge is a 2 factor scale, with a significant correlation (r = 0.883, p < 0.01). Need for affiliation is also a 2 factor scale, with a significant correlation (r = 0.793, p < 0.01). The last factor of motivation, risk taking, is a 2 factor scale, with a significant correlation (r = 0.414, p < 0.01). Running a exploratory factor analysis on the motivation dimension shows 4 factors, which match the 4 motivation factors, with a minimal factor loading of 0.420. The psychopathy questionnaire consists of 3 factors. Boldness, disinhibition and meanness. The three factors represent the traits of psychopathy. Cronbach's alpha of the boldness factor is 0.855, which indicates good reliability of the scale. Cronbach's alpha for the disinhibition factor is 0.816, which demonstrates good reliability of the scale. Cronbach's alpha of the meanness factor is 0.739.

Scale	Nr. of items	Mean	Std. Dev	Alpha	Correlation
Intelligence	2	5.03	1.07	0.859	
Creative thinking	4	4.76	1.05	0.811	
Agreeablesness	3	5.18	0.87	0.683	
Empathy	4	5.03	0.93	0.883	
Charm	3	5.11	0.93	0.718	
Need for achievement	3	4.64	1.04	0.708	
Taking charge	2	4.51	0.85		0.883 ***
Risk taking	2	5.27	1.07		0.414 ***
Need for affiliation	2	3.04	1.24		0.739 ***
Boldness	18	3.06	0.45	0.855	
Disinhibition	20	1.58	0.33	0.816	
Meanness	19	1.88	0.35	0.739	

*p < 0.05, **p < 0.01, ***p < 0.001

Table 3: Cronbach's alpha or correlations for the leadership and psychopathy factors

Instruments: Saliva collection

The hormone data collection is done by using 5 Salivette tubes for every respondent. The respondents are asked to provide 5 saliva samples, taken on a single day. They have to chew on a swab for 1 minute, and to place it back in the saliva tube afterwards. The respondents were instructed to collect the saliva on fixed times. The first collection took place at the moment of waking, the second collection took place 30 minutes after waking, the third collection took place at 12 o'clock, the fourth at 16 o'clock and the last collection took place at 22 o'clock. The samples will be described in this thesis as the hormone, followed by the n^{th} measurement. For example, the fourth cortisol measurement at 16 o'clock will be referred to as cortisol 4. The respondents were asked to register the exact times of saliva collection. The saliva samples were send back by post and analyzed in the laboratory of the Erasmus MC.

Data-analysis

All statistical analyses will be done by using SPSS 17. Hypothesis 1 and Hypothesis 2 will be tested by comparing the means of leaders and the control group. The tests that will be used for this are the independent two-tailed t-test, independent one-tailed t-test, the two-tailed Mann-Whitney test and the one-tailed Mann-Whitney test for independent samples. The leadership dummy is set as a grouping variable and the 9 leadership factors and the 3 psychopathy factors as test variables. First, the 9 leadership factors and the 3 psychopathy factors have been tested on normality. Unfortunately, intelligence ($D(84) = 0.167$, $p < 0.001$), creative thinking ($D(84) = 0.10$, $p < 0.05$), agreeableness ($D(84) = 0.13$, $p < 0.01$), charm ($D(84) = 0.10$, $p < 0.05$), taking charge ($D(84) = 0.156$, $p < 0.001$), need for affiliation ($D(84) = 0.168$, $p < 0.001$), risk taking ($D(84) = 0.12$, $p < 0.01$) and disinhibition ($D(84) = 0.12$, $p < 0.01$) are not normally distributed, according to significant results on the Kolmogorov-Smirnoff test. The variables that are not normally distributed can't be analyzed by a parametric t-test, because the assumption of normality can't be made. A non-parametric test, the Mann-Whitney test, will be used to test differences in the means of these variables. An independent t-test will be used for the other normally distributed variables, empathy, need for achievement, boldness and meanness. Another assumption made to be able to perform parametrical tests is equality of variance. Running a Levene's test on the variables results in several significant results, meaning that the variances of the leader group and the control group are not equal for all variables. The leader group and the control group do not have equal variances for the variables intelligence ($F(1, 82) = 8.001$, $p < 0{,}01$), taking charge ($F(1, 82) = 5.058$, $p < 0.05$) and disinhibition ($F(1, 82) = 4.536$, $p < 0.05$). All three variables are also not normally distributed. This means that the significant Levene's test should be taken into account, when building conclusions on the Mann-Whitney tests of these three variables. Hypothesis 3 will be tested by using Spearmans's correlation coefficients between the leadership factors and the psychopathy factors.

Hypothesis 4 is tested in several ways. First, the saliva data is transformed, so that it can be used. The saliva samples are tested on cortisol and testosterone levels. The data derived from the saliva samples will be used in several ways. Firstly, the individual hormone scores of all 5 collections of both testosterone and cortisol will be used, there is no transformation needed for this data. Secondly, the cortisol to testosterone ratios (*C/T*) of single time points will be used, which is calculated by formula 1, where C_i is the cortisol level at collection point *i* and T_i is the testosterone level at collection point *i*.

$$\frac{C_i}{T_i} = Cortisol\ to\ testosterone\ ratio = C/T \tag{1}$$

Thirdly, the area under the curve with respect to the ground level will be used, which is calculated by formula 2, 4 and 5. The AUC_g will be calculated for cortisol, testosterone and the cortisol to testosterone ratio. The AUC_g of cortisol is calculated by formula 2, with cm_i denoting the measurement of cortisol at collection point *i,* t_i denoting the time difference between cm_i and $cm_{(i+1)}$ and *n* the amount of measurements. The

calculation of t_i is displayed in formula 3, with m_i denoting hormone measurements. A standardized version of time difference is used, because the total time difference of the respondents is not equal, resulting in huge differences in the calculation of the area under the curve. Therefore, t_i denotes a percentage of the time difference between the first and the last measurement. The AUC_g of testosterone is calculated by formula 4, with tm_i denoting the measurement of testosterone at collection point *i*, t_i the time difference between tm_i and $tm_{(i+1)}$. The AUC_g of *C/T* is calculated by formula 4, where ctm_i is measurement of the cortisol to testosterone ratio at collection point *i* and t_i is the time difference between ctm_i and $ctm_{(i+1)}$.

$$Cortisol\ AUC_g = \frac{(cm_1 + cm_2) * t_1}{2} + \frac{(cm_2 + cm_3) * t_2}{2}$$

Or

$$Cortisol\ AUC_g \sum_{i=1}^{n-1} \frac{(cm_i + cm_{i+1})t_i}{2}$$

(2)

$$t_i = \frac{time\ point\ of\ measurement\ m_{i+1} - time\ point\ of\ measurement\ m_i}{time\ point\ of\ measurment\ m_5 - time\ point\ of\ measuerement\ m_1}$$

(3)

$$Testosterone\ AUC_g \sum_{i=1}^{n-1} \frac{(tm_i + tm_{i+1})t_i}{2}$$

(4)

$$C/T\ AUC_g \sum_{i=1}^{n-1} \frac{(ctm_i + ctm_{i+1})t_i}{2}$$

(5)

Fourthly, the area under the curve with reference to the first measurement (AUC_i) will be calculated as a new variable. AUC_i gives us information about the increase or the decrease of the values. The AUC_i is calculated by decreasing the value of AUC_g by respectively cm_1, tm_1, or ctm_1 multiplied by the total time difference ($t_1 + t_2$).

After transformation of the saliva data, statistical analysis can be done. The individual cortisol, testosterone and *C/T* values will be analyzed by a t-test, with the hormone scores as test variables and leadership as a grouping variable. This will be done by doing 15 t-tests, which will test Hypothesis 4. Hypothesis 5 will be tested by a one-way repeated measures ANOVA, which will check if the cortisol, testosterone and *C/T* values are significantly different over time within subjects and between groups. This basically tells us if the

hormone levels at time point *i* are different from the hormone levels at time point *i+1, i+2*, etc. for the two groups, comparing the hormone curve lines on both line shape and line positions. Additionally a hierarchical regression analysis will be done, to check the influence of the hormone scores, leadership factors and psychopathy factors on the leadership dummy and leadership experience in years.

4. RESULTS

The respondents were divided into two groups, leaders and non-leaders. The scores of the two groups on the 9 factors of leadership and 3 factors of psychopathy were first analyzed by an independent t-test or a Mann-Whitney test, with a dummy for leadership as a grouping variable and the 12 factors as test variables. The tests on the 9 leadership factors are to test Hypothesis 1 and the tests on the 3 psychopathy factors are to test Hypothesis 2.

The cognition factors are the first factors tested, which can be viewed in table 4. The first test is run to check if the mean scores of leaders on intelligence are higher than the mean scores of the control group on intelligence. A one tailed Mann-Whitney test is used, because the factor is not normally distributed. The leader group has a mean score of 5.26 (*mdn* = 5.25) on the intelligence factor, whereas the control group had a mean score of 4.65 (*mdn* = 5.00). The scores of the leaders proved to be significantly higher than the scores of the control group, (U = 574.00, $p < 0.01$). This result supports the findings of Kirkpatrick (1991), Judge (2004), French and Raven (1959) and Lord et al. (1986). The second test run, is a one tailed Mann-Whitney test on creative thinking, to test if leaders score significantly higher on creative thinking. The leader group scored a mean of 5.00 (*mdn* = 5.00), whereas the control group scored a mean of 4.36 (*mdn* = 4.50). Leaders proved to think significantly more creative, than the control group (U = 576.50, $p < 0.01$). This result supports the findings of Mumford et al. (1991; 2000; 2002), Chusmir (1986), DeVeau (1976) and Sinetar (1985), which connect creative thinking to leadership. The scores of the cognition dimension support Hypothesis 1.

The social cognition factors are the second group of factors that are tested, as shown in table 4. A two-tailed Mann-Whitney test is used, to check if the scores of leaders on agreeableness differ significantly from the score of the control group. The leaders scored a mean of 4.93 (*mdn* = 5.00), whereas the control group has a mean score of 5,5 (*mdn* = 5.67). Leaders proved to score significantly lower on agreeableness, than the control group (U = 569.50, $p < 0.05$). This could have been expected, because leadership emergence is negatively related to agreeableness (Judge et al., 2002). The scores of the leaders and the control group differ significantly, therefore the findings of the Mann-Whitney test on agreeableness support Hypothesis 1. Leaders (M = 5.29, SE = 0.148) did not score significantly higher on the leadership factor empathy than the control group (M = 5.30, SE = 0.17, $t(82) = 0.241$, $p = 0.445$) according to an independent one-tailed t-test. If empathy is a leadership factor, the scores should have differed significantly. This result is in contrast to the theory of Mayer and Caruso (2002). An explanation could be, that empathy is only positively correlated with transformational leaders and not with transactional leaders (Bass, 1985). Social cognition is a less important factor in transactional leadership, according to the literature. Leaders (*mdn* = 5.00) did not score significantly

higher on charm compared to the control group (*mdn* = 5.00, *U* = 799.50, *p* = 0.297), based on a one-tailed Mann-Whitney test. The same explanation goes for charm, charm is also a trait that is important in transformational leadership and less important in transactional leadership. The social cognition factors partially support Hypothesis 1, because agreeableness did show a significant difference in score between the two groups. On the other hand, leader scores on empathy and charm are not found to differ significantly from the control group.

The third comparison of means is done on the motivation factors. The next one-tailed Mann-Whitney test is the test on taking charge. Leaders scored a mean of 4.89 (*mdn* = 5.00) and the control group scored a mean of 3.90 (*mdn* = 4.00). Leaders proved to score significantly higher on taking charge, than the control group (*U* = 271.00, *p* < 0.001). Which is in line with the leadership theory (Winter, 1987; Zaccaro 2004; Chusmir, 1986) and very logical, because taking charge is one of the key tasks of a leader. Leaders (*M* = 2.37, *SE* = 0.10) do not score significantly different on the need for achievement compared to the control group (*M* = 2.47, *SE* = 0.15, t(82) = 0.536, p = 0.296), according to an independent two tailed t-test, but the need for achievement is significantly related to age (*r* = -0.281, *p* < 0.01), which could have caused this insignificant difference in means. Leaders (*mdn* = 5.00, *M* = 5.14) do score significantly lower on the need for affiliation than the control group (*mdn* = 6.00, M = 5.54, U = 640.00 *p* = 0.035), based on a Mann-Whitney test. Need for affiliation scores of leaders should be low according to Zaccaro (2004) and Chusmir (1986). Need for affiliation could be a driver of empathy scores and agreeableness, because of the significant positive correlations with empathy (*r* = 0.356, *p* < 0.01) and agreeableness (*r* = 0.256, *p* < 0.05). The scores of leaders (*mdn* = 3.00, *M* = 3.02) on risk taking do not differ significantly from the score of the control group (*mdn* = 2.75, *M* = 3.00, *U* = 777.00, *p* = 0.609), based on a one-tailed Mann-Whitney test. This test result is not expected and in contrast to the theories of Zaccaro (2004), Winter (1987) and in contrast to the findings of Chusmir (1986). Need for affiliation should be low according to Zaccaro (2004) and Chusmir (1986), in combination with a high need for achievement and a high score on taking charge. Leaders should be more entrepreneurial, than the control group and therefore score higher on risk taking (Javadian, 2003; Lawrence et al. 2008). The scores on the motivation factors are partially supporting Hypothesis 1. Taking charge scores of leaders are significantly higher, which supports the hypothesis. Need for achievement scores and risk taking scores did not show any differences, which does not support the hypothesis. Need for affiliation scores of leaders are found to be significantly lower, which also supports Hypothesis 1.

Variable	Group	*M*	*SE*	*T*	*U*	*p*
Intelligence	Leader	5.2264			599.500	0.022
	Control	4.6563				
Creative thinking	Leader	4.9717			600.500	0.024
	Control	4.3672				
Agreeableness	Leader	4.9308			578.000	0.013
	Control	5.5000				
Charm	Leader	5.0755			810.500	0.732
	Control	4.9583				

Empathy	Leader	5.2453	0.17622	0.223		0.824
	Control	5.2969	0.14530			
Taking charge	Leader	2.3774			278.000	0.000
	Control	2.4750				
Need for achievement	Leader	4.8868	0.15418	0.539		0.591
	Control	3.8958	0.10567			
Need for affiliation	Leader	5.1415			670.500	0.100
	Control	5.5469				
Risk taking	Leader	3.0283			807.500	0.711
	Control	3.0000				
Boldness	Leader	3.2036	0.08169	-4.148		0.000
	Control	2.8207	0.05213			
Disinhibition	Leader	1.5349			706.500	0.198
	Control	1.6578				
Meanness	Leader	1.8763	0.06517	-0.082		0.935
	Control	1.8698	0.04767			

Table 4: Descriptives of group scores on the 12 factors

The leader group scored a mean of 3.21 on boldness (*SE* = 0.05), whereas the control group scored a mean of 2.82 (*SE* = 0.08), as shown in table 4. Leaders proved to score significantly higher on boldness, than the control group ($t(82) = -4.142$, $p < 0.001$), according to an independent one-tailed t-test. This confirms the theory of Hare (1991) and Boddy (2010). The leader group (*mdn* = 1.48) did not score significantly higher on disinhibition compared to the control group (*mdn* = 1.62, $U = 695.50$, $p = 0.11$), according to a one-tailed Mann-Whitney test. Neither do leaders (*M* = 1.88, *SE* = 0.05) score different from the control group (*M* = 1.86, *SE* = 0.07) on meanness ($t(82) = -0.159$, $p = 0.437$), based on an independent one-tailed t-test. This is not in line with the theories of Hare (1991), Babiak and Hare (2006), Boddy (2010). An explanation for the lack of relation between meanness and leadership could be that meanness measures delinquency and violence, which is proven to be low for successful psychopaths, therefore it could be that the relation between leadership and meanness is not significant. There is minimal confirmation for Hypothesis 2, the only factor where leaders scored significantly higher, was the factor boldness. The other two factors do not show significant differences between the mean scores of leaders and the control group.

Hypothesis 3 is tested by using Spearmans's correlation coefficients between the leadership factors and the psychopathy factors. Intelligence does not have any significant correlations with the psychopathy factors, which is to be expected because of the psychopathy literature. Psychopathy itself is not related to intelligence, the amount of delinquencies and violence is expected to be related to intelligence. As expected, creative thinking is positively correlated with boldness ($r = 0.409$, $p < 0.001$). Agreeableness is significantly negatively correlated with meanness ($r = -0.338$, $p < 0.01$). Charm is significantly positively correlated to boldness ($r = 0.326$, $p < 0.01$). Charm is not included as a trait in the questionnaire of Patrick (2010), but is a psychopathy trait according to Hare (1991). Empathy has a significant positive correlation with boldness ($r = 0.325$, $p < 0.01$). A correlation between empathy and psychopathy could be expected, because of the lack of

empathy trait in psychopathy. The correlation with boldness, rather than meanness is unexpected. The lack of empathy trait is included in meanness and not in boldness. Empathy is mostly connected to the boldness traits persuasiveness ($r = 0.421$, $p < 0.001$) and dominance ($r = 0.258$, $p < 0.05$).). Need for achievement is positively

Variable	Group	N	Mean	SE	t	df	Sig.
Cortisol 1	Control	30	14.5067	1.06543	-2.253	79	0.027
	Leader	51	17.8157	0.9355			
Cortisol 2	Control	30	17.0167	1.33164	-2.356	79	0.021
	Leader	51	21.5922	1.26593			
Cortisol 3	Control	30	8.6	0.84353	0.431	79	0.668
	Leader	51	8.1275	0.67942			
Cortisol 4	Control	28	6.1429	0.62051	-0.371	75	0.711
	Leader	49	6.4776	0.58106			
Cortisol 5	Control	30	5.48	1.41312	1.868	31	0.071
	Leader	51	2.7941	0.26437			
Testosterone 1	Control	26	345.1423	46.88574	0.333	74	0.74
	Leader	50	325.254	35.56534			
Testosterone 2	Control	27	253.937	30.21027	1.308	71	0.195
	Leader	46	213.7043	15.58685			
Testosterone 3	Control	27	186.4852	19.69404	1.389	70	0.169
	Leader	45	155.5822	12.55613			
Testosterone 4	Control	25	140.5	12.4737	0.719	64	0.475
	Leader	41	127.2146	12.24943			
Testosterone 5	Control	27	146.8333	15.81757	-0.048	64	0.962
	Leader	39	148.0205	17.45908			
C/T 1	Control	26	0.058	0.00832	-1.728	73	0.088
	Leader	49	0.0815	0.00888			
C/T 2	Control	27	0.0858	0.00959	-2.223	71	0.029
	Leader	46	0.1216	0.01098			
C/T 3	Control	27	0.0506	0.0047	-1.312	70	0.194
	Leader	45	0.06	0.00474			
C/T 4	Control	25	0.0567	0.0083	-0.248	64	0.805
	Leader	41	0.059	0.00517			
C/T 5	Control	27	0.0309	0.00625	0.596	63	0.553
	Leader	38	0.0268	0.00374			
AUCgCT	Control	32	0.017	0.00233	-1.943	83	0.055
	Leader	53	0.0249	0.00278			
AUGiCT	Control	29	-0.0331	0.00633	1.672	78	0.099
	Leader	51	-0.0525	0.00793			
AUCgC	Control	30	4.0327	0.38448	-1.869	78	0.065
	Leader	50	4.9525	0.30344			
AUCiC	Control	30	-10.474	0.93116	1.863	78	0.066
	Leader	50	-12.9295	0.85406			
AUCgT	Control	26	64.0008	7.40733	-0.082	66	0.935
	Leader	42	64.6777	4.64818			

AUCiT	Control	26	-281.1211	42.53819	0.04	66	0.968
	Leader	42	-283.4644	37.98887			

Table 5: T-test results of hormones

correlated with meanness (r = 0.459, p < 0.001), as expected. Taking charge is significantly correlated with boldness (r = 0.646, p < 0.001). The leadership factor taking charge and the psychopathy trait dominance are closely related, according to Babiak and Hare (2006). Therefore, a correlation between boldness and taking charge is expected, because dominance is a trait that is included in boldness. Need for affiliation is negatively correlated with meanness (r = -0.310, p < 0.01). Need for affiliation measures the need to be liked by co-workers, therefore it can be expected that need for affiliation is negatively correlated meanness. Taking charge is significantly correlated with boldness (r = 0.646, p < 0.001). The leadership factor taking charge and the psychopathy trait dominance are closely related, according to Babiak. Risk taking is expected to be correlated to disinhibition, because of the boredom proneness and impulsivity traits. The bivariate correlation analysis supports this expectation (r = 0.337, p < 0.01). Risk taking is also correlated to meanness (r = 0.236, p < 0.05), which can be expected, because excitement seeking is a trait that is included in meanness. A great share of the findings support Hypothesis 3. Charm, creative thinking, and taking charge are correlated with boldness. Need for achievement, agreeableness, need for affiliation and risk taking are correlated with meanness. Empathy is not correlated with meanness, but unexpectedly with boldness. The finding that risk taking is correlated with disinhibition does also support Hypothesis 3.

The leader (M = 17.82, SE = 0.94) group has significantly higher cortisol level at the moment of waking up (cortisol 1) compared to the control group (M = 14.50, SE = 1.07, t(79) = -2.253, p < 0.05). Which is opposite of what is expected, based on the theory of Terburg (2011). The results of cortisol 2, have a similar significant result, leaders (M = 21.59, SE = 1.27) showed a significantly lower score on cortisol compared to the control group (M = 17.02, SE = 1.33, t(79) = -2.356, p < 0.05). The third, fourth and fifth measurement do not show a significant difference between groups, neither do the measurements of testosterone, as can be seen in table 5. Testosterone scores are expected to be significantly higher, than the scores of the control group (Terburg, 2011). The second *C/T* scores of leaders (M = 0.12, SE = 0.01) do differ significantly from the control group (M = 0.09, SE = 0.01, t(71) = -2.23, p < 0.05), again the effect is opposite of what is expected. The scores on the area under the curve of cortisol with respect to the ground of leaders (M = 4,95, SE = 0.38) differ marginally significant from the non-leader group (M = 4.03, SE = 0,38, t(78) = -1,87, p = 0.065). The difference between the AUC_i scores of cortisol (AUC_iC) scores of the two groups also differ marginally significant. Leaders score a mean of -12,93 (SE = 0.85), whereas the control group scores a mean of -10,47 (SE = 0.93, t(78) = 1.86, p = 0.066) on AUC_iC. The same goes for AUC_g of the *C/T ratio* (AUC_gCT). The AUC_gCT level of leaders (M = 0.25, SE = 0.01) differs marginally significant from the score of the control group (M = 0.17, SE = 0.01, t(83) = -1,94, p = 0.055). Again, the difference in the AUC values are exactly opposite of the expected direction.

The results of a hierarchical regression analysis, with 6 different models that follow the literature, include some interesting findings, which can be found in table 6. The dummy variable for leadership is been set

as the dependent variable and every model includes a new set of independent variables. The first model only includes one demographic variable, age. Other demographic variables are not suitable for a regression analysis, because these variables are nominal. Age has a significant influence on leadership, in all 6 models. The second model includes cognition, which does not make a big difference on the R^2. The cognition factors have low β's and lack in significance. The same can be said about the inclusion of the social cognition factors in model 3. However, when including the motivational factors in model 4, the factor empathy becomes significant, which was not the case in model 3. Empathy will remain significant in model 5 and 6. Taking charge is the only motivational factor in model 4, that has a significant influence on leadership. Including psychopathy factors in model 5 hardly changes anything in both the R^2, nor the β's of other variables. Including the hormone factors in model 6 does make a big difference. Taking charge stops having a significant influence, whereas cortisol 2 (B = 0.046, SE = 0.023, β = 0.796, p = 0.052), testosterone 2 (B = -0.002, SE = 0.001, β = -0.665, $p < 0.05$), C/T 2 (B = 5.853, SE = 5.675, β = 0.348, $p < 0.05$), AUC_gC (B = -0.298, SE = 0.152, β = -1.196, p = 0.056) and AUC_gCT (B = 39.922, SE = 19.873, β = 1.289, p = 0.051) have a (marginally) significant influence on leadership. The β -values show that age has a very big influence on leadership from model 1 to 5. Other variables that have a big influence on leadership are the hormone variables. AUC_gC has a β of -1.196, which is the biggest influence seen in all six models. The first model, including the constant and the age variable explains already much of the variance, R^2 = 0.325. Including the cognition variables results in a small jump to R^2 = 0.361. Inclusion of the social cognition variables in model 3 has a slightly bigger effect R^2 = 0.410. Inclusion of motivation factors in model 4 results in a positive change of R^2 of 0.145, which indicates a big improvement in the amount of variance in the leadership dummy that is explained, R^2 = 0.555. Introducing the psychopathy factors in model 5 makes a very small difference in the R^2, R^2 = 0.570. The introduction of the hormone variables is responsible for a big improvement in R^2, R^2 = 0.680.

Running a regression analysis with the amount of years of leadership performance as a dependent factor results in slightly different results, as can be seen in table 7. The first model introduces the demographic variable age. As can be expected, age has a much bigger influence in this regression model, then when the leadership dummy is set as a dependent variable. The β of age is much higher (β = 0.733) compared to the former regression analysis (β = 0.570). The R^2 of model 1 in both regression analyses, support that finding (R^2 = 0.540) compared to (R^2 = 0.325), it indicates that age has a bigger influence on leadership experience, than on the leadership dummy. Age is strongly related to years of experience and will have a significant influence in all six of the models. Cognition is introduced in the 2nd model, as can be seen in table 7, creative thinking has a significant influence. Model 3 introduces the social cognition variables. Agreeableness has a significant influence, while creative thinking remains significant. Both agreeableness and creative thinking lose their significance, when introducing the motivational factors in model 4, whereas taking charge does have a significant influence. The significance of taking charge disappears when introducing the psychopathy factors in model 5. Model six includes the hormone variables, AUC_gCT is the only introduced variable that has a significant influence in this model, together with age, all other influences are found to be insignificant. Empathy is not significant in this regression analysis, which means that empathy is not evolved over time, empathy is a

variable that an individual has or doesn't have. The same goes for the hormone variables, they do not change with an increase in leadership experience, except for AUC_gCT.