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# **WHAT MAKES YOU OVER- OR UNDERCONFIDENT?**

Self-Estimation of Performance in General Knowledge Test  
and Its Relation to Personality

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# ABSTRACT

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The first aim of this study was to gain information on how people self-estimate their performance in general knowledge questionnaire during a personnel assessment day. That is, do personnel assessment participants demonstrate overconfidence, underconfidence, or are they self-aware of their performance? Secondly, this thesis aimed at finding which personality traits may predispose individuals to over- or underconfidence.

This study was conducted in a real-life assessment center. Data was collected in 2019 by a Finnish HR-consulting company Psycon Corp. Sample collection occurred from March to April. Data collection was a part of a broader personnel selection procedure which aimed selection of candidates for expert and leader positions. Candidates participating personnel selection at Psycon were given a possibility to participate in the general knowledge questionnaire measuring over- and underconfidence specifically developed for this study. The final sample ( $n = 155$ ) consisted of participants who filled in both the general knowledge questionnaire and personality inventories, including extraversion and neuroticism related sub-traits and narcissism. The studied personality traits were Narcissism, neuroticism related sub-trait Worrying & Self-criticism, and two extraversion related sub-traits of Need for Sociability & Company and Need to Lead & Decide.

Firstly, the candidates participating personnel assessment day estimated their performance accurately and, on average, did not demonstrate over- or underconfidence. Secondly, both Need for Sociability & Company and Narcissism associated with overconfidence when simple correlations and separate regression models were studied. However, it is notable that only neuroticism was related to self-estimation of performance in the final model, including all the personality variables. In conclusion, individuals scoring high in neuroticism typically underestimated their performance. Furthermore, individuals high in extraversion subscale or narcissism tend to be overconfident, but the associations were modest and, in this study, insignificant when tested in regression analysis containing multiple variables. Therefore, neuroticism demands attention when studying the "risk-factors" of underconfidence. When considering the opposite pole, overconfidence, extraversion, and narcissism are potential contributors, but according to this study, their predictive ability is at best modest.

Including self-estimation of performance, in other words, assessing biases towards under- or overconfidence, provides information of the potential thinking style a candidate views him-/her-self, how he/she embraces risks and what type of information he/she includes into evaluations before making decisions. Additionally, studying candidate's over- and underconfidence may reveal aspects of optimism, self-view, self-efficacy, and self-awareness to mention a few possible explanations for under-/overconfidence. Methodologically this procedure brings incremental validity over and beyond traditional self-reports hence increases the predictive power of assessment battery. Assessing under- or overconfidence provides, therefore valuable information in the recruiting context. For example, neuroticism, coupled with the realistic self-estimation ability, may be a better fit to a position requiring high decision-making skills than neuroticism combined with underconfidence. Vice versa, individual high in narcissism (or extraversion) and with a realistic self-estimation ability may perform better in a position requiring risk management or high-quality decision making than an individual scoring high in narcissism (or extraversion) and overconfidence. Even though further studying is required to fully understand which factors lie under biased confidence and how these biases impact on work-related behavior assessment of over-/underconfidence provides interesting and additional information beyond self-reporting into personnel assessment battery.

Keywords: Overconfidence, Underconfidence, Confidence paradigm, Biased Self-Estimation, Personality Traits, Big Five, Narcissism, General Knowledge Questionnaire.

The originality of this thesis has been checked using the Turnitin Originality Check service.

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## INTRODUCTION

*“All the extraordinary men I have known were extraordinary in their own estimation.”*

*Woodrow T. Wilson*

To successfully function in everyday life requires a somewhat adequate insight of self-awareness (Dunning, Johnson, Ehrlinger, & Kruger, 2003). In other words, comprehension of one’s abilities and limitations is important when assessing a variety of events in everyday life; whether one catches the bus by running in full speed or the client case requires further analyzing to reach the right conclusions. Therefore, understanding the gap between the current level of knowledge and what a person hopes to know is detrimental to learning. In addition, inaccurate self-estimations can hinder the possibility of achieving valuable life-goals in, e.g., occupational field, and may ultimately result in a decreased level of psychological well-being (Freund & Kasten, 2012). On the other hand, overconfidence that refers to an individual’s unwarranted confidence of one’s abilities may produce catastrophic outcomes when paired with decision-making. Overconfidence has been linked to deficiencies in decision-making and risky behavior (Campbell, Goodie, & Foster, 2004), and therefore overconfidence may even subject organizations to an elevated risk of litigation (O’Reilly, Doerr, & Chatman, 2018).

Few would argue against the importance of self-estimation ability, but the vast body of research shows that people often harbor an elusive insight of their skills (Bass & Yammarino, 1991; DePaulo, Charlton, Cooper, Lindsay, & Muhlenbruck, 1997; Furnham, 2001). In other words, most examples show that people are prone to overconfidence. Overconfidence is an intriguing theme in the context of occupational settings and especially in the field of personnel selection since the content of, for example, CVs is derived from a self-assessed material. In addition, behavior in interviewing settings are affected by an individual’s self-constructed view on his or her abilities; thus, overconfidence may significantly affect recruiting situations. Apart from psychometrical measures, recruiting relies on candidates self-perceived ability level. Therefore, overconfident individuals may be assessed positively in, e.g., in interviewing setting, even though the positive illusion is not necessarily warranted in terms of actual abilities. Therefore, studying who is the most overconfident and why, brings valuable insight to the personnel selection process. Studying characteristics that bias self-estimation has significant implications in the field of personnel selection. Firstly, the identification of individuals at risk of having inflated self-perceptions of their abilities helps organizations finding better job-person-fits when hiring for positions that require high-quality

decision-making. Secondly, a better understanding of what biases self-estimations is crucial to improve individuals judgment abilities and find methods to control overconfidence (Macenczak, Campbell, Henley, & Campbell, 2016). Overconfidence has been associated to individual differences in personality traits and narcissism (Jacobs, Szer, & Roodenburg, 2012; Schaefer, Williams, Goodie, & Campbell, 2004; Soh & Jacobs, 2013) which raises an interesting question: Can a risk profile be developed for the overconfident type? This thesis studies if personality and narcissism-related traits are related to overconfidence, and its opposite underconfidence in a sample from a real-life assessment center. Gaining better insight of over- and underconfidence gives recruitment professionals tools to assess personnel beyond a candidate's self-report. Therefore, this study produces new information on risk factors for over-/underconfidence in real-life personnel selection context.

## **Overconfidence**

Overconfidence has been defined and studied inconsistently in previous literature. Moore and Healy (2008) offer much-needed clarity to the subject. Their review showed an in-depth exploration of “The three faces of overconfidence”: 1) Overplacement 2) Overestimation and 3) Overprecision. Overplacement occurs when an individual possesses a positively biased self-view in relation to others. In other words, he/she places self-estimated ability or skill above the average hence demonstrates better than average effect. Overestimation refers to inflated self-view of a person's ability level or performance. An individual demonstrating overestimation may, for example, rate having a test score of 9/10 while the actual performance level was 2/10. Overprecision results when an individual has exaggerated confidence concerning the accuracy of one's beliefs. Typically, and also in this thesis, overprecision is studied presenting participants a general knowledge questions (e.g., Which of the Disney films has generated the highest revenue?) and subsequently have them to estimate the level of confidence of their answer (Moore & Healy, 2008). In occupational settings, self-awareness and realistic insight of one's knowledge is critical to high-quality decision making and leadership performance; thus making accurate self-estimations is a relevant professional skill (Tekleab et al., 2008). Therefore, overprecision is the focus of this thesis. Empirical research of all the three overconfidence types is, however, presented throughout this thesis to offer a better comprehension of the concept of confidence. Also, overprecision affects both of the other two overconfidence types: More precise self-estimates should produce less error in estimation and placement. In other words, the more precise an individual is in his/her self-estimation, the less over-/underplacement and over-/underestimation he/she shows (Moore & Healy, 2008). One could argue that when, for example,

overplacement occurs, overprecision is likely to occur as well. Therefore, the studies of overplacement and overestimation can be utilized to form hypotheses for the relationships between overprecision and individual differences studied in this thesis. Overconfidence in this study is defined as the positive difference between the individual's average confidence and average accuracy in the general knowledge test. In other words, overconfidence is a judgmental error in which individuals overestimate their performance accuracy (Schaefer et al., 2004). Vice versa, negative difference indicates a bias in which individuals underestimate their performance accuracy hence demonstrate underconfidence.

Past research shows that people are prone of holding a deep and often unwarranted sense of overconfidence both in their abilities and judgments (Dunning, Heath, & Suls, 2004; Russo & Schoemaker, 1992). Overconfidence is manifested in many domains of life, such as, driving a car (Sümer, Özkan, & Lajunen, 2006), performance in vocabulary test (Stankov & Crawford, 1997), interpersonal sensitivity (Ames & Kammrath, 2004), saving money (Kruger, 1999), or cognitive abilities (Jacobs et al., 2012; Soh & Jacobs, 2013). On the contrary, individuals rate themselves below the median (underplacement/worse than average effect, WTA) when performing a difficult task, such as juggling (Kruger, 1999) and they show underconfidence when self-estimating perception ability (Stankov & Crawford, 1997). Research also shows that people tend to underestimate their performance when the task is simple or when the individual making the self-estimation is highly skilled (Burson, Larrick, & Klayman, 2006). In the following sections, previous research on overconfidence is reviewed from perspectives of the three overconfidence types. Little is known who is the most overconfident and why, therefore, this thesis presents characteristics of individual differences which have been linked to overconfidence. In addition to overconfidence, studies of underconfidence and its relation to personality (namely neuroticism) are reviewed.

### **Individual differences in self-estimation ability**

Past research has found overconfidence to be related to individual differences in big five personality traits (Jacobs et al., 2012; Schaefer et al., 2004; Soh & Jacobs, 2013) and narcissism traits (Ames & Kammrath, 2004; Macenczak et al., 2016). To find out what makes us believe we are superior, or at least better than we really are, past studies on individual differences related to overconfidence are discussed next.

### *Big five personality traits*

Big five model of personality provides a standard framework within other personality structures; in this thesis, overconfidence can be better understood (Sharpe, Martin, & Kelly, 2011). In the next section, big-five personality traits are described, and literature of the relationship between the personality traits and overconfidence is represented.

Big five is one of the most grounded structures that personality can be described. Big five divides personality into a hierarchical, five-factor organization. Namely, five basic traits: Extraversion, Agreeableness, Conscientiousness, Neuroticism, and Openness to Experiences (McCrae & John, 1992). The five traits can be described as following characterizations (Hogrefe, 2018; McCrae & Costa, 2008). Extraversion can be characterized as having, e.g., high activity level, social skills, many friendships, active vocational interests, and participating in team activities. Agreeableness can be described as having, e.g., forgiving attitudes, belief in cooperation, utilizing an inoffensive language, and having a reputation of being a pushover. Conscientiousness can be characterized as having, e.g., self-discipline, thorough approach, ability to make long-term plans, and organized support network. Neuroticism can be described as having, e.g., low self-esteem, irrational perfectionistic beliefs, and pessimistic attitudes. Openness to Experiences can be characterized as having, e.g., an interest in travel, many hobbies, and knowledge in foreign cultures.

These factors are argued to be a universal structure of individual personality differences, temporally stable, have some biological basis, and sustain cross-observer validity (Costa & McCrae, 1992; Vassend & Skrandal, 2011).

A vast body of research has concluded that certain personality traits influence on self-estimation of intelligence (SEI), but which traits predict the highest self-estimates vary from study to study. In many of the studies extraverted, stable, disagreeable and open individuals give the highest self-estimates on their intelligence or correlate positively with SEI (Chamorro-Premuzic, Furnham, & Moutafi, 2004; Chamorro-Premuzic, Moutafi, & Furnham, 2005; Furnham, Kidwai, & Thomas, 2001; Furnham, Moutafi, & Chamorro-Premuzic, 2005; Furnham & Thomas, 2004) but only openness has consistently been related *directly* to intelligence (Ackerman & Heggestad, 1997). This raises an intriguing question: Can specific personality traits bias self-estimation ability thus produce over-/underconfidence? Indeed, research concerning self-estimation of cognitive abilities has found a moderating effect of personality traits on the accuracy of self-estimation (Jacobs et al., 2012; Soh & Jacobs, 2013). This means that personality changes the relationship between self-estimated and test-based intelligence. According to Jacobs et al. (2012), individuals high in extraversion and low in

agreeableness were prone to overconfidence when self-estimating particular cognitive abilities. Soh and Jacobs (2013) studied gender differences of biasing personality traits, and they found out that women high in extraversion and men low in conscientiousness tended overplacement of specific abilities; hence, they demonstrated overconfidence. Indeed, some traits are linked to overconfidence, but caution and consideration must be applied when making conclusions: Depending on studies different traits predict overconfidence, and according to Jacobs et al. (2012) and Soh and Jacobs (2013) the relationship between traits and overconfidence is domain and presumably gender specific. For example, extraversion predicted overconfidence when a self-estimated ability was fluid reasoning, but the relationship was not found when self-estimations of comprehension-knowledge (Gc) or visual processing (Gv) were studied. Further research and meta-analytical approach are required to make well-validated conclusions on the relationship between traits and overconfidence in self-estimation of cognitive abilities.

A vast body of research exists on self-estimations of cognitive abilities but how about self-estimation and overconfidence beyond cognitive ability domain? The relationship between overconfidence and big five personality traits have also been studied by using general knowledge testing (Schaefer et al., 2004). General knowledge tests are utilized when studying how confident people are of their answers. Schaefer et al. (2004) found out that extraversion significantly predicts overconfidence while other traits are controlled for. Neuroticism has been related to lower self-estimated intelligence (SEI) but *not* with psychometrically measured cognitive abilities (e.g. Chamorro-Premuzic et al., 2005) which could indicate that neuroticism biases self-estimation and therefore may lead to underconfidence. This being said, past research has lacked finding a significant relationship between neuroticism and underconfidence (Jacobs et al., 2012; Schaefer et al., 2004; Soh & Jacobs, 2013). Research considering the role of personality on overprecision (over-certainty of one's answer) is sparse and to the author's best of knowledge overprecision type of overconfidence has not been studied in the context of personnel selection.

Even though it varies from study to study which trait is linked to overconfidence, it seems that extraversion-related traits are most often found to be related to overconfidence (Jacobs et al., 2012; Schaefer et al., 2004; Soh & Jacobs, 2013). Therefore, the relationship between extraversion and overconfidence is studied in this thesis to find out if extraversion predicts overconfidence in the personnel selection context. The relationship between neuroticism and underconfidence has not gained support from empirical research (Jacobs et al., 2012; Schaefer et al., 2004; Soh & Jacobs, 2013) even though people high in neuroticism provide low self-ratings but *not* a low performance in cognitive ability tests (Chamorro-Premuzic et al., 2005). Also, neuroticism has been linked to negative affectivity and low optimism, which theoretically could be related to underconfidence in

self-rating (McNiela & Fleeson, 2006; Sharpe et al., 2011). In addition, neuroticism has been linked to depression, which has been associated with underconfidence (Fu, Koutstaal, Fu, Poon, & Cleare, 2005). Regardless, the fact that past research has lacked finding a direct relationship between neuroticism and underconfidence, this thesis aims to study if neuroticism and underconfidence are associated in the personnel selection context.

Since this thesis concentrates on the relationship between i) overconfidence and extraversion and ii) underconfidence and neuroticism, these two constructs are explored in more detail. In general, Extraversion concludes components of sociability, tempo, and vigor, characteristic that predispose individuals to positive affect (Costa & McCrae, 1980). Neuroticism, on the other hand, concludes of components, such as general emotionality, anger, and fear predisposing individuals towards negative affect (Costa & McCrae, 1980). Personality traits can be studied via a vast array of personality tests. One of the most commonly utilized personality tests is NEO-PI-R, a theoretically based personality questionnaire developed explicitly according to Big five (Vassend & Skrandal, 2011). NEO-PI-R links six subcategories to extraversion: Warmth, Gregariousness, Assertiveness, Activity, Excitement-Seeking and Positive Emotions (Vassend & Skrandal, 2011) and as adjectives, they describe well what extraversion is. Similarly, NEO-PI-R divides Neuroticism into subcategories: Anxiety, Angry Hostility, Depression, Self-Consciousness, Impulsiveness, and Vulnerability (Vassend & Skrandal, 2011). This thesis studies extraversion and neuroticism by a Motivation test (described later in this thesis) developed by Psycon. Psycon is a company specialized in personnel assessment and the source of data in this study.

### *Narcissism*

In addition to certain big five personality traits, narcissism has been linked to overconfidence in past research; thus, narcissism is a focus of interest also in this thesis. A diagnostic criterion can define narcissism as a personality disorder, but in the current study, it is viewed as a continuum that represents a trait-like character of personality. Hence people may possess narcissistic tendencies, sometimes referred as "normal narcissism" (Campbell et al., 2004) but in the non-clinical population, the characters are more flexible and amenable than in the clinical forms (Kring et al., 2011). This being said, towards the highest end of a continuum, the clinical criteria for narcissism as a personality disorder may be fulfilled (Campbell et al., 2004). Past literature provides strong evidence of the association between narcissism and overconfidence (Campbell et al., 2004; Foster, Reidy, Misra, & Goff, 2011; Macenczak et al., 2016; Paulhus, Harms, Bruce, & Lysy, 2003) thus this thesis aims to find out if narcissistic tendencies elevate the risk of being overconfident in the context of the personnel selection process.

Narcissism is a complex personality and clinical construct with two key elements: 1) People with narcissistic characters tend to have inflated but fragile self-conceptions, and unempathetic and cynical view of others and 2) Narcissistic personalities try to maintain inflated self-views by utilizing self-regulatory strategies (Campbell et al., 2004; Morf & Rhodewalt, 2001). Firstly, displaying intrapsychic strategies, such as, experiencing heroic and achievement centered daydreams (Robert Raskin & Novacek, 1991) and, secondly, utilizing interpersonal strategies e.g. drawing attention to themselves and competing (Luchner, Houston, Walker, & Alex Houston, 2011; Nathan DeWall, Buffardi, Bonser, & Keith Campbell, 2011). Controversially, narcissistic behavior, such as, assuming others to step aside when walking by or avoidance of conversations with “low life” (Buss & Chiodo, 1991), may undermine the hard work they have put in self-enhancement since in the long term this type of behavior leads to conflicts with one’s surroundings (e.g., colleagues). Narcissistic personalities may not adapt well in conflicts since they may respond to threats to self-esteem with rage, defiance, shame, and humiliation (Morf & Rhodewalt, 2001).

Narcissism can be further understood by studying the factor structure of commonly utilized test of Narcissistic Personality Inventory (henceforth NPI is described later in this section) which measures narcissism as a continuum (Raskin & Terry, 1988). The three subscales of NPI are 1) Leadership/Authority 2) Grandiose/Exhibitionism and 3) Entitlement/Exploitativeness. Leadership/Authority is associated with adaptive outcomes, e.g. positive self-esteem, reduced internalizing pathology, confidence, assertiveness, and beliefs of leadership potential whereas the latter two: Grandiose/Exhibitionism and especially Entitlement/Exploitativeness are associated with maladaptive outcomes, such as impulsivity, antisociality and Machiavellism (Ackerman et al., 2011). NPI’s factor structure is one way to present that narcissism can be seen having both bright and dark sides, but some researchers suggest that normal (or adaptive) narcissism and pathological narcissism should be considered as two distinct forms (Pincus & Lukowitsky, 2010). Holding a positive illusion about self, asserting dominance in social hierarchies, striving for success when achievement is required and showing adaptive self-enhancement are all reflecting normal narcissism in healthy individuals (Ackerman et al., 2011; Pincus & Lukowitsky, 2010). These strategies that promote a positive self-image and facilitate agency are conventionally not viewed as problematic aspects of personality (Ackerman et al., 2011).

In contrast, pathological narcissism that is seen as a set maladaptive self-regulating processes causes significant distress and impairment (Pincus & Lukowitsky, 2010). Pincus and Lukowitsky (2010) identify pathological narcissism as grandiosity and vulnerability. According to them, grandiosity reflects inflated self-esteem, arrogant attitudes, and interpersonal behaviors that are characterized by entitlement, exhibitionism, and exploitativeness. Vulnerability, on the other hand,

reflects fragile self-esteem, emotional instability, and internalizing pathology (Pincus & Lukowitsky, 2010).

While concluding the characters of narcissistic personalities, it may not be surprising that narcissism has been related to overconfidence in several studies. Narcissistic personalities were found to be more prone to betting and losing higher points than non-narcissistic personalities in a laboratory game setting due to their elevated overconfidence (Campbell et al., 2004). They also relied on their predictions of future performance on expectations rather than on actual past performance, which implies a shortcoming in the decision-making process (Campbell et al., 2004). Narcissism has also been linked to overconfidence related phenomenon of overclaiming, that is claiming to identify pseudowords that actually does not exist (Paulhus et al., 2003). In addition, in the study of Foster, Reidy, Mistra, and Goff (2011), narcissistic personalities were prone to invest in a riskier stock market than non-narcissistic personalities. The researches explained this behavior by narcissists' oversensitivity for reward and heightened approach motivation, but the behavior can also be explained by overconfidence.

As presented above the work of Moore and Healy (2008) indicate that the three types of overconfidence (overprecision, overestimation, and overplacement) are not different manifestations of one underlying construct but are, in fact, empirically and conceptually distinct. Therefore, Macenczak, Campbell, Henley, and Campbell (2016) utilized this conceptually broader direction to study the relationship between narcissism and different types of overconfidence. They found that narcissism predicted each of the types of overconfidence in their series of four studies. Additionally, the relationship between overprecision and narcissism was the strongest of all the overconfidence types. Interestingly, the subcomponents of narcissism that correlate most strongly with extraversion, which are Grandiose/Exhibitionism and Leadership/Authority (Miller et al., 2014), were the strongest correlates with all the overconfidence types. Controversially, disagreeableness related subcomponent, Entitlement/Exploitativeness (Miller et al., 2014) was found non-significant in correlation analysis of three overconfidence types (Macenczak et al., 2016) indicating that when considering the concept of overconfidence, extraversion related facets of narcissism play an essential role.

As mentioned above, narcissism can be assessed utilizing NPI. It is widely utilized test to study narcissism as a continuum and comprises of a set of two self-describing statements (such as, "I like having authority over other people" versus "I don't mind following orders") and respondents are scored for selecting the narcissistic option of the two statements (Raskin & Terry, 1988). NPI scores range from 0-40, and the higher score indicates a higher level of narcissism (Macenczak et al., 2016; Raskin & Terry, 1988). Narcissism in this thesis is assessed by Stress Reaction Style (SRS) (described later), a test developed by Psycon.

## **Current study**

In this chapter, information of personnel assessment is provided, the aims of this study are concluded, and hypotheses are postulated.

The context of this thesis is unique since the sample is collected from a real-life personnel assessment center. Psychological personnel assessment is a tool that is utilized when selecting a new employee for organizations, developing competence, or assessing the performance of personnel (Honkanen & Nyman, 2001). Psychological personnel assessment procedure includes, for example, psychometrical measuring (e.g., personality inventories, ability tests) and interviewing to produce an assessment of a candidate's aptitude for the position in question. Psychological personnel assessments are recommended to be performed by a qualified psychologist certified specifically conducting personnel assessments. An assessment report includes (typically numerical and verbal) assessment and recommendation of the candidate's aptitude for the applied position. In addition, it includes a candidate's strengths and targets of development concerning the applied position. The report is handed to the client and the candidate. The supervising authority of certification in Finland is Finnish Psychological Association (Suomen Psykologiliitto ry, 2019).

Past research has linked over- and underconfidence to several individual differences, such as big five personality traits and narcissism. Therefore, the main aim of this thesis is to find out which of the individual differences predict over-/underconfidence. Research is conducted utilizing a sample from a real-life assessment center. Therefore, this thesis aims to find out if the results from past research apply to the field of personnel assessment. Gaining more information about over- and underconfidence is important in the personnel selection context. Firstly, the findings can be utilized in developing a risk profile for the overconfident type. Secondly, better insight into the biases in self-estimation can be utilized when selecting candidates to positions requiring skills in risk-taking, decision-making, and learning. Thirdly, when considering overconfidence as a phenomenon, this thesis sheds light to a common misconception where being sure is granted the same as being right. Overconfident individuals may be assessed positively in, e.g., in interviewing setting and gain unwarranted benefit even though the positive image is not necessarily warranted in terms of actual abilities. A better understanding of the biases in self-estimation challenges recruiters to dig deeper and base their recommendations to more than just the surface overconfidence.

## *Research questions and hypotheses*

Concluding the findings from past research following research questions and hypothesis are postulated:

- 1) How well do people self-estimate their performance in general knowledge test?  
*H1a*: Performance accuracy and confidence will have a moderate ( $r > .30$ ) positive correlation.  
*H1b*: People are prone to overconfidence (10-20%) while assessing their performance.
- 2) a. Are extraversion related traits “Need for sociability and company” and “Need to lead and decide” associated with overconfidence?  
*H2a*: “Need for sociability and company” and “Need to lead and decide” are positively associated with overconfidence.  
b. Is a neuroticism related trait “Worrying and self-criticism” associated with underconfidence?  
*H2b*: “Worrying and self-criticism” is positively associated with underconfidence.
- 3) Is narcissism associated with overconfidence?  
*H3*: Narcissism is positively associated with overconfidence. Individuals of a higher level of narcissism will score higher levels of overconfidence.

## METHODS

### Participants and procedure

Data for this thesis was collected in 2019 by a Finnish HR-consulting company Psycon Corp. Data collection was a part of a broader personnel selection procedure which aimed selection of candidates for expert and leader positions. Candidates participating personnel selection at Psycon were given a general knowledge questionnaire measuring overconfidence if they voluntarily wanted to participate in this study. Sample collection ( $n = 155$ ) occurred from March to April. In addition, participants responded questionnaires and tests concerning extraversion, neuroticism, and narcissism during their assessment day. The sample consisted of participants who filled in both the general knowledge questionnaire and personality inventories ( $n = 155$ ). Of these, 62% were male, and their average age was 39 years ( $SD = 9$ ).

### Variables

Participants completed questionnaires of general knowledge, extraversion, neuroticism, and narcissism. Descriptive information (mean and standard deviation) and reliability information (Cronbach's alpha) are represented in Table 1.

Table 1. Means, standard deviations, and Cronbach's alphas of variables ( $n = 155$ ).

Variables (range)	<i>M</i>	<i>SD</i>	<i>α</i>
Confidence of one's answers in GKQ (1 – 100)	65.6	12.1	.
Accuracy of one's answers in GKQ (0 – 100)	67.4	9.6	.
Need for sociability and company (0 – 36)	12.7	4.6	0.78
Need to lead and decide (0 – 33)	16.4	5.1	0.83
Worrying and self-criticism (0 – 24)	11.0	5.8	0.83
Narcissism (0 – 42)	18.8	5.7	0.74

*Note.* GKQ= General Knowledge Questionnaire

### *General knowledge test*

The main test method in this thesis was the general knowledge test developed measuring the level of over-/underconfidence. Participants responded to 44 general knowledge questions in the fields of natural and social sciences, history and economics (e.g., "When did the war of Lapland end?", "What is a hypothesis?"). All questions were presented in a three-alternative, multiple-choice format. After every question, the participant had to estimate how certain he/she was that the answer was right (level of confidence). Confidence was measured by a continuous sliding-scale from 1 to 100. The lowest end of the continuum (1) was labeled "My answer was a plain guess," and the highest (100) was labeled "I was absolutely sure about my answer." General knowledge test questions were time-limited to 20 seconds, and selecting confidence of one's answer had no time-limit.

The score of over-/underconfidence was computed utilizing the following equation:

$$Y_{Confidence} = Sd\bar{X}_{Confidence} - Sd\bar{X}_{PerformanceAccuracy}$$

Hence, positive values indicate overconfidence, and negative values indicate underconfidence.

### *Personality inventories*

Extraversion and neuroticism were assessed by a Motivation test developed by Psycon. Extraversion was assessed by two sub-traits: Firstly, "Need for sociability and company" ( $\alpha = 0.78$ ) and secondly, "Need to lead and decide" ( $\alpha = 0.83$ ). "Need for sociability and company" describes sociability and aspiration to be around and connect with others. This sub-trait was evaluated via 12 items (e.g., "I am likely to start conversations with strangers" and "I often seek situations where I get to be in the center of attention"). The response scale for the item varied from 0 (= "I strongly disagree") to 3 (= "I strongly agree"). The range of scores varies between 0-36. The second extraversion related sub-trait "Need to lead and decide" was measured via 11-items, which describes aspirations to lead others and utilize power. Statements, e.g., "I feel discomfort if I must command others" (reversed) and "I would like to be the most influential person in my workplace" were responded on a scale from 0 (= "I strongly disagree") to 3 (= "I strongly agree"). Therefore, the range of scores varies between 0-33.

Neuroticism was measured by an 8-item dimension "Worrying and self-criticism" ( $\alpha = 0.83$ ) which describes overly critical self-image, the presence of guilt, lack of self-efficacy and excess worrying about how situations will turn out. Statements e.g. "After a failure, I am dissatisfied with

myself and my abilities for a long period of time” and “When I face a challenging situation, I sometimes feel that I am too sensitive and critical towards myself” were responded on a scale of 0 (= “I strongly disagree”) – 3 (= “I strongly agree”). Therefore, a range of scores varies between 0-24.

All the utilized extraversion and neuroticism sub-traits correlate well with the associated Big Five sub-traits of a well-known Finnish personality inventory PK-5 (Psycon, 2019). PK-5 is a Big five-based self-assessment questionnaire applicable in psychological personnel assessment which is developed by Psykologien Kustannus Oy (Hogrefe, 2018).

Narcissism was assessed by a Stress Reaction Style (SRS) test developed by Psycon. SRS assess the individual’s style to react and behave when experiencing stress and strain. Validity information for the SRS is provided by Nederstöm & Furnham (2012). Narcissism is measured as a continuum, and the scale in SRS “*Leading, even narcissistic*” ( $\alpha = 0.74$ ) contains 14 items. This dimension describes a general aspiration to work in leadership positions, level of self-confidence, and self-efficacy. High scores of the scale indicate a lack of self-criticism, grandiose self-view, inability to learn from mistakes and an exaggerated need for social status. Low values indicate a lack of self-confidence, lack of self-efficacy, low external locus of control, or desire to present oneself in a humble light. Statements, e.g., “My ideas have been excellent without exception” were responded on a scale of 0 (= “I strongly disagree”) – 3 (= “I strongly agree”). Therefore, a range of scores varies between 0-42.

### *Background variables*

Gender and age were analyzed as background variables since they have been associated with producing a variance in confidence in past research (Soh & Jacobs, 2013; Pallier, 2003; Stankov & Crawford, 1997; Visser, Ashton, & Vernon, 2008). Different personality traits may predispose men and women to overconfidence in cognitive ability tests (Soh & Jacobs, 2013). Also, gender and confidence associate differently when studied in various domains. In the general knowledge test, men were more overconfident, whereas women were better calibrated (Pallier, 2003). On the other hand, in visual perception test, women were more underconfident, whereas men were better calibrated (Pallier, 2003). The outcome that men exhibit higher confidence than women is replicated in many studies (e.g., meta-analysis Syzmanowicz & Furnham, 2011) but the difference in an actual performance is often found non-existent or small (e.g., Pallier, 2003; Visser, Ashton, & Vernon, 2008). This indicates that men may be at risk of being overconfident in some domains, and women may be at risk of being underconfident in others. In addition to gender, age has been shown to moderate self-estimations of cognitive abilities (Pallier, 2003). According to past research, older

people show a tendency towards overconfidence when compared to younger people (Pallier, 2003; Stankov & Crawford, 1997)

### **Statistical analysis**

Statistical analysis was performed utilizing IBM SPSS Statistics 23.0 software. The correlation of background variables and over-/underconfidence was studied with Pearson's correlation. Pearson's correlation was also used to study the correlation between self-estimated confidence of one's answers and actual performance in general knowledge test (Hypothesis 1). The association of extraversion, neuroticism, and narcissism to over-/underconfidence was studied by linear regression analysis (Hypothesis 2-3).

## RESULTS

### Descriptive results

Pearson correlation coefficients are represented in Table 2. The correlation coefficients indicate that extraversion related sub-trait Need for Sociability & Company ( $r = .17, p < .05$ ) and narcissism ( $r = .19, p < .01$ ) were both positively related to overconfidence. In other words, the higher individuals scored in Need for Sociability & Company or narcissism, the higher their level of overconfidence was. In addition, neuroticism related sub-trait Worrying & Self-criticism was negatively related to underconfidence ( $r = -.24, p < .01$ ). That is, the higher individuals scored on the scale of Worrying & Self-criticism, the lower their level of confidence was. Need to Lead & Decide was not significantly related to confidence.

Studied variables correlated also mutually. Narcissism was positively related to extraversion related sub-traits Need for Sociability & Company ( $r = .49, p < .01$ ) and Need to Lead & Decide ( $r = .60, p < .01$ ) and negatively related to Worrying & Self-criticism ( $r = -.42, p < .01$ ). Need for Sociability & Company and Need to Lead & Decide were also positively associated ( $r = .63, p < .01$ ). In addition, mean accuracy was negatively related to overconfidence ( $r = -.49, p < .01$ ). This indicates that the more overconfident an individual was the less accurate he/she was. Associations between background variables and confidence were insignificant hence excluded from further analyses (see Table 2).

Table 2. Pearson correlations for study variables ( $n = 155$ )

Variables	1.	2.	3.	4.	5.	6.	7.	8.
1. Gender <sup>1</sup>								
2. Age	.22**							
3. Yconfidence <sup>2</sup>	-.06	.08						
4. Need for sociability and company	.06	.14	.17*					
5. Need to lead and decide	.04	.11	.10	.63**				
6. Worrying and Self-Criticism	.08	-.17*	-.24**	-.23**	-.25**			
7. Narcissism	-.10	.08	.19**	.49**	.60**	-.42**		
8. Mean Accuracy	-.04	.20*	-.49**	-.06	.04	.09	-.02	
9. Mean Confidence	-.08	.29**	.47**	.11	.13	-.12	.16	.53**

Note. \*  $p < .05$ , \*\*  $p < .01$  (2-tailed).

<sup>1</sup> 1 = male ( $n = 96$ ), 2 = female ( $n = 59$ )

<sup>2</sup> YConfidence =  $Z(\text{Mean Confidence}) - Z(\text{Mean Accuracy})$

## Self-estimation ability of participants

Overall, mean confidence was 65.7%, and mean accuracy was 67.5% in this study, which indicates that participants were in average accurate in their self-estimations in general knowledge questionnaire. Table 3 represents frequencies of underconfident, overconfident, and accurate participants identified in this study. These were calculated by using the formula: ‘Yconfidence’ (= Mean Confidence – Mean Accuracy). Hence, negative values indicate if an individual has been underconfident in his/her answers in the general knowledge questionnaire. Vice versa, positive values indicate overconfidence. Values close to zero (+/- 5%) can be considered as an accurate self-estimation.

Table 3. Frequencies of individual’s underconfidence, accurate self-estimation, and overconfidence in their answers in the general knowledge questionnaire ( $n = 155$ )

Confidence (%)	Frequency	%
Underconfidence ( $< -5\%$ )	50	32.2
Accurate ( $-5 < x < 5 \%$ )	85	41.3
Overconfidence ( $< 5\%$ )	41	26.5
Total	155	100

Confidence followed a normal distribution in this dataset. This indicates that the general knowledge questionnaire developed for this thesis has the ability to differentiate overconfident individuals from underconfident. Noteworthy is that the number of overconfident individuals in this study was rather modest (see Table 3) while the majority of the sample is accurate.

## The relationship between self-estimated confidence and actual performance

Hypothesis 1a was tested utilizing a Pearson correlation. The relationship between confidence and accuracy of performance was positive and statistically significant ( $r = .53, p < .01$ ). Individuals who were more accurate in their answers were also more confident that their responses were correct and vice versa. Hypothesis 1a gained support as the relationship between confidence and accuracy was moderate and positive. The amount of over- or underconfidence was studied calculating Yconfidence, % (= Mean confidence – Mean Accuracy) as percentages (as opposed to Z-values as described

earlier). Mean confidence in this study was -1.8%, which indicates an accurate self-estimation. In other words, on average, participants did not demonstrate over- or underconfidence in general knowledge questionnaire. Therefore, hypothesis 1b concerning a 10-20% of mean overconfidence did not gain support.

### **The relationships between personality traits and over-/underconfidence**

Hypotheses 2-3 were tested using regression analysis. These were done for all variables separately, and in the final phase, all variables were included simultaneously in the same model. Modeling of over-/underconfidence with only one independent variable at a time resulted in small but significant results in all three tested separate models. The first separate model ( $Y_{\text{Confidence}} = a + X_{\text{Neuroticism}}$ ) showed that neuroticism related sub-trait Worrying & self-criticism associated statistically significantly with underconfidence ( $\beta = -.21, p < .05$ ). The second model ( $Y_{\text{Confidence}} = a + X_{\text{Extraversion}}$ ) showed that extraversion related sub-trait “Need for Sociability & Company” associated also statistically with overconfidence ( $\beta = .17, p < .05$ ). Finally, the third model ( $Y_{\text{Confidence}} = a + X_{\text{Narcissism}}$ ) showed a statistically significant association between overconfidence and narcissism ( $\beta = .19, p < .05$ ). These preliminary results indicate that individuals high in neuroticism tended to be underconfident, and individuals high in extraversion subscale or narcissism tended to be overconfident.

However, the results differed when all the three variables were tested in the same regression model ( $Y_{\text{Confidence}} = a + X_{\text{Extraversion}} + X_{\text{Neuroticism}} + X_{\text{Narcissism}}$ ). Table 4 shows that neuroticism related sub-trait “Worrying & self-criticism” associated statistically significantly with underconfidence ( $\beta = -.18, p < .05$ ). This result indicates that the higher individuals scored in the scale of Worrying & Self-criticism, the greater their underconfidence was. On the contrary, Extraversion related sub-trait Need for Sociability & Company ( $\beta = .08, p = .37$ ), and narcissism ( $\beta = .08, p = .43$ ) did not statistically significantly associate with overconfidence. Overall, personality differences predicted 7% of the total variance in confidence. Multicollinearity was not found, and the VIF-values varied from 1.2 to 1.5. To conclude, Hypothesis 2b was supported by the results, as Hypotheses 2a and 3 gained support only in preliminary but not in final results.

Table 4. Predictors of over-/underconfidence ( $n = 155$ )

Variable	Over-/underconfidence		
	$\beta$	$p$	$VIF$
Sociability & Company	.08	.37	1.3
Worrying & Self-criticism	-.18	.04	1.2
Narcissism	.08	.43	1.5
$\Delta R^2$	.07		
$R^2$	.07	.01	

$\beta$  = standardized regression coefficient

$\Delta R^2 = R^2$  change, when all the predictors are in the model

## DISCUSSION

### Main results

The first aim of this study was to gain information on how people self-estimate their performance in general knowledge questionnaire during a personnel assessment day. That is, do personnel assessment participants think they are better or worse than they really are, or are they, in fact, aware of their accurate performance level? Secondly, this thesis aimed at finding which personality traits may predispose individuals to over- or underconfidence. The main results of this study first indicate that the candidates participating personnel assessment day estimated their performance accurately and on average, over- or underconfidence was *not* demonstrated. Furthermore, of all studied personality traits, only neuroticism was associated with self-estimation of performance when regression analysis was modeled in the final model, including all the personality variables. In other words, individuals scoring high in neuroticism typically underestimated their performance. Next, these results are discussed in detail.

Hypothesis 1a gained support since a moderate positive association between performance accuracy, and confidence ( $r = .53$ ) was found. Typically, in the past research, the correlation between accuracy and confidence has been smaller and varied between .20-.40 (Freund & Kasten, 2012; Furnham, 2001; Jacobs et al., 2012; Soh & Jacobs, 2013). The relationship in this study was stronger, which indicates that the participants were better in self-estimation than in past confidence research. The differing results compared to past research may be caused by two reasons. Firstly, performance in general knowledge questions may be easier to self-estimate than, for example, performance in cognitive ability tests (Furnham, 2001; Soh & Jacobs, 2013). This is because the familiarity of the self-estimation domain (in this case, general knowledge) have discussed to increase the ability to self-estimate (Freund & Kasten, 2012). In other words, individuals have gained feedback and experience in self-estimation of general knowledge related subjects during schooling and therefore are better self-estimators of their general knowledge than, for example, visual ability (Pallier, 2003).

The second explanation for differing results may lie in the ability level of participants. Since participants were candidates for specialist and leading positions, their level of ability may be higher than in the normal population which has been previously found to be related to success in self-estimating (Dunning, 2005). That is, Dunning (2005) has found that a low level of cognitive ability may elevate the risk of being overconfident whereas middle demonstrate a decreased level of overconfidence and typically the top performers tend to underestimate their performance. Basically, in Dunning's findings, typical self-ratings in reasoning tests vary between 60-70% regardless of the

actual performance, which was, in fact, the case also in this study. The current sample was extremely selected (discussed further in limitations of the study), and the majority of participants may belong to the group that has a propensity to demonstrate a decreased level of overconfidence or even underconfidence. In conclusion, familiarity and high ability level may both enhance the accuracy of self-estimation and decrease, especially overconfident self-estimation behavior.

In hypothesis 1b, 10-20% of overconfidence was expected. Mean confidence in this study was -1.8%, which indicates an accurate self-estimation. In other words, on average, participants did not demonstrate overconfidence in general knowledge questionnaire. Hence hypothesis 1b did not gain support. Interestingly, the second-largest group in the sample was the underconfident group ( $n = 50, 32\%$ ). A reasonably high number of participants demonstrating underconfidence may be explained by the themes discussed above but also by the task difficulty. Moore and Healy (2008) concluded past research where participants show most underestimation if the task in hand is easy. Since the participants performed well in the general knowledge questionnaire, many participants may have considered the task easy. This, in turn, may have led to underestimations of performance. To conclude hypothesis 1b, an accurate ability to self-estimate was found instead of average overconfidence.

Hypothesis 2b gained support as neuroticism related sub-trait Worrying and Self-criticism associated statistically significantly with underconfidence, which is an association past research has lacked finding (Jacobs et al., 2012; Schaefer et al., 2004; Soh & Jacobs, 2013). The association between neuroticism and underconfidence is supported by past research where individuals high in neuroticism provide low self-ratings but not low performances in cognitive ability tests (Chamorro-Premuzic et al., 2005). In other words, this indicates that their self-estimations may be negatively biased. Indeed, a tendency to underestimate own performance (i.e., underconfidence) among individuals high in neuroticism is a central and novel finding in this study. The reasons why individuals high in neuroticism have a propensity of underconfidence remains unknown. When studying the core of neuroticism, a vast array of characteristics potentially decreasing the level of confidence is found. Neuroticism has been linked to, for example, depression, low optimism, negative affectivity, rumination and worrying (Fu, Koutstaal, Fu, Poon, & Cleare, 2005; McNiel & Fleeson, 2006; Muris et al. 2005; Sharpe et al., 2011). Firstly, it can be hypothesized that above-mentioned tendencies to negativity can act as self-fulfilling prophecies. For example, worrying can be defined as expecting possible adverse outcomes in the future (Borkovec, Robinson, Pruzinsky, & DePree, 1983). It is plausible that worrying or other negative affects may serve as a vehicle between neuroticism and underconfidence. A second explanation may be that neuroticism is associated with a tendency to avoid risks which may have led individuals high in neuroticism to "play safe" in self-

estimation of the general knowledge test (Kuhnen, Samanez-Larkin & Knutson, 2013). A third possible explanation may be understood by the tendency of individuals high in neuroticism to be self-critical and feel personally inadequate (Watson, Clark, & Harkness, 1994). Indeed, Robinson, Ode, Moeller & Goetz (2007) found that individuals high in neuroticism are more efficient retrieving negative self-related memories. It is possible that memories on performance affect how an individual estimates his/her current performance. Therefore, it may be suggested that if memories are negatively biased, an individual may have a risk of estimating his/her performance in an underconfident manner. To conclude, overly critical and negative mindset, tendency to avoid risks and negatively biased memory may all hamper the self-estimation and produce underconfidence when self-estimating.

Hypothesis 2a and 3 did not gain support in the final model where all personality traits were included. That is, neither extraversion nor narcissism was statistically related to overconfidence in the final regression model even though preliminary results (correlations and separate regression models) indicated a positive relationship. Therefore, the intriguing theme of finding a "risk profile" of an overconfident individual suggested at the beginning of this thesis requires further studying. The reason why significant relationships between extraversion and overconfidence and also narcissism and overconfidence faded in this study may be due to four possible explanations. Firstly, to find the traits that increase the risk of overconfidence a sufficient number of overconfident participants must be included in the study. In this study, the sample size of 155, with only 41 overconfident individuals may be too small to find the predictors of overconfidence.

A second important explanation for non-significant results may be related to the Y-variable of this study. Many of the studies that touch on the topic of over-/underconfidence actually study self-estimated *confidence* without specifying is it realistic or not. They may, for example, state that extraverted, stable, disagreeable and open individuals give the highest self-estimates without analyzing the self-estimation against actual performance (Chamorro-Premuzic, Furnham, & Moutafi, 2004; Chamorro-Premuzic, Moutafi, & Furnham, 2005; Furnham, Kidwai, & Thomas, 2001; Furnham, Moutafi, & Chamorro-Premuzic, 2005; Furnham & Thomas, 2004). In other words, if the found confidence or high estimations is over- or underconfidence remains unknown. Contrary to most past research, this study actually measures whether self-estimated confidence is realistic or not, which is the main strength of this study.

Thirdly, past research has studied overconfidence phenomenon utilizing, for example, partial correlations (Schaefer et al., 2003). Also, in this study, correlations and regression analysis in separate models showed a significant relationship between extraversion and overconfidence and narcissism and overconfidence. When regression analysis was conducted, including all the three significant variables, only neuroticism sustained its significance. This suggests that a positive relationship

between overconfidence and extraversion/narcissism *is* found (when tested with correlations or separate regression models), but because of the mutual correlations and small effect sizes, these associations are not significant in the final model.

Fourthly, the contrary results may also be explained by the utilized personality scales in this study. In the current study, extraversion was assessed by only two sub-traits “Need for Sociability and Company” and “Need to Lead and Decide” whereas past research has utilized more comprehensive scales of extraversion (Jacobs, 2012; Schaefer et al., 2003; Soh & Jacobs, 2013). Therefore, the non-significant results in this study may indicate that the scales do not measure the specific facets of extraversion that associates with overconfidence. Another explanation may be that extraversion is not a relevant risk factor in specific domains or gender. In the study of Soh and Jacobs (2013), extraversion associated with overconfidence when fluid reasoning was measured but not when self-estimations of comprehension-knowledge (Gc) was studied. This is interesting since crystallized knowledge (Gc) was the focus also in the current study. Based on the understanding of these two studies, extraversion may not be a relevant predictor of overconfidence when crystallized knowledge is self-estimated. In addition, Soh and Jacobs (2013) found that high extraversion predicted overconfidence of female but not male participants. In the current study, the majority of participants were male, which may be another reason why the effect between extraversion and overconfidence remained small.

Finally, the utilized scale may also explain the non-significant result between narcissism and overconfidence. In the study of Macenczak et al. (2016), narcissism was measured with two inventories, NPI-44 and NP1-13. The former included 44 items and the latter only 13. Their results showed that the relationships between narcissism and different types of overconfidence were somewhat stronger when more comprehensive inventory was utilized and even, in one case, the significant result disappeared when a shorter inventory was analyzed. This may suggest that the narcissism inventory utilized in this study may be too narrow to study the relationship between narcissism and overconfidence optimally.

### **Estimation of the study and future research**

This study adds valuable input to the confidence research since self-estimation accuracy is studied mainly utilizing cognitive ability tests, and general knowledge based research is very sparse. In addition, past research has focused primarily on whether personality traits associate or moderate level of confidence without any differentiation when confidence is, in fact, accuracy, over- or underconfidence (Furnham, Kidwai, & Thomas, 2001; Furnham & Thomas, 2004; Soh & Jacobs,

2013). Hence, results show, for example, that certain personality traits are associated with high self-estimates *but* whether that is warranted in terms of actual performance remains unknown. Revealing the associations between personality and overconfidence and underconfidence is the main strength of this study. The general knowledge test questionnaire developed for this study is novel and broader in terms of the number of questions and included domains (e.g., history, social sciences, politics) compared to past research (Macenczak et al., 2016; Schaefer et al., 2004). Therefore, the possibility that the questionnaire is biased and gives advantage to, for example, certain professions or gender is decreased.

The main limitation of this study is a highly selected sample which also limits the applicability of the results. Firstly, the personnel selection context by itself is unique. Hence, the participants hold characteristics that may differ from the general population. On the other hand, the questionnaire developed for this study was aimed to be utilized, especially in a personnel selection context. Therefore, the context of the study is justified. Secondly, the participation in the study was voluntary; thus, individuals, especially talented in general knowledge, may have had a greater urge to participate. Thirdly, the sample also contains an unusual number of top performers as the proportion of low performers (performance accuracy in general knowledge questionnaire < 50%) was only approximately 5%. In other words, almost all performed reasonably or exceptionally well in this sample. As described earlier, high performance in the test enhances the ability to self-estimate. Therefore, the sample size ( $n = 155$ ) included a fair amount of accurate self-estimators, and surprisingly few individuals were considered as overconfident. Hence, the fourth limitation in this study is that the sample may have been insufficient in size to capture the full variance of overconfidence and the traits associated with overconfidence.

Future study is needed to deepen the knowledge of the association between neuroticism and underconfidence. Research questions to be investigated could be, for example: Do individuals high in neuroticism demonstrate underconfidence in job search (in CVs, applications)? Do individuals high in neuroticism underestimate their skills in interviewing or in employee appraisals? Are neuroticism and underconfidence associated to risk-avoidance in occupational context? This would broaden the understanding of the relationship between neuroticism and underconfidence and gain knowledge on how neuroticism is related to work-related behavior. Past research has found the relationship between personality (namely, extraversion and narcissism) and overconfidence (Macenczak et al., 2016; Schaefer et al. 2004). Therefore, the associations could be studied by utilizing a different study setting, for example, self-estimation in a social situation. In addition, different statistical approach, for example, categorizing the sample according to the level of confidence to three categories (underconfident, accurate and overconfident) could bring valuable

insight when studying the relationship between personality traits and over-/underconfidence. Additionally, past research (e.g., Dunning, 2005) has found associations between performance level and ability to self-estimate and therefore, the interaction of intelligence could be studied. Lastly, the coefficient of relationship was modest in this study. Therefore, different personality traits (e.g., optimism, extraversion as a comprehensive trait as opposed to sub-trait) could be studied to find the best predictors of over- and underconfidence.

## **Conclusions**

In light of this study and contrary to past research, overconfidence is not an issue when self-estimating one's general knowledge. On average, people are self-aware of their performance and very accurate in their self-estimation. The focus started from overconfidence in this thesis, but the results show that it is, in fact, underconfidence that demands attention. This study captured a novel finding that people high in neuroticism tend to demonstrate underconfidence in self-estimation of performance. The finding that neuroticism predicts underconfidence is important in an occupational context. Firstly, individuals high in neuroticism may be at risk of presenting oneself in a negative light, for example, in job applications and CVs. Therefore, an aware recruitment professional can utilize this information when assessing the candidate. A recruiter may, for example, utilize referee information and support the candidate to present his/her strengths and accomplishments to gain more accurate knowledge of the candidate's ability or past performance. Secondly, it is plausible that underconfidence may flatten productivity and job performance if an individual is overly risk-avoidant and does not seize opportunities worth trying. An intervention where underconfidence is focused by enhancing better self-estimation may be beneficial for individuals overly critical toward oneself. Thirdly, negative affectivity, and critical self-view may be an optimal ground for underconfidence to flourish; thus, an intervention utilizing positive psychology approaches could potentially combat against underconfidence. For example, interventions of self-compassion and psychological capital (namely, optimism, self-efficacy, resilience, and hope) have been linked to generating positive emotions, environmental mastery and many other positive outcomes (Burton, Bakenham & Brown, 2020; Cohn & Fredrikson, 2010; Luthans, Avoy, Avolio & Peterson, 2010) that may act as buffers against underconfidence. This being said, further studying is necessary to verify the power of psychological capital against underconfidence. Fourthly, it is not all doom and gloom when it comes to neuroticism at work life. Neuroticism may provide advantages in decision-making and risk-detection (Oehler, Wendt, Wedlich & Horn, 2017). At the beginning of this thesis, a worry concerning overconfidence in decision-making and risk-taking was stated. Since individuals high in neuroticism tend to

demonstrate less risky behavior, it is suggested that neuroticism (in sufficient amounts) may be beneficiary when a high degree of quality control, critical thinking, and evaluation is required (George & Jones, 2005; Jeronimus, 2015; Kuhnen, 2013; Oehler, Wendt, Wedlich & Horn, 2017). Hence in group decision-making, individuals prone to overly optimism and those prone to critical thinking may balance each other and enhance the quality of decision-making. Whether neuroticism increases accurate and realistic judgments further research is required.

Including self-estimation of performance, in other words, assessing biases towards under- or overconfidence, provides information of the potential thinking style a candidate views him-/her-self, how he/she embraces risks and what type of information he/she includes into evaluations before making decisions. Additionally, studying candidate's over- and underconfidence may reveal aspects of optimism, self-view, self-efficacy, and self-awareness to mention a few possible explanations for under-/overconfidence. Methodologically this procedure brings incremental validity over and beyond traditional self-reports hence increases the predictive power of assessment battery. Assessing under- or overconfidence provides, therefore valuable information in the recruiting context. For example, neuroticism, coupled with the realistic self-estimation ability, may be a better fit to a position requiring high decision-making skills than neuroticism combined with underconfidence. Vice versa, individual high in narcissism (or extraversion) and with a realistic self-estimation ability may perform better in a position requiring risk management or high-quality decision making than an individual scoring high in narcissism (or extraversion) and overconfidence. Even though further studying is required to fully understand which factors lie under biased confidence and how these biases impact on work-related behavior assessment of over-/underconfidence provides interesting and additional information beyond self-reporting into personnel assessment battery.

## REFERENCES

- Ackerman, P. L., & Heggestad, E. D. (1997). Intelligence, personality, and interests: Evidence for overlapping traits. *Psychological Bulletin*, *121*(2), 219–245. <https://doi.org/10.1037/0033-2909.121.2.219>
- Ackerman, R. A., Witt, E. A., Donnellan, M. B., Trzesniewski, K. H., Robins, R. W., & Kashy, D. A. (2011). What Does the Narcissistic Personality Inventory Really Measure? *Assessment*, *18*(1), 67–87. <https://doi.org/10.1177/1073191110382845>
- Ames, D. R., & Kammrath, L. K. (2004). Mind-Reading and Metacognition : Narcissism, Not Actual Competence, Predicts Self-Estimated Ability. *Journal of Nonverbal Behavior*, *28*(3), 187–209. Retrieved from <https://doi.org/10.1023/B:JONB.0000039649.20015.0e>
- Bass, B. M., & Yammarino, F. J. (1991). Congruence of Self and Others' Leadership Ratings of Naval Officers for Understanding Successful Performance. *Applied Psychology*, *40*(4), 437–454. <https://doi.org/10.1111/j.1464-0597.1991.tb01002.x>
- Borkovec, T. D., Robinson, E., Pruzinsky, T., & DePree, J. A. (1983). Preliminary exploration of worry: Some characteristics and processes. *Behaviour Research and Therapy*, *21*, 9–16.
- Burson, K. A., Larrick, R. P., & Klayman, J. (2006). Skilled or unskilled, but still unaware of it: How perceptions of difficulty drive miscalibration in relative comparisons. *Journal of Personality and Social Psychology*, *90*(1), 60–77. <https://doi.org/10.1037/0022-3514.90.1.60>
- Burton, N. W., Pakenham, K. I., & Brown, W. J. (2010). Feasibility and effectiveness of psychosocial resilience training: A pilot study of the READY program. *Psychology, Health & Medicine*, *15*(3), 266–277. doi:10.1080/13548501003758710
- Buss, D. M., & Chiodo, L. M. (1991). Narcissistic Acts in Everyday Life. *Journal of Personality*, *59*(2), 179–215. <https://doi.org/10.1111/j.1467-6494.1991.tb00773.x>
- Campbell, W. K., Goodie, A. S., & Foster, J. D. (2004). Narcissism, confidence, and risk attitude. *Journal of Behavioral Decision Making*, *17*(4), 297–311. <https://doi.org/10.1002/bdm.475>
- Carroll, J. B., (1997). *Contemporary intellectual assessment: Theories, tests, and issues. The three-stratum theory of cognitive abilities.* (& P. L. H. (Eds. . D. P. Flanagan, J. L. Genshaft, Ed.). New York: Guilford Press. Retrieved from <http://psycnet.apa.org/record/1997-97010-007>
- Chamorro-Premuzic, T., Furnham, A., & Moutafi, J. (2004). The relationship between estimated and psychometric personality and intelligence scores. *Journal of Research in Personality*, *38*(5), 505–513. <https://doi.org/10.1016/J.JRP.2003.10.002>

- Chamorro-Premuzic, T., Moutafi, J., & Furnham, A. (2005). The relationship between personality traits, subjectively-assessed and fluid intelligence. *Personality and Individual Differences*, 38(7), 1517–1528. <https://doi.org/10.1016/J.PAID.2004.09.018>
- Cohn, M. A., & Fredrickson, B. L. (2010). In search of durable positive psychology interventions: Predictors and consequences of long-term positive behavior change. *The Journal of Positive Psychology*, 5(5), 355-366. doi:10.1080/17439760.2010.508883
- Costa, P. T., & McCrae, R. R. (1980). Influence of extraversion and neuroticism on subjective well-being: Happy and unhappy people. *Journal of Personality and Social Psychology*, 38(4), 668–678. <https://doi.org/10.1037/0022-3514.38.4.668>
- Costa, P. T., & McCrae, R. R. (1992). Four ways five factors are basic. *Personality and Individual Differences*, 13(6), 653–665. [https://doi.org/10.1016/0191-8869\(92\)90236-I](https://doi.org/10.1016/0191-8869(92)90236-I)
- DePaulo, B. M., Charlton, K., Cooper, H., Lindsay, J. J., & Muhlenbruck, L. (1997). The Accuracy-Confidence Correlation in the Detection of Deception. *Personality and Social Psychology Review*, 1(4), 346–357. [https://doi.org/10.1207/s15327957pspr0104\\_5](https://doi.org/10.1207/s15327957pspr0104_5)
- Denissen J., Penke, L. (2008). Neuroticism predicts reactions to cues of social inclusion. *European Journal of Personality*, 22, 497-517.
- Dunning, D. (2005). *Self-insight: Roadblocks and detours on the path to knowing thyself*. New York, NY. US: Psychology Press. <https://doi.org/10.4324/9780203337998>
- Dunning, D., Heath, C., & Suls, J. M. (2004). Flawed Self-Assessment. *Psychological Science in the Public Interest*, 5(3), 69–106. <https://doi.org/10.1111/j.1529-1006.2004.00018.x>
- Dunning, D., Johnson, K., Ehrlinger, J., & Kruger, J. (2003). Why People Fail to Recognize Their Own Incompetence. *Current Directions in Psychological Science*, 12(3), 83–87. <https://doi.org/10.1111/1467-8721.01235>
- Foster, J. D., Reidy, D. E., Misra, T. A., & Goff, J. S. (2011). Narcissism and stock market investing: Correlates and consequences of cocksure investing. *Personality and Individual Differences*, 50(6), 816–821. <https://doi.org/10.1016/J.PAID.2011.01.002>
- Freund, P. A., & Kasten, N. (2012). How smart do you think you are? A meta-analysis on the validity of self-estimates of cognitive ability. *Psychological Bulletin*, 138(2), 296–321. <https://doi.org/10.1037/a0026556>
- Fu, T., Koutstaal, W., Fu, C. H. Y., Poon, L., & Cleare, A. J. (2005). Depression, Confidence, and Decision: Evidence Against Depressive Realism. *Journal of Psychopathology and Behavioral*

*Assessment*, 27(4), 43–252.

- Furnham, A. (2001). Self-estimates of intelligence: culture and gender difference in self and other estimates of both general (g) and multiple intelligences. *Personality and Individual Differences*, 31(8), 1381–1405. [https://doi.org/10.1016/S0191-8869\(00\)00232-4](https://doi.org/10.1016/S0191-8869(00)00232-4)
- Furnham, A., Kidwai, A., & Thomas, C. (2001). Personality, psychometric intelligence, and self-estimated intelligence. *Journal of Social Behavior and Personality*, 16 (1) Pp. 97-114. (2001) . Retrieved from <http://discovery.ucl.ac.uk/1423033/>
- Furnham, A., Moutafi, J., & Chamorro-Premuzic, T. (2005). Personality and Intelligence: Gender, the Big Five, Self-Estimated and Psychometric Intelligence. *International Journal of Selection and Assessment*, 13(1), 11–24. <https://doi.org/10.1111/j.0965-075X.2005.00296.x>
- Furnham, A., & Thomas, C. (2004). Parents' gender and personality and estimates of their own and their children's intelligence. *Personality and Individual Differences*, 37(5), 887–903. <https://doi.org/10.1016/J.PAID.2003.10.011>
- George, J. M., & Jones, G. R. (2005). Understanding and managing organizational behavior. Upper Saddle River, N.J: Pearson Prentice Hall.
- Hogrefe. (2018). PK5 - Hogrefe.fi. Retrieved January 31, 2019, from <https://www.hogrefe.fi/testit/PK5>
- Honkanen, H., & Nyman, K. (2001). *Hyvän henkilöarvioinnin käsikirja*. Helsinki: Psykologien Kustannus Oy.
- Jacobs, K. E., Szer, D., & Roodenburg, J. (2012). The moderating effect of personality on the accuracy of self-estimates of intelligence. *Personality and Individual Differences*, 52(6), 744–749. <https://doi.org/10.1016/J.PAID.2011.12.040>
- Jeronimus, B. (2015). Environmental influences of neuroticism: A story about emotional (in)stability. (Doctoral dissertation). The University of Groningen. Available: [https://www.researchgate.net/profile/Bertus\\_Jeronimus/publication/273137459\\_Environmental\\_influences\\_on\\_neuroticism\\_A\\_story\\_about\\_emotional\\_instability/links/54f981430cf210398e98cbeb/Environmental-influences-on-neuroticism-A-story-about-emotional-instability.pdf](https://www.researchgate.net/profile/Bertus_Jeronimus/publication/273137459_Environmental_influences_on_neuroticism_A_story_about_emotional_instability/links/54f981430cf210398e98cbeb/Environmental-influences-on-neuroticism-A-story-about-emotional-instability.pdf)
- Kleitman, S., & Stankov, L. (2007). Self-confidence and metacognitive processes. *Learning and Individual Differences*, 17(2), 161–173. <https://doi.org/10.1016/J.LINDIF.2007.03.004>
- Kring, A., Davison, S., Neale, G. & Johnson, J. (2011). Abnormal psychology. Hoboken, NJ: J. Wiley.

- Kruger, J. (1999). Lake Wobegon Be Gone! The “Below-Average Effect” and the Egocentric Nature of Comparative Ability Judgments. *Journal of Personality and Social Psychology*, 77(2), 221–232. Retrieved from <https://oae-ovid-com.helios.uta.fi/article/00005205-199908000-00002>
- Kuhnen, C., Samanez-Larkin, G. & Knutson, B. (2013) Serotonergic genotypes, neuroticism, and financial choices. *PLoS ONE* 8: e54632. <https://doi.org/10.1371/journal.pone.0054632>
- Luchner, A. F., Houston, J. M., Walker, C., & Alex Houston, M. (2011). Exploring the relationship between two forms of narcissism and competitiveness. *Personality and Individual Differences*, 51(6), 779–782. <https://doi.org/10.1016/J.PAID.2011.06.033>
- Luthans, F., Avey, J. B., Avolio, B. J., & Peterson, S. J. (2010). The development and resulting performance impact of positive psychological capital. *Human Resource Development Quarterly*, 21(1), 41-67. <http://dx.doi.org/10.1002/hrdq.20034>
- Macenczak, L. A., Campbell, S., Henley, A. B., & Campbell, W. K. (2016). Direct and interactive effects of narcissism and power on overconfidence. *Personality and Individual Differences*, 91, 113–122. <https://doi.org/10.1016/J.PAID.2015.11.053>
- McCrae, R. R., & Costa, P. T. (2008). *Handbook of personality: Theory and research. The five-factor theory of personality*. (O. P. John, R. W. Robins, & L. A. Pervin, Eds.) (3rd ed.). New York: Guilford Press.
- McCrae, R. R., & John, O. P. (1992). An Introduction to the Five-Factor Model and Its Applications. *Journal of Personality*, 60(2), 175–215. <https://doi.org/10.1111/j.1467-6494.1992.tb00970.x>
- McGrew, K., Flanagan, D., & McDonough. (2018). Cattell-Horn-Carrol (CHC) theory of intelligence update (2.5) - YouTube. Retrieved November 22, 2018, from <https://www.youtube.com/watch?v=6FVEyaBT2R4>
- McNiela, J. M., & Fleeson, W. (2006). The causal effects of extraversion on positive affect and neuroticism on negative affect: Manipulating state extraversion and state neuroticism in an experimental approach. *Journal of Research in Personality*, 40(5), 529–550.
- Miller, J. D., McCain, J., Lynam, D. R., Few, L. R., Gentile, B., MacKillop, J., & Campbell, W. K. (2014). A comparison of the criterion validity of popular measures of narcissism and narcissistic personality disorder via the use of expert ratings. *Psychological Assessment*, 26(3), 958–969. <https://doi.org/10.1037/a0036613>
- Moore, D. A., & Healy, P. J. (2008). The trouble with overconfidence. *Psychological Review*, 115(2), 502–517. <https://doi.org/10.1037/0033-295X.115.2.502>

- Morf, C., & Rhodewalt, F. (2001). Unraveling the Paradoxes of Narcissism: A Dynamic Self-Regulatory Processing Model. *Psychological Inquiry*, 12(4), 177–196.
- Muris, P., Roelofs, J., Rassin, E., Franken, I., & Mayer, B. (2005). Mediating effects of rumination and worry on the links between neuroticism, anxiety, and depression. *Personality and Individual Differences*, 39(6), 1105-1111. <http://dx.doi.org/10.1016/j.paid.2005.04.005>
- Nathan DeWall, C., Buffardi, L. E., Bonser, I., & Keith Campbell, W. (2011). Narcissism and implicit attention seeking: Evidence from linguistic analyses of social networking and online presentation. *Personality and Individual Differences*, 51(1), 57–62. <https://doi.org/10.1016/J.PAID.2011.03.011>
- Nederström, M., & Furnham, A. (2012). The relationship between FFM and personality disorders in a personnel selection sample. *Scandinavian Journal of Psychology*, 53(5), 421–429. <https://doi.org/10.1111/j.1467-9450.2012.00964.x>
- Oehler, A., Wendt, S., Wedlich, F. & Horn, M. (2017). Investors’ Personality Influences Investment Decisions: Experimental Evidence on Extraversion and Neuroticism. *Journal of Behavioral Finance*. 19. [10.1080/15427560.2017.1366495](https://doi.org/10.1080/15427560.2017.1366495).
- O’Reilly, C. A., Doerr, B., & Chatman, J. A. (2018). “See You in Court”: How CEO narcissism increases firms’ vulnerability to lawsuits. *The Leadership Quarterly*, 29(3), 365–378. <https://doi.org/10.1016/J.LEAQUA.2017.08.001>
- Pallier, G. (2003). Gender Differences in the Self-Assessment of Accuracy on Cognitive Tasks. *Sex Roles*, 48(5/6), 265–276. <https://doi.org/10.1023/A:1022877405718>
- Paulhus, D. L., Harms, P. D., Bruce, M. N., & Lysy, D. C. (2003). The over-claiming technique: Measuring self-enhancement independent of ability. *Journal of Personality and Social Psychology*, 84(4), 890–904. <https://doi.org/10.1037/0022-3514.84.4.890>
- Pincus, A. L., & Lukowitsky, M. R. (2010). Pathological Narcissism and Narcissistic Personality Disorder. *Annual Review of Clinical Psychology*, 6(1), 421–446. <https://doi.org/10.1146/annurev.clinpsy.121208.131215>
- Psycon. (2019). *Motivaatiomittarin manuaali*. Helsinki. Psycon Corp.
- Raskin, R., & Novacek, J. (1991). Narcissism and the use of fantasy. *Journal of Clinical Psychology*, 47(4), 490–499. [https://doi.org/10.1002/1097-4679\(199107\)47:4<490::AID-JCLP2270470404>3.0.CO;2-J](https://doi.org/10.1002/1097-4679(199107)47:4<490::AID-JCLP2270470404>3.0.CO;2-J)
- Raskin, R., & Terry, H. (1988). A principal-components analysis of the Narcissistic Personality

- Inventory and further evidence of its construct validity. *Journal of Personality and Social Psychology*, 54(5), 890–902. Retrieved from <http://www.ncbi.nlm.nih.gov/pubmed/3379585>
- Ree, M. J., Earles, J., & Teachout, M. S. (1994). Predicting Job Performance : Not Much More Than g. *Journal of Applied Psychology*, 79(4), 518–524. Retrieved from <https://oae-ovid-com.helios.uta.fi/article/00004565-199408000-00005/HTML>
- Robinson, M. D., Ode, S., Moeller, S. K., & Goetz, P. W. (2007). Neuroticism and affective priming: Evidence for a neuroticism-linked negative schema. *Personality and Individual Differences*, 42(7), 1221-1231. <http://dx.doi.org/10.1016/j.paid.2006.09.027>
- Russo, J. E., & Schoemaker, P. (1992). Managing Overconfidence. *Sloan Management Review*, 33(1), 7–17.
- Schaefer, P. S., Williams, C. C., Goodie, A. S., & Campbell, W. K. (2004). Overconfidence and the Big Five. *Journal of Research in Personality*, 38(5), 473–480. <https://doi.org/10.1016/J.JRP.2003.09.010>
- Sharpe, P., Martin, N., & Kelly, R. (2011). Optimism and the Big Five factors of personality: Beyond Neuroticism and Extraversion. *Personality and Individual Differences*, 51(8), 946–951.
- Soh, L., & Jacobs, K. E. (2013). The biasing effect of personality on self-estimates of cognitive abilities in males and females. *Personality and Individual Differences*, 55(2), 141–146. <https://doi.org/10.1016/J.PAID.2013.02.013>
- Stankov, L., & Crawford, J. D. (1997). Self-Confidence and Performance on Tests of Cognitive Abilities. *Intelligence*, 25(2), 93–109.
- Stanovich, K. E., & West, R. F. (1998). Individual differences in rational thought. *Journal of Experimental Psychology: General*, 127(2), 161–188.
- Suomen Psykologiliitto ry. (2019). Sertifikaatin hakeminen. Retrieved February 5, 2019, from [http://www.psyli.fi/tietoa\\_psykologeista/henkiloarviointi/hakumenettely](http://www.psyli.fi/tietoa_psykologeista/henkiloarviointi/hakumenettely)
- Sümer, N., Özkan, T., & Lajunen, T. (2006). Asymmetric relationship between driving and safety skills. *Accident Analysis & Prevention*, 38(4), 703–711. Retrieved from <https://doi.org/10.1016/j.aap.2005.12.016.itle>
- Syzmanowicz, A., & Furnham, A. (2011). Gender differences in self-estimates of general, mathematical, spatial and verbal intelligence: Four meta analyses. *Learning and Individual Differences*, 21(5), 493–504. <https://doi.org/10.1016/J.LINDIF.2011.07.001>
- Tekleab, A., Sims, H., Yun, S., Tesluk, P., & Cox, J. (2008). Are We On the Same Page? Effects of

Self-Awareness of Empowering and Transformational Leadership. *Journal of Leadership & Organizational Studies - J Leader Organ Stud.* 14. 185-201. 10.1177/1071791907311069.

Vassend, O., & Skrandal, A. (2011). The NEO personality inventory revised (NEO-PI-R): Exploring the measurement structure and variants of the five-factor model. *Personality and Individual Differences*, 50(8), 1300–1304. <https://doi.org/10.1016/J.PAID.2011.03.002>

Visser, B. A., Ashton, M. C., & Vernon, P. A. (2008). What Makes You Think You're so Smart? *Journal of Individual Differences*, 29(1), 35–44. <https://doi.org/10.1027/1614-0001.29.1.35>

Watson, D., Clark, L. A., & Harkness, A. R. (1994). Structures of personality and their relevance to psychopathology. *Journal of Abnormal Psychology*, 103(1), 18-31. <http://dx.doi.org/10.1037/0021-843X.103.1.18>