Handelshøyskolen BI

GRA 19703 Master Thesis

Thesis Master of Science 100% - W

Predefinert informasjon

Startdato:	16-01-2022 09:00	**Termin:**	202210
Sluttdato:	01-07-2022 12:00	**Vurderingsform:**	Norsk 6-trinns skala (A-F)
Eksamensform:	T		
Flowkode:	202210||10936||IN00||W||T		
Intern sensor:	(Anonymisert)		

Deltaker

Navn:	Andrea Solvang Hølvold og Ingrid Johanna Sandahl Uggla

Informasjon fra deltaker

Tittel *:	Social Transmission of Overconfidence and Team Performance
Navn på veileder *:	Thorvald Hærem

Inneholder besvarelsen konfidensielt materiale?:	Nei	**Kan besvarelsen offentliggjøres?:**	Ja

Gruppe

Gruppenavn:	(Anonymisert)
Gruppenummer:	160
Andre medlemmer i gruppen:	

Andrea Solvang Hølvold
Johanna Sandahl Uggla

BI Norwegian Business School
Master thesis

Social Transmission of Overconfidence and Team Performance

Hand-in date:
24.06.2022

Campus:
BI Oslo

Examination code and name:
GRA19703 Master Thesis

Supervisor:
Associate Professor Thorvald Hærem

Program:
Master of Science in Leadership and Organizational Psychology

This is a part of the MSc program at BI Norwegian Business School. The school takes no responsibility for the methods used, results found and conclusions drawn.

Acknowledgments

The thesis represents the result of our Master of Science degree in Leadership and Organisational Psychology at BI Norwegian Business School. We would like to thank BI Norwegian Business School and especially the Department of Management and Organisation, for two inspiring and educational years.

We would also thank our supervisor Thorvald Hærem for his insightful advice and guidance as well as his ability to engage and challenge us throughout this process. Also, we would like to thank our second supervisor, Lewend Mayiwar, for his guidance, advice, and encouragement throughout the writing of the thesis. We value our relationship with Lewend tremendously - he is always there to help, answer our questions, and share all tips he knows when it comes to the whole thesis project. We both value our supervisor's method of establishing psychological safety, supporting, and showing understanding. We are very grateful for both of our supervisors' time.

We would like to extend our sincerest thanks to Eirik Berger for assisting in advanced code creation in R studio, and to Magnus Abel Berger for his support and for spreading joy during a stressful time. We would also like to thank each other, from the first meeting in 2020 during the first week at BI, to countless exam assignments and presentations that we wrote together, and now finally delivering the final master's thesis together. We have enjoyed our time getting to know one another which has resulted in a friendship going forward.

Table of content

Abstract

The purpose of this study was to explore the relation between social transmission of overconfidence and team performance. We explored the moderating effect of analytical and intuitive cognitive styles and situational awareness on social transmission of overconfidence on team performance to gain a comprehensive understanding of this relation. An experimental study was conducted, and a sample of 567 participants provided the basis for this study. The results revealed, as expected, that social transmission of overconfidence will be negatively associated with team performance. We found no support for either of our moderating hypotheses, however, we did find significant direct effects of two of our moderating variables, which were analytical style and situational awareness on team performance. The implications for theory and practice, as well as the direction of future research, are discussed.

Keywords: Overconfidence, Social Transmission of Overconfidence, Groupthink, Situational Awareness, Cognitive style, Analytical Cognitive Style, Intuitive Cognitive Style.

1.0 Introduction

A profound interest in human cognitive biases and heuristics has grown in the judgement and decision-making field, as several scholars have acknowledged that individuals' capacities to make judgments and decisions are not solely dependent on rational cognitive processes (Kahneman, 2011; Simon, 1990). According to Tversky and Kahneman (1974), the human mind has specific systematic and predictable biases that influence judgment, thus they can lead to systematic and predictable errors in terms of decision-making. Overconfidence is one of the most constant, powerful, and prevalent psychological biases in humans (Johnson & Fowler, 2011; Kahneman, 2011). In 2015, Nobel Prize winner and psychologist Daniel Kahneman stated in the Guardian that if he could use a magic wand to eliminate any human bias, it would be overconfidence (Shariatmadari, 2015). The overconfidence bias influences decision-making in various areas such as leadership, politics, financial markets and organisations and gets the blame for global crises, dangerous leadership and bankruptcy (Glaser & Weber, 2010; Johnson & Fowler, 2011).

While individual overconfidence has received lots of research attention, group overconfidence has received significantly less (Cheng et al., 2021; Powell et al., 2011). Cheng and colleagues (2021) contribute to this field of research in their recent study, showing that individuals converge on levels of overconfidence when exposed to the overconfidence of others. They propose to test the social transmission of overconfidence hypothesis, which implies that social transmission mechanisms may be to blame for why and how overconfidence evolve in teams, groups and organisations. Managers and leaders in organisations should investigate how to develop highly effective teams, and research shows that reducing the overconfidence bias may enhance performance (Kahneman et al., 1982; Russo & Schoemaker, 1992). As part of this discussion, there is a debate on how to conceptualize overconfidence (Moore & Healy, 2008). Scholars agree that individuals' accuracy, or situational awareness, is part of overconfidence measures (Olsson, 2014). Situational awareness is a commonly used term to explain if individuals have gained an appropriate awareness of the situation they are in (Smith & Hancock, 1995), and high situational awareness levels are crucial for employees to work effectively together in teams (Brennan et al., 2020; Endsley & Kiris, 1995; Rafferty et al., 2013).

Furthermore, individual differences, particularly cognitive styles, are linked to decision-making heuristics and biases (Alaybek et al., 2021; Tversky & Kahneman, 1974). Rules of logic and statistics have been linked to rational reasoning, whilst heuristics have been linked to error-prone intuitions or even irrationality (Gigerenzer & Gaissmaier, 2011). These cognitive preferences for style impact how individuals approach and make decisions (Hodgkinson & Clarke, 2007b). As a result, it brings new perspectives to the debate over the influence cognitive style has on team performance.

Our study seeks to contribute to the lacking theory on group overconfidence mechanisms. The purpose of this thesis is to expand our understanding of the influence of social transmission of overconfidence on team performance. Additionally, we investigate if and how cognitive style and situational awareness are associated with the relation between social transmission of overconfidence and team performance.

2.0 Theoretical framework and hypotheses

Individuals are constantly surrounded by environments requiring them to make decisions in different settings. To reduce the complex task of assessing probabilities and predicting values when making decisions, individuals tend to rely on a limited number of cognitive heuristic principles to simplify judgmental operations (Tversky & Kahneman., 1974). In general, some argue that cognitive heuristics may be beneficial, however, a substantial amount of research shows that decisions based on such heuristics can lead to systematic mistakes, and thus poor judgment (Kahneman et al., 1982; Russo & Schoemaker, 1992). The Overconfidence Bias is one of the most robust findings in the decision and judgment literature (Meloy, 2006), and as Plous (1993) claimed *"No problem in judgment and decision making is more prevalent and more potentially catastrophic than overconfidence*" (p. 217). As a consequence, scholars have been interested in how to reduce decision-making biases (Cristofaro, 2017; Kahneman et al., 1982; Milkman et al., 2009). Kahneman (2011) argues that individuals rely on two types of thinking, where one happens automatically and almost unconsciously and depends on our intuition, while the other occurs when individuals engage in analytical and slower thinking processes. These two types of thinking have been commonly known as individuals' cognitive style (Blackman & Goldstein, 1982;

Denes-Raj & Epstein, 1994; Hodgkinson & Clarke, 2007a). When engaging in analytical processes, individuals may reduce the effect of cognitive heuristics and reduce systematic errors in decision-making (Kahneman, 2011).

The next section seeks to further examine the theory of overconfidence and its consequences, as well as further investigate how cognitive style may reduce biases, influence decision-making, and potentially impact performance.

2.1 Overconfidence

Overconfidence is described as the tendency to overestimate one's abilities (Brenner et al., 1996). People tend to make self-assessment errors, and when they do, they are usually in the direction of overconfidence (Miller & Geraci, 2011). For instance, students that perform poorly tend to predict that they will perform much better on exams than they do (Miller & Geraci., 2011). Additionally, people tend to underestimate the time they need to complete tasks (Buehler et al., 1994) and believe that they have better leadership skills than others (Dunning et al., 2004). There are several examples from everyday life where the Overconfidence bias is claimed to be the source of poor decision-making. For instance, high rates of corporate merger and acquisition failures (Malmendier & Tate, 2005), high levels of trading on financial markets despite high trade expenses (Barber & Odean, 2001), and underestimation of associated risk of active stock investing (Kyle & Wang, 1997). War and other human tragedies, such as the Vietnam War (Johnson & Fowler, 2011) and the 1986 Chernobyl nuclear disaster, have also been blamed on the Overconfidence bias (Plous, 1993).

There has been a debate among researchers on how to conceptualise and understand the mechanisms of overconfidence (e.g., (Campbell et al., 2004; Griffin & Tversky, 1992; Larrick et al., 2007). Moore and Healy (2008) have been influential researchers in the field of overconfidence by conceptualising the term. They examine overconfidence in three ways: *overestimation*, *overprecision*, and *overplacement*. *Overestimation* refers to the overestimation of one's true competence, performance, degree of control, or possibility of success. The second, *overprecision*, is the correctness of one's opinion. Finally, *overplacement occurs* when people believe that they are better than the average (Moore & Healy, 2008; Larrick et al., 2007). The importance of separating these three methods for assessing overconfidence is argued by research because of three key issues. First, the most frequent research paradigm confounds overestimation with overprecision. Second,

there is a high prevalence of underconfidence, and finally, there is a contradiction between overestimation and overplacement: domains with the highest overestimation generally have the highest underplacement, and the opposite (Moore & Healy, 2008, p. 502). Since these three types of overconfidence manifest differently in situations and have substantially disparate effects (Moore & Schatz, 2017), they should be considered individually and not interchangeably.

2.2 Overconfidence at a group-level

While research focusing on the overconfidence of individual decision-makers has received lots of attention, group mechanisms concerning overconfidence have received significantly less attention (Cheng et al., 2021; Powell et al., 2011). This is unexpected given that most decisions in modern organisations are made by teams rather than by individuals (Schwenk, 1995). In this study, we hope to add to the absence of group-level research on overconfidence by understanding more about how individuals in teams are influenced by the overconfidence levels of others and how this may influence team performance.

Meissner and colleagues (2018) refer to a definition of group overconfidence that was originated in 1996 by Kerr and colleagues (1996): *"group overconfidence is the collective overconfidence of a group in its decisions"*. Research on group-level overconfidence in teams has yielded mixed results (Meissner et al., 2018). Most of these studies have been aiming to examine how mechanisms, such as group interaction, affect group overconfidence. For instance, Plous (1995) found that groups with members that do not interact directly show lower levels of overconfidence than groups with members with direct interaction. Sniezek and Henry (1989) add to these results with a different perspective, arguing that group interaction reduces group overconfidence, especially in groups where there is a high level of disagreements between team members. Additionally, Brookins and colleagues (2014) found that within-group overconfidence is reduced in the presence of group identity. However, research on how group overconfidence relates to performance is deficient, and we, therefore, add on theories from other fields to help construct the hypothesis of the current study.

2.3 Groupthink and group overconfidence

Research on group decision-making has identified biases that are specific to the group level, including a well-known concept of groupthink. The concept of

groupthink refers to theories explaining how systematic errors made by groups can lead to potentially bad collective decisions (Janis, 2008). An example examined by many scholars (Esser & Lindoerfer, 1989; Moorhead et al., 1991; Turner & Pratkanis, 1998) regards the Space Shuttle Challenger disaster. In 1986, a group of experts was put together to ensure the success of the launch of the Space Shuttle Challenger. Even though they were acknowledged experts within their field, the launch of the space shuttle resulted in a fatal explosion, claiming the lives of seven people onboard.

Irving Janis (2008) outlined symptoms that may be recognized in groups when individuals fall into a group-think mentality. Some of them are the result of overconfidence in the group's abilities. Firstly, groups with an illusion of invulnerability might fall into groupthink mechanisms. With reference to the Space Shuttle Challenger scandal, one of the managers stated: *"everything is going to work out alright because we are a special group"* (Janis, 2008, p. 239). His statement is an example of overconfidence; his self-assessment exceeded the actual outcome. Secondly, belief in the inherent morality of the group is a symptom of groupthink. This mechanism describes the tendency of members to automatically assume the rightness of their cause, even though they might be wrong. We see such overconfidence-related groupthink symptoms as indicators that overconfidence may operate at the group level and spread across people in groups.

Another symptom of groupthink is group cohesiveness (Park, 2000). Park's (2000) study examined in depth the relation among variables in the groupthink model, and he discovered that group cohesiveness was one of two major antecedent conditions on symptoms of groupthink. These findings support Janis' (2008) hypothesis that group cohesion acts as a fundamental antecedent factor for symptoms of groupthink. A risk in group decision-making is that the group consensus is given the benefit of the doubt, and individuals in groups seldom take the position that undermines the group's unity (Janis, 2008).

2.4 Group homogeneity

Building on groupthink theory, Janis himself (2008) and other scholars (Forsyth, 2019; Stahl et al., 2010) argue that homogenous groups will perform poorer than heterogeneous ones. Team diversity is another term for explaining homogeneity-heterogeneity in teams and is determined by the extent to which team members are different from each other (Forsyth, 2019). However, the term team

diversity is broad and refers to many types of diversity related to differences in knowledge and skills, social categories, values or beliefs, and personality or other categories (Forsyth, 2019). Even though studies on diversity yield mixed results (Van Knippenberg & Schippers, 2007), Stahl and colleagues (2010) found in their meta-analysis that diverse groups are more creative when solving problems and making decisions, even though conflict may be greater. Based on these results, we would expect that the less homogenous teams in terms of overconfidence would perform better. We find few existing studies examining the direct effect of group homogeneity of overconfidence on team performance. More common are studies on how different types of diversity affect levels of overconfidence (Meissner et al., 2018; Tsai et al., 2018).

2.5 The overconfidence transmission hypothesis

In recent work by Cheng and colleagues (2021), a hypothesis of overconfidence transmission is tested. The overconfidence transmission hypothesis predicts that individuals calibrate their self-assessment in response to the confidence others display in their social groups (Cheng et al., 2021, p. 157). Their hypothesis was developed based on a review of the literature on how group effects in overconfidence occur. Cheng and colleagues (2021) argue that since cultural traits arise among people within groups, so will overconfidence. Their evidence indicates that individuals converge on levels of overconfidence about their own performance rankings when they were assigned to collaborate in laboratory dyads. Additionally, they found that when individuals observe overconfident others, their own overconfidence levels increase. The social transmission effect persists over time and across task domains and even spreads across indirect social ties.

The evidence of Cheng and colleagues (2021) provides a solid foundation for testing social transmission of overconfidence and the practical consequences. Building on their argument that there is a need to investigate how social clustering of overconfidence influence team performance, we propose to test how homogeneity of overconfidence within groups affects team performance. Cheng and colleagues (2021) measure social transmission mainly as the difference between overconfidence measured at one time compared to a later time (typically after exposure of overconfidence in others). In the current study, we argue that group homogeneity of overconfidence will reflect if individuals converge on levels of overconfidence, hence, measuring social transmission.

Based on research on overconfidence, groupthink, and team homogeneity, we propose the following hypothesis:

H1: Social transmission of overconfidence will negatively impact team performance.

2.6 Situational awareness and overconfidence

The concept of situational awareness was identified during World War 1 by Oswald Boelcke who realized the importance of gaining an awareness of the enemy before the enemy gained a similar awareness (Gilson, 1995). The construct has stimulated great interest in research given its central role in safety and efficiency in operations in crisis situations (Salas, 2017). For individuals to maintain an adequate awareness, they need to track the development of events as they gradually unfold (Woods, 1988). Situational awareness has mostly been referred to in the context of aviation (Salas, 2017), however, others have suggested that the concept is equally applicable to other contexts (Kaber & Endsley, 1998).

Endsley (1988) defined situational awareness as *"the perception of the elements in the environment within a volume of time and space, the comprehension of their meaning and a projection of their status in the near future"* (Endsley, 1988, p. 97). She classified situational awareness into three levels. Level 1: the perception of the elements in the current situation, level 2: the comprehension of the current situation, and level 3: the projection of the situation's future conditions (Endsley, 1995). The concept of situational awareness is relevant in the present study for several reasons. Firstly, it is suggested by research that loss of situational awareness is correlated with poorer performance (Endsley & Kiris, 1995). When handling crisis situations, it is required of individuals to make rapid decisions. Individuals with lost situational awareness may detect problems slower and may use more time on identifying problems (Endsley & Kiris, 1995). Therefore, we suggest that there will be a direct impact of situational awareness on team performance, and present the following hypothesis:

H2a: Situational awareness will be positively related to team performance.

Secondly, the concept of situational awareness reflects the degree to which team members accurately know the information to reach their goals (Burke et al, 2006), and may therefore be used as a measure of participants accuracy in the crisis situation. This is highly relevant in the present study since accuracy often is used as part of measuring overconfidence (Busenitz & Barney, 1997; Meissner et al., 2018; Olsson, 2014). Overconfidence is determined by the difference between the mean subjective probability of a correct answer and the proportion of correct answers given (Olsson, 2014). There is a natural consequence of the given equation that if the participants' accuracy increases, overconfidence will decrease. Given our main hypothesis that social transmission of overconfidence will negatively impact team performance, we hypothesise that:

H3a: Situational Awareness will weaken the negative effect of social transmission of overconfidence on team performance.

2.7 Cognitive style

The current study seeks to investigate not only the processes of social transmission of overconfidence and its link to performance, but also if individual traits, notably cognitive style, would influence the relation between social transmission and team performance. Cognitive style has grown in popularity in the organisational behaviour literature as researchers utilise it to investigate decision-making behaviour (Leonard et al., 1999). An individual's cognitive style may be characterised as a self-consistent manner of functioning that expresses itself in perceptual and intellectual activity (Witkin et al., 1977). According to Glodstein and Blackman (1982), cognitive style refers to the distinctive and habitual way in which an individual processes and assesses information, solves issues, and makes judgments. These cognitive styles have been shown by research to be associated with different brain regions (Agor, 1984; Allinson & Hayes, 1996; Kozhevnikov et al., 2002; Mintzberg et al., 1976; Waber et al., 1989) with the left cerebral hemisphere being primarily specialized for rational, sequential information processing and the right cerebral hemisphere is primarily specialised for intuitive, holistic, and simultaneous information processing.

Epstein (1990) developed a cognitive-experiential self-theory, CEST, which explains two separate information-processing systems, rational and experiential,

which operate simultaneously and interactively (Epstein & Pacini, 1999). CEST as well as other dual-process theories share one fundamental assumption: information is processed by two independent but interacting types of cognitive processes or systems: Type 1 processes (described as 'experiential' in CEST) are fast, automatic, and beyond conscious awareness and control, and they give rise to intuition; Type 2 processes (described as 'rational' in CEST) are slower, controlled, and volitional, and they give rise to analysis. In other words, this theory posits that individuals can move between intuitive and analytic modes as needed, both unconsciously and strategically, although the mode is governed by their cognitive style preferences (Hodgkinson & Sadler-Smith, 2018). The CEST theory, which is firmly based on the individual difference tradition (Epstein, 1990), asserts that cognitive stylistic preferences are relatively stable and reliable individual differences (Epstein et al., 1996). Situationally and contextually, some people tend to have a more intuitive cognitive style while others tend to have a more analytical cognitive style. Hodgkinson and Clarke (2007a) explain that an individual's cognitive style influences how tasks are addressed and completed, implying that cognitive styles can both have direct and indirect effects on team performance through cognitive processing systems.

2.8 Cognitive style and decision-making

There appear to be diverse perspectives on which cognitive style is the most effective in terms of decision-making (Alaybek et al., 2021; Hodgkinson & Sadler-Smith, 2018). The analytical tend to be more rational, calculated, consistent, and logical, whereas the intuitive is more automatic, narrative, and spontaneous (Denes-Raj & Epstein, 1994). Some argue that increased information gathering and analytical processing contribute to better performance in rapidly changing environments and that an analytical cognitive style will lead to higher performance (Eisenhardt, 1989). Tversky & Kahneman (1974) argue that analytical decision-makers perform better than intuitive ones most of the time. Moreover, Alaybek and colleagues (2021) discovered direct impacts of cognitive styles on team performance in their meta-analysis, finding a positive relation between analytic cognitive style and performance, however, no relation between intuitive cognitive style and performance (Alaybek et al., 2021). The analytic cognitive style also requires logical and conscious processing, so an individual with a strong preference

for this style will tend to exert more cognitive effort over a longer period than an individual with a weak preference for analytical processing (Hogarth, 2001).

On the other hand, others argue that intuition may emerge via experience since it enhances processing capacity and allows large volumes of information to be processed faster (Gigerenzer & Gaissmaier, 2011; Pretz, 2011). This stream of research often refers to the concept of fast and frugal heuristics, defined as efficient cognitive processes that ignore information and make use of the environment's structure (Gigerenzer & Gaissmaier, 2011). Several studies have claimed that intuition is a crucial tool to utilise in decision-making, particularly in stressful or time-limited settings (Akinci & Sadler-Smith, 2013; Gigerenzer, 2000; Hodgkinson & Sadler-Smith, 2018; Klein, 2017).

However, Pretz (2011) found that analytical techniques even outperform intuition for experienced individuals in real issue solving. These examples highlight a frequent debate in the field of cognitive style and performance.

In the current study, we seek to investigate whether differences in cognitive style may influence the relation between the social transmission of overconfidence. Tversky & Kahneman (1974) have contributed to the literature concerning cognitive style and reducing the overconfidence bias, arguing that intuition is the source of most cognitive errors. To overcome judgment errors, they argue that an analytical cognitive style is required to overcome the heuristic aspect of intuition. Therefore, an analytical style and analytical processes are necessary to overcome the overconfidence bias. Other studies also support this argument, for example, Dane and Pratt (2007) showed that intuition can limit accuracy, especially when making decisions under time pressure. Accordingly, we propose testing the following hypotheses:

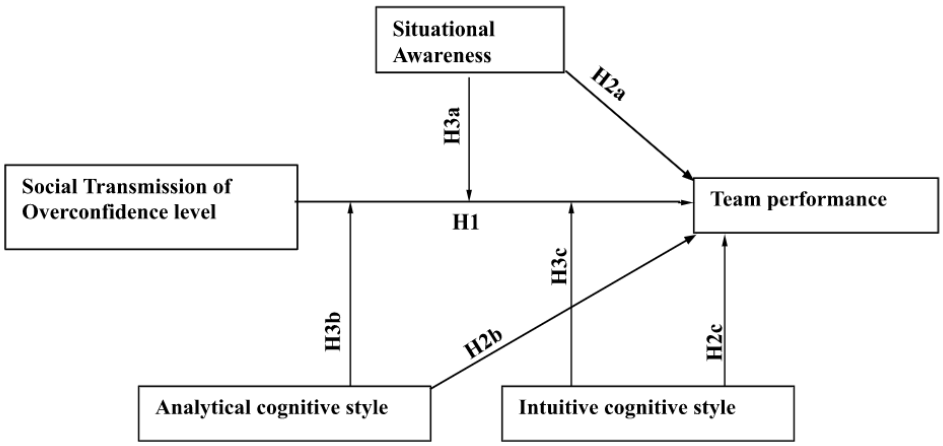
H2b: Analytical cognitive style will positively impact team performance.

H2c: Intuitive cognitive style will negatively impact team performance.

H3b: Analytical cognitive style will weaken the negative effect of social transmission of overconfidence on team performance

H3c: Intuitive cognitive style will strengthen the positive effect of social transmission of overconfidence on team performance

3.0 Conceptual Model



4.0 Methodology

4.1 Data Collection - Experimental design

This study took a quantitative approach to data gathering through a laboratory experiment, using MindLab[2]. The experiment is designed as a computer game simulation of a crisis management situation. The main subtasks are to detect unidentified objects, determine whether they are friendly or hostile, and intercept hostile objects before they approach a critical area (Hansson et al., 2021). The participants are separated into three teams that are sequentially dependent on each other, with each role possessing a specific and complimentary set of competencies and resources. The roles are as follows: Orion, a surveillance plane capable of detecting boats; Patrol, a coastline speedboat capable of looking for vessels;

[2] MindLab Software is a computer simulation lab that was created to generate accurate crisis management scenarios as well as collect data based on the participants' action patterns (Hansson et al., 2021, p. 10).

and Frigate, a military vessel capable of attacking and eliminating threats. The participants are separated and the only way to communicate is through the built-in chat/email function (Hansson et al., 2021). The participants are randomly assigned to different roles and teams and engage in three different scenarios. The participants are faced with challenges associated with team monitoring, information exchange, coordination, and collective team strategy in the simulated scenarios. The game is constructed so that it will be challenging in terms of communication and coordination, and it entails several steps to identify terrorists.

4.1.1 Experimental procedure

The participants play the simulated game twice, once for Mission 1 and once for Mission 2. The data is collected automatically, and following the game, participants completed a survey administered by Qualtrics (Qualtrics, Provo, UT) to measure their situational awareness and confidence levels. In addition, participants were asked to complete a questionnaire based on the Rational-Experiential Inventory-40 (REI-40) (Pacini & Epstein, 1999) a few days before the experiments to assess their cognitive style. In general, the survey should take between 10 and 15 minutes (Pacini & Epstein, 1999).

4.2 Data cleaning

We performed a mandatory check of our gathered data for data entry errors and errors in the processing of the data as well as for missing data (Tabachnick & Fidell, 2019, cited in Bell et al., (2022). Our data files that contained data from the presurvey (measuring cognitive style, REI-40), as well as the surveys in between the missions (measuring situational awareness and confidence levels), were downloaded directly from Qualtrics. The data regarding performance measures were downloaded directly from MindLab. These initial data-files included data from 2014 to 2021, but a significant amount of data was missing throughout this time period, necessitating a huge clean-up effort. The Qualtrics database provides information from all missions that have been tested and played during the experiment. Our first cleaning of the data consisted of removing all test missions, as well as removing all data from all tutorial missions. This was simple since the database had information about which data was related to specific tests or tutorials. Because most of the data from 2014 were test missions, they were deleted from our final dataset. Additionally, the experimental procedure was slightly different from

year to year. Some years the experiment consisted of three missions, and some years only two. In addition, some years the data was collected through different questionnaires with different questions than the ones we had access to. Therefore, a criterion for involving data in our final dataset was that this data was collected during the time period where only two missions were played. A second criterion for involvement was that the data was collected in a period where the items in the questionnaires matched the questions that we had access to. After removing data according to the mentioned criteria, we were left with a dataset with data from 2016 and 2020. In this dataset, we handled missing data using listwise deletion, which involves removing all data that the participant provided (Bell et al., 2022) because we were not able to construct our variables if certain information from participants was missing.

The dataset consisting of performance data was then paired with the dataset consisting of all survey information, using unique and anonymized IDs per participant. We were then able to connect these participants to the correct team. However, since removing some participants from the dataset due to missing data, we ended up in a situation where some teams were left with only two participants, not three. Using listwise deletion method (Bell et al., 2022), all teams with missing participants were removed from our final dataset. Finally, we were left with a dataset that was used to run all our analyses and test our hypothesis, and the dataset is further described below.

4.3 Sample

Our final sample consisted of 567 (*N*=567) participants and each of them completed both two missions. This results in 1134 (567 participants*2 missions) observations in total. These participants are divided into 189 (567/3=189) teams, each team consisting of three team members. As mentioned, after conducting data cleaning in original files after strict criteria, the final sample is divided over a period from 2016 to 2020.

4.4 Measures

4.4.1 Dependent variable – Team Performance

An objective measure of team performance was used to measure this variable. The team performance score is a measure of group success in the

performance of the crisis management situation. The team performance score indicates a total score for each team and is determined by the total score of participants speed of detection, info search score, attach score, and movement score during the game. Higher values indicate better team performance.

4.4.2 Independent Variable – Social Transmission of Overconfidence

To be able to construct a measure of our independent variable, we first needed to construct a variable measuring participants' overconfidence levels. Participants' individual overconfidence levels were operationalized as the extent to which self-estimated precision exceeded actual precision. Adapted from Olsson (2014), we calculate overconfidence levels as the difference between the mean subjective probability of a correct answer (in this case, the participants' Confidence Levels), and the proportion of correct answers (in this case, participants' Situational Awareness). Item-confidence estimates are used to employ participants' Confidence Level (CL) (González-Vallejo & Bonham, 2007). The item-confidence questions are a series of questions that ask participants to identify the correct answer and then indicate their level of confidence (in percent) that their answer is correct. The items where participants identify correct answers are measuring Situational Awareness (SA), while the items where participants indicate their subjective opinion of the probability of correct answer measure Confidence Level (CL). Following each Mission (Mission 1 and Mission 2), the participants were given 18 questions, whereas 9 of them are measuring CL and the other 9 measured SA. Items measuring SA are typically formulated like this: *"Where was Orion at the moment of his launch?"* (See Appendix 1) and are followed by different answer options where one of the options is correct. This results in a score of either 1 or 0 related to each item, where 1 indicates correct answer and 0 indicates the wrong answer. Participants' mean SA score was measured as the mean percentage of accurate responses. All items measuring CL are provided directly after each SA-item, and are formulated like this: *"What is the probability that your answer is correct?"* (See Appendix 1). All of these items were measured with probability for correct response in intervals of 1-10%, 11-20%, 21-30%, 31-40%, 41-50%, 51-60%, 61-70%, 71-80%, 81-90%, 91-99%. Higher percentages indicate that participants believe that there is a high probability that they answered correctly on the previous SA-item. Participants' CL score was measured as the mean percentage of probability for correct answer. Our construct of overconfidence specifically measures

overprecision, which according to Moore and Healy (2008) is a part of overconfidence characterised by individuals being overly precise regarding the correctness of their opinions.

After computing individual variables for each participant's SA-level and CL-level in Mission 1 and Mission 2, we were able to calculate Overconfidence Level (OCL) as the difference between participants' CL and SA (Busenitz & Barney, 1997; Meissner et al., 2018; Olsson, 2014). This results in a variable at the individual level that ranges from -10 to 10, where positive values indicate overconfidence whereas negative values indicate underconfidence. For instance, if the participants on average assess the probability that they have selected the correct answer (CL) at 80% (8), but their accuracy (SA) is only 60% (6), overconfidence will be 2 (Olsson, 2014). Similarly, the less accurate the participants are the larger the value of overconfidence. If participants have higher accuracy than the assessed probability for the correct answer, the OCL will be negative, indicating underconfidence.

To test Social Transmission of Overconfidence, we propose that if individuals have converged on levels of overconfidence, within-group variance of overconfidence will be low. Standard deviation is a common measure for measuring similarity of group members (Ancona & Caldwell, 1992; Eby & Dobbins, 1997). Using a standard deviation measure for the Social Transmission of Overconfidence variable results in a scale from 0 to 10, where values closer to 0 indicate high group homogeneity, i.e high social transmission, whereas values closer to 10 indicate low group homogeneity, i.e. low social transmission. Hence, we introduce a reversed scale, meaning that an increase in social transmission of overconfidence will be reflected by a decrease in our measure (standard deviation).

4.4.3 Moderating Variables – Cognitive style

Rational-Experiential Inventory-40 (REI-40) was used to assess the moderating variables (Epstein & Pacini, 1999). This is a 40-item adaption of the original REI based on Epstein's (1990) Cognitive-Experiential Self-Theory (CEST), which asserts that individuals process information through two independent but interactive systems, the conscious experiential system, and the conscious rational system (Epstein, 1994). The Rational-Experiential Inventory (REI-40) (Epstein et al., 1998; Pacini & Epstein, 1999) is a 40-item self-report instrument measuring two independent dimensions of human information

processing—rational and experiential. Each dimension is assessed using two subscales composed of 10 items each under the factors Rational Ability, Rational Engagement, Experiential Ability, and Experiential Engagement (Epstein, Pacini, & Norris, 1998; Pacini & Epstein, 1999). All questionnaire items were scored on a 5-point scale, from 1 to 5 (1= definitely not true of myself to 5= definitely true of myself). Averaging the 10 composite items yields the subscale scores. Thus, each respondent obtains four scores: one for Rational Ability, one for Rational Engagement, one for Experiential Ability, and one for Experiential Engagement. The ability and engagement scores may be averaged to get two composite scores for Rationality and Experientiality (Pacini & Epstein, 1999). The scale of Analytical and Intuitive style ranges from 1 to 5 where a larger value indicates a tendency toward each style. Items for Rational Ability could be phrased as *"I am much better at figuring things out logically than most people"*, Rational Engagement items as *"I try to avoid situations that require thinking in depth about something."*, Experiential Ability items as *"I believe in trusting my hunches,"* and Experiential Engagement as *"Intuition can be a very useful way to solve problems".*

5.0 Results

5.1 Descriptives

Table 5.1.1
Descriptives

	Mission	Performance	ST-OC	Analytic	Intuitive	SA	OC-L
N	1	567	567	567	567	567	567
	2	567	567	567	567	567	567
Missing	1	0	0	0	0	0	0
	2	0	0	0	0	0	0
Mean	1	545	1.05	3.17	2.79	4.83	1.32
	2	592	1.14	3.17	2.79	4.01	2.98
Median	1	551	0.958	3.16	2.80	5.00	1.50
	2	595	1.10	3.16	2.80	3.33	3.17
Standard deviation	1	129	0.560	0.367	0.396	1.55	2.06
	2	96.0	0.592	0.370	0.396	1.85	2.60
Minimum	1	207	0.0350	1.74	1.10	0.00	-5.25
	2	317	0.141	1.74	1.10	0.00	-4.38
Maximum	1	832	2.51	4.42	4.05	9.00	6.50
	2	806	2.57	4.42	4.05	10.0	8.51

To gain more information on the core characteristics of our data, we conducted a descriptive analysis (Table 5.1.1) at the variable level (Bell et al., 2022). Our dataset was sorted with observations per mission in a separate column, therefore, we chose to split the descriptive per mission for a more correct picture of our dataset. Our sample size per mission is 567 participants, whereas all participants completed two missions. We may also note that our data consist of different levels, meaning that Team Performance and Social Transmission of Overconfidence is constructed at a team level with three similar observations per team. The other variables: Analytical Style, Intuitive Style and Situational Awareness are all variables at an individual level, meaning that each participant will have a unique score at these variables. We also wanted to include the Overconfidence Level variable in our descriptive analysis, since this variable is part of the construction of the Social Transmission of Overconfidence variable. The overconfidence level variable indicates the overconfidence levels of each participant at an individual level, while the social transmission of overconfidence variable expresses within team variance of the individual overconfidence levels of participants.

The mean in team performance increases for teams from mission 1 to mission 2 (mean mission 1=545, mean mission 2=592). We observe that there is a variation in team performance in teams, given minimum scores (mission 1= 207, mission 2=317) and maximum scores (mission 1=832, mission 2=806) and standard deviation of 129 for mission 1 and 96 for mission 2. In other words, there is large variation among teams in terms of Team Performance Scores.

Additionally, the mean, minimum and maximum values of Social Transmission of Overconfidence are interesting. This variable is measured through the standard deviation of overconfidence in teams, hence, a value close to 0 indicates a very low variation in teams, i.e., high group homogeneity (Bell et al., 2022), while values closer to 10 indicate a large variation, i.e., low group homogeneity. We observe that the average team is homogeneous in terms of overconfidence, given mean values of 1.05 for mission 1 and 1.14 for mission 2. The minimum value for mission 1 at 0.0350 indicates that we have team/teams in our dataset that are strongly homogenous. Additionally, the maximum value (mission 1=2.51, mission 2=2.57), as well as the standard deviation (mission 1=0.560, mission 2=0.592) indicates that most teams are homogeneous, since these maximum values are far from 10.

We also highlight the observations in individual overconfidence levels of participants. The individual levels of overconfidence illustrate the difference between participants' situational awareness and confidence levels and is therefore different from Social transmission of overconfidence (standard deviation of overconfidence levels). As noted earlier, the scale of overconfidence ranges from -10 to 10, where negative values closer to -10 indicate strong underconfidence, while positive values closer to 10 indicate strong overconfidence. The mean value of overconfidence indicates that the average participant is more overconfident than underconfident, given a positive mean value of 1.32 for mission 1 and 2.98 for mission 2. The mean values indicate that the average participant gets more overconfident in the last mission compared to the first. Given the minimum, maximum and standard deviation values, we observe that participants differ in terms of how underconfident or overconfident they are. The minimum values are -5.25 for mission 1 and -4.38 for mission 2, and the maximum are 6.50 in mission 1 and 8.51 in mission 2. Hence, the standard deviation at 2.06 for mission 1 and 2.60 for mission 2.

The scales of Analytical Style and Intuitive Style range from 1 to 5, where larger values indicate a tendency towards each of the styles. We observe that the mean Analytical Style of participants is 3.17, indicating that the average participant is more analytical than intuitive (Mean =2.79). Additionally, we see that the participants differ in their cognitive style, given minimum and maximum values for analytical style (minimum=1.74, maximum=4.42), and minimum and maximum values for intuitive style (minimum=1.10, maximum=4.05). The standard deviation (analytical=0.367, intuitive=0.396), indicates that there is variation in terms of that some individuals are strongly analytical, and others are strongly intuitive.

Situational awareness in our dataset has a mean of 4.83 for mission 1 and 4.01 for mission 2, ranging from 0.00 in both missions to 9.00 in mission 1 and 10.00 in mission 2. The mean values indicate that the average participant in our dataset provides correct answers to around 48,3% (mission 1) and 40,1% (mission 2) of the items measuring situational awareness. Hence, from mission 1 to mission 2, there is an average decrease in situational awareness, meaning that the average participant is less accurate in mission 2. Additionally, in both missions there have been participant/participants that have had no correct answers, equal to the lowest degree of situational awareness possible. In mission 2, there are

participant/participants that have had complete accuracy, given situational awareness of 10. The standard deviation (mission 1=1.55, mission 2=1.85) indicates variance among participants in situational awareness.

Table 5.1.2

Correlation Matrix

		Performance	ST-OC	Analytic	Intuitive	SA
Performance	Pearson's r	—				
ST-OC	Pearson's r	0.165 ***	—			
Analytic	Pearson's r	0.123 ***	-0.005	—		
Intuitive	Pearson's r	0.050	-0.050	0.051	—	
SA	Pearson's r	0.123 ***	0.086 **	0.075 *	-0.006	—

Note. Performance = team performance, ST-OC = social transmission of overconfidence, SA = situation awareness. * $p < .05$, ** $p < .01$, *** $p < .001$

A correlation analysis (Table 5.1.2) was conducted to establish the strength and direction (positive/negative) of the relation between our main variables (Bell et al., 2022). We did not include a split between missions in our correlation analysis, hence, the observations in the correlation matrix (table 1.2) are based on observations from both mission 1 and mission 2.

Not surprisingly, we find a significant and positive correlation between the social transmission of overconfidence and team performance (Pearson's r=0.165). Since Social Transmission of Overconfidence is constructed as a reversed scale, an increase in Social Transmission of overconfidence would indicate larger group heterogeneity. As expected, increasing group heterogeneity will lead to an increase in team performance.

Further, situational awareness correlated positively with team performance (Pearson's r=0.123), indicating that higher situational awareness will result in higher performance. Situational awareness is significantly correlated with social transmission of overconfidence (Pearson's r=0.086), not surprisingly since situational awareness is part of the construct of social transmission of overconfidence. Additionally, situational awareness was positively correlated with analytical style (Pearson's r=0.075), indicating that there is a relation between participants' level of accuracy and how analytical they are.

Finally, we observe a positive correlation between analytical style and team performance (Pearson's r=0.123), meaning that higher levels of analytical style would indicate higher levels of team performance.

5.2 Linear mixed modeling

Table 5.2.1

Linear mixed model predicting team performance

Dependent variable: Team Performance

	Main effects		**With interactions**	
Predictors	*Estimates*	*CI*	*Estimates*	*CI*
Intercept	568.41 **	517.20 – 619.62	568.70 **	516.47 – 620.93
ST-OC	27.60 **	16.37 – 38.83	27.09 **	15.83 – 38.34
SA	10.24 **	6.45 – 14.04	10.75 **	6.90 – 14.60
Analytic	34.41 **	16.89 – 51.92	33.60 **	16.06 – 51.15
Intuitive	15.28	-0.97 – 31.54	15.79	-0.50 – 32.08
ST-OC x INTUITIVE			14.89	-15.16 – 44.94
ST-OC x ANALYTIC			-7.62	-35.13 – 19.90
ST-OC x SA			-4.07	-10.09 – 1.94
Random Effects				
σ^2	12144.26		12147.05	
τ_{00}	1341.08 $_{Mission}$		1395.60 $_{Mission}$	
ICC	0.10		0.10	
N	2 $_{Mission}$		2 $_{Mission}$	
Observations	1134		1134	
Marginal R^2 / Conditional R^2	0.059 / 0.153		0.061 / 0.158	

Note. ST-OC = social transmission of overconfidence, SA = situation awareness. * $p < 0.05$ ** $p < 0.01$.

Considering our data's nested structure, we ran a hierarchical linear mixed regression model to test our hypothesis. We used the lme4 package in R[1] to run the model (Bates et al., 2014). Participants were nested within teams with a repeated-measure of the dependent variable (Team Performance) in Mission 1 and 2. As predictors in the model, there was situation awareness, intuitive cognitive style, analytical cognitive style, situation awareness X social transmission of overconfidence, intuitive style X social transmission of overconfidence, and analytical style X social transmission of overconfidence. Prior to performing the analysis, all predictors were mean-centered (Aiken et al., 1991). Model 1 (Main Effects) comprises solely main effects, meaning predictors without interactions. Model 2 (With interactions) incorporates both major effects and interactions. We included Mission as a random effect in the linear mixed model to account for repeated-measures dependencies, which in our case is the repeated measure of team performance across the two missions. Random effects capture random or stochastic variability in the data that comes from different sources (Singmann & Kellen, 2019, p. 2).

The results support H1 concerning the effect of social transmission on team performance. The effect is significant ($p < 0.01$). Given the way social overconfidence is constructed in our study, an increase in social transmission of overconfidence is equal to a decrease within-group variation. Hence, we find support for our assumptions that when within-group variation increases, so do team performance. We did not find support for any of our moderating hypotheses. That is, social transmission of overconfidence did not interact with analytical style, intuitive style, nor situational awareness in predicting team performance. Thus, we found no support for hypotheses H3a, H3b, and H3c. However, two of our moderating variables were directly associated with team performance: analytical style and situational awareness. Hypothesis H2a and H2b are this supported, while H3c concerning the direct relationship between intuitive style and team performance is not supported.

[1] The lmer function in the lme4 package for R may be used to calculate maximum likelihood or restricted maximum likelihood (REML) estimates of parameters in linear mixed-effects models.

6.0 Discussion

Our main objective with this study was to examine whether social transmission of overconfidence would influence team performance. Our findings support our hypothesis that social transmission of overconfidence (measured by group homogeneity) will be negatively associated with team performance. These findings contribute to the recent discussion by Cheng and colleagues (2021), and our findings add to their suggestion for further research by exploring the practical consequences of social transmission of overconfidence.

In regard to our findings, we make a few noteworthy remarks. Firstly, our results indicate that group homogeneity will lower performance regardless of the direction of the homogeneity. In other words, we argue that regardless of whether the participants are strongly homogenous in terms of overconfidence, underconfidence, or none of them, team performance will decrease. We find these results to be of great interest in terms of how Social Transmission of Overconfidence is constructed in our study. Social Transmission of Overconfidence is constructed as the standard deviation of participants' confidence level and situational awareness level (CL-SA=OCL), which means that we may have teams with high SA and high CL and yet have homogeneous teams. It is natural to assume that if all participants have high SA, they will all agree in terms of understanding the situation and will be accurate. One could expect strong team performance in such a situation.

However, our results show that the more homogeneity, the lower performance. A potential reason may be the influence of confidence level on the relation between situational awareness. If participants have high SA, they may still have different confidence levels. Some could be strongly overconfident or underconfident, which will affect the overall overconfidence levels and group homogeneity.

Furthermore, we believe it is interesting to discuss how teams with high SA and CL might still perform poorer than more diverse teams. We find that our results add value to the groupthink theory. The present study presents a measure for how decision-making biases that spread in teams leads to poor performance. This is much similar to how Janis (2008) himself described how illusions of invulnerability, belief in inherent morality, collective rationalism and similar mechanisms are symptoms of groupthink, and leads to poor decision-making. There

is no official hierarchy among participants in the experiment, which means that no official leadership role is assigned. It is therefore natural to assume informal leadership to emerge, as it frequently does for teams in circumstances with unexpected disruptive occurrences when no official leadership role exists (Mann, 1959; Johannessen et al., 2015). Referring to the Space Shuttle Challenger scandal that has been examined several times in relation to groupthink theory (Esser & Lindoerfer, 1989; Janis, 2008; Moorhead et al., 1991; Turner & Pratkanis, 1998), managers are often those who come with bold statements and the team participants will follow their lead to uphold group consensus. Based on our findings, we argue that groupthink symptoms and their consequences are so profound that the more team members are similar to each other in terms of overconfidence, the poorer their performance will become.

This study also examined individuals' cognitive styles. Our results support our hypothesis stating that an analytical cognitive style would be positively related to team performance. Our findings support the previous theory that possessing an analytical cognitive style involves traits relevant to team performance (Eisenhardt, 1989; Alaybek et al., 2021). Analytical cognitive styles outperform intuitive cognitive style in decision-making scenarios the majority of the time (Tversky & Kahneman; 1974; Kahneman, 2011). This research indicates those with an analytical cognitive style will most likely comprehend the information more quickly than individuals with an intuitive cognitive style, which in turn positively influences team performance. Hodgkinson and Clarke (2007) investigated how certain combinations of cognitive types impact performance, and hypothesised that people who are high on the analytic dimension and low on the intuitive dimension approach issues in a step-by-step manner because they are aware of details. Based on our findings, having team members with analytical cognitive styles is vital when constructing a performing team.

In our current study, the tasks that are expected to be accomplished must be considered fully, meaning that a deliberate and calibrated approach is necessary, and awareness of details is crucial. If not, they will let terror attacks happen to the oil rigs, which in turn will lead to major consequences. Also, in rapidly changing conditions where basic environmental rules have altered, enhanced information collection, processing, and the ability to apply analytical thinking can lead to higher performance (Eisenhardt, 1989). Similarities may be drawn to our study, where the

environment in which the simulated task game takes place changes constantly, implying that it is natural to assume that being careful as unforeseen events may occur is vital. An analytic cognitive style involves both logical and conscious processing, which means that an individual with a strong preference for this style will tend to exert more cognitive effort over a longer period than an individual with a weak preference for analytical processing (Hoghart, 2001). Time duration might vary in a crisis management situation, but an analytical cognitive style can exercise more resilience than an intuitive cognitive style (Hoghart, 2001), allowing it to make judgments more quickly under unconscious conditions and uncertain time constraints.

Moreover, we were unable to provide evidence to support our hypothesis that intuitive style is related to team performance. We also find that the correlation between the variables is not statistically significant, implying that there is no evidence in our study that intuitive style is connected to team performance. According to our findings, forming teams with only intuitive individuals does not benefit team performance. However, our findings do not rule out the potential that intuitive style influences team performance in other contexts. For example, other researchers have claimed that analytical people would not have enough time to process all important information under time constraints (Hoghart, 2011).

The third aspect investigated in this study regards situational awareness. We were not able to find a moderating effect of situational awareness on the relation between social transmission of overconfidence of team performance. This was surprising for several reasons. Firstly, our measure of overconfidence levels consists partly of participants' situational awareness levels. Since higher SA levels would automatically lead to lower overconfidence levels, we would assume that higher situational awareness would weaken the negative effect of social transmission on team performance.

Even though we were unable to demonstrate a significant moderating influence of situational awareness (SA), we discovered evidence for the direct relation of SA on team performance. These findings are valuable, and we argue that they contribute to the existing literature arguing that high SA in high-risk scenarios increase performance. In our study, the participants were exposed to a situation with a high degree of uncertainty, time pressure, and risks involved. In such settings, we have shown that higher levels of accurate perception of the elements in the current

situation, high comprehension of the current situation, and projection of the future status of the situation (Endsley & Kiris, 1995) will increase team performance. Also, our findings support the research underlying the popular terms of "loss of SA", "lack of SA", and "poor SA", which have been claimed to lead to incidents, such as military-friendly fire incidents (Rafferty et al., 2012). Brennan and colleagues (2020) also contend that in high-risk organisations, a decrease in SA can have catastrophic, perhaps lethal consequences.

7.0 Practical implications

Our results provide value in various organisational contexts. Firstly, in terms of the discussion regarding team diversity. Scholars have argued that team diversity in terms of knowledge, skills, values, beliefs, personality, among others, is beneficial for teams when solving problems (Forsyth, 2019). Our results add to these arguments, stating that group heterogeneity in terms of overconfidence will increase performance. If the problem to be solved is related to situations with high degrees of stress and time pressure, our results indicate that a high-performing team should strive to maintain a balance between overconfidence and underconfidence, hence, team members and team leaders should be aware that the spread of overconfidence or underconfidence will harm performance.

Furthermore, our results raise an important discussion regarding virtual teamwork and performance. In the experiment, participants can only interact with one another via an integrated mailbox, implying a virtual setting. We believe that this setting is appropriate because the use of virtual teams has become more common in modern organisations (Lipnack & Stamps, 1999). Rafaeli and Ravid (2003) investigated the relation between information sharing accomplished via electronic mail and the performance of teams and found that when information is shared online, teams perform significantly better. Our results indicate that social transmission of overconfidence could be a moderator when investigating such relations further. We would expect, based on our results, that social transmission of overconfidence in teams would weaken the relation between information sharing accomplished by electronic mail and team performance.

We believe our findings are applicable to organisations and leadership management, particularly in terms of team composition in crisis management. While some argue that analytical style outperforms intuitive cognitive style, others

argue that pure homogeneously analytical cognitive styles in team performance, i.e., no variance of individual differences in the team assigned to perform, may signal possible performance issues. Several researchers have investigated cognitive diversity, which examines the features of team members (Harrison et al., 1998; Levine & Moreland, 2004), including information-processing styles (O'Reilly III et al., 1998). It is important to emphasize, however, that the information and findings acquired about analytical cognitive style and team performance are context-specific and do not necessarily apply across all organisational contexts. Diverse teams have cognitive resources and cognitive variance, depending on the context and type of task they are confronted with (McGrath, 1984), and whether they benefit from analytical or intuitive thinking, which affects their performance. The current study shows that analytical cognitive resources are beneficial in crisis management situations, meaning that teams handling such situations should be formed of individuals with analytical cognitive styles. This could be argued for as companies depend heavily on teams because they hold the experience, information, and skills necessary to make decisions and accomplish organisational tasks (Bunderson, 2003).

Additionally, in organisational settings, it gets important to maintain and strengthen SA and avoid loss or lack of SA. In high-risk organisations, tunnel vision can lead to a decrease in SA. Tunnel vision occurs when professionals are focusing and concentrating only on a single aspect of a task (Brennan et al., 2020), indicating that individuals in high-risk organisations should broaden their focus and concentration and focus on the overall picture to maintain and strengthen SA. The topic of how to construct teams with a high level of situational awareness should be examined by team leaders, managers, or HR functions. Our results imply that for organisations handling crises, such as the police or the fire force, teams should consist of individuals that are situational aware to perform better. Endsley and Bolstad (1994) argue that individual differences make a difference in contributing to high situational awareness in individuals. To exemplify, experience has shown to be positively related to high SA levels. More experience leads to a larger body of episodic memories to draw upon when organizing the complexity and multiplicity of objects in the environment (Endsley & Bolstad., 1994). As a result, for organisations designed to manage crisis circumstances, crisis simulations and training on realistic scenarios are as valuable as ever, because realistic training

increases experience, which increases SA (Endsley, 2017). Proper briefing of the team before starting operations makes an ideal opportunity to develop and improve the SA of all team members.

8.0 Limitations and Future research

The study's findings should be interpreted in light of several limitations. Firstly, we note that one restriction of our study is related to the formulation of our independent variable: social transmission of overconfidence. As mentioned, several times throughout our thesis, social transmission is constructed as a measure of the standard deviation of each team member's individual overconfidence levels. This measure provides information in terms of whether group homogeneity in overconfidence affects team performance, however, the main limitation is that this measure does not indicate the direction of the homogeneity. In other words, high levels of homogeneity (indicated by low variance), do not provide information of whether the participants in the team are strongly overconfident, strongly underconfident, or none of them. As a result, when developing the variable of Social Transmission of Overconfidence (ST-OC), we propose that the direction of the homogeneity in terms of overconfidence levels be considered.

Our analysis was run with a total of 189 teams which we consider to be a fairly small sample size, resulting in numerous implications for generalizability and validity (Bell et al,. 2021). Additionally, aside from the participants' cognitive styles, our gathered sample was anonymous, which means we know little about our sample in terms of education, experience, background, age, gender, and similar. Although we do not focus on the differences between participants in detail in this thesis, we recommend incorporating this type of information about the sample, to shed light on additional approaches and discussions. Future research should include a larger sample size of teams to provide more accurate results and provide a broader understanding of the relation between social transmission of overconfidence and team performance.

Finally, the research method applied does not include manipulation of the independent variable. As a consequence, we are not able to argue for any causality and there is ambiguity about the direction of the relations (Bell et al., 2022). In addition, the setting in which the participants are placed in a simulated setting, is built to be as close to reality as possible. However, experiments that take place in

laboratories often represent limitations. The participants do not play out a real crisis management situation, and we must therefore expect lower validity and should be aware that we are not aware of how well these findings will apply to a similar real-life setting (Bell et al., 2022).

9.0 Concluding Remarks

This study explored the relation between social transmission of overconfidence and team performance. As expected, we found that social transmission of overconfidence is negatively associated with team performance. Even though we did not find that cognitive style and situational awareness would either strengthen or weaken the negative effect of social transmission of overconfidence on team performance, we found that analytical style and situational awareness are both positively related to team performance. Our findings support the presented theoretical framework on social transmission of overconfidence, cognitive style, and situational awareness in organisational settings. Based on our findings, we imply that team leaders should be aware to maintain heterogeneity in terms of overconfidence in teams and be aware of the potential symptoms of groupthink. Additionally, teams handling crisis situations should consist of members with analytical cognitive styles. Finally, training and adequate briefing of team members are critical to preventing a lack of situational awareness.

10.0 References

Agor, W. H. (1984). Using intuition to manage organizations in the future. *Business Horizons*, *27*(4), 49–54.

Aiken, L. S., West, S. G., & Reno, R. R. (1991). *Multiple regression: Testing and interpreting interactions*. sage.

Akinci, C., & Sadler-Smith, E. (2013). Assessing individual differences in experiential (intuitive) and rational (analytical) cognitive styles. *International Journal of Selection and Assessment*, *21*(2), 211–221.

Alaybek, B., Wang, Y., Dalal, R. S., Dubrow, S., & Boemerman, L. S. (2021). Meta-analytic relations between thinking styles and intelligence. *Personality and Individual Differences*, *168*, 110322.

Allinson, C. W., & Hayes, J. (1996). The cognitive style index: A measure of intuition-analysis for organizational research. *Journal of Management studies*, *33*(1), 119–135.

Ancona, D. G., & Caldwell, D. F. (1992). Demography and design: Predictors of new product team performance. *Organization science*, *3*(3), 321–341.

Barber, B. M., & Odean, T. (2001). Boys will be boys: Gender, overconfidence, and common stock investment. *The quarterly journal of economics*, *116*(1), 261–292.

Bates, D., Mächler, M., Bolker, B., & Walker, S. (2014). Fitting linear mixed-effects models using lme4. *arXiv preprint arXiv:1406.5823*.

Bell, E., Harley, B., & Bryman, A. (2022). *Business research methods*. Oxford university press.

Blackman, S., & Goldstein, K. M. (1982). Cognitive styles and learning disabilities. *Journal of Learning Disabilities*, *15*(2), 106–115.

Brennan, P. A., Holden, C., Shaw, G., Morris, S., & Oeppen, R. S. (2020). Leading article: What can we do to improve individual and team situational awareness to benefit patient safety? *British Journal of Oral and Maxillofacial Surgery*, *58*(4), 404–408.

Brenner, L. A., Koehler, D. J., Liberman, V., & Tversky, A. (1996). Overconfidence in probability and frequency judgments: A critical examination. *Organizational Behavior and Human Decision Processes*, *65*(3), 212–219.

Brookins, P., Lucas, A., & Ryvkin, D. (2014). Reducing within-group overconfidence through group identity and between-group confidence judgments. *Journal of Economic Psychology*, *44*, 1–12.

Buehler, R., Griffin, D., & Ross, M. (1994). Exploring the" planning fallacy": Why people underestimate their task completion times. *Journal of personality and social psychology*, *67*(3), 366.

Bunderson, J. S. (2003). Recognizing and utilizing expertise in work groups: A status characteristics perspective. *Administrative science quarterly*, *48*(4), 557–591.

Busenitz, L. W., & Barney, J. B. (1997). Differences between entrepreneurs and managers in large organizations: Biases and heuristics in strategic decision-making. *Journal of business venturing*, *12*(1), 9–30.

Campbell, W. K., Goodie, A. S., & Foster, J. D. (2004). Narcissism, confidence, and risk attitude. *Journal of behavioral decision making*, *17*(4), 297–311.

Cheng, J. T., Anderson, C., Tenney, E. R., Brion, S., Moore, D. A., & Logg, J. M. (2021). The social transmission of overconfidence. *Journal of Experimental Psychology. General*, *150*(1), 157–186. https://doi.org/10.1037/xge0000787

Cristofaro, M. (2017). Reducing biases of decision-making processes in complex organizations. *Management Research Review*.

Dane, E., & Pratt, M. G. (2007). Exploring intuition and its role in managerial decision making. *Academy of management review*, *32*(1), 33–54.

Denes-Raj, V., & Epstein, S. (1994). Conflict between intuitive and rational processing: When people behave against their better judgment. *Journal of personality and social psychology*, *66*(5), 819.
Dunning, D., Heath, C., & Suls, J. M. (2004). Flawed self-assessment: Implications for health, education, and the workplace. *Psychological science in the public interest*, *5*(3), 69–106.
Eby, L. T., & Dobbins, G. H. (1997). Collectivistic orientation in teams: An individual and group-level analysis. *Journal of Organizational Behavior: The International Journal of Industrial, Occupational and Organizational Psychology and Behavior*, *18*(3), 275–295.
Eisenhardt, K. M. (1989). Making fast strategic decisions in high-velocity environments. *Academy of Management journal*, *32*(3), 543–576.
Endsley, M. R. (1988). Design and evaluation for situation awareness enhancement. *Proceedings of the Human Factors Society annual meeting*, *32*(2), 97–101.
Endsley, M. R. (2017). Toward a theory of situation awareness in dynamic systems. I *Situational awareness* (s. 9–42). Routledge.
Endsley, M. R., & Bolstad, C. A. (1994). Individual differences in pilot situation awareness. *The International Journal of Aviation Psychology*, *4*(3), 241–264.
Endsley, M. R., & Kiris, E. O. (1995). The out-of-the-loop performance problem and level of control in automation. *Human factors*, *37*(2), 381–394.
Epstein, S. (1990). *Cognitive-experiential self-theory. handbook of personality: Theory and research/ed. pervin l. a*. New York: The Guilford Press.
Epstein, S., & Pacini, R. (1999). *Some basic issues regarding dual-process theories from the perspective of cognitive–experiential self-theory.*
Epstein, S., Pacini, R., Denes-Raj, V., & Heier, H. (1996). Individual differences in intuitive–experiential and analytical–rational thinking styles. *Journal of personality and social psychology*, *71*(2), 390.
Esser, J. K., & Lindoerfer, J. S. (1989). Groupthink and the space shuttle challenger accident: Toward a quantitative case analysis. *Journal of Behavioral Decision Making*, *2*(3), 167–177. https://doi.org/10.1002/bdm.3960020304
Forsyth, D. R. (2019). *Group dynamics*. Cengage Learning.
Gigerenzer, G. (2000). *Adaptive thinking: Rationality in the real world*. Oxford University Press, USA.
Gigerenzer, G., & Gaissmaier, W. (2011). Heuristic decision making. *Annual review of psychology*, *62*(1), 451–482.
Gilson, R. D. (1995). Special Issue Preface. *Human Factors*, *37*(1), 3–4. https://doi.org/10.1518/001872095779049426
Glaser, M., & Weber, M. (2010). *Overconfidence* (SSRN Scholarly Paper ID 1852590). Social Science Research Network. https://papers.ssrn.com/abstract=1852590
González-Vallejo, C., & Bonham, A. (2007). Aligning confidence with accuracy: Revisiting the role of feedback. *Acta Psychologica*, *125*(2), 221–239.
Griffin, D., & Tversky, A. (1992). The weighing of evidence and the determinants of confidence. *Cognitive psychology*, *24*(3), 411–435.
Hansson, M., Hærem, T., & Pentland, B. T. (2021). The effect of repertoire, routinization and enacted complexity: Explaining task performance through patterns of action. *Organization Studies*, 01708406211069438. https://doi.org/10.1177/01708406211069438
Harrison, D. A., Price, K. H., & Bell, M. P. (1998). Beyond relational demography: Time and the effects of surface-and deep-level diversity on work group cohesion. *Academy of management journal*, *41*(1), 96–107.
Hodgkinson, G. P., & Clarke, I. (2007a). Conceptual note: Exploring the cognitive

significance of organizational strategizing: A dual-process framework and research agenda. *Human Relations*, *60*(1), 243–255.
Hodgkinson, G. P., & Clarke, I. (2007b). Conceptual note: Exploring the cognitive significance of organizational strategizing: A dual-process framework and research agenda. *Human Relations*, *60*(1), 243–255. https://doi.org/10.1177/0018726707075297
Hodgkinson, G. P., & Sadler-Smith, E. (2018). The dynamics of intuition and analysis in managerial and organizational decision making. *Academy of Management Perspectives*, *32*(4), 473–492.
Hogarth, R. M. (2001). *Educating intuition*. University of Chicago Press.
Janis, I. L. (2008). Groupthink. *IEEE Engineering Management Review*, *36*(1), 36.
Johnson, D. D., & Fowler, J. H. (2011). The evolution of overconfidence. *Nature*, *477*(7364), 317–320.
Kaber, D. B., & Endsley, M. R. (1998). Team situation awareness for process control safety and performance. *Process Safety Progress*, *17*(1), 43–48. https://doi.org/10.1002/prs.680170110
Kahneman, D. (2011). *Thinking, fast and slow*. Macmillan.
Kahneman, D., Slovic, S. P., Slovic, P., & Tversky, A. (1982). *Judgment under uncertainty: Heuristics and biases*. Cambridge university press.
Klein, G. A. (2017). *Sources of power: How people make decisions*. MIT press.
Kozhevnikov, M., Hegarty, M., & Mayer, R. E. (2002). Revising the visualizer-verbalizer dimension: Evidence for two types of visualizers. *Cognition and instruction*, *20*(1), 47–77.
Kyle, A. S., & Wang, F. A. (1997). Speculation duopoly with agreement to disagree: Can overconfidence survive the market test? *The Journal of Finance*, *52*(5), 2073–2090.
Larrick, R. P., Burson, K. A., & Soll, J. B. (2007). Social comparison and confidence: When thinking you're better than average predicts overconfidence (and when it does not). *Organizational Behavior and Human Decision Processes*, *102*(1), 76–94.
Leonard, N. H., Scholl, R. W., & Kowalski, K. B. (1999). Information processing style and decision making. *Journal of Organizational Behavior*, *20*(3), 407–420. https://doi.org/10.1002/(SICI)1099-1379(199905)20:3<407::AID-JOB891>3.0.CO;2-3
Levine, J. M., & Moreland, R. L. (2004). Collaboration: The social context of theory development. *Personality and Social Psychology Review*, *8*(2), 164–172.
Lipnack, J., & Stamps, J. (1999). Virtual teams: The new way to work. *Strategy & Leadership*.
Malmendier, U., & Tate, G. (2005). CEO overconfidence and corporate investment. *The journal of finance*, *60*(6), 2661–2700.
McGrath, J. E. (1984). *Groups: Interaction and performance* (Bd. 14). Prentice-Hall Englewood Cliffs, NJ.
Meissner, P., Schubert, M., & Wulf, T. (2018). Determinants of group-level overconfidence in teams: A quasi-experimental investigation of diversity and tenure. *Long Range Planning*, *51*(6), 927–936.
Meloy, J. R. (2006). Empirical basis and forensic application of affective and predatory violence. *Australian & New Zealand Journal of Psychiatry*, *40*(6–7), 539–547.
Milkman, K. L., Chugh, D., & Bazerman, M. H. (2009). How can decision making be improved? *Perspectives on psychological science*, *4*(4), 379–383.
Miller, T. M., & Geraci, L. (2011). Unskilled but aware: Reinterpreting overconfidence in low-performing students. *Journal of experimental psychology: learning, memory,*

and cognition, *37*(2), 502.
Mintzberg, H., Raisinghani, D., & Theoret, A. (1976). The structure of" unstructured" decision processes. *Administrative science quarterly*, 246–275.
Moore, D. A., & Healy, P. J. (2008). The trouble with overconfidence. *Psychological review*, *115*(2), 502.
Moore, D. A., & Schatz, D. (2017). The three faces of overconfidence. *Social and Personality Psychology Compass*, *11*(8), e12331.
Moorhead, G., Ference, R., & Neck, C. P. (1991). Group Decision Fiascoes Continue: Space Shuttle Challenger and a Revised Groupthink Framework. *Human Relations*, *44*(6), 539–550. https://doi.org/10.1177/001872679104400601
Olsson, H. (2014). Measuring overconfidence: Methodological problems and statistical artifacts. *Journal of Business Research*, *67*(8), 1766–1770.
O'Reilly III, C. A., Williams, K. Y., & Barsade, S. (1998). *Group demography and innovation: Does diversity help?*
Pacini, R., & Epstein, S. (1999). The relation of rational and experiential information processing styles to personality, basic beliefs, and the ratio-bias phenomenon. *Journal of Personality and Social Psychology*, *76*(6), 972–987. https://doi.org/10.1037/0022-3514.76.6.972
Park, W.-W. (2000). A comprehensive empirical investigation of the relationships among variables of the groupthink model. *Journal of Organizational Behavior*, *21*(8), 873–887. https://doi.org/10.1002/1099-1379(200012)21:8<873::AID-JOB56>3.0.CO;2-8
Plous, S. (1993). *The psychology of judgment and decision making.* Mcgraw-Hill Book Company.
Plous, S. (1995). A comparison of strategies for reducing interval overconfidence in group judgments. *Journal of Applied Psychology*, *80*(4), 443–454. https://doi.org/10.1037/0021-9010.80.4.443
Powell, T. C., Lovallo, D., & Fox, C. R. (2011). Behavioral strategy. *Strategic Management Journal*, *32*(13), 1369–1386.
Pretz, J. E. (2011). Types of intuition: Inferential and holistic. I *Handbook of intuition research*. Edward Elgar Publishing.
Rafaeli, S., & Ravid, G. (2003). Information sharing as enabler for the virtual team: An experimental approach to assessing the role of electronic mail in disintermediation. *Information Systems Journal*, *13*(2), 191–206.
Rafferty, L. A., Stanton, N. A., & Walker, G. H. (2013). Great expectations: A thematic analysis of situation awareness in fratricide. *Safety science*, *56*, 63–71.
Russo, J. E., & Schoemaker, P. J. (1992). Managing overconfidence. *Sloan management review*, *33*(2), 7–17.
Salas, E. (2017). *Situational awareness*. Routledge.
Schwenk, C. R. (1995). Strategic decision making. *Journal of management*, *21*(3), 471–493.
Shariatmadari, D. (2015, juli 18). Daniel Kahneman: 'What would I eliminate if I had a magic wand? Overconfidence'. *The Guardian*. https://www.theguardian.com/books/2015/jul/18/daniel-kahneman-books-interview
Simon, H. A. (1990). Bounded rationality. I *Utility and probability* (s. 15–18). Springer.
Singmann, H., & Kellen, D. (2019). An introduction to mixed models for experimental psychology. I *New methods in cognitive psychology* (s. 4–31). Routledge.
Smith, K., & Hancock, P. A. (1995). Situation Awareness Is Adaptive, Externally Directed Consciousness. *Human Factors*, *37*(1), 137–148. https://doi.org/10.1518/001872095779049444

Sniezek, J. A., & Henry, R. A. (1989). Accuracy and confidence in group judgment. *Organizational Behavior and Human Decision Processes*, *43*(1), 1–28. https://doi.org/10.1016/0749-5978(89)90055-1

Stahl, G. K., Mäkelä, K., Zander, L., & Maznevski, M. L. (2010). A look at the bright side of multicultural team diversity. *Scandinavian Journal of Management*, *26*(4), 439–447.

Tsai, F.-S., Lin, C.-H., Lin, J. L., Lu, I.-P., & Nugroho, A. (2018). Generational diversity, overconfidence and decision-making in family business: A knowledge heterogeneity perspective. *Asia Pacific Management Review*, *23*(1), 53–59.

Turner, M. E., & Pratkanis, A. R. (1998). Twenty-Five Years of Groupthink Theory and Research: Lessons from the Evaluation of a Theory. *Organizational Behavior and Human Decision Processes*, *73*(2), 105–115. https://doi.org/10.1006/obhd.1998.2756

Tversky, A., & Kahneman, D. (1974). Judgment under Uncertainty: Heuristics and Biases: Biases in judgments reveal some heuristics of thinking under uncertainty. *science*, *185*(4157), 1124–1131.

Van Knippenberg, D., & Schippers, M. (2007). Work group diversity. *Annual review of psychology*, *58*, 515–541.

Waber, D. P., Bernstein, J. H., & Merola, J. (1989). Remembering the Rey-Osterrieth complex figure: A dual-code, cognitive neuropsychological model. *Developmental Neuropsychology*, *5*(1), 1–15.

Witkin, H. A., Moore, C. A., Goodenough, D. R., & Cox, P. W. (1977). Field-dependent and field-independent cognitive styles and their educational implications. *Review of educational research*, *47*(1), 1–64.

Woods, D. D. (1988). Coping with complexity: The psychology of human behaviour in complex systems. I *Tasks, errors, and mental models* (s. 128–148).