When team reflexivity pays off:

The effects of leadership style and guided reflexivity on team performance improvement and the role of adaptive behavior

By
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Preface

This thesis report was written for the part-time Master of Science Business Administration at the Rotterdam School of Management, Erasmus University.

I would like to express my gratitude to Michaéla Schippers for her excellent guidance during the complete project. Giving feedback actively, introducing me to other studies and maintaining high standards resulted in the current presented work. My gratitude goes also to Sjir Uitdewilligen for his help with the design of the experiment, the analysis of the results and his overall feedback. I would like to thank Jan Dul for his feedback during the initial development of the research proposal and his methodological advise during the process.

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Lex van der Vegt

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Summary

A growing body of literature suggests that team reflexivity is positively related to team effectiveness. A number of studies demonstrated that guided reflexivity, an intervention to induce team reflexivity, helps accelerate performance improvement. Recently, a study performed by Uitdewilligen, Santos, Passos and Schippers (2016) demonstrated that teams with directive leaders benefit more from guided reflexivity than teams with empowering leaders. This paper elaborates on this study, providing support and explanations. First, it is proposed that teams with directive leaders perform initially better than, but on the long-term will be outperformed by teams with participative leaders. Subsequently, it is proposed that teams with directive leaders benefit more from guided reflexivity than teams with participative leaders. It was proposed that these interactions between directive leadership, guided reflexivity and performance improvement are partially explained by the role of team adaptation. In an experiment involving three rounds (N = 37 teams, n = 111 participants) I found support for these ideas. Results indicated that teams with directive leaders benefit more from guided reflexivity than teams with participative leaders. The interaction effects between directive leadership and guided reflexivity on performance improvement were mediated by team adaptation. The inferences of these results are discussed in the context of the search for boundary conditions of team reflexivity.

1. Introduction

"In retrospect of my years as a junior army officer being quite an impatient and authoritative leader, I wish I allowed myself a substantial larger amount of time to spend on reflection."

General O. van Wiggen at the conference of his book:
"No one is more important than the team", 9th of February 2016.

Imagine a military officer commanding a small combat unit, leading his men through complicated but critical situations on a daily basis. Persistent time pressure requires him to adapt his leadership style into giving orders, barely enabling his subordinates to share their ideas or give any other input. Although the team leader successfully leads his unit through stressful operations, the performance of his team stagnates. In his early years as a junior officer, general van Wiggen found himself in this particular setback. But leading teams in stressful situations that demand directive leadership does not only involve military leaders. Numerous branches are familiar with team leadership under stress (e.g. emergency services, traffic control, surgical teams) and the negative effects that might come along. Both individual reflection and team reflection are used as means to move teams forward.

In the past decades, team reflexivity, the extent to which teams overtly reflect on and adapt their working methods and functioning, has been the subject of a growing body of literature (e.g. Carter & West, 1998; De Drue, 2002; Schippers, West & Dawson, 2015). In academic literature there seems to be a consensus that team reflexivity is a key factor and an important predictor of team outcomes (for reviews see Schippers, Edmondson & West, 2014; Schippers, West & Edmondson, 2016; Widmer, Schippers, & West, 2009; Konradt, Otte, Schippers & Steenfatt, 2016). Recently, several researchers have begun to investigate the effects of deliberately manipulating reflexivity to stimulate and increase team reflexivity (Gabelica, Van den Bossche, de Maeyer & Segers, 2013; Konradt, Schippers, Garbers & Steenfatt, 2015). These studies reported observations that through the use of guided reflexivity, team reflexivity increased and therefore team performance improved. The Konradt et al. study (2015) demonstrated that teams that are induced to be more reflexive were better able to adapt their processes and strategies, and

improved their performance better than either the control group or the experimental group that was given feedback only, instead of both feedback and guided reflexivity (Konradt et al., 2015).

Although the number of studies that demonstrate the benefits of team reflexivity is growing, a recent review by Moreland & McMinn (2010) suggests that enthusiasm for the usefulness of team reflexivity should be tempered, until more and better research has been done. They conclude that team reflexivity can have performance benefits, but only under specific conditions. Indeed, since then a number of studies have shown an amount of these conditions. A longitudinal study among 73 teams of students, working on their bachelor thesis, found a strong positive relationship between teams that performed initially relatively poor, whereas the relationship became less clear when a team did relatively well from the beginning (Schippers, Homan, van Knippenberg, 2013). Another important condition may be the team leader's leadership style in combination with reflexivity. A recent study among 80 student teams demonstrated that guided reflexivity is more beneficial for teams with directive leaders than for teams with empowering leaders (Uitdewilligen, Santos, Passos and Schippers, 2016). As the development of leaders is an area of interest in many disciplines, discovering which leadership styles are most effective when combined with guided reflexivity is a relevant matter to investigate.

Directive leadership, the leadership style on which this study focuses, is defined as leadership behavior aimed at actively structuring subordinates' work through providing clear directions and expectations – there is a minimal amount of two-way interaction between follower and leader (Somech, 2005, Bass & Bass, 2008; Lorinkova, Pearsall & Sims, 2013). Although there exists a vast amount of studies that describe the negative effects of directive leadership (e.g. Yukl, 1999; Kahai, Sosik & Volio, 2004), practitioners are often required to adopt a directive leadership style due to their task environment. As mentioned in the introduction, numerous branches are familiar with frequent and continual stressful situations, which demand directive leadership and not allow leaders to ask team members for suggestions or encourage participative behavior. How can leaders, operating under such high demanding circumstances improve their performances and the performances of their teams?

This research focuses on the interaction effects between a directive leadership style, guided reflexivity and team performance. In line with Uitdewilligen et al. (2016) the study demonstrates

that directive leaders benefit more from guided reflexivity than participative leaders. The explanation for this occurrence is that teams with directive leaders and guided reflexivity are able to adapt better than teams with participative leaders and guided reflexivity (Konradt et al. 2015). This study contributes to the guided reflexivity theory by demonstrating under which particular leadership conditions guided reflexivity is most effective. Furthermore the study contributes to the directive leadership theory by demonstrating how directive leaders can improve their team performances relatively easily by using a reflexivity intervention.

The paper proceeds as follows. First, a theory of guided reflexivity in combination with directive leadership is presented along with the hypotheses concerning their relationship with team adaptation and team performance improvement. Second, the research method, including participants, procedure, design, manipulation checks and measures is described. Third, the results of the data-analyses will be presented. Finally, the results are discussed, and both theoretical implications and limitations are explicated.

2. Theoretical background and hypotheses

Interventions to induce reflexivity are not only investigated under the denominator 'guided reflexivity'. Similar concepts are referred to as 'team self-correction', 'after-event reviews', 'after action reviews', 'action team learning', 'briefing-debriefing technology', or simply 'reflexivity interventions' (for an overview see Schippers, Edmondson & West, in press). Whether reflexivity interventions affect analogous concepts as transactive memory (Lewis, Belliveau, Herndon & Keller, 2007), team mental models (Smith-Jentsch, 2008; Konradt et al., 2015) or shared mental models (Gurtner, Tschan, Semmer, Nägele, 2007), the common belief is that guided reflexivity increases team performance ultimately. Team performance is defined as "how effectively and efficiently a group has been able to accomplish its problem solving task" (Kahai, Sosik & Volio, 2004).

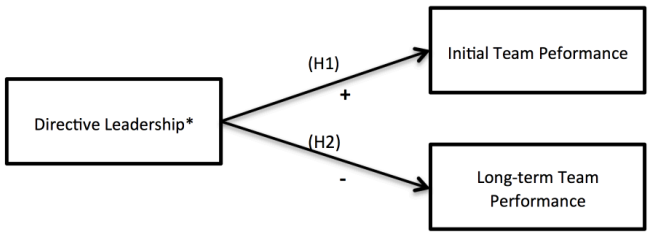
The research performed by Uitdewilligen et al. (2016) demonstrates the difference between guided reflexivity in teams led by directive leaders and guided reflexivity in teams led by empowering leaders. Lorinkova et al. (2013) described empowering leaders as creating psychological ownership of the task, heightening efficacy and commitment, and increasing

coordination and collective information processing. Lorinkova and colleagues (2013) demonstrated that teams with empowering leaders showed less performance improvement after guided reflexivity than teams with directive leaders. It suggests that in certain leadership conditions it is recommended to reflect actively, whereas in other leadership conditions it becomes less important.

A theory on leadership that is widely conceived and used as a practical advice to managers is the 'Situational Leadership-theory' and is developed by Hersey & Blanchard (1988). This leadership model suggests four different leadership styles that leaders can adopt as follower readiness differs. Follower readiness reflects the follower's ability, motivation and security in performing their task. Practitioners are suggested to practice four kinds of leadership behavior: telling, selling, participating and delegating leadership. Telling leadership has become better known as directive leadership (Yukl, 1999; Kahai et al., 2004; Lorinkova, Pearsall & Sims, 2013) and focuses on behavior related to giving detailed directions, expecting subordinates to follow without enabling input. In contrast of directive leadership, participative leadership focuses on socio-emotional support allowing high amounts of two-way communication and discussion (Hersey & Blanchard, 1988).

Inspired by the Hersey & Blanchard's Situational Leadership Theory (1988) and the study of Uitdewilligen et al. (2016), this study includes two conceptual models, describing dependent variables which are time-fixed in the first model (figure 1), and team performance improvement as a dependent variable which is process-based in the second model (figure 2). In the first model the effects of directive leadership on respectively initial team performance and long-term team performance is proposed.

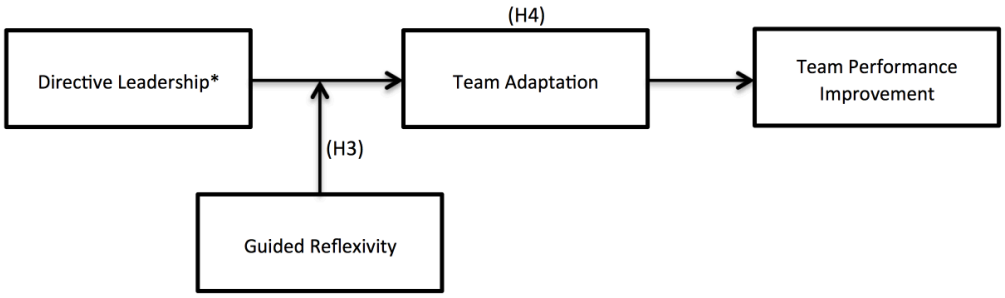
Figure 1: Proposed theoretical framework 1 with hypotheses 1 and 2



*Directive leadership is presented as a dichotomous variable with directive leadership = 1, and participative leadership = 0.

In the second model the interaction effects between directive leadership, guided reflexivity, team adaptation and team performance improvement are depicted in a moderated mediation model. In both models directive leadership is presented as a dichotomous variable with directive leadership as an opposite of participative leadership. The objects of study in the entire research are teams.

Figure 2: Proposed theoretical framework 2 with hypotheses 3 and 4



*Directive leadership is presented as a dichotomous variable with directive leadership = 1, and participative leadership = 0.

2.1 Directive leadership and participative leadership

Hersey & Blanchard's Situational Leadership model (1988) suggests that when follower's readiness is low, leaders should adopt a directive style, providing specific instructions and supervising performance closely. Larsson, Foster-Fishman & Franz (1998) observed that directive leaders improved information exchange and team performance by asking questions and repeating unshared information. Studies describing positive effects of directive leadership on team performance are performed by Peterson (1997), Yun, Faraj & Sims (2005), Somech (2005) and Lorinkova et al. (2013). The last two however, also shed light on the downsides of directive leadership. Directive leadership was associated with averted team innovation (Somech, 2005) and negative team improvement over time (Lorinkova et al., 2013).

Participative leadership is often described and investigated as an opposite of directive leadership (e.g. Hersey & Blanchard, 1988; Bass, 1990; Yukl, 1999; Somech 2005; Arnold, 2013). It is defined as joint decision-making or at least shared influence in decision-making combining two-way interaction with a leader who takes the follower's input into account (Somech, 2005; Kahai et al., 2004; Bass & Bass, 2008). Participative leadership is also

associated with follower's empowerment and team involvement (Somech, 2005). Arnold & Loughlin (2013) found that participative leadership combined with intellectual stimulation led to more creative thinking and better problem solving in government, business and military teams.

There is a common understanding however, that teams that are exposed to a new task, working together as a newly formed group, or both, perform better in initial phases under directive leaders rather than under participative leaders (e.g. Hersey & Blanchard, 1988; Lorinkova, 2013). They reason that in situations where team members are unfamiliar with the given task and the composition of the team, a directive leader will be able to focus the team's attention on specific tasks. The directive leader acts as an explicit coordination mechanism, overviewing the execution of the complete process. Especially in these initial phases, teams under directive leaders are effective because minimal time is spend on developing routines and shared cognitions (Espinosa, Lerch & Kraut, 2004). Therefore the first hypothesis is:

> H1: Teams with directive leaders will have a higher initial performance than teams with participative leaders.

According to Hersey & Blanchard (1988) leaders should not adopt a directive style when followers are in a moderate to high readiness condition. Bass (1990) describes that directive leaders, in contrast to participative leaders, commonly lack the initial time investment to develop subordinates and therefore do not create an effective operation for the long run. Recent research performed by Lorinkova et al. (2013) supports the same image of directive leaders contrasted with empowering leaders. In her study of sixty student teams engaged with a complex task in a networked based computer simulation, the teams with directive leaders were outperformed on average by teams with empowering leaders as they developed over time. Based on the results of these studies, it is proposed that:

> H2: Teams with directive leaders will have lower long-term performance scores than teams with participative leaders.

2.2 Guided reflexivity

Team reflexivity is defined as "the extent to which group members overtly reflect upon and communicate about the group's objectives, strategies (e.g. decision-making) and processes and make changes accordingly" (Schippers, West & Dawson, 2015; West, 2000). In prior research, team reflexivity is often referred to as a team's general working style and measured as an attribute of team behavior (for reviews see Konradt, Otte & Schippers, 2016; Schippers, Edmondson & West, 2014; Widmer, Schippers & West, 2009). There is a growing amount of studies however, which demonstrates that team reflexivity can be used as a deliberate action, an intervention that is referred to as 'guided reflexivity' (Konradt et al., 2015; Gabelica et al., 2014). Guided reflexivity is defined as an intervention to induce group reflexivity (Gurtner, Tschan, Semmer & Nägele, 2007; Konradt et al., 2015). It is described as "a formal and structured intervention, which provides teams with devoted time, space and specific guidelines about how to collaboratively extract meaning from the provided feedback and set new goals and strategies for future performance" (Gabelica et al., 2014, p88). A laboratory study by Konradt et al. (2015) among 98 teams showed that guided reflexivity contributed to the improvement of team performance via the improvement of shared mental models and team adaptation.

Lorinkova et al. (2013) demonstrated that teams with directive leaders had better initial scores, but were outperformed by other teams when co-operating over time. Uitdewilligen et al. (2016) investigated the effect of guided reflexivity in teams with directive leaders in comparison with teams led by empowering leaders over time. The last mentioned study found that the teams with directive leaders and with guided reflexivity where able to accelerate their improvements on the same level as teams with empowering leaders. In contrast to the teams with empowering leaders without guided reflexivity, it was observed that teams without guided reflexivity but with directive leaders demonstrated the worst performance improvement and were outperformed on the long run by all three experimental groups. Elaborating on this study, we propose that:

> H3: The relationship between directive leadership and performance improvement is moderated by guided reflexivity, such that teams with directive leaders show more performance improvement after guided reflexivity than teams with participative leaders.

2.3 Team adaptation

Most definitions of team adaptation refer to the manner or extent to which a theoretical unit (i.e. person, group or organization) achieves correspondence between the unit's behavior and a set of novel demands faced by the unit (LePine, 2003; 2005). As the concept grows in academic research, there are distinctions among adaptation concepts with respect to the nature of how correspondence is achieved. West (2000) describes team adaptation as team behavior relevant to the achievement of desired changes in team objectives and strategies that are identified during the stage of reflection. This concept underlines the importance of the reflection phase in which agreements are made about adjusting objectives, processes and strategies. Burke (2006), defined team adaptation as:

"A change in team performance, in response to a salient cue or cue stream, that leads to a functional outcome for the entire team. Team adaptation is manifested in the innovation of new or modification of existing structures, capacities, and/or behavioral or cognitive goal-directed actions (p. 1190)."

From this perspective, team adaptation focuses on the extent to which teams can overcome problems, deal with changing environments and generate innovative solutions, regardless the phase of the team process. Burkes definition is widely adopted and further investigated in subsequent research on team performance (e.g. Ilgen, Hollenbeck, Johnson, & Jundt, 2005; Kozlowski & Ilgen, 2006; Randall, Resick & DeChurch, 2011). Therefore the definition of Burke and colleagues (2006) of team adaptation is adopted in the present study.

A vast amount of studies on team adaptation provided evidence for it's positive relationship with team performance (e.g. Randall et al., 2011; Kozlowski, Gully, Nason & Smith, 1999), but there are fewer studies that investigated the influence of guided reflexivity on team adaptation. Konradt et al. (2015) adopted West's definition of team adaptation and succeeded partially to demonstrate a positive relationship between team adaptation and team reflection. Considering the definition of guided reflexivity by Burke (2006) and the results of the Konradt et al. study (2015), it is likely to assume that guided reflexivity leads to better team adaptation and therefore to more performance improvement. It is expected that teams with participative leaders will not

benefit significantly from guided reflexivity, and will therefore not become more adaptive after guided reflexivity. Therefore:

> H4: The relationship between teams with directive leaders and team performance improvement is mediated by team adaptation, such that directive leadership combined with guided reflexivity will have higher team adaptation and therefore more team performance improvement than teams with participative leaders.

3. Method

3.1 Sample

The sample consisted of 111 cadets (100 male, 11 female), aspirant army officers, who are trained and educated at the Netherlands Defence Academy (NLDA) to lead military operations in the future. The cadets came from four platoons corresponding with their year of attendance at the NLDA: 27 first-year cadets, 24 second-year cadets, 30 third-year cadets and 30 fourth-year cadets included the sample. After basic training of one year, all cadets following the extended training program are expected to attend a three years academic course, investing minimal time in soldiering skills. This implies that it can be assumed that all cadets are generally at the same level of military experience and tactical knowledge, whether it is a first year-cadet or a fourth year-cadet. The participant's age ranged from 18 to 28 years (M = 22.1 SD = 1.8). The participants were assigned by their commanding officer and informed that they would be part of an experiment. To encourage their competitive spirit they were also told that the experiment would be evaluated with their commanding officer. All cadets were debriefed after the procedure and none of the participants chose to stay excluded from the sample. Participants were divided in 37 three-person teams. It was not possible to select and divide the teams randomly, because participants were only made available at set times, prescribed by their staff.

3.2 Task

The task required three participants to act as a small reconnaissance unit with a tactical assignment to infiltrate an area of operations, avoid enemy forces and attack a designated target.

The teams executed a series of three tactical assignments, 45 minutes for each assignment. A PC-based first-person simulation of high graphical quality, Virtual Battle Space (VBS) 3 was used. The simulation is used by defence forces of multiple NATO countries to train military units ranging from a squad (four persons) up to a platoon (thirty persons). To pursue an optimal environment in which the theorized concepts of this research could be tested, a tactical assignment was developed and repeatedly tested by the Simulation Centre of the Netherlands Army in close coordination with the researcher. The task environment requires participants to process information fast, and to interact and cooperate intensively. Participants were exposed to complex situations in newly formed teams with a novel task, time pressure and an extensive amount of information to process. Due to the accurate reflection of a realistic military assignment in an unknown environment, the simulation fitted properly to examine the theorized concepts of performance improvement in complex and high-demanding situations.

In each assignment the purpose of the teams was to 1) infiltrate behind enemy lines, 2) make contact with a local partisan, 3) identify a target (person) with the information that was given by the partisan, 4) neutralize the target and finally exfiltrate to a point where they were 5) being picked up by a helicopter. At the beginning of each assignment all team members had to select their equipment for the complete mission. For example, at the start of each assignment choices had to be made between night-vision goggles and hand grenades, or between a machine gun and a sniper rifle. To navigate through the terrain and to analyse their task, teams were handed two maps and two assignments in hard copy. This necessitates the participants to share information and interact intensively, because teams consisted of three members and were forbidden to look on each other's screen. All team members had memory-sheets for the controls of their keyboards available.

In each assignment teams had to infiltrate the area without being spotted by enemy forces, who patrolled the area and observed key sections from guard posts. In the event that a team was compromised by the enemy, all team members were respawned to their starting point and reproved with 10 penalty points. After reaching the local partisan teams were rewarded with essential information to localize the target.

After reaching the location of their target, teams were supposed to scout the area, identify the

target and plan an attack to neutralize the target person. Pilot testing demonstrated that tactics involving a coordinated attack from multiple angles using the slopes of the terrain and combining multiple weapon systems would lead to the best results, as the target person was guarded with seven enemy forces. In this phase teams could earn 120 points: 50 for neutralizing the target and 10 points for each additional neutralized enemy. Finally, after the attack on their target, teams had to exfiltrate to a pick-up point in the area where they were extracted by a helicopter. They had to reach the pick-up point with all team members within 45 minutes earning 50 points once more. Besides small differences to avoid teams simply repeating their initial routes and tactics, the second task was similar to the first task.

The third round involved an unforeseen change to create a situation in which team adaptation could be examined. Consistent with the task-change paradigm (LePine, 2003, 2005; Uitdewilligen, Waller & Pitariu, 2013), teams were enabled to establish routines to accomplish their task during the first rounds, whereas an unforeseen change in the final round required them to adapt their strategy. In the first two rounds of the VBS-simulation, enemy forces were programmed such that teams were able to infiltrate by practising standard infiltrating techniques. In the third round however, teams received an onscreen message with a warning that the enemy reinforced their security. Enemy patrols and observation posts where double as intense as in the rounds before, making the objectives harder to complete. The intensifying of enemy presence required the teams to adapt their strategy into either follow and observe enemy movements closely, or to take out some enemy patrols and accept penalty points in order to reach their main objective. To remind the teams that objectives were prioritized, the incoming message stated that teams would be awarded double points if they reached both main objectives, making the reprove of penalty points marginal and to adopt an alternative strategy more attractive. Pilot testing demonstrated that teams that adapted their strategy into either stalking the enemy or taking out an enemy patrol in an early stage, were able to reach both main objectives in the final round.

3.3 Procedure

About four weeks before the experimental sessions, participants completed an online questionnaire that assessed their natural leadership tendencies. Based on the outcome of these tests as is described in the subsequent section, the team leaders were

asked to arrive twenty minutes before the start of the experiment to receive instructions. Upon arrival, each leader was assigned to a lab where a video was shown. Depending on the leadership condition they were selected for, the video instructed participants to exhibit a directive or participative leadership style. After the video, the leaders were handed the team assignment for the first round. In the mean time, the other team members arrived and were introduced to the assignment by the experimenter. After the leader was instructed in isolation of the rest of the team, team members joined the team leader and the experiment started immediately.

The experiment approximately lasted three hours and fifteen minutes. After both team leader and team members where instructed, all participants followed a 30-minutes instruction course to get familiar with the simulation's controls on movements, weapons and navigation. To make sure every participant would start the experiment on an equal level as much as possible, it was made sure that each participant was familiar with a range of six selected weapons and was able to accomplish an obstacle course, which tested their movement skills.

Each tactical assignment started with footage of an unmanned aerial vehicle (drone) to get an overview of the area of operations and possible enemy positions. After these video images the teams got a total of 45 minutes. In this time they had to 1) determine their strategy, which involves route planning, discussing formations and other tactics, 2) select their equipment and 3) fulfil their assignment. Each scenario stopped after 45 minutes and participants were instructed to follow a guided reflection format, as described in the manipulations section, or fulfil a given filler task. After ten minutes, team members answered questions about the leadership style of their leader in a questionnaire, while the team leader was instructed for the next round. The same procedure was repeated for the second and third tactical assignment. After the third assignment the participants were asked to complete the questionnaire, debriefed and thanked for their participation.

4. Design and measures

The experiment was designed as a longitudinal 2 (directive/participative) x 2 (guided reflexivity yes/no) design. The research is appointed as longitudinal, because hypotheses three and four include emphasis on a change process and the experiment encompasses three

observations (Ployhart & Vandenberg, 2010). The 37 participating teams where divided in four experimental groups:

Directive – Guided reflexivity: N = 8 teams

Directive – No guided reflexivity: N = 9 teams

Participative – Guided reflexivity: N = 10 teams

Participative – No guided reflexivity: N = 10 teams

The explanation for the slight inequalities of sizes of the experimental groups is that it was scheduled originally to distribute 40 teams equally over the four experimental groups. However two teams turned out to be unavailable for the experiment due to last moment changes in their obligatory training program and one team was left out of the analysis due to technical failure.

4.1 Leadership manipulation

In line with Durham, Knight and Locke (1997) and Lorinkova et al. (2013) a two-step approach is used, which consists of first selection and second instruction of leaders to maximize the effectiveness of the manipulation. Leaders were selected based on their predisposition to behave as a directive leader or participative leader and were additionally instructed to adopt the preferred leadership style during the experiment.

As described in the former section, all participants filled in an online questionnaire about four weeks prior to the experiment. Based on the results of this survey, leaders were selected and assigned to one of the four experimental groups. To measure the predisposition of directive leadership, a 7-item questionnaire was used, based on the Directive Leader Scale (Durham et al., 1997), which was adapted from Cox and Sims (1996). Participants were asked to indicate whether they would feel comfortable to behave as a directive leader, such as "giving instructions to group members", "determining objectives for each member" and "taking command of a group." All questions were asked on a 7-point Likert scale (1 = *extremely uncomfortable,* and *7 = extremely comfortable).*

To measure the predisposition of participative leadership, a 5-item questionnaire was used,

adapted from the Empowering Leadership Questionnaire, developed by Arnold et al. (2000). This validated questionnaire encompasses five aspects of empowering leadership, including participative leadership. Participants were asked to indicate whether they would feel comfortable to behave as a participative leader, such as "encourage work group members to express their ideas", "give all group members the chance to voice their opinions" and "listen to the ideas of group members." All questions were asked on a 7-point Likert scale (1 = *extremely uncomfortable,* and *7 = extremely comfortable).*

To select the leaders with the most extreme predispositions, the means of both the directive and participative questionnaire of each individual were compared. It was assumed that participants with the highest differences in means had the highest contrast in preferred leadership style and accordingly should have the strongest predisposition for either directive or participative leadership. The participants were not informed about the reason for the selection of leaders.

All team leaders followed a ten-minute instruction video immediately before the start of the experiment. First it is explained what directive or participative leadership actually is. Subsequently, consistent with Lorinkova et al. (2013), they were shown a short movie clip, which contains fragments of the film Apollo 13. Depending on the leader's leadership condition, examples of directive or participative leadership were provided in the movie clip. After watching these fragments leaders were urged that it was essential to adopt the prescribed leadership style in order to succeed in the simulation. To ensure that the selected leaders would maintain their prescribed leadership style during all three assignments, they were handed a memory-sheet with examples of key verbal phrases regarding their leadership style. As the suggested phrases only served to reinforce the manipulation, they did not reflect any useful directions.

4.2 Guided reflexivity manipulation

Teams in the guided reflexivity condition received written instructions after their first and second assignment to reflect upon their performance. Following Gurtner et al. (2007), teams were asked to (1) reflect on how they performed suggesting five subjects (e.g. time management, use of equipment), (2) consider potential improvements and (3) develop new plans accordingly. A total time of ten minutes was given to conduct the reflexivity intervention. Teams without the

reflexivity manipulation were given a filler task, which consisted of filling in a questionnaire with questions about the training and education program of aspirant officers.

4.3 Measures

Team adaptation. Consistent with the adopted definition (Burke, 2006), team adaptation was observed as a reaction to an unforeseeable change. Previous studies adopted a task-change paradigm to assess postchange team performance (LePine, 2003, 2005; Uitdewilligen, et al., 2013). In this paradigm teams are trained in one context until they get a basic proficiency in executing the task following a certain tactic or method. Then some aspect in the task situation changes, requiring the team to adapt their tactic or method to the new situation. The extent to which they are able to adapt and fulfil their task in the new situation indicates their level of team adaptation (Uitdewilligen et al., 2013).

In the present study, team adaptation was measured by the extra time in minutes the team needed to reach the local partisan in the postchange situation (assignment three) compared to the second assignment. After evading enemy forces during the first rounds, teams are expected to gain a basic proficiency in executing their task. Teams requiring little extra time to reach the partisan in the third round were able to adapt faster to the new situation and took less time to find a safe way through enemy lines. For simplifying reasons, these scores are reversed: the extra taken minutes are subtracted from an arbitrary chosen number (20), which results in a logical reasoning (higher scores means more team adaptation).

Table 1: Score system in the tactical assignment

Action	Points
Compromise	-10
Open fire during infiltration	-5
Casualties own side	-5
Main target neutralized	50
Complete arrival at point of extraction	50
Other enemies neutralized	10

Team performance. Team performance was calculated as the sum of points that teams were able to collect. Due to the practice of penalty points, scores could end up in negative numbers. A summary of rewards and penalties is presented in table 1. Initial team performance was measured by the team performance of assignment 1. Long-term team performance was measured by the

team performance in the last scenario, assignment 3.

Control variables. In the experiment we controlled for game experience and military experience. Game experience might influence the theorized concepts because the simulation is based on a first-person game platform and participants familiar with similar first-person shooter games might have an advantage in getting used to the controls. Game experience is measured by asking participants to indicate how often they play computer games on average during the last year (in hours per week). Military experience might influence the theorized concepts because pilot testing demonstrated that the use of military tactics in the simulation scenarios leads to better results. It was imaginable that participants in a higher stage of training would practice military tactics better. Military experience is measured by the year of attendance at the military academy (*1 = 2015* and *4 = 2012)*. Because both control variables aimed to capture constructs with teams as unit of analysis, the individual scores were aggregated to the team-level.

5. Results

5.1 Manipulation checks

To ensure that the designated leaders demonstrated the instructed leadership-style, team-members answered questions about their perception on their leader's behavior. Participative leadership was measured with a three item-questionnaire, adapted from Pearce, Sims, Cox, Ball, Schnell & Smith (2003). Directive leadership was measured with a three-item questionnaire, adapted from Durham et al. (1997). Both questionnaires used 7-point Likert type scales (1 = *strongly disagree* and 7 = *strongly agree*) and were answered after each round during the experiment. Because the intention was to check the perceived behavior by the individual team member on his team leader, scores were not aggregated to the team level. Results indicated that the participants in the directive condition perceived their leader to be significantly more directive ($M = 5.75$; $SD = 0.72$) than those in the participative condition ($M = 4.71$; $SD = 1.04$); $t_{(72)} = 4.99$, $p < .01$. Accordingly, leaders in the participative condition were perceived as more participative ($M = 6{,}24$; $SD = 0.61$) than the leaders in the directive condition ($M = 5.74$; SD 0.94); $t_{(74)} = 2{,}74$, $p < .01$. Together, both results provide support for the effectiveness of the two leadership manipulations.

5.2 Data Analyses

Consistent with the nature or the hypotheses, three different statistical analyses were used. First, hypothesis 1 and 2 are tested using one-way ANOVA. In these analyses the effect of directive leadership on initial team and long-term performance is tested

For hypothesis 3, to test the effect of guided reflexivity and directive leadership on performance improvement, the random coefficient growth modelling method (RCM) of Bliese and Ployhart (2012) is used to develop a growth model to analyse the longitudinal data. The six-step model estimation procedure is followed, entering leadership as a dichotomous Level 2 variable (Directive leadership = 1 and Participative leadership = 0) and the team performance scores at each round as a Level 1 outcome, using similar variables and procedures as Lorinkova et al. (2013). In this analysis the open source statistical software program R version 2.14.0 supported with the Nonlinear and Linear Mixed Effects package (nlme) was used. Following Bliese and Ployhart (2012) steps 1 through 4 were performed to optimize the level 1 model examining the performance scores of the teams with growth over time. In step 5 and 6 model 2 was developed examining leadership style and guided reflexivity with initial performances and finally over time. This results in a model that fits the data most optimal, allowing hypothesis 3 to be tested.

Finally, hypothesis 4 is tested using generalized least square (GLS) regression analysis to examine the conceptual model. Because team adaptation was only measured during the third assignment, it was not a longitudinal variable and therefore the use of RCM was not possible. Accordingly, GLS was used to analyse the path from leadership style and guided reflexivity to team adaptation and finally team performance improvement in line with Shrout and Bolger (2002). In order to estimate the strength of the indirect path, bootstrapped confidence intervals were constructed in PROCESS (Hayes, 2013) following the recommendations of Preacher, Rucker and Hayes (2007).

5.3 Hypothesis Testing

A summary of means, standard deviations and correlations is provided in table 2. It should be noted that standard deviations appear to be very high, which is the result of negative scores. For

example, team scores in the initial team performance phase ranged from -90 points up to 145 points, resulting in a seemingly low mean and high standard deviation. Applying Necessary Condition Analysis (NCA) (Dul, 2016) on the two control variables revealed no significant necessity (CR-FDH varying between $d = .004$ and $d = .073$) to deliver a high initial or long-term team performance. Although none of the control variables were significantly correlated, to increase the robustness of the results, both variables were controlled for in the subsequent results.

Applying NCA on the relationship between team adaptation and long-term performance however, revealed a NCA effect size (CR-FDH) of $d = 0.43$, which implies that a certain desired level of long-term team performance can only be achieved if team adaptation was at an accordingly minimal level. On the other hand, only a high level of team adaptation was not sufficient to deliver high long-term team performances (Dul, 2016). Based on these results, it can be assumed that teams needed to adapt well in the third round to achieve high performance, which is consistent with the proposed theoretical framework.

Table 2: Descriptive statistics and correlations

Variables	M	SD	1	2	3	4	5	6	7
1. Leadership condition	46	.51							
2. Guided reflexivity condition	.49	.51	-.03						
3. Game experience	3.46	2.08	.15	.04					
4. Military experience	2.57	1.14	.02	-.11					
5. Team adaptation	9.08	12.39	-.10	.10	-.02	-.03			
6. Initial team performance	12.84	66.86	.33*	-.02	-.09	.06	-.17		
7. Long-term team performance	47.84	82.70	.01	.13	.12	.11	.78**	.09	-

N = 37. Leadership condition is a dichotomous variable with Directive leadership = 1, and Participative leadership = 0. Guided Reflexivity is a dichotomous variable with 1 = Reflexivity intervention, 0 = No reflexivity intervention (filler task).
*p < .05, **p < .01

Hypothesis 1. The first hypothesis predicted that teams led by directive leaders would have better initial team performances than teams led by participative leaders. Because in the first assignment teams were not manipulated yet on the reflexivity condition, it was allowed to include all experimental groups in the analysis (N = 37). Using one-way ANOVA the relationship was found to be significant $F(1, 35) = 4.29$, $p < .05$. Teams led by directive leaders performed visibly higher in their initial performance ($M = 36.47$, $SD = 63.73$) than teams with participative leaders ($M = -7.25$, $SD = 64.23$). Within the criteria of Cohen (1977) the effect-size of the test is large (eta-sq = .11) explaining a vast amount of the variance in teams. Together

these results provide support for hypothesis 1.

Hypothesis 2. The second hypothesis predicted that teams led by directive leaders would show lower team performance than teams with participative leaders on the long term. Unlike hypothesis 1, not all experimental groups could be included in the analysis of hypothesis 2, because two experimental groups were manipulated with guided reflexivity during the process. Including teams in the directive leadership - guided reflexivity condition (N = 8) or teams in the participative leadership - guided reflexivity condition (N = 10) would result in a biased measure of directive and participative leadership. Both conditions were exposed to a reflexivity intervention, which in the theoretical framework was proposed to be effective in the directive condition and less effective in the participative. Therefore, the remaining sample size to test hypothesis 2 included only the experimental groups in the non-guided reflexivity condition. The test revealed no statistical result to support the hypothesis $F(1, 17) = 2.23$, $p = .25$. The lack of statistical significance might be due to a small residual sample size (N = 19), requiring the researcher to examine the results more qualitatively.

Despite the lack of statistical significance, the results of the one-way ANOVA revealed an effect-size of eta-sq .07, which is classified by Cohen (1977) between medium-to-large, indicating support for a substantial difference between the directive and participative groups. An explanation for this relative high effect-size is that the performances of teams with directive leaders in the last scenario ($M = 15.45$, $SD = 65.32$) was more than 50 points below the average team with participative leaders and without guided reflexivity ($M = 68.75$, $SD = 90.74$). A difference of 50 points represented the difference between success and failure in the simulation. In the assignment, there were two main objectives: 1) neutralize the target and 2) arrive at the extraction point as a team. Each main objective was rewarded with 50 points. As the average difference of scores between teams with directive leaders versus teams with participative leaders was 53.30 points, the average difference in long-term performance was the difference between success for the participative groups and failure for the directive groups. Based on these findings, hypothesis 2 is accepted.

Hypothesis 3. The third hypothesis predicted that teams led by directive leaders benefit more from guided reflexivity than teams led by participative leaders. The expectation was that teams

with directive leaders would show less performance improvement compared to teams in the reflexivity conditions. Teams with participative leaders in contrast, were not expected to improve their performance significantly if they are exposed to a reflexivity intervention.

As described in the former section, to test hypothesis 3, steps 1 through 6 of the RCM-procedure as suggested by Bliese and Ployhart (2012) were performed. Developing the level 1 Model, steps 1 and 2 reveal that adding a random intercept term to the model improved the fit of data ($LL(2) = 3{,}40$, $p = .07$). The improved model now shows a significant correlation between time and team performance ($\gamma = 2.18$, $p < .05$), which concludes that the model that allows teams to randomly vary in terms of their initial team performance, fits the data better. Step 3 reveals that the model is not improved adding random slope variation amongst the teams ($LL(2) = 0.41$, $p < .09$). Using a quadratic parameter for time was better to capture team performance trajectories ($\gamma = 4.98$, $p < .001$) than the linear parameter ($LL(2) = 7.62$, $p < .2$) and resulted in the best fitting model. In step 4, the final step of the level 1 Model, a test to check for autocorrelation and heteroscadasticity was performed, revealing no significant influences, which allows maintaining the model as currently developed.

Table 3: Results of random coefficient models for moderator testing

Model and Parameter	Parameter estimate	SE	t
Final Level 2 Model			
Intercept	11.39	10.99	1.04
Military Experience	-0.77	7.61	-0.10
Game Experience	1.00	7.60	0.13
Leadership	20.67	14.66	1.41
Guided Reflivity	12.38	14.70	0.84
Time	37.67	7.57	4.98**
Time * Leadership	-23.27	14.90	-1.56
Time * Guided Reflexivity	15.07	15.15	0.99
Leadership * Guided Reflexivity	29.95	34.04	0.39
Time * Leadership * Guided Reflexivity	77.70	27.15	2.86**

For all Level 1 parameter estimates, df = 73; for all level 2 parameters analyses, df = 72. Leadership is a dichotomous variable with 1 = Directive Leadership, and 0 = Participative Leadership.
**p <. 01

The development of the level 2 Model, where initial scores and variation in performance improvement are modelled, is performed through steps 5 and 6 for the leadership condition and the reflexivity intervention. The results of the models are presented in table 3. The model did not show a significant overall main effect of the leadership condition on team performance

improvement over time (γ = -1.56, p = .12). This is explained by the reasoning that guided reflexivity helps to reduce the negative long-term effects of directive leadership would therefore perform equally as participative leadership. Nor did the results show an overall main effect of the guided reflexivity on team performance improvement ((γ = 0.99, p = .32) as it was reasoned that teams with participative leaders would not benefit, or benefit less from guided reflexivity. However, combining the leadership condition, the reflexivity intervention and time results in significant linear three-way interaction effects on team performance (γ = 2.86, p < .01), indicating a positive relationship combining directive leadership with guided reflexivity rather than with participative leadership.

As figure 3 shows, teams with directive leaders and guided reflexivity improved their performances substantially more (M = 96.25) than the other control groups (M = 69.99) after the first scenario. Whereas directive teams without guided reflexivity showed, despite their highest initial scores, by far the least performance improvement in the second (M = 34.09) and third (M = -55.00) scenario.

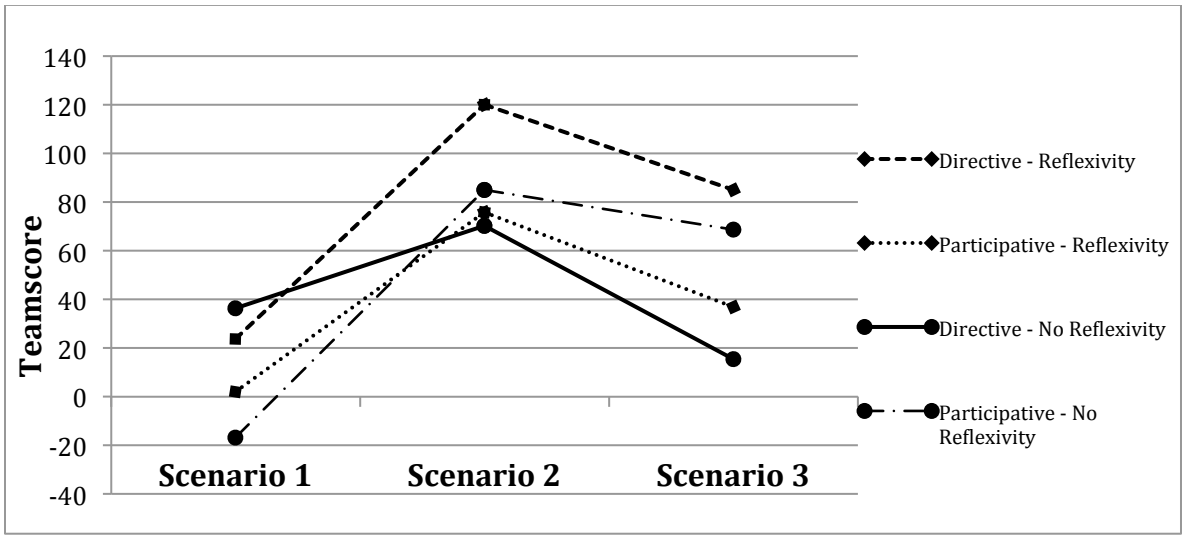


Figure 3: Interactive influences of leadership and guided reflexivity over time. The loss of performance in scenario 3 reveals team adaptation and will be analysed in hypothesis 4.

This contrast is even more noticeable with regard to the contrast between teams with participative leaders. The means of scores in assignment 2 and assignment 3 show minimal differences between both experimental groups in the participative condition. Moreover, teams

with participative leaders without guided reflexivity showed more performance improvement (*M* = 101.88) than participative teams with guided reflexivity (*M* = 74.00). Accumulative, these findings provide support for hypothesis 3.

Hypothesis 4. Hypothesis 4 predicted that teams with directive leaders benefit more from guided reflexivity, because after guided reflexivity their team adaptation will increase and subsequently their performance improvement will be higher. Therefore the relationship is partially explained by team adaptation which acts as a mediator. As noted in the data-analyses section, in line with Shrout and Bolger's procedure to test mediation models in experimental studies (2002) GLS regression was used to test the hypothesis. Team performance improvement was tested by analysing the team scores of assignment two and three. The results of this procedure are presented in table 4. Results show that team adaptation is significantly related to leadership style combined with guided reflexivity ($\gamma = 3.11$, $p < .01$), which provides support that leadership style reinforced with guided reflexivity explains variability in team adaptation.

Table 4: Results of GLS for testing team adaptation as a mediator

Variable	Team adaptation as outcome	Team performance as outcome
Military Experience	0.24	-0.06
Game Experience	0.42	0.12
Leadership	-0.85	0.51
Guided Reflexivity	0.85	1.11
Leadership*Guided Reflexivity	3.11**	2.01*
Time		-2.20*
Team Adaptation		3.35**
Degrees of Freedom (df)	*74*	*74*

*p < .05, **p < .01

Figure 4 visualises the effect of leadership style combined with guided reflexivity on team adaptation. This image is consistent with the hypothesis that teams with directive leaders have relatively higher team adaptation after guided reflexivity than teams with participative leaders. In the next step, table 4 reveals that team adaptation was significantly and positively related to the development of team performance ($\gamma = 3.35$, $p = .001$). Whereas leadership style combined with guided reflexivity predicting team performance became less significant ($\gamma = 2.00$, $p = .048$), which supports the mediational role of team adaptation.

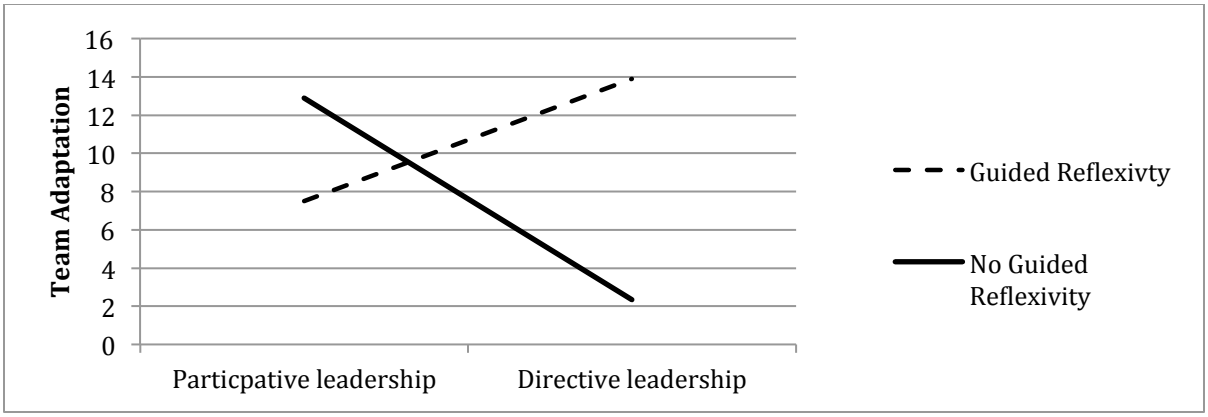


Figure 4: Step 1 of the mediation analysis. The effects of directive leadership moderated by guided reflexivity on team adaptation.

In recommendation of Preacher, Rucker and Hayes (2007) this procedure was followed by bootstrapping the analysed data to assess the indirect effect. The 95% bootstrapped confidence interval (5.000 resamples) estimating the effect size of the mediation variable excluded zero [CI = 5.32; 86.27], providing significant support for the hypothesis. Furthermore, regressing team adaptation with team performance improvement reveals that team adaptation accounts for a large amount of variation (Adjusted R-sq = .59) in team performance improvement, indicating partial mediation. Accumulatively, these findings provide support for hypothesis 4.

6. Discussion

Theoretical developments over the past two decades highlighted the benefits of team reflexivity for team effectiveness, team performance and team innovation, but the body of research demonstrating boundary conditions of team reflexivity is small (for exceptions, see De Dreu, 2002, 2007; Schippers et al. 2015; Uitdewilligen et al. 2015). Moreland and McMinn (2010) argue that team reflexivity only works under specific circumstances and that the benefits of team reflexivity should be further investigated. The present research extended past research on team reflexivity by finding leadership contingencies in which team reflexivity is beneficial in particular.

Findings of the current study revealed that teams with directive leaders benefit more from guided reflexivity than teams with participative leaders. I showed that the effects of guided reflexivity on teams with participative leadership on team performance improvement are marginal, if not negative. The teams with directive leaders and without guided reflexivity, which

improved their performances worst, contrasted teams with directive leaders and with guided reflexivity showing the highest improvement rates on average. Allthough not hypothisized, teams with directive leaders – with guided reflexivity showed also the highest long-term performance scores. The results of the study indicated that teams with directive leaders have better initial performance scores and, if reinforced with guided reflexivity, improve to outperform all other group conditions.

A remarkable result is that the reflexivity interventions seem to have had a negative effect on teams with participative leaders. Teams with participative leaders showed more performance improvement without guided reflexivity than teams with guided reflexivity. This could be an indication that it might have an averse effect to teams with leaders who already have a reflexive attitude during team assignments and start evaluating their working methods additionaly. However no significant relationship was found of this possible averse effect, it could be an opening for further research or debate.

6.1 Theoretical implications

Given the limitations as described in the subsequent section, the present study made four contributions to the literature of guided reflexivity and directive leadership. First, this paper demonstrated that guided reflexivity is not always as effective as might be expected. On one hand the findings support Moreland and McMinn's claim (2010) that enthusiasm for team reflexivity should be tempered, because it only seems to increase performance under particular conditions. On the other hand, Moreland and McMinn (2010) suggested that these conditions might be so special that they are very hard to create. The results of this study demonstrate that this might be wrong, because the conditions in the experiment were rather straightforward and did reflect a presumable practitioner's task.

Second, the study provides support for the theory originated by Uitdewilligen et al. (2016), which suggests that reflexivity sessions are especially important for directive leaders, rather than for leaders who already emphasize reflection during task performance. They found evidence for their theory manipulating leaders with directive leadership and empowering leadership. The current study found evidence for the theory, manipulating participants into participative leaders

instead of empowering leaders as a counterpart of directive leadership. Demonstrating the contrast of the effectiveness of guided reflexivity between teams with directive leaders and teams with participative leaders contributes to the robustness of the theory of Uitdewilligen and colleagues (2016).

Third, in addition to the support of the above-mentioned theory, this study suggests also a partial explanation. The reason why guided reflexivity is important for directive leaders is that the intervention to induce reflexivity contributes to the team's ability to adapt. Without the provided reflexivity intervention, teams with directive leaders were less able to adapt their tactics and techniques to the given circumstances. Therefore these teams showed the least performance improvement and were outperformed by all other teams. Guided reflexivity in teams with participative leaders on the other hand, seemed to temper their adaptive behavior, which resulted in an overall decrease of performance improvement. An explanation for this observation might be the possibility that guided reflexivity enables directive leaders to use suggestions of team members when situations change, whereas participative leaders are slowed down by becoming by guided reflexivity and becoming less decisive.

Finally, this study creates contrast with respect to previous studies suggesting that team reflexivity might be particularly important for teams with relatively poor initial performances (Schippers et al., 2012; Schippers et al., 2013). In this study, the teams in the participative leadership conditions demonstrated relatively poor initial performance scores, but seemed to benefit least from guided reflexivity. Teams with directive leaders on the other hand scored initially relatively high, but benefited most from guided reflexivity. Whether this observation forms an exceptional occurrence or is an indication of a trend needs to be further investigated.

6.2 Managerial implications

Allthough the use of a convenient sample out of an unknown population does not allow generalising the results to other instances, a number of managerial implications are brought up with any restraint. As our findings suggest, in this study teams with directive leaders benefited more from guided reflexivity than teams with participative leadership. Therefore, organisations that are aware of the fact that their leaders find themselves in a task environment which demands

directive leadership, might invest time in team reflexivity. As teams are not able to discuss their working methods and functioning during performance episodes, it becomes more important to provide reflexivity interventions after or between these episodes. Directive leadership with guided reflexivity resulted in more team adaptation and consequently in better performance improvements. As a result, one can argue that if there seems to be no opportunity to make a directive leader more reflexive, one should try to compensate the lack of reflexivity by finding another way to become more adaptive as a team. Since guided reflexivity turned out to be less important for teams with participative leaders, it might be not worth the investment to spend time on reflexivity sessions.

7. Limitations and future research

To evaluate the results of the present study there are some limitations that need to be acknowledged and adressed. First, because the sample that is used for data collection was chosen convenient, the translation of the results from the sample to any population has low statistical reliability. Moreover, because team leaders were selected by their leadership predisposition, a selection bias is not precluded. The existence of confounding variables influencing both dependent and independent variables might be present. Hence, the results should be accepted with caution and cannot form the basis of generalisation. Future research might aim to select both leaders and participants randomly from a known population, and therefore allowing inferential statistics, enabling generalisation and reducing possible influences of confounding variables.

Second, however internal validity and reliabilty are strenghts in this research, it should be noted that the use of the simulation Virtual Battle Space (VBS) 3 involved several technical limitations that possibly affected the performance of teams. For instance, the pre-programmed enemy was not always taking the designated paths, influencing the outcome of the assignment. Furthermore the use of the military licensed software VBS 3 also limitates the possibility to replicate the study. Developing and operating scenarios in VBS 3 requires expertise from the Simulation Centre and consent of the military instance involved. Future research might be performed using Arma software, which is the civilian counterpart of VBS and is publicly accessible to program and operate.

The third limitation is that, however the ecological validity regarding the reality of the simulation is high, one needs to take into account certain influential aspects. The formation of the teams was on ad-hoc basis, which is not common in military teams. Additionally, teams existed of novice soldiers exposed to a complicated, highly interactive and dynamic task. In real life context, before military teams enter an operational theater, soldiers are normally well-prepared for their task. Furthermore, the limited number of team members must be considered. Teams of more than three team members might affect the results of a reflexivity intervention and the adopted leadership style. Accumalively, these factors limit the extent to which the results of this particular study can be applied to other instances. To enhance ecological validity, future research might investigate teams in their natural environment, following their performances over time.

Finally, suggestions for future research can aim to focus on possible averse effects of guided reflexivity in conditions where leaders already tend to be participative or reflexive. In the present study the relationship on performance improvement has been found to be negative, but not significant, possibly due to a low sample size. West (2002) already demonstrated that participative leadership helps to lower barriers between individuals and stimulates team innovation to optimize work processes. For those teams, the addition of guided reflexivity might result in too much reflection slowing down team processes and possibly negatively affecting team performances.

8. Conclusion

Over the past two decades, research on team reflexivity has grown steadily. Within the paradigm of team reflexivity a vast amount of studies demonstrated the benefits of reflexivity interventions (e.g. Gurtner et al., 2007; Gabelica et al., 2014; Konradt et al., 2015) but only one study recently demonstrated leadership conditions in which guided reflexivity was highly effective (Uitdewilligen et al., 2016). The present study followed these ideas and investigated the effects of guided reflexivity combined with two leadership styles in a longitudinal experimental design. In the framework of team reflexivity and leadership this study adds the directive leadership style as a contingency in which guided reflexivity can be considerd a reinforcement. Participative leadership on the other hand was found to be a boundary condition for which

guided reflexivity is less important or even harmful. While the debate of pros, cons and boundary conditions of team reflexivity has not been ended, this study demonstrated that for directive leaders in a complex and high-demanding environment, team reflexivity does pay off.

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Appendix A: Screenshots of the Virtual Battle Space-simulation

Figure 5: Selection of weapons and equipment

Figure 6: Localizing and attacking the designated target

Appendix B: one-way ANOVA analysis hypothesis 1

Report

Initial Performance

Directive leadership	Mean	N	Std. Deviation
,0	-7,250	20	64,2257
1,0	36,471	17	63,7320
Total	12,838	37	66,8595

ANOVA Table

		Sum of Squares	df	Mean Square	F	Sig.
Initial Performance * Directive leadership	Between Groups (Combined)	17565,042	1	17565,042	4,288	,046
	Within Groups	143361,985	35	4096,057		
	Total	160927,027	36			

Measures of Association

	Eta	Eta Squared
Initial Performance * Directive leadership	,330	,109

Appendix C: one-way ANOVA analysis hypothesis 2

Report

Performance 3rd round

Directive leadership	Mean	N	Std. Deviation
0	57,50	10	88,514
1	16,11	9	65,991
Total	37,89	19	79,396

ANOVA Table

			Sum of Squares	df	Mean Square	F	Sig.
Performance 3rd round * Directive leadership	Between Groups	(Combined)	8114,401	1	8114,401	1,309	,268
	Within Groups		105351,389	17	6197,141		
	Total		113465,789	18			

Measures of Association

	Eta	Eta Squared
Performance 3rd round * Directive leadership	,267	,072