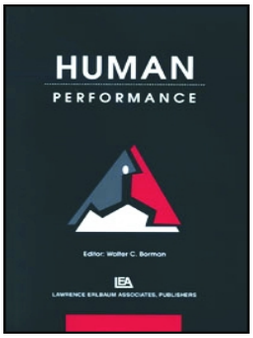
Establishing Team Knowledge Coordination from a Learning Perspective



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Establishing team knowledge coordination from a learning perspective

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ABSTRACT
Research has identified the importance of knowledge coordination in high-performing teams. However, little is known on the processes through which these cognitive structures are developed, more specifically on the learning occurring as teams communicate and interact to build new team knowledge. In a multiple-measures experiment, 33 teams with no prior experience in flight simulations were assigned to newly formed dyads to complete 4 successive performance episodes of a flight simulation task, modeling a complex, fast-paced, and high workload task context. The study showed how team learning processes (i.e., team learning behaviors and team reflexivity), driven by task cohesion, and group potency supported coordination development, which in turn predicted team performance.

Introduction

Teams have become the centerpiece of contemporary organizations because of their flexibility and capacity to make high-quality decisions and solve complex problems (e.g., Cooke, Salas, Kiekel, & Bell, 2004; Salas, Rosen, Burke, & Goodwin, 2009). Increasingly, organizational teams are composed of individuals with diverse backgrounds and unique knowledge and expertise. However, gathering skilled people together does not guarantee successful team performance (Hackman, 1990; Sims, Salas, & Burke, 2005). Team members also need to combine their contributions into an integrated team response (Hinsz, Tindale, & Vollrath, 1997). This synchronization is referred to as knowledge coordination in the team literature (Wittenbaum, Vaughan, & Stasser, 1998). Knowledge coordination ensures the smooth management of knowledge and skills dependencies and prevents unnecessary duplications of expertise within the team. As a consequence, it is a key determinant of team performance (e.g., Faraj & Sproull, 2000; Fisher, Bell, Dierdorff, & Belohlav, 2012; Rico, Sánchez-Manzanares, Gil, & Gibson, 2008).

Nevertheless, our understanding of how knowledge coordination is enabled is limited. Specifically, underlying processes facilitating knowledge coordination should be examined to fully grasp how teams become coordinated units (e.g., Fiore & Salas, 2004; Gibson, 2001; Ren & Argote, 2011; Rico et al., 2008). We identify three primary problems in uncovering antecedents of team knowledge coordination. First, empirical studies commonly consider collaborative work as a cognitive activity (cognitive perspective) or as a social process (social perspective). As a result, team research may overlook the sociocognitive processes affecting the development of knowledge coordination, which is the functional part of cognitive structures at the team level (DeChurch & Mesmer-Magnus, 2010; Salas & Fiore, 2004). Yet research suggests that teams build their team cognition through interacting with each other (e.g., Cooke, Gorman, & Rowe, 2009). Team cognition and

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social context are thus intertwined. As such, the inquiry of both is needed to provide a more coherent and integrated understanding of how teams coordinate more efficiently. Second, few studies have attempted to incorporate the role of time when looking into team cognition (DeChurch & Mesmer-Magnus, 2010; Mohammed, Hamilton, & Lim, 2008). Certainly, however, the temporal factor plays a key role in the study of teams in organizations (McGrath, 1984). Although few studies have demonstrated that team cognition is not static, but dynamic (e.g., Mathieu, Heffner, Goodwin, Salas, & Cannon-Bowers, 2000), how knowledge coordination improves as a function of established factors is not yet understood (Ren & Argote, 2011). We posit that collective experience is not sufficient to explain better subsequent knowledge coordination. High-knowledge coordination may not be realized unless interaction processes during which teams learn occur (Goodman & Dabbish, 2011). Third, this learning potentially available in teams is often conceptualized as a change in team performance and not as the processes by which collective knowledge is built (Kozlowski & Bell, 2008). To date, little is known on the joint role of different team learning processes on the establishment of team knowledge coordination and performance.

In the present article, we address these issues and make a contribution to the question of how team learning can be investigated as a process fostering knowledge coordination by (a) identifying sociocognitive processes underlying team learning that are hypothesized to be drivers of team knowledge coordination, which in turn predicts performance; (b) looking at team members' beliefs associated with the task and the team, predicting the emergence of these processes; and (c) empirically examining the underpinnings of team knowledge coordination and performance with a multiple-measures experiment allowing for temporal considerations. For this purpose, novice dyads were confronted with successive performance episodes of a simulation modeling a complex, fast-paced, and high workload task context. Two-person teams (dyads) were deliberately chosen as the smallest and simplest form of teamwork and knowledge distribution implemented in many professions (e.g., pair programming, flight crews; e.g., Williams, 2010).

Background and hypotheses

Drawing on theories of team learning, knowledge coordination, and performance, we formulated predictions about antecedent team behaviors, processes, and beliefs that might explain later high knowledge coordination and performance. The conceptual framework of the present study, depicted in Figure 1 and discussed next, presents the expected relationships between beliefs about the task and the team, team learning behaviors and reflexivity, knowledge coordination, and team performance. In this dynamic model, antecedent factors occur earlier in time (T-1) than each subsequent dependent variable.

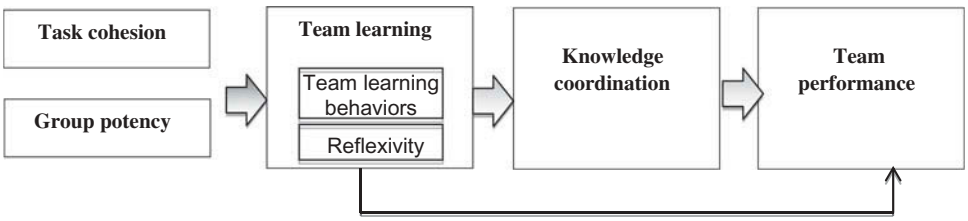

Figure 1. The conceptual model.

Team coordination

Working in interdependent teams typically necessitates high levels of coordination of members' diverse and unique knowledge and contributions to achieve successful team actions (Hinsz et al., 1997). Team members may effectively manage their individual responsibilities but still lack coordination if they do not take into account the dependencies about subtasks, resources, and people (Espinosa, Lerch, & Kraut, 2004; Malone & Crowston, 1994). At the basic level, group or team coordination has been defined as the effective synchronization and integration of members' resources, activities, and responses (Cannon-Bowers, Tannenbaum, Salas, & Volpe, 1995). The term *coordination* has been used as a generic term for teamwork coordination or as a specific term for coordination of various types (e.g., coordination of actions, movements, knowledge, or tangible resources). The most prevalent uses concern the management of team members' actions (typically studied in action teams) and of knowledge and expertise (more critical in knowledge teams; Faraj & Sproull, 2000).

In line with various perspectives on the theoretical definition of coordination, the literature seems to display two main approaches to its operationalization. The "output" approach, most commonly adopted, conceptualizes coordination as an output (i.e., state of coordination or coordination success), more specifically the result of emergent knowledge structures (e.g., transactive memory systems). In the "process" approach, coordination is rather regarded as a team process (i.e., coordinating; Espinosa et al., 2004).

In the "process" approach, coordination depicts the activities team members complete to effectively orchestrate the processing of knowledge and resources (Espinosa et al., 2004). It is argued that by interacting, teams transform knowledge of individual team members into team knowledge that serves as the basis for action (Cooke et al., 2004; Espinosa, Slaughter, Kraut, & Herbsleb, 2007; Fiore et al., 2010a). According to Marks, Mathieu, and Zaccaro (2001), coordination processes during action phases include verbal communication (i.e., information exchange) and behavioral processes such as teams adjusting their actions to those of other members (Brannick, Roach, & Salas, 1993). For example, Marks and Panzer (2004) conducted a simulated flight combat team exercise and found that coordination activities and behaviors were predictive of performance outcomes.

In the "output" approach, coordination is seen as the product of team cognition (Fiore & Salas, 2004). This approach acknowledges that team cognition is more than the sum of individual knowledge available in the team. It is, rather, an emergent knowledge structure derived from the interplay (e.g., overlap, dispersion, and complementarity) of team members' individual cognitions (Cooke et al., 2004). This structure contains well-organized and distributed knowledge that is crucial for team functioning (Kozlowski & Ilgen, 2006). Team knowledge, in turn, allows implicit coordination and thus the anticipation of upcoming events and actions that team members are about to take (e.g., Entin & Serfaty, 1999; Espinosa, Slaugther, Kraut, & Herbsleb, 2007; Rico et al., 2008; Stout, Canon-Bowers, Salas, & Milanovich, 1999). One of the most researched team cognitive structures are transactive memory systems (TMSs; Ren & Argote, 2011; Wildman et al., 2012). TMSs are based on the idea that individuals are able to benefit from differentiated knowledge insofar as they elaborate a good shared understanding of who knows what in the team and synchronize this knowledge collaboratively to complete tasks efficiently (e.g., Austin, 2003; Brandon & Hollingshead, 2004; Lewis, 2004; Wegner, 1986). For example, Lewis (2003) conducted a field study in technology companies and demonstrated that knowledge coordination was correlated with performance measures (managers and teams' evaluations). Michinov and Michinov (2009) further demonstrated that knowledge coordination essentially explained the relationship between TMSs and performance.

Notwithstanding the evidence that poor coordination leads to poor performance and that coordinated teams achieve success, it is not entirely clear which sociocognitive mechanisms may help teams establish this knowledge coordination and likewise prevent poor coordination (Rentsch, Delise, Salas, & Letsky, 2010; Stasser & Titus, 1985). These research strands on team coordination

insufficiently address the question of the underlying emergent states, processes, and activities contributing to coordination success (Ren & Argote, 2011).

Addressing this gap, we propose that knowledge coordination, considered as an output in the present study, is a function of learning mechanisms occurring when teams interact and discuss their task and their team. Interactions and common experience are therefore necessary but not sufficient conditions for high knowledge coordination because teams have to learn from them to manage their knowledge and expertise more effectively. This learning potential of teams may not be fully achieved unless teams (a) share what they know about the task and mutually refine and build on shared information and ideas (i.e., knowledge-building behaviors) and (b) explicitly question, analyze, explore, review past events with self-awareness, and discuss possible alternatives and solutions to complete the task more effectively (i.e., team reflexivity; e.g., Lewis, Lange, & Gillis, 2005; Rentsch, Delise, et al., 2010). By explicitly sharing, exploiting, and questioning information and knowledge and the way they work toward more effective knowledge coordination, teams are expected to be better able to identify knowledge gaps and unique and common knowledge available in the team and decide how and when this knowledge needs to be synchronized (Espinosa et al., 2007). In other words, we approach knowledge coordination through the lens of a learning perspective and posit that these team-level resources have the potential to help understand how teams achieve coordination success. In the next section, we describe these two learning processes (i.e., team learning behaviors and team reflexivity) through which knowledge coordination is enabled.

Processes building team knowledge coordination: Team learning behaviors and reflexivity

We regard knowledge coordination as the product of collaborative processes wherein team members create, share, and evaluate knowledge together. These are fundamentally learning processes. Overall, team learning has proved to be important so that teams become an increasingly high-performing system (Zellmer-Bruhn & Gibson, 2006). Edmondson, Dillon, and Roloff (2007) identified three research streams investigating learning in teams, although some studies have used the words "team or group learning" ambiguously or with no clear reference on how it has been operationalized (Goodman & Dabbish, 2011; Wilson, Goodman, Cronin, 2007). The first research stream focused on team learning curves allowing for the examination of differential rates of learning across teams. The second stream operationalized team learning as an output of communication and coordination processes. Work in the third research area adopted a process view of learning and unbundled team learning processes, refining our understanding of their effects on performance. In previous studies, various team learning behaviors and activities have been identified. Taken together, they seem to converge into an iterative process of action and collective reflection (e.g., Argyris & Schön, 1978; Edmondson, 1999; Kasl, Marsick, & Dechant, 1997). Team learning behaviors have recently been emphasized as important drivers of team performance (e.g., Argote, Gruengeld, & Naquin, 2001; Edmondson, 2002; Van den Bossche, Gijselaers, Segers, & Kirschner, 2006). However, these team learning behaviors and activities have been frequently studied independently with heterogeneity of conceptualization and operationalization (Edmondson et al., 2007).

The present study follows the third research tradition, wherein team learning is operationalized as sociocognitive team behaviors and activities from which an outcome is improved knowledge coordination, which mediates the relation between team learning and performance. Specifically, we focus on two types of team learning processes, which are (a) basic team learning processes (i.e., manifesting how teams learn) and (b) facilitating team learning processes (i.e., prescribing how teams should learn; for review, Decuyper, Dochy, & Van den Bossche, 2010). These are (a) team learning behaviors that can be seen as knowledge-building behaviors (as basic team learning processes) and (b) team reflexivity (as a facilitating team learning process).

Van den Bossche et al. (2006) conceptualized team learning behaviors as three basic processes through which agreement among agents is attained (Galliers, as cited in Baker, 1995). As stressed by Baker (1995), joint understanding, which is supposed to be an essential characteristic of agreement,

starts with team members bringing information and ideas (*construction*). However, a simple accumulation of single contributions is not sufficient, because each contribution has to draw on previous ones. Moreover, information sharing will eventually generate new knowledge if information can be translated into knowledge that team members can use (Fiore, Smith-Jentsch, Salas, Warner, & Letsky, 2010b; Rentsch, Mello, & Delise, 2010). Consequently, *co-construction*, a mutual process of building meaning (Baker, 1994), is a necessary procedure when dealing with problems (Rentsch, Delise, et al., 2010; Rentsch, Mello, et al., 2010). Negotiation is a central process in this stage (Baker, 1995; Dillenbourg, Baker, Blaye, & O'Malley, 1996; Van den Bossche et al., 2006). Team members have to negotiate and determine meanings and solutions among different proposals (Baker, 1995). In some cases, meanings are displayed and confirmed (Roschelle & Teasley, 1995). At the same time, reaching this common ground that forms the base for action is not a simple process. Some divergences can generate a rejection, at worst, or further elaboration via argument and clarification, at best. This process is referred to as *constructive conflict*. Teams will benefit from conflicts generating communication and negotiation. These task conflicts are occasions to reconsider ideas and solutions, learn about members' knowledge more directly and accurately, and discover new ways to integrate knowledge. As a result, they are likely to stimulate the development of more effective knowledge coordination and, in turn, performance (Van den Bossche et al., 2006).

In addition, research on team learning has recently emphasized that effective teams undertake planning activities, think while performing their actions, and debrief about their achievements and failures to understand accomplishments so far (Schippers, Den Hartog, Koopman, & Wienk, 2003; Smith-Jentsch, Cannon-Bowers, Tannenbaum, & Salas, 2008; West, 2000). The concept of "team reflexivity" is used to capture these facilitating learning processes. It integrates reflection, planning, and improvement (West, 2000). More specifically, before a task execution, reflective teams identify their team goals, the task nature, and its requirements; define the problem they are about to face; and plan strategies they would need to reach their objectives. During the task, team members evaluate whether they are on the right track and whether their actions produce the expected results and consider the potential new problems that arise during action. Reflexivity occurring after the task consists of evaluations or debriefings. Specifically, teams review the course of their actions, their unexpected results, the methods used to solve problems or issues during the task and work out what can be learned from past achievements or failures (West, Garrod, & Carletta, 1997). In turn, reflection on the collaborative process can lead to a better match between team member expertise and elements of the task. Conversely, without reflection on team processes and outcomes, teams may fail to uncover why they did or did not succeed and what knowledge and resources they need to perform more effectively. Further, some misunderstandings may remain unsolved and teams may fail to adjust their future approaches (Wills & Clerkin, 2009). In teams initially holding inaccurate task representations, a lack of reflection on the task would keep them stuck with an inappropriate approach (Van Ginkel, Tindale, & Van Knippenberg, 2009). It is important that progress might be held back by a suboptimal use of knowledge and skills available in the team.

High levels of team reflexivity have been found to be positively related to team functioning, as well as team outcome variables (e.g., team performance; e.g., De Dreu, 2002; Gurtner, Tschan, Semmer, & Nägele, 2007; Hoegl & Parboteeah, 2006; Schippers et al., 2003; Tjosvold, Chun, & Ziyou, 2003). For example, highly reflective TV-production teams were evaluated by their superiors as being more effective (Carter & West, 1998). However, in their recent review, Moreland and McMinn (2010) highlighted studies in which researchers could not demonstrate the performance benefits of reflexivity. They draw attention to the need for more rigorous evidence-based studies to justify the recent enthusiasm for reflexivity. They argued that the field needs more carefully controlled experimentation to definitively show a causal relationship between reflexivity and performance differences. The present study aims at responding to this concern.

In the present study, we expect teams to improve their knowledge coordination, not only because they spend more time together, expand their experience with the task, or gain access to task-generated feedback (Ren & Argote, 2011), but more significantly because they interactively engage

in these team learning processes involving knowledge sharing and construction and shared reflection (e.g., Brandon & Hollingshead, 2004; Cooke, Gorman, & Kiekel, 2008; Fiore et al., 2010). In this respect, Lewis and colleagues (2005) put forward a learning perspective of the development of TMSs. They have introduced a framework for understanding TMSs as learning agents through which teams can apply what they learned from one task to another. Progressively, as teams interact and share knowledge (i.e., team learning behaviors), team members associate others more accurately with specific knowledge areas. This results in the integration of members' knowledge and generation of new knowledge that was previously not available in the team and that needs to be synchronized harmoniously to improve performance. Teams also learn by analyzing what works and what does not work. Based on these evaluations, they can revise and refine their understanding (i.e., team reflexivity). In this way, they build a more elaborate understanding of their task and can anticipate instead of reacting, which in turn helps them perform in a more coordinated and adaptive manner (Lewis et al., 2005; Moreland & Myaskovksy, 2000).

As such, these team learning activities improve performance through knowledge coordination. Given the highly interdependent nature of the task, we hypothesize that learning as a collective only positively affects team performance through an efficient knowledge coordination of individual inputs. Knowledge coordination ensures that newly constructed knowledge and strategies and remedies are put into practice in a coordinated way. Lewis et al. (2005) found that learning transfer (i.e., learning from one task to another one) was influenced by the maintenance of expertise across tasks and in particular for those teams who already built their TMS during the first task. Thus, earlier TMS also has to be accounted for to explain later improvements.

Based on the preceding arguments, we formulated the following hypothesis:

H1: Knowledge coordination mediates the positive relation between team learning behaviors and subsequent team performance.

H2: Knowledge coordination mediates the positive relation between team reflexivity and subsequent team performance.

Antecedents to team learning behaviors and reflexivity: Task cohesion and group potency

The line of research studying processes of team learning has started to explore team members' beliefs that jointly form a broad mental environment for the team interaction which influences team learning (Edmondson, 1999, 2003; Wong, 2004). Relatively little is known about the drivers that render teams more likely to reflect on their experiences, plan for future actions, and co-construct new knowledge (Schippers, Homan, & Van Knippenberg, 2013).

Our model holds that team performance and knowledge coordination are unlikely to be achieved unless favorable beliefs toward the task are installed. As collaborative work is an interactive process, it is argued that team members' appraisal of the task and its relationship to member perceptions are antecedent conditions that facilitate learning in a collaborative effort. In the present study, we focus on the two emergent states that have been investigated the most in team research (e.g., Beal, Cohen, Burke, & McLendon, 2003; Gully, Incalcaterra, Johi, & Beaubien, 2002; Mullen & Copper, 1994) but less frequently related to team learning and not as its antecedents (Wilson et al., 2007): group potency and task cohesion. In a field study with student teams, it has been shown that the shared beliefs that their team is able to perform (i.e., group potency), and that each member is committed to the team task (i.e., task cohesion), were associated with performance and team knowledge-building behaviors (Van den Bossche et al., 2006). Edmondson (1999) has demonstrated that a sense of collective efficacy (i.e., team confidence to succeed in a very specific activity) was related to group reflection in work teams. Collective efficacy is task specific and context specific, whereas group potency is a more generalized belief concerning any situation or demand a team may encounter

(Bandura, 1997; Chen et al., 2002; Stajkovic, Lee, & Nyberg, 2009). These studies help one better understand the processes through which task cohesion and group potency may be related to performance. Their power seems to lie in their motivational role in allocating and sustaining effort and attention to the team goal (Kozlowski & Ilgen, 2006), in regulating team processes, sharing information, and solving problems encountered (Gully et al., 2002). Tuckman (1965) suggested that favorable perceptions were preconditions allowing teams to focus effectively on their task performance. High task motivation underlying shared commitment and perception of team competence is evidence of the existence of shared goals that teams are trying to reach and of merged forces maintaining team participation (Mullen & Copper, 1994). It may trigger teams to adjust and regulate their behaviors by sharing and building new knowledge and reflecting upon their actions and strategies (especially if they had been shown to be ineffective) to achieve these goals (Van den Bossche et al., 2006). Also, it may be that group potency promotes a team's confidence (Edmondson, 1999; Gully et al., 2002), consequently raising the probability that situations are perceived as opportunities instead of threats and that teams will be prone to persevere in the face of problems (Gully et al., 2002). This will influence team ability to reconsider available knowledge and to think of possible alternatives to implement. Based on prior research, we hypothesized the following:

H3: Task cohesion will be positively associated with subsequent team learning behaviors.

H4: Task cohesion will be positively associated with subsequent reflexivity.

H5: Group potency will be positively associated with subsequent team learning behaviors.

H6: Group potency will be positively associated with subsequent reflexivity.

Method

Participants

Sixty-six (34 male, 32 female) voluntary undergraduate students were recruited from a university in the Netherlands in exchange for an individual incentive (vouchers). Their ages ranged from 18 to 31 years (M = 22.5, SD = 2.8). They did not have any prior experience in flight simulations. Participants were assigned to two-person newly formed teams and randomly assigned to a specific role—pilot or copilot. They were paired with a same-gender (female and male teams, respectively, n = 10 and n = 11) or a different-gender partner (mixed teams, n = 12), for a total of 33 teams, and completed a flight simulation task.

Task apparatus

In the present study we used a computer simulation not to mimic real-work team environments (e.g., transportation teams) but rather to study a constructed set of theoretical relations (i.e., nomological network) among constructs within specific boundaries: a complex, fast-paced, and high-workload situation in which unequally distributed information and knowledge needed to be coordinated to achieve the team goal and keep on learning (Marks, 2000). A PC-based flight simulator of high graphical quality, Microsoft Flight Simulator X, was used to stimulate this task context. This task context included key elements important to sustain knowledge coordination and emphasized interdependence, cooperation, and communication.

A series of four tasks (landing missions) was sequentially performed by each team. Specifically, students were in command of an aircraft during its descent in preparation for landing. They had to follow the determined traffic pattern of a landing approach, that is to say, maintaining an appropriate speed, altitude, and configuration, completing a landing checklist, aligning the plane with the

runaway, touching down at the right point, and gently coming to a stop on a landing field. These tasks had an increasing degree of difficulty in the sense that one additional difficulty element was inserted in the simulation at every trial departing from a basic traffic pattern (Mission 1) to a traffic pattern performed under lower visibility and less benchmarks (Mission 4). In this way, a high level of complexity throughout the simulation was ensured while the task remained the same and was comparable across trials. The computer was screened on a whiteboard to increase realism and was equipped with a joystick, a gas controller, and headphones connecting the copilot to the Air Traffic Controller. Both participants were in the same room and could communicate freely. The team missions were recorded.

Procedure

Before the experiment, participants were explicitly informed about two criteria for admission: They were supposed to have no prior experience in flight or war simulations and no familiarity with their teammate. Only those matching the criteria were randomly assigned to a role within a team. The experiment lasted approximately 2.5 hr and consisted of three phases. First, upon arriving at the laboratory, participants were told that the purpose of the study was to investigate how teams work together. They were given additional information about the study (timing, sequence of events, and participants' roles), and an overview of the task. Moreover, they completed a short survey about demographic information and their use of computer games double-checking for their familiarity with the task and their teammate. Second, team members were individually trained on the assigned roles. The objective of the 45-min training was to provide both participants with specialized knowledge on their roles and subtasks to fulfill. Each team member was given a booklet containing written information corresponding to the differentiated critical knowledge of piloting or monitoring an aircraft (e.g., how to check and regulate the speed and altitude; knowing the flaps and landing gears and how to activate them; understanding stall speed). The pilots were responsible for flying the plane and using the joystick. To that purpose, they completed an additional 10-min hands-on training consisting of an individual exercise to become acquainted with the joystick. The copilots were responsible for controlling the gas of the plane and giving indications and directions to the pilot. They could draw from information provided by Air Traffic Control and cockpit instruments they were trained to interpret. For the training, participants were sitting in separate rooms. Third, teams were back together in the same room to sequentially complete the four landing tasks. They were allowed to restart missions after a crash within a time frame of 15 min, after which the game stopped. Between each mission, teams had a time-out (transition phase) during which they were free to communicate. Before each mission, they were given a brief written description of the mission scenario and the flight objectives. All teams were videotaped performing the simulation. They were debriefed following the fourth team task.

Data collection

After each landing, participants were required to complete questionnaires. Self-reported measures were collected after the task, whereas objective task performance was rated based on the actual landing for each time (referred to as Time 1, 2, 3, & 4). Questionnaires were ordered according to the order of appearance of the corresponding variables in the model of the study. More specifically, after Time 1 and Time 3, individuals completed a questionnaire containing task cohesion, group potency, and knowledge coordination measures. Because task cohesion and group potency were supposed to assess teams' beliefs about their task and their team that would allow or prevent learning activities to occur, they were measured at the first measurement time and before the first measurement of team learning processes. Knowledge coordination was purposely measured at Time 1 also to obtain an immediate rating of knowledge coordination at the first team experience and control for initial levels of knowledge coordination, shortly after the specialized training. As such, the starting point of

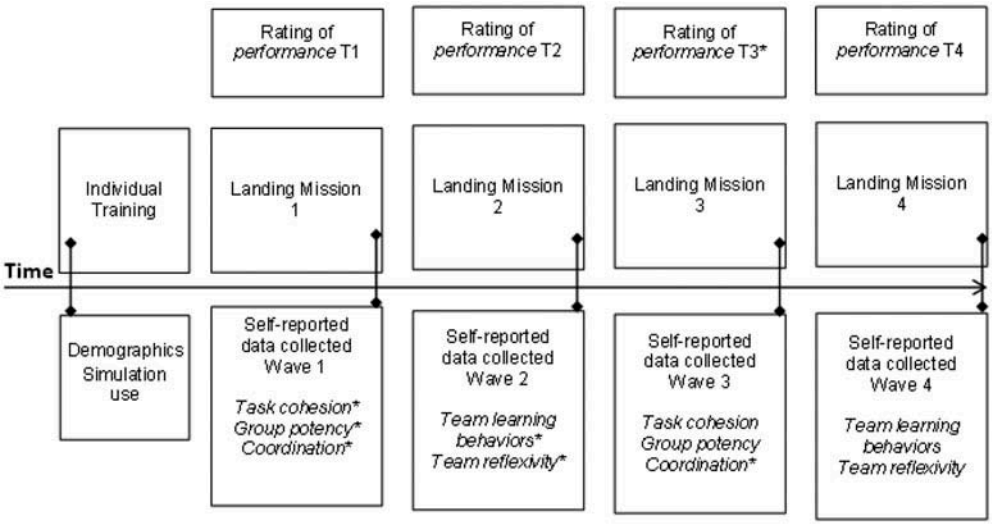

Figure 2. Overview of the measures used in the model testing **Figure 2**.
Note. Asterisks signal measures included in the model tested.

coordination was Time 1 and was assessed in relation to the first landing as a team. After Time 2 and 4, they were given the team learning behaviors and reflexivity questionnaire because these processes were expected to be a consequence of task cohesion and group potency measured at T1 and an antecedent of knowledge coordination measured at T3. Items of the questionnaire were assessed on a 7-point Likert scale, from 1 (*completely disagree*) to 7 (*completely agree*). To summarize, we used task cohesion and group potency ratings at Time 1, team learning behaviors and reflexivity ratings at Time 2, and knowledge coordination and performance measures at Time 3, controlling for knowledge coordination at Time 1 to allow for consideration of temporal (causal) relationships hypothesized in the model. Figure 2 shows all the measures collected for our study and asterisks highlight the measures used in the causal model tested in the present study.

Measures

Performance

An objective performance rating instrument was developed based on two sources. First, a task analysis was conducted with an expert in the flight simulation used in the study to extract key criteria to perform a successful flight. Second, the simulation itself provided players with some tests for awarding flight certificates. We used these criteria provided by the simulation developers to refine the criteria and develop the final performance rating form. The form was pretested during a pilot study aiming at testing the whole experimental design.

Team performance for each mission was the total number of points won (correct actions) by the teams relative to objective criteria (e.g., speed, altitude, activation of flaps and landing gear, landing position). It was emphasized that a crash was not a major issue in the experiment. The possibility of reflying missions after a crash reinforced the relative low weight of "crash" in their overall performance. The 15-min time frame was set to avoid penalizing teams crashing quickly. With respect to the maximum number of correct actions per mission, although the four missions shared common features and correct actions to be completed in a landing situation, they varied in certain specific aspects. These corresponded to additional gradual difficulties teams had to face throughout the missions. More precisely, to get the maximum score in Mission 1, teams had to display nine correct actions. Consequently, the best score in Mission 1 was measured on a scale ranging from 0 to 9. In

Missions 2 and 3, 13 correct actions were necessary to get a full score. Mission 4 was the most thorough, with 19 correct actions needed to perform a perfect flight.

Knowledge coordination

To measure knowledge coordination, we employed a modified version of the Transactive Memory Scale of Lewis's (2003), for which reliability and validity have been established previously. Only the coordination subscale was used in the present analyses. Five items covered knowledge coordination (e.g., "Our team worked together in a well-coordinated fashion"). The original Transactive Memory Scale was used in the context of project teams. To fit the specific task employed in the present study, we changed each occurrence of the word "project" by the word "mission." In the present study, the coordination subscale had Cronbach's alphas of .80 and .83 for Time 1 and Time 3, respectively. Coordination items loaded high (minimum = .68) on one factor for both times.

Team learning behaviors

Construction, co-construction, and constructive conflict were measured by a questionnaire developed and validated by Van Den Bossche et al. (2006). The original nine items were adapted to fit a flight simulation task. Example items include "Team members elaborate on each other's information and ideas" (co-construction) and "This team tends to handle differences of opinions by addressing them directly" (constructive conflict). We found a similar factor analysis pattern uncovering a single underlying factor for all the items. The nine items were averaged to create a single score of team learning behaviors (α = .83 for Time 2, α = .85 for Time 4).

Reflexivity

Reflexivity was tapped with a nine-item measure derived from a questionnaire developed by Schippers et al. (2003). Team member rated these items on a 7-point scale (sample item: "We regularly discuss whether the team is working effectively"). Ratings of reflexivity converged to a single underlying dimension and did not overlap with team learning behaviors (loadings from .58 to .82) as defined by Van Den Bossche et al. (2006). Teams were hence assigned a reflexivity score and a score for their team-learning behaviors. The reflexivity scale had Cronbach's alphas of .82 and .88 for Time 2 and Time 4, respectively.

Task cohesion

A four-item scale from Carless and de Paola (2000) was employed to assess task cohesion. The items included, for instance, "This team is united in trying to reach its goals for performance." Cronbach's alpha coefficients were .68 for Time 1 and .75 for Time 3. The four items tapped into a shared construct (minimum = 0.65 for Time 1, and 0.70 for Time 3).

Group potency

Group potency was measured using an instrument developed in earlier work by Sargent and Sue-Chan (2001); Gibson, Randel, and Earley (2000); and Guzzo, Yost, Campbell, and Shea (1993). The six items loaded high on a single factor (minimum = .67 for Time 1 and 0.81 for Time 3) and produced a reliability coefficient of .83 for Time 1 and .90 for Time 3. A sample item for group potency was "This team believes it can be very effective."

Aggregation on team level

Performance scores were direct measures of team-level performance. In contrast, all the concepts captured by questionnaires were team-level constructs on which individual team members had to provide their perceptions. Consequently, the data gathered from individual team members to measure these team-level variables were aggregated at that level. The multiple-item estimator r_{wg} (James, Demaree, & Wolf, 1984) was used to assess within-group agreement. This analysis showed mean values of .86 (Time 1) and .90 (Time 3) for task cohesion, .87 (Time 1) and .74 (Time 3) for

group potency, .76 (Time 1) and .80 (Time 3) for knowledge coordination, .86 (Time 2) and .87 (Time 4) for team learning behaviors, and .75 (Time 2) and .80 (Time 4) for reflexivity. These results supported the creation of team-level measures.

Methods of analysis

Path analysis and model-fitting techniques were used to test the theoretically hypothesized relations depicted in Figure 1 (H1–H6). Path analysis is used as a method for assessing the web of relationships among observed variables and the values of the coefficients in the underpinning linear model. The proposed path model was evaluated using LISREL version 8.8 (Jöreskog & Sörbom, 2002) and based on the Maximum Likelihood method of Estimation. The statistical significance of estimated path coefficients and statistics specifying goodness of fit for the model as a whole were analyzed. Specifically, the comparative fit index (CFI), the non-normed fit index (NNFI), the root mean squared error of approximation (RMSEA), the standardized root mean square residual (SRMR), and chi-square were used as model fit criteria. The model was considered a good or excellent fit to the data if CFI and NNFI were greater than .90 or .95 respectively (Schumacker & Lomax, 1996). Both CFIs are not affected by sample size, whereas NNFI penalizes for a lack of parsimony, in contrast with CFI (Guay, Marsh, & Boivin, 2003). Values lower than .10 or .08 for SRMR have been recommended as acceptable or good fit values for this measure (Hu & Bentler, 1999). Finally, RMSEA, an index related to residuals in the model, is interpreted as a good fit measure when values are below 0.08 and a reasonable fit measure when they are between .05 and .08 (Browne & Cudeck, 1993). In addition, we conducted bootstrap analyses to cross-validate the results of the significance of the mediated effects (Efron & Tibshirani, 1993; Shrout & Bolger, 2002).

The following was the procedure used to test the model as a whole. The first test was to see how well the team learning model based on previous literature (Figure 1) fit the data. We included time as an important factor in the analyses by selecting time measures of the independent variables preceding the dependent variables. Particularly, we used scores at Time 1 for group potency and task cohesion, scores at Time 2 for team learning behaviors and reflexivity, and scores at Time 3 for knowledge coordination and performance. We did not use performance at Time 4 in the analyses, because the mean performance at time 4 dropped significantly although it was supposed to be sustained as difficulty level increased. This suggests that the increase of level of difficulty from Mission 3 to Mission 4 was higher than the progression followed from Mission 1 to Mission 3. One control variable, initial knowledge coordination of the teams (measured at Time 1), was allowed to affect knowledge coordination at Time 3. As the team literature does not suggest any directional relationship between the two team learning processes included in this study, we allowed their errors to covary. The model adequacy and path coefficients of each of the hypothesized relationships were hence estimated. Second, *T* values were used to eliminate the insignificant parameters in the path analysis (in the interest of parsimony), whereas modification indexes were examined for the eventual addition of unspecified parameters (Sörbom, 1989). The revised model was estimated accordingly.

Results

Descriptive statistics and intercorrelations for the entire sample of the variables in the path model are presented per time period in Table 1.

The original model (Model 1) hypothesized that knowledge coordination would develop through team learning behaviors and reflexivity (H1 and H2), which would emerge through initial group potency and task cohesion (H3–H6) and that knowledge coordination would in turn predict performance (in line with previous literature). This initial model resulted in an almost acceptable fit to the data according to most of the measures, $\chi^2(9) = 14.54$, $p = .10$; RMSEA = 0.15, CFI = 0.93, NNFI = .83, SRMR = 0.065. However, the NNFI was below the desired value of .90 and the RMSEA

Table 1. Correlations Between Measures.

	M	*SD*	1	2	3	4	5	6	7	8	9	10	11	12	13	14
1. Coordination T1	4.55	1.10	1													
2. Coordination T3	5.26	.85	.69**	1												
3. Task cohesion T1	5.75	.74	.41*	.42*	1											
4. Task cohesion T3	5.81	.75	.43*	.57**	.73**	1										
5. Group potency T1	5.08	.79	.54**	.60**	.37*	.41*	1									
6. Group potency T3	5.23	.83	.56**	.89**	.48**	.61**	.73**	1								
7. TLB T2	5.27	.76	.24	.41*	53**	.45**	.26	.51**	1							
8. TLB T4	5,22	.65	.42*	.61**	.42*	.68**	.49**	.73**	.47**	1						
9. Reflexivity T2	4.51	.67	.02	.33ł	.32	.18	.15	.37*	.65**	32	1					
10. Reflexivity T4	4.75	.87	.33	.58**	.35*	.58**	.40*	.66**	.43*	.82**	.54**	1				
11. Best score T1 (%)	57.64	16.80	.46**	.22	−.12	−.10	.03	.07	−.24	.09	−.24	.00	1			
12. Best score T2 (%)	54.55	20.02	.49**	.34	.34	.09	.23	.29	.21	.14	.34	.20	.20	1		
13. Best score T3 (%)	54.78	18.22	.47**	.57**	.38*	.53**	.05	.43*	.29	.56**	.21	.40*	.42*	.30	1	
14. Best score T4 (%)	36.67	20.75	.32	.64**	.27	.29	.31	.61**	.29	.38*	.43*	.34	.08	.36*	.50**	1

Note. All measures on a Likert scales from 1 to 7, except performance scores in % of correct actions. T1 = Time 1 (Mission 1); T2 = Time 2 (Mission 2); T3 = Time 3 (Mission 1); T4 = Time 4 (Mission 4); TLB = team learning behaviors.
*$p < .05$. **$p < .01$.

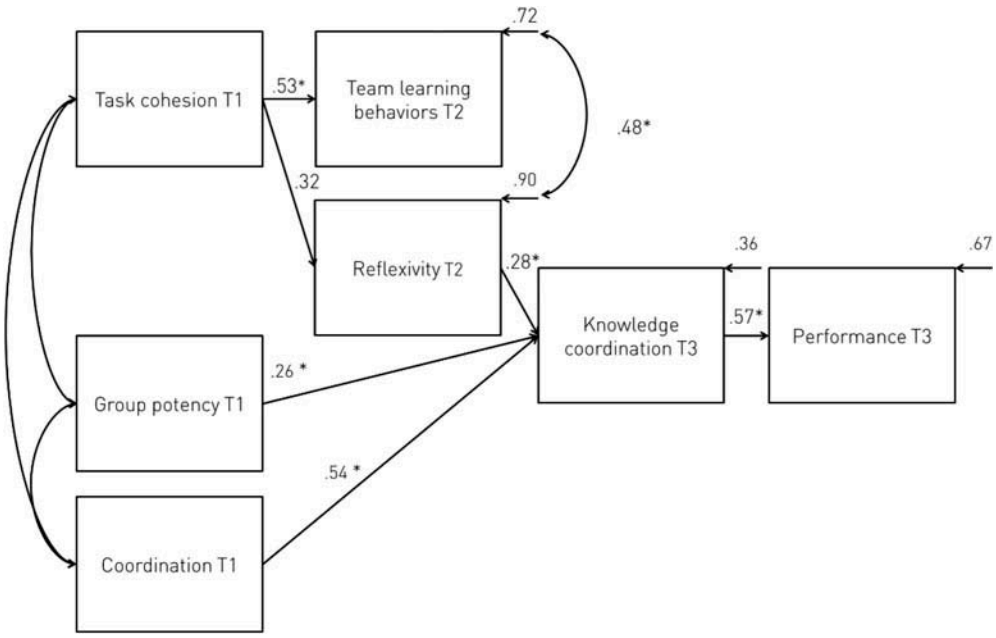

Figure 3. Model 3.
Note. Paths with asterisks are statistically significant.

was above the 0.05 criterion. Overall, these fit indices suggest the model fit is approaching a reasonable level; however, some model modifications might provide a better model fit.

The original model was improved, based on modification indexes. A path was added from group potency at Time 1 to knowledge coordination at Time 3, therefore assuming a direct effect of group potency on subsequent knowledge coordination instead of the postulated indirect effect through both team learning processes (H5–H6). The modified model, displayed in Figure 3, showed a good fit, $\chi^2(11) = 11.05$, $p < .05$; RMSEA = 0.012, CFI = 0.98, NNFI = .96, SRMR = 0.070, thus confirming the final model.

Chi-square, as well as the other model fit statistics, denoted a better model fit to the data than Model 1 (Table 2). In line with prior work, knowledge coordination at Time 3 was a good predictor of objective performance even when taking initial knowledge coordination into account ($\beta = .58$, $p < .001$). Second, consistent with H3, task cohesion was positively associated with subsequent team

Table 2. Fit Indices for Model 1 and Final Model.

Model	χ^2	CFI	NNFI	PGFI	χ^2 Diff	Diff NNFI
Model 1 (Figure 1)	14.54	0.93	0.83	0.28		
Final model	11.05	0.98	0.96	0.36	3.77	.13

Note. CFI = comparative fit index; NNFI = non-normed fit index; PGFI = parsimonious goodness of fit index.

learning behaviors (β = .50, p < .01). Third, the results showed support for H2: Reflexivity had a positive and significant effect on knowledge coordination (β = .28, p < .01) and, in turn, on performance. The effect of initial group potency on subsequent knowledge coordination was also significant (β = .26, p < .05). Contrary to H4, task cohesion and reflexivity were only marginally significantly related (β = .32, p < .10). This path had a marginally significant t value. It was consequently not deleted from the model. Finally, the very low T value of the path between team learning behaviors and knowledge coordination revealed that team learning behaviors were not contributing directly to knowledge coordination (when its covariance with reflexivity was taken into account). Thus no support was found for H1.

To cross-validate the results of the mediated effect of knowledge coordination (H2) found in the path analysis, we used bootstrapping procedures, recommended for smaller sample sizes. Following the recommendations of Shrout and Bolger (2002), we created a bootstrap sample of 1,000 to estimate the mediated path of our hypothesized model. Based on the bias-corrected percentile method (Efron & Tibshirani, 1993), we adjusted the resulting confidence intervals (CIs) for differences between the mediated effect from the full sample and the median of the estimated mediation from the bootstrap sample to obtain a bias-corrected CI. The results indicate that the indirect effect of team reflexivity on team performance through team knowledge coordination was significant, 95% CI [.049, 1.81], thus providing additional support for H2.

The structural equations indicated that a reasonable amount of the variance in each observed variable, with the exception of reflexivity, was accounted for. Objective performance at Time 3 had 33% of its variance predicted, whereas knowledge coordination had 64% of its variance explained by the antecedents included in the model. In addition, the results accounted for 28% of the variance in team learning behaviors but only 10% in reflexivity. This latter effect suggests that this construct still has a great deal of unknown antecedents to be identified.

Conclusion

Knowledge coordination involves the combination and synchronization of disparate team-member knowledge and expertise (Wittenbaum et al., 1998). The organized execution of team tasks requires a high degree of common understanding of the interrelationships between team members' contributions and mutual adjustments of team activities (Michinov & Michinov, 2009). Knowledge coordination among team members has been recognized as being important for performance improvement in teams (e.g., Cannon-Bowers et al., 1995; Faraj & Sproull, 2000). In spite of the fact that literature is replete with theoretical and empirical work in the area of knowledge coordination (with different conceptualizations across disciplines), we still know very little about the antecedents of knowledge coordination. The present study sought to identify sociocognitive processes and behaviors allowing effective knowledge coordination to get established in newly formed teams. We hypothesized that team performance would be predicted by high knowledge coordination within the team that would develop as a function of team learning processes, shaped by the task cohesion and group potency. The present study expands and lends support to previous research by (a) identifying sociocognitive behaviors supporting knowledge coordination development (more specifically team reflexivity), (b) highlighting the importance of the shared beliefs about the task (i.e., task cohesion and group potency) to set a mental environment in which these team learning processes emerge, and (c) allowing multiple time cycles to better understand how teams learn to be coordinated in a complex task. In other words, it was shown that

teams believing in their mutual commitment built more team learning behaviors and exhibited more reflexivity, making them better able to coordinate in an efficient fashion, which finally helped them be more efficient. Group potency, or confidence in team effectiveness, also impacted team performance through knowledge coordination. Although researchers have previously established a relation between knowledge coordination and performance (e.g., Austin, 2003; Lewis, 2003) and team learning behaviors and emergent states (Van den Bossche et al., 2006), this study builds upon this through the use of a multiple-measure design, to unravel how motivational and sociocognitive factors combine to predict how well teams would subsequently coordinate and perform. In what follows, we outline the theoretical and practical implications of these findings.

Theoretical implications

This study develops and extends research on knowledge coordination. The results are consistent with previous studies showing a positive relationship between knowledge coordination and performance (e.g., Cannon-Bowers et al., 1995; Faraj & Sproull, 2000). More important, they broaden our understanding of the underpinnings of knowledge coordination. Previous research has mostly examined inputs as antecedents of TMSs, overlooking the potential of team processes and emergent states for shaping knowledge coordination (Ren & Argote, 2011). Our results add to the literature by showing that the positive effect of knowledge coordination on performance is bounded by the team ability to learn from its past team experiences and share knowledge and by its shared favorable beliefs about team commitment (i.e., task cohesion) and about its competence (i.e., group potency). This study makes a significant contribution to the understanding of why certain teams experience knowledge coordination problems (Cronin & Weingart, 2007; Marks et al., 2001; Wittenbaum et al., 1998) and of how certain beliefs, behaviors, and processes can help teams fix these to better perform in the future (Wittenbaum et al., 1998). These results suggest that knowledge coordination may not be a sufficient condition for effective team performance, even in tasks with substantial dependencies. Despite knowledge coordination's direct positive impact on performance, it appears that other antecedent factors, of a different nature (social, cognitive, and motivational), are in play to optimize the effect of knowledge coordination

It might be that teams who can coordinate on certain aspects of the tasks may not automatically perform at higher levels unless certain conditions are present as well (Espinosa et al., 2004). As such, it is important for future research on team coordination and performance to validate these factors in other settings and identify other possible antecedents that might reinforce and facilitate team ability to learn to be a coordinated unit. The combination of team processes, emergent states, and behaviors we found may change as the task progresses over time (Faraj & Xiao, 2006).

Overall, concerning the time factor, the multiple-measure design appears crucial to better understand how knowledge coordination develops and under which conditions. These findings are promising and should be explored further with more team types and more measures over longer periods, as well as at different stages of team development.

Another important result regarding team learning processes emerged from the current study. The small but growing research line on team reflexivity (i.e., conscious reflection on team functioning) delivers insight into how teams learn from their past (Schippers et al., 2013). The results of this research strand have been mixed. Although reflexivity appears to be positively related to performance in many occasions (mostly in cross-sectional studies), this is not always the case (Moreland & McMinn, 2010). Moreland and McMinn (2010) called for rigorous designs showing its performance benefits, and even more recently, Schippers et al. (2013) raised the question of the drivers and mediators of reflexivity when considering its relation with performance. The present study addresses both calls: We explain the relation between reflexivity and team learning behaviors and performance through the establishment of knowledge coordination, and we showed that reflexivity had a potential antecedent, task cohesion, which accounted for 10% of its variance. The first belief of strong commitment of the other team member appears to be more essential in the subsequent emergence

of knowledge-sharing behaviors. Our results suggest that there are some unknown antecedents of reflexivity yet to be uncovered. In the present study, group potency was not related to team learning processes but directly impacted knowledge coordination. Consequently, an important challenge for future research on team reflexivity will be to unravel more factors shaping team ability to put into practice what they learned from the past (Schippers et al., 2013). Concerning team learning behaviors, they seem to play a role only in the overall model through their relationship with team reflexivity while not directly impacting team coordination and performance. Further studies are therefore necessary to determine how and when team learning activities combine their effects to impact better coordination and performance.

Practical implications

The present study provides important benefits for educators, managers, or team leaders responsible for enhancing group coordination and performance. We highlighted key processes and behaviors that have the power to influence the development of knowledge coordination and consequently performance. These could be facilitated through formal interventions that can take place between performance episodes. Although our study does not comprise measures over a long period, the temporal relationships allow some general guidelines about group development. If team researchers continue to make systematic efforts to examine knowledge coordination in teams addressing issues discussed in this article, this stream of research may offer more precise prescriptions on how to create a team environment in which team members learn to coordinate effectively and become better able to display implicit coordination patterns and switch to explicit knowledge coordination when important changes arise.

Our results suggest that members quickly develop beliefs about their teams and that these are necessary for learning behaviors and processes to emerge. For example, it may be that during the forming phase of a team (Tuckman & Jenson, 1977), specific attention to favorable beliefs and appraisals of the task and team (high cohesion and group potency) would help reduce tension arising from the feeling of anxiety and uncertainty often observed in newly formed teams. Moreover, during later phases of a team, when team members start to challenge each other, constructive conflict and reflexivity may be critical to support and scaffold so that teams increasingly become more team and self-aware of their processes. However, field studies looking into group learning has emphasized that learning, as a team, is usually difficult and sparse (Wilson et al., 2007). This calls for the implementation and the evaluation of the performance benefits of interventions aiming at facilitating team learning and maintaining high learning opportunities throughout the team tasks (Gabelica, Van den Bossche, Segers, & Gijselaers, 2012; Hackman & Wageman, 2005; Schippers et al., 2003). For example, there is an emerging research strand that showed that reflexivity in teams can be induced by formal practical interventions (Gabelica, Van den Bossche, Segers, & Gijselaers, 2014; Gabelica, Van den Bossche, De Maeyer, Segers, & Gijselaers, 2014). It is suggested that induced reflexivity helps teams become more effective, especially if their initial performance is low (Gurtner et al., 2007; Schippers et al., 2013). These findings have important implications for learning in team domains requiring complex collaborative processes. This includes learning in science teams, particularly when members come from different disciplines (e.g., Börner et al., 2010). Much like problem solving teams, where knowledge building is essential to effectiveness (Fiore et al. 2010a), knowledge coordination and integration form the foundation for success in science teams. Our findings offer an important line of research on collaborative learning in the context of scientific team effectiveness (Falk-Krzesinski et al., 2011; Fiore, 2008). To confirm these implications for team management, further research should be conducted in more naturalistic team settings and adopt longitudinal designs to focus more specifically on the following questions. First, at what point of team history, or after which event, or observed behaviors, should team managers pay more attention to the setting of a favorable context in which something of significance occurred? Second, how can we assess the emergence of team learning behaviors, and how do these evolve over time and without a formal structure to facilitate their use? To answer these questions, it seems necessary to develop some behavioral markers specifying

observable actions that are involved in team learning and observe their pattern and sequencing over time (Rousseau, Aubé, & Savoie, 2006).

Limitations and future research

The present study, however, was subject to some limitations. First, it is important to define the team task and context (i.e., complex, fast-paced, and high-workload) used in this experiment that may partially explain some results but also limit their generalizability. The team task defines the workflow structure and knowledge coordination requirements (Kozlowski & Ilgen, 2006). In the present experiment, team members were externally assigned different roles and responsibilities in the completion of a highly structured task. Interdependence was triggered by the study design. Consequently, knowledge coordination of newly acquired knowledge was necessary to perform the task efficiently. As such, our findings may apply to teams in which knowledge coordination and knowledge integration are crucial to carry out complex and divisible tasks and not to teams performing loosely defined tasks and requiring low knowledge coordination and specialized expertise (Lewis et al., 2005). In the experiment we did not set out to model real transportation crews. Rather we created a controlled situation where teams of people experienced high workload in situations requiring knowledge coordination to effectively synchronize unequally distributed information and knowledge (Marks, 2000). Moreover, we chose to look at team learning behaviors and knowledge coordination from their starting and learning phases to get a better insight into how newly formed teams learn to be coordinated and effective. The control for individuals' prior experience and team history allowed us to observe the emergence of team interactions and knowledge in the early stage of performance. However, as complexity of the task increases, individual expertise and previous interactions between longer tenure team members play an important role in how teams perform. In organizations, established teams need to learn and coordinate knowledge, routines, and behaviors that are more complex as they are embedded in more dynamic environments (Levine & Choi, 2004; Wilson et al., 2007). This calls for additional field studies taking into account these complex variables that could act as moderators of our findings and testing the external validity of the present findings in real-world teams under natural constraints (Mathieu, Heffner, Goodwin, Cannon-Bowers, & Salas, 2005).

Second, we used dyads, whereas team size and team proximity are said to be of influence in intrateam interactions (Daft & Lengel, 1986). We are aware that there has been a recent debate about whether findings from research on dyads can be simply generalized to larger teams (Moreland, 2010; Williams, 2010). We acknowledge that certain aspects of team processes and dynamics (e.g., coalitions, group socialization) can hardly be grasped by the use of dyads. Also, previous studies have suggested that team size was an important factor in team cognitive capability. Specifically, they highlighted that bigger teams had greater cognitive resources and diversity and dissimilarity of skills and opinions than smaller teams (e.g., Bantel & Jackson, 1989; Smith et al., 1994). However, we also believe that many two-person teams (e.g., aircrews, agile software developers) display the same basic work processes driving team performance as sizable teams, although larger teams may exhibit more complex social interactions. In the present study looking into basic team behaviors displayed by individuals working together to understand a new task, dyads were chosen to test a simple learning model with the most simple form of knowledge distribution in a controlled, experimental way. We follow Williams's conceptualization of teams and rely on the definition of Salas, Dickinson, Converse, and Tannenbaum (1992) that

> a team is a distinguishable set of two or more people who interact, dynamically, interdependently, and adaptively toward a common goal/objective/mission, who have each been assigned specific roles or functions to perform, and who have a limited life-span of membership. (p. 4)

This definition fits the dyads used in the present study. Still, further research exploring the dynamics of team coordination with more team members and in different settings will be needed to

understand the complexity of how team members with different expertise, knowledge, and possibly high diversity learn collectively to coordinate and perform more efficiently and effectively.

Another limitation of the study was that most collected data were derived from self-report measures. Although these measures have obtained reliability and construct validity evidence through both convergent and discriminant validation, we acknowledge that self-reported team learning processes probably do not fully capture the richness of behaviors and strategies in which teams engage and suggest the use of additional qualitative data to fully grasp team learning and coordination development. For example, coding actual reflective behaviors would help us to better understand whether teams exhibiting reflective behaviors before (planning behaviors), during, or after the task (reviewing and strategizing behaviors), are the ones showing the highest coordination and performance. Thus, qualitative data may facilitate the understanding of why certain teams achieve optimal coordination, and others not, and show the resulting changes of effective coordination processes, especially by analyzing the type and object of learning and the structure of interactions leading to a new learning (Goodman & Dabbish, 2011).

Finally, we tested a basic dynamic model of team coordination establishment. Future research could extend our findings and investigate retroactive models with iterative loops. Feedback loops in which previous performance acts as an input for determining subsequent processes and performance have been recently forwarded as relevant models to understand team dynamics (Ilgen, Hollenbeck, Johnson, & Jundt, 2005).

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