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Why is Your Team More Creative Than Mine? The Influence of Shared Mental Models on Intra-group Conflict, Team Creativity and Effectiveness

Catarina Marques Santos, Sjir Uitdewilligen and Ana Margarida Passos

In competitive and dynamic contexts team members need to be creative to ensure that teams achieve high levels of performance and feel satisfied with their work. At the same time, team members need to have a shared understanding regarding relevant aspects related to task accomplishment and team interaction. In this study we investigate the mediating mechanisms of intra-group conflict and creativity in the relationship between shared mental models and team effectiveness (team performance and satisfaction). We tested our model in a sample of 161 teams (735 individuals) performing in a management simulation. We collected data at three time points. Our results suggest that high shared mental models are related to low levels of intra-group conflict, foster creativity, and in turn improve team performance and satisfaction. These findings contribute to a scarce thematic – the relationship between shared mental models and creativity – emphasizing the importance of a shared understanding for creativity and team effectiveness.

Introduction

The organizational contexts in which teams operate are becoming increasingly competitive. As a result teams often need to be creative to achieve their goals, present new solutions or suggest new products (Burke et al., 2006). Researchers have analyzed team factors that foster team creativity, such as task interdependence, team size and cohesion (Hülshager, Anderson & Salgado, 2009). Yet, an in-depth investigation of the impact of team cognitive factors, such as shared mental models, is lacking. Shared mental models (SMM) refer to a common understanding among the team members about relevant task and team aspects of their work (Klimoski & Mohammed, 1994). Although empirical studies show that SMM foster a variety of team processes and outcomes, such as coordination,

adaptation and performance (e.g., Mathieu et al., 2000; Santos & Passos, 2013; Uitdewilligen, Waller & Pitariu, 2013), empirical studies that analyze the effect of SMM on creativity are still missing. As SMM imply a common understanding shared by team members, it is important to analyze whether SMM inhibit creative ideas because team members share the same ideas and do not discuss different points of view, or whether SMM potentiate creative ideas because they facilitate effective co-ordination and co-operation among the team members.

Literature about the impact of SMM on creativity is scarce. On the one hand, it has been argued that SMM may stifle creativity (Skilton & Dooley, 2010). When team members have too much overlap in their understanding about task and team aspects of work, this may reduce their ability to innovate and to be crea-

tive. On the other hand, previous studies suggest a positive effect of SMM on adaptation, which is closely related to creativity and innovation because teams need to solve problems and create new products in order to be able to adapt (Burke et al., 2006).

Intra-group conflict is likely to play a role in the relationship between SMM and creativity. Conflict results from the tension among team members and involves discrepancies and incompatible goals (Jehn & Mannix, 2001; De Dreu & Weingart, 2003). Intra-group conflict may hamper creativity, impede team members' ability to develop new ideas and thereby decrease team effectiveness (Jehn, 1995; Simons & Peterson, 2000; De Dreu & Weingart, 2003; de Wit, Greer & Jehn, 2012). A recent study showed that SMM similarity diminishes the level of relationship conflict and in turn improves team effectiveness (Santos & Passos, 2013). However, empirical studies that analyze the relationships among SMM, conflict, creativity and effectiveness are needed.

In the present study we investigate the mediating mechanisms of intra-group conflict and team creativity in the relationship between SMM and team effectiveness (team performance and satisfaction). We analyze four types of intra-group conflict: task, relationship, process and temporal conflict. Analyzing the mediating role of intra-group conflict and creativity allows us to integrate and test alternative theories on how SMM impact team effectiveness (Mathieu, DeShon & Bergh, 2008).

Shared Mental Models

Previous research suggests that SMM impact team performance and satisfaction (e.g., Mathieu et al., 2000, 2010; Santos & Passos, 2013). Performance is an objective criterion that indicates team-level actual task accomplishment. Team satisfaction is an affective concept that indicates the degree to which team members are satisfied with the team experience (McGrath, 1964; Hackman, 1987). SMM foster team effectiveness because they enable team members to anticipate the needs and actions of other team members and to adapt their actions to align with their colleagues as well as with the demands of the task (Cannon-Bowers, Salas & Converse, 1993; DeChurch & Mesmer-Magnus, 2010). When team members have SMM, they make efficient use of their information and knowledge, produce efficient collective responses to immediate task requirements, and subsequently are able to achieve high levels of performance and feel satisfied with the team experience (Cannon-Bowers, Salas &

Converse, 1993; DeChurch & Mesmer-Magnus, 2010; Santos & Passos, 2013).

Shared Mental Models and Intra-group Conflict

Intra-group conflict is a process that occurs when team members perceive their interests and values to be incongruent with those of other members of the team (Jehn & Mannix, 2001; DeChurch, Mesmer-Magnus & Doty, 2013). Three different types of intra-group conflict have been identified in the literature: task, relationship and process conflict (Jehn, 1995, 1997). Task conflict refers to disagreements among team members related to the content of the tasks, such as differences regarding ideas or opinions (Jehn, 1995). Relationship conflict refers to arguments about personal and social issues that are not directly related to the task and that involve negative emotions and tension (Jehn, 1995; De Dreu & van Vianen, 2001). Process conflict refers to differences on the procedures by which the task should be accomplished, the distribution of responsibilities, and the structure of delegation within the team (Jehn, 1997). Recently, scholars have added a fourth type of conflict: temporal conflict, which refers to intra-group disputes about time, the duration of a task, and the length of time the team should spend on a specific task or goal (Mohammed & Nadkarni, 2011; Standifer et al., 2015).

Different perspectives exist regarding the impact of intra-group conflict on team functioning. Previous empirical studies consistently show that relationship conflict and process conflict limit team members' ability to share, exchange and process relevant information, and that they distract team members from engaging in effective task execution (Jehn, 1997; De Dreu & Weingart, 2003; Passos & Caetano, 2005; de Wit, Greer & Jehn, 2012; Santos & Passos, 2013). Research on temporal conflict suggests that it increases ambiguity about task deadlines and the sequence of task accomplishment, which disrupts co-ordination processes and increases team members' frustration (Mohammed & Nadkarni, 2011; Standifer et al., 2015). Findings about task conflict, however, are inconsistent. Although initial research suggests that task conflict may facilitate innovativeness and high-quality team decisions (Jehn, 1995; Amason, 1996), a meta-analysis by De Dreu and Weingart (2003) shows that task conflict has disruptive effects on team effectiveness. Nevertheless, a recent meta-analysis did not show a strong and negative association between task conflict and team performance (de Wit, Greer & Jehn, 2012).

SMM play an important role in the development of intra-group conflict by stimulating constructive conflict and avoiding disruptive conflict. As teams that have SMM have a common understanding of the task goals, procedures and strategies, this facilitates co-ordination among the team members and fosters knowledge about what other members need to accomplish their task. Therefore members are able to openly discuss ideas and different viewpoints arising over the team life-cycle (Cannon-Bowers, Salas & Converse, 1993; DeChurch & Mesmer-Magnus, 2010; Santos, Uitdewilligen & Passos, 2015). When team members have SMM and discuss ideas that are aligned with the task and team aspects of their work, they are likely to increase their effectiveness in executing their task. In short, when team members have SMM, they can engage in task conflict situations, solve them, make optimal decisions, achieve high levels of performance, and feel satisfied with their work.

Hypothesis 1(a) Task conflict mediates the relationship between SMM and team effectiveness (team performance and satisfaction).

Team members who have SMM are focused on task accomplishment and discuss aspects related to the task and team interaction that really matter for effectiveness. Consequently, teams avoid disagreements based on personal issues, on team members' responsibilities and on the length of time the team should spend on a specific task or goals and thereby achieve high levels of performance and member satisfaction (Simons & Peterson, 2000; Santos & Passos, 2013; Standifer et al., 2015). Thus, teams that have SMM experience low levels of relationship, process and temporal conflict and achieve high levels of performance and their members feel satisfied with their team.

Hypothesis 1(b) Relationship conflict, 1(c) process conflict and 1(d) temporal conflict mediate the relationship between SMM and team effectiveness (team performance and satisfaction).

Shared Mental Models and Team Creativity

Creativity refers to the process of 'coming up with fresh ideas for changing products, services, and processes so as to better achieve the organization's goals' (Amabile et al., 2005, p. 367). Creativity requires originality and effectiveness, as 'original things must be effective to be creative' (Runco & Jaeger, 2012, p. 92). Past research has demonstrated that team input variables, such as task interdependence and job-relevant diversity stimulate team crea-

tive processes (West, 2002; van der Veegt & Janssen, 2003; Hülshager, Anderson & Salgado, 2009). Team processes, such as communication patterns, task orientation and intra-group conflict, also have an impact on creativity and innovation (Jehn, 1995; West & Anderson, 1996; De Dreu, 2006).

Despite these important findings in creativity research, a relevant discussion exists on the effect of SMM on creativity that needs clarification. Skilton and Dooley (2010) pose that SMM may stifle creativity. They argue that particularly when team members work together on creative projects, they internalize and synchronize their SMM, which over time become resistant to change. In subsequent projects, team members may avoid discussing novel ideas and diverging points of view in order to avoid conflict and not to disrupt the status quo (Skilton & Dooley, 2010). In short, Skilton and Dooley (2010) argue that the common understanding shared by team members inhibits innovative and creative ideas.

Contrastingly, a number of empirical studies have shown that SMM positively foster team adaptation, which includes innovation as a sub-facet (Burke et al., 2006; Resick et al., 2010; Uitdewilligen, Waller & Pitariu, 2013). When team members have SMM, they are able to adapt their routines when they are confronted with complex and dynamic task environments (Kozlowski et al., 2001; Resick et al., 2010). Hülshager, Anderson and Salgado (2009) argue that when teams have SMM, the positive relationship between job-relevant diversity and innovation might be strong, because then team members' working styles are aligned, they agree on team norms, and they are co-ordinated and willing to co-operate with each other (Kozlowski & Bell, 2003; Bledow et al., 2009). Furthermore, team members who have SMM are able to generate, create and implement new ideas or products that are aligned and in accordance with the requirements of the task and the needs of the team (Burke et al., 2006; Hülshager, Anderson & Salgado, 2009). Consequently, teams achieve high levels of performance and team members feel satisfied.

Although team factors directly impact team creativity, they also impact the extent to which individuals can be creative, which in turn facilitates team effectiveness. Research suggests that when team members 'are open to new ideas, constructively challenge one another, effectively communicate and provide feedback, successfully manage conflict, trust and help each other, and share a commitment to their work' (DiLiello, Houghton & Dawley, 2011, p. 155), they perceive support for creativity, which fosters team and organizational

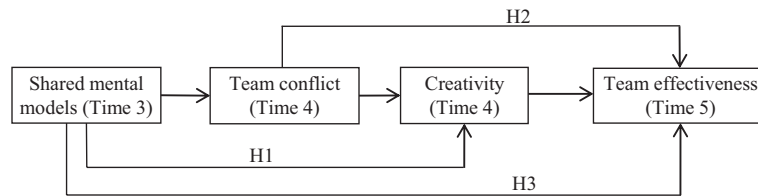


Figure 1. Hypothesized model

innovation and effectiveness (Amabile, 1988; DiLiello, Houghton & Dawley, 2011). In this sense, we argue that a team work environment, where members have a similar understanding regarding relevant team and task aspects of their work, fosters team members' creativity. SMM and creativity, in turn, have a positive impact on the ability of the team to perform and the extent to which its members feel satisfied with the team.

Hypothesis 2 Creativity positively mediates the relationship between SMM and team effectiveness (team performance and satisfaction).

Shared Mental Models, Intra-group Conflict and Team Creativity

A number of empirical studies have given special attention to the relationship between task conflict and creativity (Pelled, Eisenhardt & Xin, 1999; Chen, 2006; De Dreu, 2006; Badke-Schaub, Goldschmidt & Meijer, 2010). Findings suggest that task conflict fosters creativity because when team members disagree about central components of the task, they are likely to explore opposing ideas, and discuss diverging viewpoints, which enhances the generation of new ideas (Chen, 2006; Badke-Schaub, Goldschmidt & Meijer, 2010). Conversely, relationship conflict hampers creativity because it limits team members' ability to communicate, discuss and share information (Jehn, 1995; Simons & Peterson, 2000; Chen, 2006).

We argue that teams that have SMM, and experience high levels of task conflict and low levels of relationship, process and temporal conflict, are likely to create new solutions for problems or unexpected situations and to achieve high levels of team effectiveness. As team members share a common understanding of relevant aspects of their work, they discuss issues related to task accomplishment and team goals, and they avoid disruptive conflicts (Jehn, 1995; Simons & Peterson, 2000; Santos & Passos, 2013). Consequently, as team members think about new ideas and solutions, they achieve high levels of performance and

feel satisfied with the team. Thus, we expect a relationship between SMM, team conflict, creativity and effectiveness.

Hypothesis 3(a) Task conflict, 3(b) relationship conflict, 3(c) process conflict, and 3(d) temporal conflict and creativity sequentially mediate the relationship between SMM and team effectiveness.

The research model is represented in Figure 1.

Method

Participants

A total of 161 teams (735 individuals) participated in this study. All teams were enrolled in a national management and strategy simulation for a 5-week period. The teams were composed of workers (42.6 per cent), university students (41.1 per cent), or a mix of workers and students (16.4 per cent). Team sizes ranged from three to five members, with an average of 4.67 (s.d. = 0.62). The average age was 29 years (s.d. = 8.42) and 67.4 per cent of the participants were male.

Simulation

We collected data using the business simulation the Global Management Challenge®. In this simulation teams run fictitious companies that have the objective of gaining the highest share price on the simulated stock exchange. The simulation has been running for over 30 years, and many top companies encourage their employees to take part in it. The simulation comprises four stages: first round, second round, national final and international final. We collected data in the first round of the simulation that takes place across five consecutive weeks and involves a larger number of teams. Before the beginning of the simulation, teams receive a manual that explains how the simulation works, and a management report about the companies they will run. This information can be used over the simulation. Further, approximately one month before the beginning of the simulation, participating teams enrol in two training sessions. The

teams were assigned to a group consisting of a maximum of eight teams representing a competitive market, in which they had to compete with one another. The simulation lasts five weeks, with each week simulating three months. In each quarter teams make decisions on the marketing, production, personnel, purchasing and finance of their fictional company. The simulation algorithm computes the effect of these decisions on the companies' financial indicators, their share price and on their ranking relative to the other teams. This information is presented to the team in the form of a management report to the teams after each quarter.

Team members are free to assemble their own team. Because members might know each other from their university (for student teams), or from their jobs (worker teams), some teams may have worked together before. The mix teams were formed by students and workers. For these teams it is less likely that members have worked together previously. Companies may ask students to join their teams as part of a recruitment process as this enables them to analyse the behaviours, competencies and skills of these students.

Procedure

Team members answered two different on-line questionnaires during the simulation. Performance was provided by the company responsible for the simulation. The company authorized data collection and informed participants about the research, whereas the authors of the study were responsible for sending the link to the questionnaires and for collecting the data. The link to the questionnaires was sent to the team members by e-mail at different time moments in the simulation period. Participants answered the questionnaires individually before receiving the management report with the feedback about their decisions.

Measures

Shared Mental Models

Based on the four types of models identified by Cannon-Bowers and colleagues (1993), we developed a four-item scale to evaluate SMM. On a 7-point Likert scale (1 = totally disagree, 7 = totally agree) the participants indicated how much they agreed with each of the statements. A list of the statements is provided in the Appendix. We performed an exploratory factor analysis which revealed only one factor with 81.24 per cent of variance explained. A confirmatory factor analysis (CFA) executed in Mplus (Muthén & Muthén, 1998–2010) indicated an acceptable goodness of fit index, with

all indices falling within acceptable ranges (Hu & Bentler, 1999; Schreiber et al., 2006): $\chi^2(2) = 55.73, p = 0.00$; RMSEA (root mean square error of approximation) = 0.00; CFI (comparative fit index) = 0.97; TLI (Tucker-Lewis index) = 0.90; SRMR (standardized root mean square residual) = 0.02. SMM were measured in the third week of the competition ($\alpha = 0.92$).

Intra-group Conflict

Relationship, task and process conflicts were measured using 12 items from the Intra-group Conflict Scale by Jehn (1995, 1997). Temporal conflict was measured with a modified three-item scale by Yang (2009) based on the original process conflict scale developed by Jehn (1995) and Shah and Jehn (1993). On a 7-point scale (1 = never, 7 = always), the participants indicated how often each behaviour occurred in their team. A list of the statements is provided in the Appendix. Conflict was measured in the fourth week of the competition ($\alpha_{\text{relationship}} = 0.96$; $\alpha_{\text{task}} = 0.87$; $\alpha_{\text{process}} = 0.92$; $\alpha_{\text{temporal}} = 0.95$).

Creativity

Creativity was measured with the self-perceived creativity and creative self-efficacy (5 and 6 items respectively) scales by DiLiello and colleagues (2011). On a 7-point scale (1 = totally disagree; 7 = totally agree), the participants rated the extent to which they agreed with each sentence. A list of the sentences is provided in the Appendix. We used the two scales together, because an exploratory factor analysis revealed only one factor with 78.14 per cent of variance explained. A CFA was implemented by Mplus (Muthén & Muthén, 1998–2010) which presented an acceptable goodness of fit index as all indices fell within acceptable ranges (Hu & Bentler, 1999; Schreiber et al., 2006): $\chi^2(35) = 327.39, p = 0.00$; RMSEA = 0.00; CFI = 0.95; TLI = 0.93; SRMR = 0.03. Creativity was measured in the fourth week of the competition ($\alpha = 0.97$).

Performance

Performance was operationalized as the share price at the end of the simulation. The share price was given in Euros and was automatically calculated by the simulation software. The simulation also automatically provided the team's relative position in the group, ranging from first to eighth. We operationalized performance by recoding the share price on a 1- to 8-point scale through the percentile values – we asked for the cut-off points for eight equal groups. We created a new variable based on the values of the eight groups,

which was used in the mediation analyses. The lowest share prices correspond to lower values and the highest share prices correspond to higher values. This performance measure was discussed and constructed on the basis of recommendations of the developers of the management simulation.

Team Satisfaction

Team satisfaction was measured with eight items adapted from the Job Satisfaction Scale by Spector (1997). On a 7-point scale (1 = very dissatisfied; 7 = very satisfied), the participants rated how much they were satisfied with different aspects of their teamwork. A list of the statements is provided in the Appendix. Satisfaction was measured in the fifth week of the competition ($\alpha = 0.98$).

Control Variables

We included team size, team composition (workers, university students or both), and familiarity as control variables in our analyses (van Knippenberg & Schippers, 2007; Humphrey, Morgeson & Mannor, 2009). We controlled for team size because it can impact a team's ability to establish and build upon mental models. Team size was measured as the number of members in the team. For the control variable team composition, we transformed the categorical variable into two dummy variables, using the workers as a baseline, as they represented more teams in the competition. Familiarity was measured as the percentage of team members that already knew each other before the start of the simulation.

Results

Aggregation

The level of analysis in this study was the team. Thus, all individual survey responses were aggregated to the team level for further analysis (Costa et al., 2013). To justify aggregation, we computed $R_{wg(j)}$ (James, Demaree & Wolf, 1993), designed for multiple-item scales, and intra-class correlation coefficients (ICC) (Bliese, 2000). All the values were in accordance with the required criteria (see Table 1). Therefore, individual answers were aggregated to the team level.

Hypotheses Testing

Table 1 provides the means, standard deviations and the correlations for all study variables at the team level. The results show a negative and significant correlation between

mental models and the four types of intra-group conflict. The results show a positive and significant correlation between SMM and creativity ($r = 0.53, p < 0.01$), as well as satisfaction ($r = 0.60, p < 0.01$). The four types of conflict were negative and significantly correlated with creativity and satisfaction. Creativity was positively and significantly correlated with team effectiveness ($r_{performance} = 0.21, p < 0.01$; $r_{satisfaction} = 0.52, p < 0.01$). Regarding the control variables, familiarity was positively and significantly correlated with mental models ($r = 0.20, p < 0.05$).

To evaluate our research model with multiple sequential mediators, we used the PROCESS macro, developed by Hayes (2013). This macro allows for testing the indirect effects of SMM on effectiveness through conflict and creativity, even when there is no association between SMM and effectiveness. Team size, team composition and familiarity were entered as control variables. We re-sampled 5,000 times and examined for 95 per cent confidence intervals (CI). We can assume that the indirect effects are significant and that mediation occurred if zero falls outside of the 95 per cent confidence interval (Preacher & Hayes, 2008).

Table 2 provides the path estimates for the models. Hypotheses 1(a–d) propose that intra-group conflict mediates the relationship between SMM and team effectiveness. Intra-group conflict mediated the relationship between SMM and satisfaction (task: 0.05 [CI = 0.01, 0.13]; relationship: 0.11 [CI = 0.05, 0.22]; process: 0.09 [CI = 0.03, 0.19]; temporal: 0.10 [CI = 0.04, 0.20]). Intra-group conflict did not mediate the relationship between SMM and performance (task: -0.13 [CI = -0.40, 0.02]; relationship: -0.00 [CI = -0.25, 0.24]; process: -0.08 [CI = -0.38, 0.14]; temporal: 0.02 [CI = -0.27, 0.30]). Hypotheses 1a, 1b, 1c and 1d were partially supported.

Hypothesis 2 proposes that creativity positively mediates the relationship between SMM and team effectiveness. The results showed that creativity mediated the relationship of SMM with performance (0.37 [CI = 0.09, 0.73]) and satisfaction (0.14 [CI = 0.05, 0.27]). Hypothesis 2 was supported.

Hypotheses 3(a–d) pose that intra-group conflict and creativity sequentially mediate the relationship between SMM and team effectiveness. The results showed that task conflict and creativity mediated the relationship of SMM with performance (0.04 [CI = 0.01, 0.16]) and satisfaction (0.02 [CI = 0.01, 0.05]). Hypothesis 3a was partially supported. Relationship conflict and creativity mediated the relationship of SMM with performance (0.08 [CI = 0.01, 0.24]) and satisfaction (0.03 [CI = 0.01, 0.07]).

Table 1. Means, Standard Deviations and Correlations among All Team-Level Variables

	$R_{wg(i)}$	ICC(1)	ICC(2)	M	SD	1	2	3	4	5	6	7	8	9	10	11	12
1. Team size	-	-	-	4.56	0.70												
2. Students	-	-	-	0.42	0.50	-0.24**											
3. Workers	-	-	-	0.42	0.49	0.06	-0.72**										
4. Mix teams	-	-	-	0.16	0.36	0.25**	-0.37**	-0.36**									
5. Familiarity	-	-	-	80.78	25.76	-0.27**	0.31**	0.12	-0.60**								
6. SMM	0.83	0.16	0.47	5.55	0.69	-0.03	-0.02	0.12	-0.10	0.20*							
7. Task conflict	0.72	0.12	0.39	2.75	0.84	0.12	0.13	-0.10	-0.06	0.06	-0.19*						
8. Relationship conflict	0.72	0.16	0.47	1.92	0.89	0.06	0.28**	-0.24**	-0.10	0.11	-0.29**	0.71**					
9. Process conflict	0.74	0.14	0.43	2.28	0.82	0.10	0.24**	-0.18*	-0.12	0.12	-0.29**	0.87**	0.90**				
10. Temporal conflict	0.71	0.13	0.42	2.18	0.87	0.06	0.24**	-0.15	-0.16*	0.14	-0.34**	0.78**	0.90**	0.93**			
11. Creativity	0.81	0.09	0.33	5.21	0.64	-0.40	-0.12	0.14	-0.03	0.07	0.53**	-0.32**	-0.49**	-0.42**	-0.48**		
12. Performance	-	-	-	4.44	2.30	-0.01	-0.28**	0.24**	0.05	-0.07	0.13	0.02	-0.15	-0.08	-0.15	0.21**	
13. Satisfaction	0.80	0.18	0.51	5.83	0.84	-0.07	-0.05	0.06	0.03	0.08	0.60**	-0.32**	-0.49**	-0.43**	-0.46**	0.52**	0.25**

Note: N = 161 teams; * $p < 0.05$; ** $p < 0.01$; SMM = shared mental models.

Table 2. Model Path Estimates for Models with Task, Relationship, Process and Temporal Conflict

	Performance model		Satisfaction model	
	Coefficient	<i>p</i> value	Coefficient	<i>p</i> value
Model with task conflict				
SMM → Effectiveness ^a	0.25	0.44	0.68	0.00
SMM → Effectiveness ^b	-0.03	0.94	0.47	0.00
SMM → Task conflict	-0.35	0.00	-0.36	0.00
SMM → Creativity	0.46	0.00	0.43	0.00
Task conflict → Creativity	-0.14	0.05	-0.18	0.01
Task conflict → Effectiveness	0.37	0.14	-0.14	0.05
Creativity → Effectiveness	0.80	0.03	0.32	0.00
Model with relationship conflict				
SMM → Effectiveness ^a	0.25	0.44	0.68	0.00
SMM → Effectiveness ^b	-0.11	0.78	0.45	0.00
SMM → Relationship conflict	-0.43	0.00	-0.43	0.00
SMM → Creativity	0.39	0.00	0.38	0.00
Relationship conflict → Creativity	-0.27	0.00	-0.26	0.00
Relationship conflict → Effectiveness	-0.00	0.99	-0.26	0.00
Creativity → Effectiveness	0.70	0.08	0.22	0.02
Model with process conflict				
SMM → Effectiveness ^a	0.25	0.44	0.67	0.00
SMM → Effectiveness ^b	-0.06	0.87	0.45	0.00
SMM → Process conflict	-0.43	0.00	-0.43	0.00
SMM → Creativity	0.41	0.00	0.40	0.00
Process conflict → Creativity	-0.23	0.00	-0.23	0.00
Process conflict → Effectiveness	0.19	0.50	-0.22	0.00
Creativity → Effectiveness	0.78	0.04	0.27	0.00
Model with temporal conflict				
SMM → Effectiveness ^a	0.25	0.44	0.68	0.00
SMM → Effectiveness ^b	-0.11	0.77	0.45	0.00
SMM → Temporal conflict	-0.50	0.00	-0.48	0.00
SMM → Creativity	0.38	0.00	0.37	0.00
Temporal conflict → Creativity	-0.26	0.00	-0.27	0.00
Temporal conflict → Effectiveness	-0.03	0.91	-0.21	0.00
Creativity → Effectiveness	0.68	0.08	0.26	0.01

Note: N = 161 teams; SMM = shared mental models; The coefficients refer to the unstandardized regression coefficient.

^a The total effect of SMM on team effectiveness without the inclusion of mediator variables.

^b The total effect of SMM on team effectiveness with the inclusion of mediator variables.

Hypothesis 3b was supported. Process conflict and creativity mediated the relationship of SMM with performance (0.08 [CI = 0.01, 0.20]) and satisfaction (0.03 [CI = 0.01, 0.06]). These results support Hypothesis 3c. Temporal conflict and creativity mediated the relationship of SMM with performance (0.09 [CI = 0.01, 0.27]) and satisfaction (0.03 [CI = 0.01, 0.08]). Hypothesis 3d was supported.

Discussion

This study presents important findings for teams functioning in highly competitive and dynamic environments where team members

need to be creative and present innovative solutions. Our study shows the importance of SMM in constraining the level of intra-group conflict, in stimulating creativity and in fostering team effectiveness.

Our findings suggest that SMM diminish the level of conflict and in turn improve team satisfaction. However, in contrast with our hypothesis, SMM did not improve team performance by decreasing intra-group conflict. These results are contrary to our expectations, which postulated that when team members have SMM they engage in task conflict because they are able to discuss ideas and divergent viewpoints that arise over the team lifecycle as

they clearly know the task goals and procedures as well as the needs of other members. Our findings may suggest that as team members share an understanding about the task procedures, they previously define all the aspects related to task execution, and discuss different ideas and points of view. Thus, by the middle of the team lifecycle all these aspects have been clearly defined and they do not need to discuss these again.

SMM diminish the level of intra-group conflict and in turn improve team satisfaction. Our research reveals important findings on a mediator that is scarcely analysed in SMM research. It appears that SMM impede discussions about personal issues, deadlines and task delegation because team members are focused on task accomplishment. Consequently, team members are more likely to feel satisfied with the teamwork experience (Rentsch & Klimoski, 2001). However, SMM did not improve team performance via team conflict. These results are contrary to our expectations, and may suggest that intra-group conflict is more relevant as a mediating mechanism in the relationship between SMM and team satisfaction than in the relationship between SMM and performance. The social issues, deadlines, task procedures and task delegations that teams discuss in the middle of the team lifecycle are important for the level of satisfaction team members feel at the end of the task accomplishment, but they do not impact the level of performance.

Finally, our findings show that intra-group conflict and creativity act as mediating mechanisms between SMM and team effectiveness. These results are in accordance with our expectations and show that as team members have SMM, they do not engage in conflict behaviours, which allows them to be creative and in turn to achieve high levels of performance and feel satisfied with the team.

Theoretical and Research Implications

Our research represents a contribution to the study of SMM by showing that this cognitive construct positively influences team creativity, and in turn team effectiveness. Thus far, different perspectives exist regarding the impact of SMM on creativity. While some authors argue that SMM block creativity (Skilton & Dooley, 2010), other authors argue that when team members have SMM they are more likely to be creative because they are co-ordinated, willing to co-operate with each other, and they trust and help each other (Hülsheger, Anderson & Salgado, 2009; DiLiello, Houghton & Dawley, 2011). Our findings support the latter perspective and show

that in organizational contexts where team members have SMM, team members develop creative ideas, because their working styles are aligned, and they agree on important aspects of taskwork and teamwork (Hülsheger, Anderson & Salgado, 2009). Therefore, team members are able to achieve high levels of performance and feel satisfied with their work. However, more research about these topics is needed.

Our study analyses temporal conflict, which represents a recent dimension of intra-group conflict with important implications for team functioning. Increasingly, teams are pressured by time, work to tight deadlines and need to distribute their time and resources over different projects. Thus, it is important that teams avoid temporal disagreements and know how to work from the beginning of the team lifecycle. More research about temporal conflict is needed.

Practical Implications

Our study offers a number of insights that companies may use in order to help their teams to improve their creativity and effectiveness. First, our study offers insights into the importance of fostering SMM and creativity in organizational teams. Our findings show that when team members have SMM, team members develop creative ideas that are in accordance with the requirements of the task and the needs of the team. Furthermore, our findings show that teams need to avoid conflict situations to be creative and to perform optimally. This implies that teams would benefit from receiving information about the importance of developing SMM and avoiding and managing conflicts.

Previous research suggests that the development of SMM may be promoted by having team members engage in collective planning prior to task performance (Stout et al., 1999). In addition, a number of studies emphasize the important role the team leader plays in fostering the development of SMM. Marks, Zaccaro and Mathieu (2000) found that team leaders can help teams to develop SMM by providing briefings before the actual performance episode. Lorinkova, Pearsall and Sims (2013) found that teams with empowering leaders develop more similar mental models than teams with directive leaders. So, when creativity is important for goal attainment, team leaders may be instructed to develop an empowering leadership style, in which they involve all team members in the goal-setting and decision-making processes.

Some interventions can be used particularly for (interdisciplinary) teams that work

virtually, for instance, international teams. A mind-mapping intervention can be used where team members should, individually, think about or write the main actions and/or the main information they need to perform well in the task (Rentsch et al., 2010). Then, each team member should explain to each other the meaning of each action. In the next step, team members should collectively make the connection among those concepts, thereby creating a shared mental representation. Face-to-face teams may do this intervention together and make a 'physical' mind map, for instance on a whiteboard. International or virtual teams may develop this shared knowledge object, for instance in a video-conference, using virtual collaboration software. This intervention is likely to facilitate team members' understanding of each other's work, align their strategy, and increase the knowledge of each other skills, leading to a shared knowledge about the main aspects of the task and teamwork.

To prevent conflict situations, team leaders and team members need to learn strategies that could help them to discuss important aspects of work, deadlines and task delegation in a way, and at a time, that would not interfere with team functioning. Team members and leaders need to develop conflict management competencies and learn how and when to use those strategies to prevent dysfunctional conflict situations. Behfar et al. (2008) identified a number of strategies that can help teams to reduce conflict and improve performance and satisfaction. For instance, to prevent task conflict, team members can discuss or debate different ideas and opinions in order to achieve consensus, ensuring that all members have a chance to explain their viewpoints. To prevent relationship conflict, team members can be trained to avoid taking disagreements in a personal way. Conflict management training can help team members focus on the content of the arguments instead of on the possibly unpleasant style in which these are formulated. To prevent process conflict, team members can schedule meetings in which they discuss and ensure the quality of the work, and prevent or plan for potential future problems. They can also assign a member (e.g., the team leader) to allocate responsibilities, or they can provide team members with autonomy to choose which specific task they want to execute (Behfar et al., 2008). Preventing temporal conflict is not only important for teams that work together in the same place and time, but is particularly important for international or virtual teams (Montoya-Weiss, Massey & Song, 2001). Both types of teams can use temporal co-ordination mechanisms that help them to communicate

and co-ordinate effectively. For instance, they can create rules and procedures to prevent time management issues, they can establish consensus on the allocation of time to the different team tasks, and they can schedule deadlines to align the pace and effort among the team members (Montoya-Weiss, Massey & Song, 2001; Behfar et al., 2008).

Limitations and Directions for Future Research

The management simulation is an artificial scenario that has some limitations for the external validity of the findings. For instance, team members may not be fully engaged in the simulation, or may not work for the collective goal. However, similar to real teams in organizations, teams need to make several complex decisions where team members need to focus on different indicators to achieve a specific objective, and need to work together in an episodic way over five weeks (Mathieu et al., 2000; Mathieu & Rapp, 2009). This scenario, as in the real world, requires high levels of interaction and co-ordination. In the real world we could expect that teams would share a stronger SMM than in the simulation because team members have known each other for a long period of time, and they are familiar with the tasks they need to perform, as well as with each other's preferences and abilities. Thus, the effect of SMM fostering creativity, reducing intra-group conflict and, in turn, improving team effectiveness could be stronger than in the simulation.

We analysed creativity through individual level measures: self-perceived creativity and creative self-efficacy, which were aggregated to the team level. As our study is a team-level study, we should analyse creativity through a team-level measure (Costa et al., 2013). However, individuals still need to be creative for a team to perform well. As we measured and considered team members' perception of their own creativity, our findings can help team members and leaders to identify creativity gaps and help human resources managers to design training programmes and interventions in order to develop some untrained creative skills and competencies (DiLiello, Houghton & Dawley, 2011). Despite this advantage, future studies should analyse creativity through team level measures.

The creativity measure we used in this study reflects self-perceived creativity and creative self-efficacy, which may refer to a fixed characteristic of the person. Despite research showing that team factors influence individuals' perception of their own creativity (Amabile, 1988; DiLiello, Houghton & Dawley,

2011), fixed characteristics of the person normally are not easily influenced by the environment. We could measure creativity before the teamwork experience has started to test its relationship with mental models, conflict and team effectiveness.

Although our study shows that SMM do not impede creative ideas, it is important to understand when too much overlapping of mental models becomes disruptive to creativity and to team functioning. If all team members have an exact replication of each other's mental models, the creation of new solutions and ideas can be threatened (Salas, Sims & Burke, 2005). Future studies should analyse these questions.

Conclusion

In increasingly competitive contexts, teams need to share an understanding about the way they work and interact. Simultaneously they need to present new ideas and solutions in order to achieve high levels of performance and compete with other teams and organizations. Our study provides important implications that should be taken into account by team leaders and organizational managers who want that their teams to present creative ideas, experience low levels of conflict and achieve high levels of effectiveness.

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Appendix

Shared mental models scale (based on Cannon-Bowers, Salas & Converse, 1993)

1. In my team, the team members have a similar understanding about the procedures, strategies and contingency plans involved in decision making.
2. In my team, the team members have a similar understanding of each other's responsibilities, interdependent roles and communication patterns.
3. In my team, the team members have a similar understanding about the technology, resources and tools needed to make decisions.
4. In my team, the team members are familiar with the preferences and abilities of each other.

Relationship conflict (adapted from Jehn, 1995)

1. How much friction is there among members in your team?
2. How much are personality conflicts evident in your team?
3. How much tension is there among members in your team?
4. How much emotional conflict is there among members in your team?

Task conflict (adapted from Jehn, 1995)

1. How often do people in your team disagree about opinions regarding the work being done?
2. How often are there conflicts about ideas in your team?
3. How often are there differences of opinion in your team?
4. How often are there disagreements within you team about the task you are working on?

Process conflict (adapted from Jehn, 1997)

1. How often are there disagreements about resource allocation in your team?
2. How often is there conflict in your team about task responsibilities?
3. How often are there disagreements about the way to complete a certain task?

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4. How often are there disagreements about who should do what in your team?

Temporal conflict (adapted from Yang, 2009)

1. To what extent do team members disagree about time allocation in your work team (how much time to spend on tasks)?
2. To what extent is there conflict about how you should pace task activities in your team?
3. To what extent are there disagreements about how long to spend on specific tasks in your team?

Creativity (adapted from DiLiello, Houghton & Dawley, 2011).
Self-perceived creativity

1. I feel that I am good at generating novel ideas.
2. I have confidence in my ability to solve problems creatively.
3. I have a knack for developing the ideas of others further.
4. I am good at finding creative ways to solve problems.
5. I have the talent and skills to do well in my work.

Creative self-efficacy

1. I feel comfortable trying out new ideas.
2. I have opportunities to use my creative skills and abilities at work.
3. I am invited to submit ideas for improvements in the workplace.
4. I have the opportunity to participate on team(s).
5. I have the freedom to decide how my job tasks get done.
6. My creative abilities are used to my full potential at work.

Team satisfaction (adapted from Spector, 1997)

How satisfied are you with . . .

1. your team?
2. the functioning of your team?
3. your participation in the simulation?
4. the decisions made by your team?
5. communication among your team members?
6. the performance of the team leader?
7. the strategy of your team?
8. the interpersonal relationships among the team members?