Psihologia Resurselor Umane, **18** (2020), 23–37

http://dx.doi.org/10.24837/pru.v18i1.459

RESEARCH ARTICLE

Ups and downs on the roller coaster of task conflict: the role of group cognitive complexity, collective emotional intelligence and team creativity

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Abstract

This study explores the association between task conflict and team creativity and the role of group cognitive complexity (GCC) as a potential explanatory mechanism in a sample of 159 students organized in 49 groups. Moreover, we analyzed the moderating effect of collective emotional intelligence (CEI) in the relationship between task conflict and GCC. As hypothesized, we found that task conflict has a nonlinear relationship with GCC, but contrary to our expectations, it follows a U-shaped association, not an inversed U-shape. In addition, the moderating role of CEI was significant only at low levels. Contrary to our expectation, the mediating role of GCC did not receive empirical support. Theoretical and practical contributions are discussed.

Keywords

task conflict, group cognitive complexity, collective emotional intelligence, team creativity

An increasing number of organizations are relying on teams in order to cope with the dynamic business environment they operate in and considerable evidence now suggests that team creativity is a key contributor to a company's competitiveness, performance and survival (Tjosvold, et al., 2004; Zhou & Shalley, 2011). Team creativity refers to the production of novel and useful ideas, products, processes and procedures by a team of people working together (Amabile, 1996; Shalley & Gilson, 2004; Shin & Zhou, 2007). While abundant research exists on the antecedents of individual creativity (Amabile & Pratt, 2016; Joo et al., 2013), the potential of team creativity to create a consistent competitive

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Acknowledgement: Andreea Gheorghe was supported by the "Horia Pitariu" grant for students awarded in 2019 by the Association of Industrial and Organizational Psychology (APIO). The funders had no role in study design, data collection and analysis, decision to publish, or reparation of the manuscript.

advantage (Anderson et al., 2004) has spurred a more recent focus on understanding what are the factors that foster its emergence (Anderson et al., 2014; Shalley, Zhou, & Oldham, 2004).

One of the most researched antecedents of team creativity is the level of within-group task conflict (also labeled as cognitive conflict). Task conflict refers to disagreements among team members about the task being performed, based on differences in viewpoints, ideas and opinions (Jehn & Bendersky, 2003). The popularity of this construct in relation with creativity stems from the idea that such disagreements among team members are a trigger for information exchange, thorough exploration of opposing opinions, reevaluation of the status quo, and scrutiny of the task at hand. As such, task conflict is argued to be beneficial for the emergence of complex knowledge structures and the generation of novel ideas and solutions (De Dreu & West, 2001; Hulsheger et al., 2009). These arguments are in line with the minority dissent theory, which claims that the presence of different views within the group stimulates team members to take into consideration multiple perspectives by means of tension and surprise (Nemeth & Staw, 1989).

However, despite the logic that suggests that task conflict promotes creativity through processes of divergent thinking and information search, there are also authors (De Dreu & Weingart, 2003) who argue that increased levels of conflict might decrease the team members' ability to process and evaluate information due to cognitive overload. In line with the cognitive load hypothesis (Kirschner et al, 2009) and too much of a good thing effect (Grant & Schwartz, 2011), when the number of task related disagreements is too high, the group might be unable to integrate the large pool of perspectives into a rich cognitive structure (the team might have produced differentiation, but this impedes integration). In turn, this could be detrimental for a team's creative output (De Dreu, 2006; Farh et al., 2010).

At the same time, intensely debating on the diverse perspectives (i.e., experiencing high levels of task conflict) might result in tension and frustration stemmed from the lack of progress, and even transform into relational conflicts (Simons & Peterson, 2000). Handling such a rich underlying affective dynamics could make it difficult for a team to allocate enough resources in order to integrate conflicting opinions in a rich knowledge structure (i.e. indicative of a cognitively complex team). As such, exploring the way the group manages its emotions gains significant importance for understanding the task conflict – creativity link.

Imagine for example a team of scientists from an R&D department who are trying to develop a vaccine for the coronavirus. Some might bring up ideas based on previous research; some might express entirely new opinions, or will not have anything to say for the moment. If the flow of ideas is rather slow and not exactly diverse, the progress for creating the vaccine might stop right there. Conversely, if they express many different perspectives, the total pool of ideas will grow larger and they might feel some progress towards the objective. However, producing many different ideas does not mean they found the solution. A high level of differentiation might render it difficult to achieve integration because they are not able to process all of the opinions, or team members get defensive and start criticizing each other, which might escalate into intense arguments. Without the emergence of a complex knowledge structure related to the task, the combination of perspectives into new ideas and thorough elaboration might become just a pipe dream, with no breakthrough in the end.

To sum up, the available empirical data on the effects of task conflict on creativity are inconsistent (Hulsheger et al., 2009), thus pointing out to the potential existence of multiple mechanisms and contingencies that might operate in this relationship.

The contribution of our paper is threefold. First, in this paper, we build on group cognition as emergence (Curşeu, 2006; Curşeu et al., 2007, 2013) and explore the mediating role of group cognitive complexity (i.e. the richness of collective knowledge structures/ GCC) in the relation between task conflict and team creativity. Second, in line with the too-much-of-a-good thing (TMGT) meta-theoretical framework (Busse et al., 2016; Grant & Schwartz, 2011; Pierce & Aguinis, 2013), we posit a non-linear relation (reversed

U-shape) between task conflict and GCC. We argue that an average level (compared to low levels) of task conflict is beneficial to GCC due to cognitive differentiation, whereas increased levels of task conflict might be detrimental to the richness of knowledge structures due to idea integration costs and finally impeding team creativity. We thus aim to add to the team creativity literature by trying to shed light on the inconsistent findings concerning the role of task conflict for team creativity. Finally, we explore the contingent role of collective emotional intelligence (i.e. the group's capacity to recognize and handle its emotional dynamics) in the relation between task conflict and GCC.

Theory and Hypotheses

In our attempt to answer the call regarding what are the factors that have an impact on creativity at the team level, we adopted the input-mediator-output-input (IMOI) model (Ilgen et al., 2005) as an overarching theoretical background framework. Briefly put, the model depicts teams as complex, adaptive and dynamic systems, whereby team inputs (i.e., team composition, resources etc.) influence the type and quality of team processes (i.e., team members' interactions) and emergent states (i.e., cognitive, affective and motivational states or/and structures that describe the group in itself). In turn, the interplay of processes and emergent states influences the quality of outputs such as team performance and creativity.

Simultaneously, we adopted the perspective of groups as sociocognitive systems (Curșeu, 2003; Hinsz et al., 1997; Hollan et al., 2000) and argue that the ability of such social systems to process information rests both on the cognitive processes and individual representations, as well as on the quality of interactions that take place among group members. Group cognitive complexity (GCC) refers to the richness of collective knowledge structures emerging from knowledge exchange through team members' interactions. A complex knowledge structure is characterized by differentiation (includes many semantic nodes, concepts or themes) and integration (the nodes are interconnected) (Curșeu et al., 2007; Curșeu et al., 2010). Therefore, in order to produce these differentiated knowledge structures, the group members have to engage in debates regarding the task at hand, also labeled task conflict, and make use of their diverse expertise and opinions.

In a study conducted by Curșeu et al. (2012), they argued that task conflict has a positive effect on GCC in a way that fosters the cognitive activity of the group in terms of information search and evaluation because it is associated with diverse opinions expressed during group discussions. The expression of various viewpoints and the information exchanges associated with task conflict might increase the levels of elaboration and careful analysis of the task's content, as well as exploration behaviors directed at problem solving.

On the other hand, the information processing perspective (Carnevale & Probst, 1998), suggests that the emergence of within group task conflict might in fact represent a distraction from the task itself as handling the conflict uses up cognitive resources that cannot be directly invested to solve the task. This increases cognitive load, interferes with other cognitive processes and might actually lead to a narrowed view of the problem (De Dreu, 2008). Moreover, high levels of task conflict might result in tension, dissatisfaction and escalate into relationship conflict (i.e., disagreements concerning values, personality) (Pluut & Curșeu, 2013). Moreover, the negative emotionality associated with relationship conflict might actually decrease the cognitive flexibility of the members and their motivation to explore different views, which in turn might lead to rigid and less complex cognitive structures, both at the individual and group level (Carnevale & Probst, 1998). Therefore, a moderate level of task conflict ensures just enough debate and processing of group members' ideas and expertise in order to create a differentiated (i.e., including many concepts and ideas) yet integrated (i.e., ideas are related to one another) cognitive structure., On the other hand, higher levels of task conflict might negatively interfere with the integration process such that arguing intensely on the

diverse pool of ideas might hinder establishing connections between different pieces of information.

Hypothesis 1. Task conflict has a nonlinear association (inverted U shape) with GCC in such a way that at lower to moderate levels of conflict this relationship is positive, whereas at moderate to higher levels of conflict it becomes negative.

As previously argued, team creativity refers to the production of novel and useful ideas, products, processes and procedures by a team of people working together (Amabile, 1996; Shalley & Gilson, 2004; Shin & Zhou, 2007). Two different theoretical frameworks explain the emergence of team creativity. One theoretical approach suggests that it is actually a function of individual creativity and that it could be explained as either the average or a weighted average of team members' creativity (Pirola-Merlo & Mann, 2004). A different theoretical perspective revolves around the idea of creative synergy assuming that the group is able to produce a novel, creative output due to diverse cognitive inputs provided by team members and the quality of interpersonal interactions (Kurtzberg & Amabile, 2001). As such, ideas are formed, shared and shaped via interpersonal interaction.

Research regarding the relationship between cognitive complexity and creativity are scarce and have focused solely on the individual level where a positive association has been reported (Charlton & Bakan, 1989; Quinn, 1981). Switching to the team level, we argue that group cognitive complexity might also be beneficial for team creativity. Producing a creative output involves finding connections among seemingly unrelated concepts, requiring a rich store of knowledge (Boden, 2003), or acting upon an idea and transforming it into something new by introducing modifications. As such, having achieved a complex knowledge structure (i.e., indicative of a high level of cognitive complexity) makes it easier for the group to shift between perspectives (due to differentiation) and have a larger pool of ideas on which they can further elaborate. In addition, team members' efforts of drawing connections among concepts act as a catalyst for coming up with unique perspectives (due to integration). Therefore, balancing the differentiation and integration mechanisms associated with group cognitive complexity has a positive influence on the fluency, flexibility and originality of the group's ideas.

As such, we depart from the idea that individual creativity is a necessary and sufficient condition for team creativity. Instead, we take into consideration the systemic approach arguing that group processes and emergent states are equally important determinants of team creativity and performance (Ilgen et al., 2005; Mathieu et al., 2008). For example, Taggar (2002) found that team processes (e.g. effective communication, involving others, team citizenship, providing feedback, reacting to conflict, etc.) accounted for additional variance in team creativity beyond the one already accounted for by individual creativity. This is aligned with the IMOI framework arguing that team outputs, such as team creativity, are the result of input factors (such as team composition and resources) and the information processing and quality of interactions that take place among its members.

As such, we argue that:

Hypothesis 2. There is a positive association between GCC and group creativity.

Hypothesis 3. GCC mediates the relationship between task conflict and creativity.

As previously argued, task related disagreements among team members are a key driver for group cognitive complexity, which in turn has a positive influence on team creativity. These viewpoint differences (i.e., task conflict) might carry an attached emotion, which influences the way that events are perceived (Yang & Mossholder, 2004), and fMRI research has suggested that perceived conflict can stimulate the activity of the amygdala, which generates emotions such as anxiety and stress (Etkin et al., 2006). For example, disagreements pertaining to the task might be interpreted as personal attacks by team members (Simons & Peterson, 2000) and the expression of the associated negative emotions might escalate during conflict through emotional contagion (Hatfield et al., 1994). Therefore, the group's emotional

climate as well as the quality of interpersonal interactions themselves could be improved when groups are emotionally intelligent (Druskat & Wolff, 2001).

Collective emotional intelligence (CEI) represents an emergent group level competence (Curşeu et al., 2015) which is defined as the ability of a group to develop a set of norms that promotes the expression, awareness and regulation of member and group emotions (Druskat & Wolff, 2001). Emotionally intelligent groups are able to develop norms that allow them to experience moderate levels of task conflict without an escalation into relationship conflict (Yang & Mossholder, 2004). High levels of CEI are also associated with an increased chance of stimulating positive emotions among the members, cooperation and the efficient management of dysfunctional reactions (Ayoko et al., 2008).

Jiang et al. (2012) have shown that individuals and groups skilled at emotion regulation were able to capitalize on the advantages of task conflict for effective performance and limit the negative impact of relationship conflict. They argued that efficient emotion regulation decreases the chance of being distracted by negative emotions and cognitive loads, which increases the probability to make use of the information resulted from task conflict and ultimately to improve performance. Moreover, empirical evidence has shown that team emotional intelligence promotes both cognitive and affective team trust, which in turn fosters a collaborative culture that promotes team creativity (Barczak et al., 2010). Emotionally intelligent groups are able to deal with emotions and maintain positive interpersonal relationships, which might facilitate cohesion and an atmosphere of open discussion and exchange of diverse ideas. Troth et al. (2011) have shown that team level emotional skills (e.g. own and others' emotional awareness and emotional management) are predictive for individual level communication performance. They suggested that teams with greater collective emotional skills during interactions would promote an environment where the members are more prone to listen to alternative viewpoints and follow the appropriate rules of communication exchange. Also, the results of a more recent study (Lee & Wong, 2017) show that team emotional intelligence decreases the negative effect of task conflict on team effectiveness. Moreover, their findings indicate that team emotional intelligence plays a moderating role on decoupling task conflict and relationship conflict, which might harm the team's interaction processes. Furthermore, team emotional intelligence can mitigate the negative emotions resulted from a task conflict by managing them in a collaborative manner (Jordan & Troth, 2004).

Therefore, when dealing with creative tasks, it is likely that groups with high levels of collective emotional intelligence will be able to tolerate more task conflict before the slope between conflict and GCC becomes negative. This will allow them to take advantage of a larger pool of information because idea generation is paralleled by the maintenance of the quality of interpersonal interactions, which will promote the integration of knowledge structures into complex networks and increase the odds of obtaining a creative output. As such, we argue that:

Hypothesis 4. Collective emotional intelligence moderates the nonlinear association between task conflict and GCC in such a way that for groups with high levels of CEI, the inflection point of the curve is higher compared to groups with low levels of CEI.

Figure 1 presents the overall model with the four hypothesized relations.

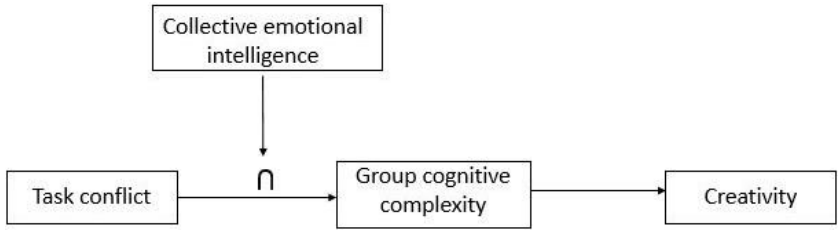

Figure 1. *Summary of the research hypotheses*

Method

Participants

We used a convenience sample consisting of first year students enrolled in a Romanian university at two different courses. Participation was voluntary, and from the 230 students enrolled, 159 students (124 women) took part in our study. They were informed one week prior to the study that their next class will be conducted by the first author and that they will be involved in activities pertaining to data collection related to a previously studied theme (attitudinal change). The participants were distributed in 49 groups having 3 to 5 members (*M*group size = 3.2 members, *SD* = .*52*, *M*age = 19.5 years, *SD* = .98).

Measures and procedure

Prior to data collection, we introduced the participants to the method of constructing a mind map and worked out an example together. Afterwards, we formed ad-hoc groups, which were required to complete two different tasks (they had 20 minutes for each). The first task was used to derive the GCC score, whereas the second task was used in order to compute the level of creativity. At the end of each task, team members filled out the questionnaires related to demographic variables (gender, age), task conflict and emotional intelligence.

Task conflict was assessed using the four-item scale developed by Jehn (1995). Sample items for task conflict are the following: "How frequently are there conflicts about ideas in your team?" and "How often do people in your team disagree about opinions regarding the task being done?". Answers could be given on a 7-point scale (1= *not at all*, to 7= *totally agree*). Alpha Cronbach is .79, 95% CI [.74, .84].

Collective emotional intelligence (CEI) was measured using an eight-item scale developed by Curșeu et al. (2015). Sample items are: "We usually had a good sense of how each team member felt, even if they did not express it in words" and "We made each other feel better when we were down". Answers could be given on a 7-point scale (1= *not at all*, to 7= *totally agree*) and Cronbach's α is .73, 95% CI [.65, .78].

We used a cognitive mapping technique (Curșeu et al., 2010; Davies, 2011) to measure group cognitive complexity (GCC). Each group was asked to generate by group discussions as many concepts regarding a topic they have studied throughout the semester (persuasion) and organize them in a map reflecting the perspective of the entire group on that subject by drawing connections among the concepts and specifying the nature of their relationship. The cognitive map that resulted during group interactions reflects the knowledge structures that the groups developed in relation with a specific domain.

The GCC of each map was computed using the following formula (Curșeu, 2008): GCC = NoC × CMC × CMD, where NoC refers to the total number of concepts used in the map, CMC represents the total number of connections established between the concepts, and CMD stands for the number of distinct type of relations established between the concepts. Based on the typology defined by Gómez et al. (2000) there are seven types of distinct relations: causal, association, equivalence, topological, structural, chronological, and hierarchical. The maps were evaluated on those three indicators (NoC, CMC, CMD) by two external raters who coded them afterwards. At first, each evaluator coded the maps individually, and afterwards they met in order to discuss any differences in

their coding and solve them in a consensus fashion.

We evaluated team creativity through a task where each group had to create a poster in order to change the attitude of a target audience on a specific topic by implementing the concepts used in the previous mind mapping technique. The final product was coded by external raters on five dimensions: fluency (generating as many ideas, options or solutions as possible- the total number of non-redundant elements), flexibility (approaching the problem from a new perspective, or the variety of the elements used, both inter- and intra- category: e.g. text messages, illustrations, graphics) , originality (the distinctiveness of the elements used when compared with other posters, memorable elements, distinctive identity), utility (there is a match between the poster's content and the target audience; the elements included are compelling enough for an attitudinal change) and coherence (the messages are clearly formulated and there is a logical connection between the elements included, the content makes sense). These categories were inspired by Rietzschel et al. (2007) and Curșeu (2010). The final creativity coefficient for each group was obtained by computing the Bartlett factor score (Bartlett, 1937; DiStefano et al., 2009) on those five dimensions.

Results

The descriptive statistics and bivariate correlations are presented in Table 1.

Table 1. *Means, Standard Deviations, and Correlations*

	Variable	*M*	*SD*	1	2	3	4
1.	Gender	-	-				
2.	Task Conflict	2.084	.698	.044			
3.	Group cognitive complexity	423.367	354.614	.082	.306*		
4.	Creativity	3.796	1.546	.088	.125	.162	
5.	Collective emotional intelligence	5.338	0.630	-.171	-.211	-.174	.032

Note: $*p < .05$, $N = 49$

Data was analyzed using the SPSS v23 software. In order to check interrater agreement among team members, we calculated within-group agreement (*Rwg*) values using uniform null distribution and obtained mean values of .80 for CEI with a range between .52 and .95, and .87 for task conflict with a range between .55 and 1. These values are above the conventionally accepted value of .70 (LeBreton & Senter, 2008). Additionally, we calculated the intra class correlation coefficients *ICC (1)* and *ICC (2)* and found .39 and .67 for CEI, and .27 and .55 for task conflict. These statistics justify the aggregation of the data to the group level (Bliese, 2000).

To test H1 and H4, we conducted an OLS regression analysis (Table 2). In the first step we entered gender (the percentage of women in each group), task conflict and CEI; in the second step we entered the squared task conflict; in the third step, we entered the cross product between task conflict and CEI and the cross product between squared task conflict and CEI. Before entering the variables in the regression models, they were grand mean centered so as to reduce possible multicollinearity.

Table 2. *Results of the OLS Regression Analysis*

	Model 1	**Model 2**	**Model 3**
Main effects			
Gender	.05	-.04	.032
TC	.28	-.006	-.16
CEI	-.11	-.09	.09
Quadratic effect			
TC squared		.46*	.20
Linear interaction			
TC x CEI			.35
Quadratic interaction			
TC squared x CEI			-.76*
R	.333	.477	.553
R^2	.111	.228	.305
F	1.824	3.167*	3.004*

Note. Standardized regression coefficients are presented in the table. TC= task conflict; CEI= collective emotional intelligence
*$p < .05$

The first hypothesis (H1) stated that task conflict has a nonlinear (inverted U shape) association with GCC. This hypothesis was partially supported by data, as the beta coefficient for the quadratic term is significant (β = .462, p = .014) but positive (which describes a U shape association), whereas the beta coefficient for the linear effect of task conflict is positive and not significant (β = .281, p = .060). That is, the relationship between task conflict and GCC shows a downward trend at low to average levels of task conflict and an upward trend at average to high levels of task conflict. Figure 2 shows the U-shaped association between task conflict and GCC and depicts the inflection point at around the sample mean (the computed inflection point for the centered variable is .010004).

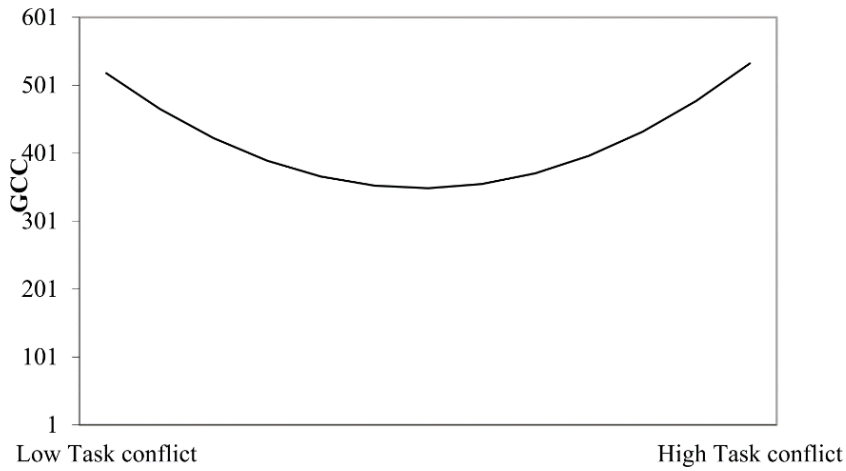

Figure 2. *The U-shaped association between task conflict and group cognitive complexity (GCC)*

The fourth hypothesis (H4) stated that CEI moderates the nonlinear association between task conflict and GCC. This hypothesis received empirical support as the beta coefficient for the quadratic interaction is significant (β = -.763, p = .040), whereas the beta coefficient for the linear interaction is not significant (β = .36, p = .218). The moderation effect of the quadratic relationship between task conflict and GCC at low versus high levels of CEI is plotted in Figure 3 and it seems that at low levels of CEI the task conflict – GCC relationship follows a U-shaped curve, whereas at high levels of CEI, the relationship becomes an inverted U shaped curve. To affirm whether our visual observation was valid, we continued to probe this interaction effect using the "pick a point" procedure which tests the conditional effect of task conflict on GCC at three levels of CEI: the mean and plus/minus one *SD* from the mean (Hayes, 2015). The results showed that when CEI was low (1 *SD* below the mean), the curvilinearity in the association between task conflict and GCC is positive and significant (θ X2→Y |M= -0.63 =225.25, p = .037), but at moderate and high levels of CEI, there is no statistically significant evidence of curvilinearity in the association between task conflict and GCC (θ X2→Y |M= 0 = 79.36, p = .498; θ X2→Y |M= 0.63 = -66.52, p =.677).

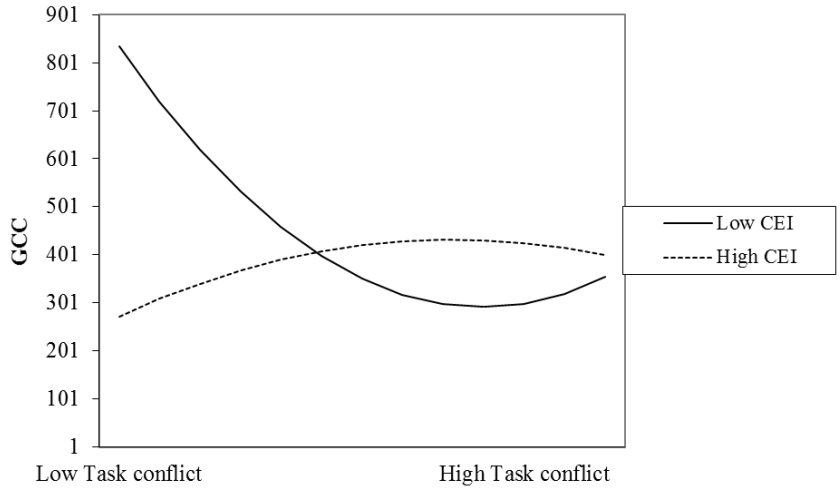

Figure 3. *Curvilinear interaction of task conflict and group cognitive complexity (GCC) at low and high levels of collective emotional intelligence (CEI)*

Furthermore, in order to test H2 and H3 we conducted a mediation analysis using MEDCURVE in SPSS (Hayes & Preacher, 2010). This method allows the estimation of the instantaneous indirect effect (θ) of X (task conflict) on Y (team creativity) through M (GCC) at low (one standard deviation below the mean), moderate (sample mean), and high (one standard deviation above the mean) values of X. One of the advantages of using this technique, which is based on bootstrapping, is that it does not require distribution assumptions to be met and is suited for mediation with rather small sample sizes (Hayes & Preacher, 2010).

The second hypothesis (H2) which stated that there is a positive relationship between GCC and creativity did not receive empirical support, as the regression coefficient was positive but not significant (β=.0004, p=.37).

The third hypothesis (H3) stated that GCC mediates the relationship between task conflict and team creativity. This hypothesis did not receive empirical support, as the instantaneous indirect effect was not significant at either low (θ low = -.0843, 95%

confidence interval [CI] = [-1.0652, .0672]), moderate (θ average = .0027, 95% confidence interval [CI] = [-.1014, .1385]) or high levels of task conflict (θ high = .0896, 95% confidence interval [CI] = [-.0735, .7122]).

Discussion

The purpose of this study was to examine the relationship between task conflict and team creativity. Specifically, we examined whether this relationship is mediated by the cognitive complexity of the group (H3), where the association between task conflict and GCC is nonlinear (H1) and the association between GCC and creativity is positive (H2). Moreover, we argued that the hypothesized curvilinear relationship between task conflict and GCC is moderated by the level of collective emotional intelligence (H4).

We found partial support for our first hypothesis specifying a nonlinear relationship between task conflict and GCC. Contrary to what we expected however, the relationship between task conflict and GCC follows a U shaped pattern and not a reversed U-shape as predicted. More specifically, we found that up to the inflection point, as task conflict increases, GCC is decreasing, whereas after the inflection point, as task conflict continues to increase, GCC is also increasing.

This suggests that the emergence of higher levels of group cognitive complexity is associated with either low or increased levels of task conflict. To be able to construct this rich cognitive structure, groups have to engage in task conflict in order to produce the differentiation component, and in the same time, to be able to integrate the generated concepts. Our results suggest that increased levels of task conflict are necessary for the emergence of cognitive complexity, which seem to contradict some arguments presented in the literature, where it is believed that too much task conflict may result in cognitive overload and render it difficult for the members of the group to arrive at a coherent solution (De Dreu, 2006; Farh et al., 2010). One possible explanation for this effect might be the case that high levels of task conflict have produced the necessary level of differentiation, whereas the simple fact that the task we used to measure the group's cognitive complexity required them to organize the concepts and draw associations between them on a paper based support, has allowed them to better visualize this rich differentiation and achieve integration. This is in line with the arguments presented by Nusbaum and Schraw (2007) who suggest that a graphic organizer could help to scaffold the students' ability to integrate arguments and counterarguments because it might lower the load on the working memory.

Future research might investigate different types of graphic organizers that allow teams to achieve integration even in high differentiation contexts. One of the simplest method might be the use of post-it notes, which are considered capable of flexibly carrying symbolic representations of ideas and can be grouped and sorted accordingly to their physical characteristics (color, size) to represent larger, emergent concepts and support categorization qualities associated with semantic long-term memory (Dove et al., 2018) which might facilitate the integration of different semantic nodes.

When it comes to explaining the relationship between low levels of task conflict and high GCC, we could think that in low conflict situations, the group does not suffer from increased negative emotionality, since human conflict does not exist in the absence of emotions (Bodtker & Jameson, 2001), and can direct its attention towards solving the task by maximizing the positive effects of those small differences in opinions. It might be the case that in the context of reduced task conflict, the group achieves high differentiation through additional mechanisms (for example, small disagreements inside the group trigger idea generation in one or some of the group's members) and can also achieve high levels of integration because the cognitive load associated with processing multiple perspectives is reduced, as well as the negative emotional costs.

For the average conflict-low GCC relationship, a possible explanation might be the fact that integration is impeded due to the negative affect associated with increasing levels of conflict and possibly diminished motivation to process all those differences in opinion. Whereas after a certain threshold (the inflection point), they might be able to attain

integration even though conflict is increasing because they interpret those different perspectives as a sign of personal involvement in solving the task and good intentions (so the negative affect is reduced).

We only found partial support for our fourth hypothesis, which states that CEI moderates the nonlinear association between task conflict and GCC since this conditional effect was statistically significant only at low levels of CEI. Our results show that for groups with low CEI, less conflict is beneficial to GCC, and while task conflict increases, GCC decreases up to the inflection point where it starts to increase again, but not too much. A possible explanation is that since conflict is an affective event, without the proper norms and mechanisms that emotionally intelligent groups are developing, only a small amount of conflict is necessary for a positive impact on the team's task. This is in line with the findings of Ayoko et al. (2008) who reported that lower levels of task conflict were associated with productive reactions such as learning from conflict and settling disagreements. Increasing conflict also increases emotionality, which might impair the differentiation and integration mechanisms. However, the slight increase in GCC after the inflection point might be attributed to the fact that high levels of conflict are associated with a longer duration of arguments, which Ayoko et al. (2008) argue that it gives an opportunity to the team members for conflict reappraisal. This might offer them the chance to change focus from the emotional aspects (which they don't know how to manage) to cognitive aspects, which in turn will positively influence their GCC

For high levels of CEI, the visual inspection shows a slight shape flip tendency for an inversed U-shape, even though it was not statistically significant. It might be the case that including only ad-hoc groups in the research sample has allowed us to observe only the effects of low levels of CEI, whereas high CEI was less likely to emerge, which impacted our moderation analysis. Future research could try to disentangle these results by manipulating the level of CEI in each group and observe the impact it has on team processes and outcomes. This could be achieved by designing an intervention in the form of a gaming simulation which aims at teaching group members specific behaviors and norms related to the awareness and management of affective states, and follow up the impact of transferring those behaviors in team work contexts.

The third hypothesis stating that GCC mediates the relationship between task conflict and team creativity was not supported by the data. One possible explanation for these results might be indeed that other mechanisms carry on the effect of task conflict on team creativity and not GCC. For example, even though experiencing task conflict is associated with the group using many richly and differently interconnected concepts in order to represent a specific domain, this complex cognitive representation might not be further translated into a creative output unless the group perceives the requirement of creativity. A study conducted by Gilson and Shalley (2004) has argued that the perceived expectation for creativity seems to translate into more active engagement in the creative processes. An alternative explanation for the lack of empirical support for the mediation hypothesis is the reduced power of the study due to the small sample size, which is also a limitation of this study.

Limitations and future research

Aside from potential contributions, a limitation of this study is the student sample used. Hence, caution is recommended in generalizing the results to established teams working in organizations. Furthermore, we used a cross-sectional design and thus we cannot draw causal inferences for the relationships found, even though the tasks used for measuring our variables were separated in time, which could help determine the direction of their association. Future studies could attempt to use longitudinal designs and experience sampling methods (Bloger & Laurenceau, 2013) in order to examine the relationship between conflict and creativity. It might be interesting to see what happens with long established teams who work in creativity-required contexts in terms of daily interactions and norms for managing

their affective dynamics, as well as if there are any patterns emerging depending on the stage of the project they are working on.

Another possible limitation might be the way we measured the level of task conflict by aggregating the individual responses. It might be the case that when team members were asked to evaluate the level of task conflict at the group level, they thought about the disagreements they had with each member and computed an average score or maybe thought that only two members of the group shared different opinions and evaluated that with a low score, so that their perceptions might influence the accuracy of the measurements. Future research might investigate other methods for evaluating these team level variables like the use of external coders who could count each of the disagreements expressed, as well as the number of members involved in order to better illustrate the level of conflict.

Contributions and practical implications

Our study answers the call for more research in the field of team creativity and innovation that focuses on contingency models and potential curvilinear effects within processes and outcomes (Hulsheger et al., 2009). The results of one study (Curșeu et al., 2012) in the literature that examined the linear positive relationship between task conflict and GCC have only reached marginal statistical significance. We contribute to the literature by specifying a nonlinear association between task conflict and GCC and obtaining support for a U shaped curve that illustrates it.

One of the methodological contributions of our study is the use of a method to code the creative output of the groups that uses independent raters, instead of relying on self-ratings of the dependent variable. The latter approach is still heavily used in many published studies in the field of creativity and innovation research, despite the evidence that it has inherent shortcomings such as common method bias, percept-percept inflation, and construct validity concerns (Anderson et al., 2014; Potočnik & Anderson, 2012). Moreover, since our study is a team level study, we analyzed creativity through a team level measure (Costa et al., 2013).

Our study might have as well important practical contributions for teams that are working in environments where the handling of complex knowledge and information is a requirement for effectiveness. Team leaders and managers could try to stimulate increased levels of task conflict in order to help the team construct a complex cognitive representation, which can be especially useful at early stages, prior to task performance (Farh et al., 2010). This could be done by normative interventions at the team level or delegation of specific roles, which different team members could assume by rotation in order to stimulate the sharing of different viewpoints. However, if the team is newly formed and their level of CEI is reduced, keeping task conflict at low levels might be more beneficial to their cognitive outputs.

Moreover, the use of a mind mapping technique might help them achieve better integration, facilitate the understanding of ideas, and align their strategy by combining this visual organizer with schema-enriched communication (Rentsch et al., 2010). Mind mapping might come in handy as a way of diminishing the cognitive load associated with high levels of conflict. This particular strategy might also be useful for international or virtual teams in order to paint a complex image of the situation before engaging in decision processes or lead to a shared knowledge common ground. Even though the results of our mediation analysis did not reach statistical significance, stimulating task conflict in order to generate a large pool of ideas and using a graphic organizer to integrate them into a complex representation, might help a team come up with a creative output in a climate supportive for creativity with valued participative problem solving and shared goals (Gilson & Shalley, 2004).

References

Amabile, T. M., Conti, R., Coon, H., Lazenby, J., & Herron, M. (1996). ASSESSING THE WORK ENVIRONMENT FOR CREATIVITY. *Academy of Management Journal*, *39*(5), 1154-1184. https://doi.org/10.2307/256995

Amabile, T. M., & Pratt, M. G. (2016). The dynamic componential model of creativity and innovation in organizations: Making progress, making meaning. *Research in Organizational Behavior*, *36*, 157-183. https://doi.org/10.1016/j.riob.2016.10.001

Amason, A. C. (1996). Distinguishing the Effects of Functional and Dysfunctional Conflict on Strategic Decision Making: Resolving a Paradox for Top Management Teams. *Academy of Management Journal*, *39*(1), 123-148. https://doi.org/10.2307/256633

Anderson, N., Potočnik, K., & Zhou, J. (2014). Innovation and Creativity in Organizations. *Journal of Management*, *40*(5), 1297-1333. https://doi.org/10.1177/0149206314527128

Ayoko, O. B., Callan, V. J., & Härtel, C. E. (2008). The Influence of Team Emotional Intelligence Climate on Conflict and Team Members' Reactions to Conflict. *Small Group Research*, *39*(2), 121-149. https://doi.org/10.1177/1046496407304921

Barczak, G., Lassk, F., & Mulki, J. (2010). Antecedents of Team Creativity: An Examination of Team Emotional Intelligence, Team Trust and Collaborative Culture. *Creativity and Innovation Management*, *19*(4), 332-345. https://doi.org/10.1111/j.1467-8691.2010.00574.x

Bartlett, M. S. (1937). The Statistical Conception of Mental Factors. *British Journal of Psychology*, *28*(1), 97-104. https://doi.org/10.1111/j.2044-8295.1937.tb00863.x

Bieri, J. (1955). Cognitive complexity-simplicity and predictive behavior. *The Journal of Abnormal and Social Psychology*, *51*(2), 263-268. https://doi.org/10.1037/h0043308

Bliese, P. D. 2000. Within-group agreement, non-independence,and reliability: Implications for data-analysis. In K. J. Klein & S. W. J. Kozlowski (Eds.), *Multi-level theory, research, and methods in organizations*: 349-381. Jossey-Bass.

Boden, M. A. (2004). *The Creative Mind: Myths and Mechanisms*. Psychology Press.

Bolger, N., & Laurenceau, J. P. (2013). *Intensive longitudinal methods: An introduction to diary and experience sampling research*. Guilford Press.

Busse, C., Mahlendorf, M. D., & Bode, C. (2015). The ABC for Studying the Too-Much-of-a-Good-Thing Effect. *Organizational Research Methods*, *19*(1), 131-153. https://doi.org/10.1177/1094428115579699

Carnevale, P. J., & Probst, T. M. (1998). Social values and social conflict in creative problem solving and categorization. *Journal of Personality and Social Psychology*, *74*(5), 1300-1309. https://doi.org/10.1037/0022-3514.74.5.1300

Charlton, S., & Bakan, P. (1989). Cognitive Complexity and Creativity. *Imagination, Cognition and Personality*, *8*(4), 315-322. https://doi.org/10.2190/c21k-gm0l-av83-3p4h

Costa, P. L., Graça, A. M., Marques-Quinteiro, P., Santos, C. M., Caetano, A., & Passos, A. M. (2013). Multilevel research in the field of organizational behavior: An empirical look at 10 years of theory and research. *Sage Open*, *3*(3). https://doi.org/10.1177/2158244013498244

Curşeu, P. L. (2006). Emergent States in Virtual Teams: A Complex Adaptive Systems Perspective. *Journal of Information Technology*, *21*(4), 249-261. https://doi.org/10.1057/palgrave.jit.2000077

Curşeu, P. L. (2008). The role of cognitive complexity in entrepreneurial strategic decision making. In P. A. M. Vermeulen & P. L. Curs¸eu (Eds.), *Entrepreneurial strategic decision making: A cognitive perspective* (pp. 68–86). Edward Elgar.

Curseu, P. L., Schruijer, S., & Boros, S. (2007). The effects of groups' variety and disparity on groups' cognitive complexity. *Group Dynamics: Theory, Research, and Practice*, *11*(3), 187-206. https://doi.org/10.1037/1089-2699.11.3.187

Curşeu, P. L. (2010). Team Creativity in Web Site Design: An Empirical Test of a Systemic Model. *Creativity Research Journal*, *22*(1), 98-107. https://doi.org/10.1080/10400410903579635

Curşeu, P. L., Janssen, S. E., & Raab, J. (2011). Connecting the dots: social network structure, conflict, and group cognitive complexity. *Higher Education*, *63*(5), 621-629. https://doi.org/10.1007/s10734-011-9462-7

Curşeu, P. L., & Pluut, H. (2013). Student groups as learning entities: The effect of group diversity and teamwork quality on groups' cognitive complexity. *Studies in Higher Education*, *38*(1), 87-103. https://doi.org/10.1080/03075079.2011.565122

Curşeu, P. L., Pluut, H., Boroș, S., & Meslec, N. (2014). The magic of collective emotional intelligence in learning groups: No guys needed for the spell! *British Journal of Psychology*, *106*(2), 217-234. https://doi.org/10.1111/bjop.12075

Curşeu, P. L., Schalk, R., & Schruijer, S. (2010). The Use of Cognitive Mapping in Eliciting and Evaluating Group Cognitions. *Journal of Applied Social Psychology*, *40*(5), 1258-1291. https://doi.org/10.1111/j.1559-1816.2010.00618.x

Davies, M. (2010). Concept mapping, mind mapping and argument mapping: what are the differences and do they matter? *Higher Education*, *62*(3), 279-301. https://doi.org/10.1007/s10734-010-9387-6

De Dreu, C. K. (2006). When Too Little or Too Much Hurts: Evidence for a Curvilinear Relationship Between Task Conflict and Innovation in Teams. *Journal of Management*, *32*(1), 83-107. https://doi.org/10.1177/0149206305277795

De Dreu, C. K. W., & Gelfand, M. J. (2008). Conflict in the workplace: Sources, functions, and dynamics across multiple levels of analysis. In C. K. W. De Dreu & M. J. Gelfand (Eds.), *The psychology of conflict and conflict management in organizations* (pp. 3–54).

De Dreu, C. K., & Weingart, L. R. (2003). Task versus relationship conflict, team performance, and team member satisfaction: A meta-analysis. *Journal of Applied Psychology*, *88*(4), 741-749. https://doi.org/10.1037/0021-9010.88.4.741

De Dreu, C. K., & West, M. A. (2001). Minority dissent and team innovation: The importance of participation in decision making. *Journal of Applied Psychology*, *86*(6), 1191-1201. https://doi.org/10.1037/0021-9010.86.6.1191

DiStefano, C., Zhu, M., & Mindrila, D. (2009). Understanding and using factor scores: Considerations for the applied researcher. *Practical*

Assessment, Research, and Evaluation, *14*(1), 20. https://doi.org/10.1007/978-94-6209-404-8_5

Dove, G., Abildgaard, S. J., Biskjaer, M. M., Hansen, N. B., Christensen, B. T., & Halskov, K. (2018). Grouping notes through nodes: The functions of Post-It notes in design team cognition. *Design Studies*, *57*, 112-134. https://doi.org/10.1016/j.destud.2018.03.008

Druskat, V. U., & Wolff, S. B. (2001). Collective emotional intelligence and its influence on group effectiveness. In C. Cherniss & D. Goleman (Eds.), *The emotionally intelligent workplace: How to select for, measure, and improve emotional intelligence in individuals, groups, and organizations* (pp. 132–155).

Etkin, A., Egner, T., Peraza, D. M., Kandel, E. R., & Hirsch, J. (2006). Resolving Emotional Conflict: A Role for the Rostral Anterior Cingulate Cortex in Modulating Activity in the Amygdala. *Neuron*, *52*(6), 1121. https://doi.org/10.1016/j.neuron.2006.12.003

Farh, J., Lee, C., & Farh, C. I. (2010). Task conflict and team creativity: A question of how much and when. *Journal of Applied Psychology*, *95*(6), 1173-1180. https://doi.org/10.1037/a0020015

Gilson, L. L., & Shalley, C. E. (2004). A Little Creativity Goes a Long Way: An Examination of Teams' Engagement in Creative Processes. *Journal of Management*, *30*(4), 453-470. https://doi.org/10.1016/j.jm.2003.07.001

Grant, A. M., & Schwartz, B. (2011). Too Much of a Good Thing. *Perspectives on Psychological Science*, *6*(1), 61-76. https://doi.org/10.1177/1745691610393523

Gómez, A., Moreno, A., Pazos, J., & Sierra-Alonso, A. (2000). Knowledge maps: An essential technique for conceptualisation. *Data & Knowledge Engineering*, *33*(2), 169-190. https://doi.org/10.1016/s0169-023x(99)00050-6

Hatfield, E., Cacioppo, J. T., & Rapson, R. L. (1994). Emotional contagion: Cambridge studies in emotion and social interaction. *Cambridge University Press.*

Hayes, A. F. (2015). Hacking PROCESS for estimation and probing of linear moderation of quadratic effects and quadratic moderation of linear effects. *Unpublished White Paper. Ohio State University*.

Hayes, A. F., & Preacher, K. J. (2010). Quantifying and Testing Indirect Effects in Simple Mediation Models When the Constituent Paths Are Nonlinear. *Multivariate Behavioral Research*, *45*(4), 627-660. https://doi.org/10.1080/00273171.2010.498290

Hinsz, V. B., Tindale, R. S., & Vollrath, D. A. (1997). The emerging conceptualization of groups as information processors. *Psychological Bulletin*, *121*(1), 43-64. https://doi.org/10.1037/0033-2909.121.1.43

Hülsheger, U. R., Anderson, N., & Salgado, J. F. (2009). Team-level predictors of innovation at work: A comprehensive meta-analysis spanning three decades of research. *Journal of Applied Psychology*, *94*(5), 1128-1145. https://doi.org/10.1037/a0015978

Ilgen, D. R., Hollenbeck, J. R., Johnson, M., & Jundt, D. (2005). Teams in Organizations: From Input-Process-Output Models to IMOI Models. *Annual Review of Psychology*, *56*(1), 517-543. https://doi.org/10.1146/annurev.psych.56.091103.070250

Jehn, K. A. (1995). A Multimethod Examination of the Benefits and Detriments of Intragroup Conflict. *Administrative Science Quarterly*, *40*(2), 256. https://doi.org/10.2307/2393638

Jehn, K. A., & Bendersky, C. (2003). Intragroup conflict in organizations: a contingency perspective on the conflict-outcome relationship. *Research in Organizational Behavior*, *25*, 187-242. https://doi.org/10.1016/s0191-3085(03)25005-x

Jiang, J. Y., Zhang, X., & Tjosvold, D. (2012). Emotion regulation as a boundary condition of the relationship between team conflict and performance: A multi-level examination. *Journal of Organizational Behavior*, *34*(5), 714-734. https://doi.org/10.1002/job.1834

Joo, B. (., McLean, G. N., & Yang, B. (2013). Creativity and Human Resource Development. *Human Resource Development Review*, *12*(4), 390-421. https://doi.org/10.1177/1534484313481462

Jordan, P. J., & Troth, A. C. (2004). Managing Emotions During Team Problem Solving: Emotional Intelligence and Conflict Resolution. Human Performance, 17(2), 195-218. https://doi.org/10.1207/s15327043hup1702_4

Kirschner, F., Paas, F., & Kirschner, P. A. (2008). A Cognitive Load Approach to Collaborative Learning: United Brains for Complex Tasks. *Educational Psychology Review*, *21*(1), 31-42. https://doi.org/10.1007/s10648-008-9095-2

Kurtzberg, T. R., & Amabile, T. M. (2001). From Guilford to Creative Synergy: Opening the Black Box of Team-Level Creativity. *Creativity Research Journal*, *13*(3-4), 285-294. https://doi.org/10.1207/s15326934crj1334_06

LeBreton, J. M., & Senter, J. L. (2007). Answers to 20 Questions About Interrater Reliability and Interrater Agreement. *Organizational Research Methods*, *11*(4), 815-852. https://doi.org/10.1177/1094428106296642

Lee, C., & Wong, C. (2017). The effect of team emotional intelligence on team process and effectiveness. *Journal of Management & Organization*, 25(6), 844-859. https://doi.org/10.1017/jmo.2017.43

Nemeth, C. J., & Staw, B. M. (1989). The Tradeoffs of Social Control and Innovation in Groups and Organizations. *Advances in Experimental Social Psychology*, 175-210. https://doi.org/10.1016/s0065-2601(08)60308-1

Nussbaum, E. M., & Schraw, G. (2007). Promoting Argument-Counterargument Integration in Students' Writing. *The Journal of Experimental Education*, *76*(1), 59-92. https://doi.org/10.3200/jexe.76.1.59-92

Parayitam, S., & Dooley, R. S. (2009). The interplay between cognitive- and affective conflict and cognition- and affect-based trust in influencing decision outcomes. *Journal of Business Research*, *62*(8), 789-796. https://doi.org/10.1016/j.jbusres.2008.02.006

Pierce, J. R., & Aguinis, H. (2011). The Too-Much-of-a-Good-Thing Effect in Management. *Journal of Management*, *39*(2), 313-338. https://doi.org/10.1177/0149206311410060

Pirola-Merlo, A., & Mann, L. (2004). The relationship between individual creativity and team creativity: aggregating across people and time. *Journal of Organizational Behavior*, *25*(2), 235-257. https://doi.org/10.1002/job.240

Pluut, H., & Curşeu, P. L. (2012). Perceptions of intragroup conflict: The effect of coping strategies on conflict transformation and escalation. *Group*

Processes & Intergroup Relations, *16*(4), 412-425. https://doi.org/10.1177/1368430212453633

Potočnik, K., & Anderson, N. (2012). Assessing Innovation: A 360-degree appraisal study. *International Journal of Selection and Assessment*, *20*(4), 497-509. https://doi.org/10.1111/ijsa.12012

Quinn, E. (1980). Creativity and cognitive complexity. *Social Behavior and Personality: an international journal*, *8*(2), 213-215. https://doi.org/10.2224/sbp.1980.8.2.213

Rentsch, J. R., Delise, L. A., Salas, E., & Letsky, M. P. (2010). Facilitating Knowledge Building in Teams: Can a New Team Training Strategy Help? *Small Group Research*, *41*(5), 505-523. https://doi.org/10.1177/1046496410369563

Shalley, C. E., & Gilson, L. L. (2004). What leaders need to know: A review of social and contextual factors that can foster or hinder creativity. *The Leadership Quarterly*, *15*(1), 33-53. https://doi.org/10.1016/j.leaqua.2003.12.004

Shalley, C. E., Zhou, J., & Oldham, G. R. (2004). The Effects of Personal and Contextual Characteristics on Creativity: Where Should We Go from Here? *Journal of Management*, *30*(6), 933-958. https://doi.org/10.1016/j.jm.2004.06.007

Shin, S. J., & Zhou, J. (2007). When is educational specialization heterogeneity related to creativity in research and development teams? Transformational leadership as a moderator. *Journal of Applied Psychology*, *92*(6), 1709-1721. https://doi.org/10.1037/0021-9010.92.6.1709

Simons, T. L., & Peterson, R. S. (2000). Task conflict and relationship conflict in top management teams: The pivotal role of intragroup trust. *Journal of Applied Psychology*, *85*(1), 102-111. https://doi.org/10.1037/0021-9010.85.1.102

Tjosvold, D., Tang, M. M., & West, M. (2004). Reflexivity for Team Innovation in China. *Group & Organization Management*, *29*(5), 540-559. https://doi.org/10.1177/1059601103254911

Troth, A. C., Jordan, P. J., Lawrence, S. A., & Tse, H. H. (2011). A multilevel model of emotional skills, communication performance, and task performance in teams. *Journal of Organizational Behavior*, *33*(5), 700-722. https://doi.org/10.1002/job.785

Yang, J., & Mossholder, K. W. (2004). Decoupling task and relationship conflict: the role of intragroup emotional processing. *Journal of Organizational Behavior*, *25*(5), 589-605. https://doi.org/10.1002/job.258

Zhou, J., & Shalley, C. E. (2011). Deepening our understanding of creativity in the workplace: A review of different approaches to creativity research. *APA handbook of industrial and organizational psychology, Vol 1: Building and developing the organization*, 275-302. https://doi.org/10.1037/12169-009