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The benefits of collaboration in computer-mediated preference exchange in teams: A psychological perspective

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ABSTRACT

Computers are increasingly used in teams in various contexts, for example in negotiations. Especially when using computer-support for decision-making processes, it is an important question whether active collaboration within the team – for example via audio-conference – has additional benefits beyond the supply of full task-relevant information via computer. In team negotiations, team representatives are only able to represent the whole team, if diverse preferences of the team members are aligned *prior* to the negotiation. In an experimental study with 150 participants, we provided team members with the complete information about each other's preferences during an either collaboratively (computer-mediated) or separately conducted computer-supported negotiation preparation and subsequently asked them for their priorities as representatives of the team. Our results showed that providing complete task-relevant information via computer is insufficient to compensate for the absence of active collaboration within the team: Representatives who could collaborate within the team during the computer-mediated negotiation preparation phase (1) moved away more from their initial individual preferences, (2) stated more similar priorities within the team, (3) assessed more accurately the importance of different negotiation issues for the team, which was mediated by the similarity of priorities within the team, and (4) were more satisfied.

1. Introduction

New technologies and innovations are changing the way people communicate and exchange information in various areas. Also in teamwork and decision-making, computers are increasingly used to exchange information between team members. This is also the case in context of negotiation teams (Kersten & Lai, 2010). Yet, little is known about the exchange of information and preferences within the team prior to a negotiation and the role of active collaboration in this process beyond the transmission of information via computer.

In negotiation teams, the team members often have their own specific preferences for a negotiation. This is especially the case, when a team is composed of members with different expertise or its members come from different departments (e.g., production, marketing, accounting and finance). Team members are often not aware enough of such crucial discrepancies in their preferences and therefore do not align these properly *prior* to a negotiation (Brett, Friedman, & Behfar, 2009). Conflicting preferences and goals for a negotiation have been identified as one of the main problems within teams in the negotiation context (Behfar, Friedman, & Brett, 2008). It could also be shown experimentally that unsolved preference divergences within the team lead to a poorer negotiation performance of the team (Halevy, 2008). Yet, when the whole team sits at the negotiation table, the team members can still compensate the detrimental effects of conflicts occurring within the team at least to a certain degree, for example, by taking breaks during the negotiation to resolve intra-team conflicts or by exchanging information within the team (e.g., Thompson, Peterson, & Brodt, 1996). But when a representative leads the negotiation on behalf of the team, the other team members are usually not directly on-site. Furthermore, without even being sufficiently aware of the divergences of preferences within the team, the representative often misleadingly thinks that he or she is pursuing the actual team priorities and goals. Hence, in order to be able to represent the preferences of the whole team in a negotiation, the representative has to enter the negotiation with an already clear concept of what the joint priorities of the team members are. But if the preferences of the team members are not

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addressed and aligned prior to the negotiation in order to agree on joint team priorities, the representative is not able to judge properly which negotiation issues serve the team's preferences best in the negotiation.

In this experimental study, we created a simple experimental negotiation preparation support tool that provided representatives with the complete information about the preferences of all team members via bar charts (i.e., *preference awareness*) during a computer-supported preparation for a negotiation. While prior research has mainly focused on the negotiation *between* the opposing parties, little is known about the factors that play a role in the negotiation preparation within the team (e.g., Brodt & Thompson, 2001). Especially when using computer-support for such a decision-making process, it is an important question whether active collaboration within the team – for example via audio-conference – has additional benefits for the alignment of team members' preferences when the representatives are already provided with the full information about all preferences within the team. In order to investigate this research question, we compared a condition in which team members prepared collaboratively via audio-conference with computer-supported awareness of the team members' preferences with a condition in which they had to prepare alone in front of the computer with preference awareness.

2. The challenge of being a team representative in a negotiation

Especially in situations that are complicated and of high relevance, often more than one person is involved in the decision-making and negotiation processes (e.g., Homan, Van Knippenberg, Van Kleef, & De Dreu, 2007). When conflicts between groups are present, usually the groups try to reach a solution via negotiations (Pruitt, 1998) and if several persons form one joint negotiation party, one speaks of a negotiation team (Brodt & Thompson, 2001). Yet, in many cases, not the whole team takes part in the actual negotiation with the other party, but rather a representative of the team is chosen to represent the team's interests and goals (Steinel, De Dreu, Ouwehand, & Ramirez-Marin, 2009). This particularly applies to modern times of a growing globalization and digitization where team members are often spatially distributed. Hence, in numerous situations, representatives make important decisions on behalf of people who do not directly participate in the negotiation with the other party but are affected by the outcomes that the representative reaches during the negotiation (cf. Reinders Folmer, Klapwijk, de Cremer, & van Lange, 2012).

But when representatives lead a negotiation on behalf of a team, they face specific challenges. During the negotiation itself, representatives have to take over a specific boundary role: They not only have to pursue the preferences of the team that they represent, but also have to deal with the preferences and goals of the other negotiation party in order to reach a satisfying negotiation outcome (Jones & Worchel, 1992). The complexity of preferences (cf. Lewicki, Saunders, & Barry, 2007) becomes even more challenging because the individual preferences of the representative usually differ to a certain extent from the preferences of the other team members, for example, due to different positions that the team members hold in an organization (cf. Brett et al., 2009). If the diverse preferences within the team are not aligned prior to the negotiation, the representative will not be able to pursue the preferences of the whole team during the negotiation – the other team members not being present at the negotiation table. But the alignment of preferences within the team has pitfalls itself: Besides the fact that team members are often not aware of the crucial differences within the team and therefore neglect the importance of the negotiation preparation (Brett et al., 2009), several collaboration barriers during the negotiation preparation phase can impede the proper alignment of preferences. In team discussions, people usually focus more on shared information and the preferences that they have in common, disregarding unshared information and preferences (e.g., Bowman & Wittenbaum, 2012; Stasser & Titus, 1985), and they also have difficulty integrating diverse information (Scholten, Van Knippenberg, Nijstad, & De Dreu, 2007).

As a further challenge, the representative has to face mixed motives: On the one hand, the representative is connected to the other team members due to being part of the same negotiation party (i.e., the same ingroup), which usually implicates a common fate (i.e., the negotiation results usually affect all team members) and to some extent also collectively shared goals (cf. Trötschel, Huffmeier, & Loschelder, 2010). Therefore, representatives usually face strong accountability and are motivated to benefit their ingroup (Reinders Folmer et al., 2012), which is only possible if they consider the preferences of all team members for the negotiation. On the other hand, the representative is part of a negotiation team that usually consists of individuals with differing preferences and goals (Brett et al., 2009). Therefore, the representative is not exclusively motivated to benefit the ingroup, but he or she is also motivated to pursue his or her own goals and priorities as an individual in the negotiation.

3. Computer-supported preference awareness in the negotiation preparation

In prior research about group awareness (e.g., Buder & Bodemer, 2008) – which basically means to create awareness of things that are usually not made aware within groups (e.g., knowledge or attitudes) – it could have been shown in a variety of studies that collaboration barriers within groups can be overcome: Spatially distributed work groups reach a higher effectiveness and efficiency in problem solving tasks when its members are made aware of each other's knowledge via computer-support (e.g., Engelmann & Hesse, 2010; Schreiber & Engelmann, 2010); and they also exchange as well as discuss unshared information more intensively (Engelmann & Hesse, 2011). Based on this research stream, we created an experimental negotiation preparation support tool that provided complete information about the preferences of the team members for several attributes of the negotiation issues that were supposed to be negotiated later via different sized bar charts on the computer, accompanied by numerical values (i.e., *preference awareness*). Computerized negotiation support systems are used to support negotiators in preparing and conducting a negotiation (Kersten & Lai, 2010). The support of such systems can range from passive involvement (e.g., by visualizations) to active involvement in the process (cf. Vahidov, Kersten, & Saade, 2014). Most of the available negotiation support systems have a more active part in the negotiation process (e.g., Gettinger, Koeszegi, & Schoop, 2012; see Kersten & Lai, 2010 for an overview). With preference awareness, we provided a passive negotiation support tool. Our goal was to just tacitly support the representatives with preference awareness and thereby enhance *human* decision-making processes with computer support, but not to actively conduct the process with any kind of algorithm or predefined suggestions of software. Consequently, we also did not script the participants in any way; it was totally up to them if and how they would use the available information for their decision about the priorities of the team.

Our main research question was how the mode of preparation with computer-supported preference awareness (i.e., collaboratively within the team via Skype or separately) affects the alignment process of the preferences within the team among representatives, especially against the background of the described mixed-motive character of the negotiation preparation phase. Computer-mediated collaboration in our study is conceptualized as the possibility to communicate via Skype in order to actively collaborate during the negotiation preparation. If active collaboration within the team has no additional effects for the decision-making process beyond the complete information about team members' preferences, the negotiation preparation process would be even more efficient. This could be especially useful if schedule difficulties or time pressures hinder a mutual exchange within the whole team, which often is the case, for example, in organizational teams that consists of different experts or managers. Furthermore, with growing technological possibilities, people are relying increasingly on

computers for information processing or aggregation of data. Enhanced artificial intelligence even offers features and algorithms to play more and more a pro-active role in decision-making processes. As an example, software agents can be used to automate partially or fully the conduct of the whole negotiation process (e.g., Vahidov et al., 2014). Against the background of these developments, it is important to figure out whether providing complete information via computer is able to fully compensate for the absence of active collaboration within the team during important decision-making processes, especially when the task involves mixed-motives.

4. Hypotheses

We assume that active collaboration within the team during the negotiation preparation has positive effects on the consensus about the team priorities and also on further task-related and social variables. Before we formulate our hypotheses in detail, we describe several indicators for our assumptions.

It has been shown that the absence of collaboration via direct communication – under availability of all task-relevant information via computer – can have detrimental effects on the performance of the team members in problem-solving tasks (Engelmann, Baumeister, Dingel, & Hesse, 2010). Though the negotiation preparation of representatives in order to decide about the priorities of the team for the negotiation is not a classical problem-solving task as it was used in the study by Engelmann et al. (2010), it can be regarded as a cognitive demanding task to align various preferences of several team members for a negotiation. Teams have a larger range of resources, skills and knowledge in comparison to individuals (Hinsz, Tindale, & Vollrath, 1997), and the use of teams has been shown to be useful in important decisions and tasks (Kooij-de Bode, van Knippenberg, & van Ginkel, 2008). In the course of these developments, negotiations are a particularly important field where teams are used (Bazerman, Mannix, & Thompson, 1988; Swaab, Postmes, & Eggins, 2011). Hence, from a cognitive perspective, active collaboration could possibly contribute to a more elaborated decision about the team priorities beyond the sole awareness of team members' preferences. Further, when missing collaboration already has detrimental effects in a classical problem-solving task (Engelmann et al., 2010) that does not exhibit the described mixed-motive character of the negotiation preparation of team representatives, we argue that the disadvantages could be even larger in our case: When collaboration is missing, there is no direct inhibiting effect on the representative's motivation to pursue his or her own individual preferences and goals (cf. Brett et al., 2009; Thompson & Fox, 2001). But, in order to represent their entire team in a negotiation instead of just pursuing their own goals, the representatives have to move away to a certain extent from their own individual preferences when determining the negotiation priorities. In a collaborative negotiation preparation, the other team members have the possibility to play an active part and to inhibit the tendency of the representative to favor his or her own preferences for the decision about which priorities to pursue for the team in the negotiation. Hence, we assume:

H1. Representatives who collaborate within the team during the negotiation preparation with preference awareness subsequently state priorities for the negotiation that differ more from their initial individual preferences than representatives who prepare separately.

So far, we argued that the lack of active collaboration via direct communication within the team could have negative effects on the alignment of team members preferences because of its detrimental effects in cognitive demanding tasks (Engelmann et al., 2010) in which teams have been shown to be superior to individuals (e.g., Kooij-de Bode et al., 2008) and, further, because of the missing direct influence of the other team members on the motivation of representatives to pursue his or her own preferences to a higher extent (cf. Brett et al., 2009; Thompson & Fox, 2001). Both of these aspects should be detrimental for a consensus about the team priorities within the team. First, a high team consensus about the negotiation priorities requires a high elaboration of the preferences on a cognitive level. Second, due to the collaboration within the team, each team member can actively argue for his or her own preferences. Considering the mixed-motive-character of the task, the participation of all team members in this process should lead to a higher consensus within the team about the team priorities. A further argument for this assumption is that active collaboration via direct communication has been shown to have positive effects on the solution of conflicts in distributed teams (e.g., Hinds & Mortensen, 2005). Since diverse preferences within the team for a negotiation lead to conflict within the team (Brett et al., 2009), active collaboration could contribute to solve these conflicts in order to cooperate and this should further foster a higher team consensus about the priorities for the negotiation. In contrast, we assume that just processing information about the preferences via computer and then prepare separately without the possibility to actively collaborate in order to solve preference divergences should lead to less similar priorities within the team. Due to the mentioned reasons, we hypothesize:

H2. Representatives who collaborate within the team during the negotiation preparation with preference awareness subsequently state more similar priorities within the team than representatives who prepare separately.

A good understanding of the preferences of all team members and a high similarity of priorities are a prerequisite for successfully negotiating with the opposing party (cf. Brett et al., 2009; van der Schalk, Beersma, Van Kleef, & De Dreu, 2010), because it enables the representatives to make mutually beneficial trade-offs with the other party in favor of the team (e.g., Ten Velden, Beersma, & De Dreu, 2007), which is an important indicator for the negotiation performance. Therefore, we assume that representatives that collaborate within the team during the negotiation preparation phase can further judge more accurately how important different negotiation issues are for the team.

H3. Representatives who collaborate within the team during the negotiation preparation with preference awareness can subsequently assess the importance of different negotiation issues for the team more accurately than representatives who prepare separately.

In order to obtain more insight into the underlying mechanisms and following our argumentations for H2 and H3, we postulate within Hypothesis H4 that the influence of collaborative negotiation preparation with preference awareness on the accuracy of the assessment of the importance of different negotiation issues is mediated by the similarity of priorities within the team.

H4. Representatives who collaborate within the team during the negotiation preparation with preference awareness can subsequently assess the importance of different negotiation issues for the team more accurately than representatives who prepare separately because the former state more similar priorities within the team.

We further assume that the possibility to directly collaborate within the team should also have positive effects on the satisfaction with the negotiation preparation and on social variables such as the mutual perception within the team. As mentioned, active collaboration can have positive impact on conflicts in groups (e.g., Hinds & Mortensen, 2005) and therefore the joint solution of the preference divergences through active collaboration should lead to a higher satisfaction among the representatives. Further, the experience of resolving conflicts about preference divergences in a collaborative setting should also contribute to a better mutual perception within the team. This assumption is also strengthened by the fact that in e-negotiations, negotiation partners that could use brief personal telephone conversations, achieved better social outcomes (Morris, Nadler Kurtzberg & Thompson, 2002). We therefore assume in H5 and H6:

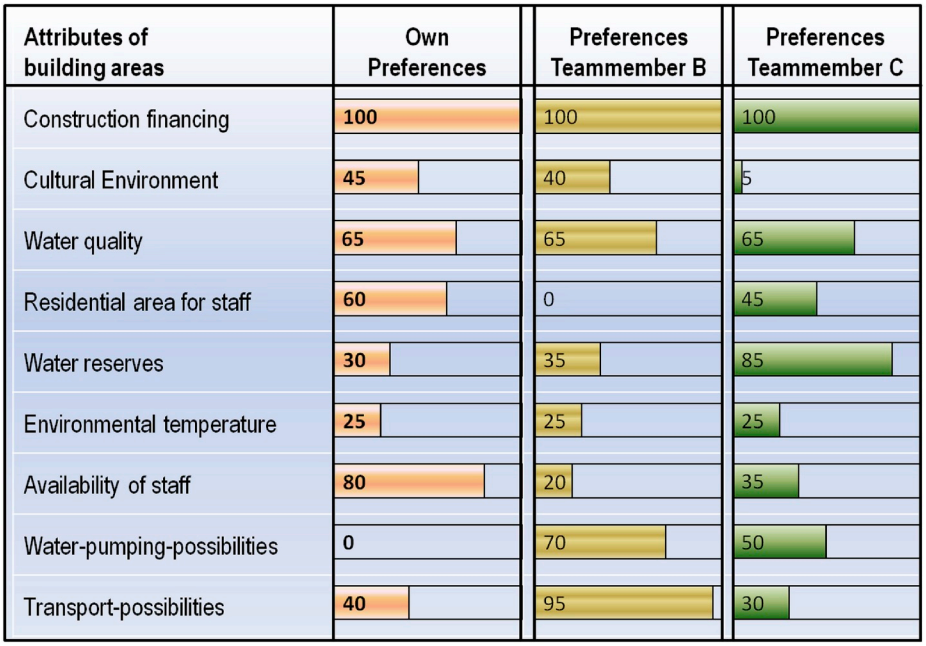

Fig. 1. Preference awareness as it was presented to the manager of staff.

H5. Representatives who collaborate within the team during the negotiation preparation with preference awareness are more satisfied with the result of the negotiation preparation than representatives who prepare separately.

H6. Representatives who collaborate within the team during the negotiation preparation with preference awareness have a more positive mutual perception within the team than representatives who prepare separately with preference awareness.

5. Method

5.1. Participants and design

In order to investigate our assumptions, we conducted an experimental study. The sample consisted of 150 university students (113 female, 37 male, M_{age} = 23.42, SD_{age} = 2.85, age range: 18–32). Participants were paid 8€ per hour. They were randomly assigned to either a condition with collaborative preference awareness or a condition with non-collaborative preference awareness. Fifty negotiation teams were generated by randomly assigning participants to one out of three manager roles within each team. This resulted in 25 teams per condition.

5.2. Procedure and material

5.2.1. Individual pre-phase

Each run started with the reception of the three participants, in which they were informed about the frame conditions of the study. After being split into three rooms, the participants started the experiment with a questionnaire about personal data such as field of study, gender, age, as well as the usage of computers, diagrams, and tables. Then, the participants were informed about the scenario: Each participant would take over the role of one out of three leading managers of a global operating water supply company, building a three-person team. The team would be working in an EU-funded project of high value for the company, which would be about the construction of ten new waterworks in South Africa. It is explained that also a competing company had been chosen by the EU to take part in the upcoming construction project and that, therefore, a negotiation about the distribution of the building areas for the waterworks would take place between the two parties. Thus, the team would have to prepare for the upcoming negotiation. In the scenario description, each participant then received one out of three management roles within the company: manager of research and development, manager of staff, or manager of logistics and transport. Then, each participant was presented the preferences for nine different attributes of the building areas that they would have to take over within their manager role, including a description of the meaning of each attribute. It was explicitly mentioned that personal preferences as private persons should not be considered in the task. For each attribute, it was shown via different sized bar charts and numerical values from 0 to 100 how important it would be for this manager in the upcoming negotiation. The higher the bar chart and corresponding value, the higher was the preference for the corresponding attribute. Each participant was informed that the preferences of their manager role would stay available for the course of the whole experiment. The participants were only informed about their own special field of expertise, not receiving further information about the other two managers.

5.2.2. Collaborative versus individual negotiation preparation phase

The scenario description was followed by the negotiation preparation phase. At this point, the two conditions differed. The participants in the collaborative preference awareness condition were told that they would have up to 20 min' time to prepare within the team for the upcoming negotiation via audio-conference. Additionally, they would see the preferences of all team members in a spreadsheet on the computer screen for the duration of the team discussion (i.e., preference awareness). In contrast, in the non-collaborative preference awareness condition, the participants were told that they would have to prepare alone for the upcoming negotiation but that the other team members would provide their preferences for the negotiation preparation, presented in a spreadsheet on the computer screen. In both conditions, the participants had a piece of paper available for possible notes. In line with our goal to just tacitly support human decision-making with preference awareness and not to script or guide the behavior of the participants, we gave no further instructions. Fig. 1 pictures how preference awareness was implemented in the experiment. The preferences were presented in the same way as during the prior scenario description, just extended by the preferences of the other team members. The individual

preferences for the attributes were always located at the left side of the spreadsheet for each participant. Regarding the diverse preferences, every manager had especially high preferences for those attributes that corresponded to their field of expertise in the company.

5.2.3. Individual post-phase

After the negotiation preparation phase, also the participants of the collaborative preference awareness condition worked alone again. The participants were informed individually that they would have to represent their team in the upcoming negotiation with the other party. Hence, we let each participant think that he or she was the single representative for the whole team. We additionally emphasized that the preferences of all team members should be represented in the negotiation. Then we asked the participants which priorities they would want to pursue for the team during the negotiation. For this purpose, the participants were asked to state their priority for each of the nine attributes of the building areas via ranking (from 1 to 9) in a drop-down menu. In a further subsequent task, we presented five negotiation issues (i.e., building areas) that were supposed to be negotiated later and asked each representative to state how important it would be for him or her to obtain each of the building areas in the negotiation for the team by ranking them from 1 to 5. For each of the building areas, we therefore pictured how well it covered the different attributes by using stars from 1 to 10. We held the overall number of stars constant for each building area so that only the distribution of the stars made them more or less valuable for the team (with the value based on all team members' preferences). In Fig. 2, the building areas are pictured.

After this task, we informed the participants that an actual negotiation with the other party would not take place due to the main focus of the experiment being on the negotiation preparation phase and that we could not have informed them earlier for motivational reasons. In a concluding questionnaire, the participants answered several questions about their satisfaction with the negotiation preparation as well as the mutual perception within the team.

5.3. Measures

5.3.1. Movement away from individual preferences

As stated in Hypothesis H1, we wanted to investigate to what extent the representatives would move away from their individual preferences when they state the priorities for the negotiation after preparing for the negotiation. Therefore, we calculated the deviation of the stated priority ranking of each representative from the ranking that would have resulted if only his or her individual preferences would have been considered for the priority ranking. If, for example, the manager of staff as representative of the team would have ranked the transport-possibilities 5th, the deviation from the corresponding individual preferences-based priority rank (which ranked 6th) for that attribute would be 1. For each attribute the deviation was calculated and then we summed them up over all nine attributes.

5.3.2. Similarity of priorities within the team

In order to investigate how similar the priorities were within the team (see Hypothesis H2), we analyzed how much the stated priority rankings of the representatives for the nine attributes of the building areas differed within the team. Therefore, we calculated for each of the nine attributes how much the priority rankings deviated between the three representatives and summed the deviations up over all nine attributes. As an example, if representative A would have ranked the attribute “availability of staff” 2nd, representative B 4th and representative C 5th, the deviation score for that attribute within the team would be 6 (i.e., deviation between representative A and B = 2, A and C = 3, and B and C = 1). The highest similarity of priorities was consequently reached when all representatives gave the same priority rank for each attribute, which would have resulted in a deviation score of zero.

5.3.3. Accuracy of negotiation issue ranking

By this measure, we investigated how accurate the representatives could judge how important different negotiation issues would be for the team. The importance of a building area for the team was determined by analyzing how well its characteristics corresponded to the preferences of *all* team members. Each building area was different to the extent that it covered the different attributes (shown by stars from 1 to 10 for each attribute, see Fig. 2). A building area was of higher value for the team the better its coverage of the attributes corresponded to the priority ranking that was based on all team members' preferences (i.e., the priority ranking that resulted when all team members' preference values for each attribute were averaged). Hence, we calculated a deviation score between the rankings of the building areas that were given by each representative and the ranking of the building areas that would result when the preferences of all team members were considered. These deviation scores were calculated analogous to the measures before.

Fig. 2. Illustration of the building areas.

5.3.4. Satisfaction with the negotiation preparation and mutual perception within the team

For the questionnaire data, we developed several questions and used a seven-point rating scale that ranged from 1 “strongly disagree” to 7 “strongly agree”. Inverted questions (-) were subsequently recoded by reversing the corresponding value (e.g., reverse 7 to 1 and vice versa); further, we created the mean score for multiple questions of one measure. The satisfaction with the negotiation preparation was assessed by three questions (i.e., “I am satisfied with the result of the negotiation preparation”, “The result of the negotiation preparation is unjust (-)” and “I am dissatisfied with the result of the negotiation preparation (-)”). In order to assess the mutual perception within the team, we used three different measures and asked the participants how likeable (i.e., “My team members are likeable” and “I do not want to work with these team members in the future (-)”), honest (i.e., “I had the impression that the other team members were open and honest with me”, “I had the impression that the other team members were withholding information (-)”, and “I had the impression that the other team members lied to me (-)”), and competent (i.e., “My team members made a competent impression on me” and “I think that my team members are not very competent (-)”) they perceived the other team members to be.

5.3.5. Additional data

For exploratory reasons, we recorded the average time that was used for the negotiation preparation. Further, we assessed in the concluding questionnaire how diverse the preferences were perceived by the representatives within the team with four questions (i.e., “The preferences of the team members are different”, “We have more different than joint preferences in the team”, “The preferences of team members are similar”, and “We have more joint than different preferences within the team (-)”) as well as how cooperative the mutual perception within the team was with two questions (i.e., “I think that we have cooperated well with each other in the team” and “I had the impression that the we were competitive within the team (-)”).

6. Results

For the analyses, we used either a *t*-Test (for H1, H2, H3, H5 and H6) and if the normality assumptions were violated a Wilcoxon rank-sum test (this was the case for the control measures). Since we used multiple t-tests, we decided to apply a Bonferroni-Holm-Correction (Holm, 1979), To apply this method, the sorted p-values of the individual tests are assigned increasing levels of significance in ascending order (e.g., Victor, Elsäßer, Hommel, & Blettner, 2010). In order to investigate the mediation Hypothesis H4, we tested the requirements for mediation by Baron and Kenny (1986) with multivariate regressions and additionally tested the indirect effect for significance with the mediator analysis of Hayes (2012) by using bootstrapping. In order to investigate the effects within the team and to consider the interdependence of the individuals within each team, we used the aggregated data on team level for the analyses (more precisely: the mean scores of the representatives within each team for the measures). For the control measures age, as well as the usage of computers and tables, no differences were found between the conditions. However, representatives in the non-collaborative preference awareness condition had more experience with the usage of diagrams ($M = 3.33$, $SD = 0.25$) than representatives in the collaborative preference awareness condition ($M = 3.05$, $SD = 0.37$, $U = 182$, $p = .007$). Table 1 (see Appendix) holds an overview of the correlations between the used measures.

First, we investigated Hypothesis H1 to find out whether collaboration led to a higher movement away from representatives' initial individual preferences. This was confirmed: Representatives who collaborated within the team during the negotiation preparation with preference awareness subsequently stated priorities for the negotiation that differed on average more from their initial individual preferences ($M = 13.69$, $SD = 1.25$) than representatives who prepared separately ($M = 12.23$, $SD = 1.70$, $t(48) = -3.476$, $p = .001$, $d = 0.98$).

With Hypothesis H2, we wanted to investigate further whether representatives that could collaborate during the negotiation preparation phase subsequently also stated more similar priorities within the team. This was the case: Representatives who collaborated within the team during the negotiation preparation with preference awareness subsequently stated priorities that deviated – on average – less within the team ($M = 6.35$, $SD = 3.93$) than the stated priorities of representatives who prepared separately ($M = 9.73$, $SD = 3.77$, $t(48) = 3.111$, $p = .003$, $d = 0.88$).

In Hypothesis H3, we postulated that representatives who could collaborate within the team during the negotiation preparation phase subsequently would also be able to assess the importance of different negotiation issues for the team more accurately. Hypothesis H3 could be confirmed: Representatives who collaborated within the team during the negotiation preparation with preference awareness deviated – on average – less from the accurate team ranking for the negotiation issues ($M = 2.45$, $SD = 1.82$) than representatives who prepared separately ($M = 3.95$, $SD = 2.47$, $t(48) = 2.431$, $p = .019$, $d = 0.69$).

With Hypothesis H4, we aimed to find out what constitutes the underlying mechanism that enabled representatives who could collaborate within the team while preparing for negotiation with preference awareness to assess the importance of different negotiation issues for the team more accurately. Consistent with Baron and Kenny's conditions that have to be met for the confirmation of a mediation the conducted regression analyses showed, that (1) collaborative preference awareness (i.e., predictor) had a significant effect on the similarity of priorities within the team (i.e., mediator; $\beta = 0.410$, $t(48) = 3.111$, $p = .003$) as well as (2) on the accuracy of negotiation issue ranking (i.e., dependent variable; $\beta = 0.331$, $t(48) = 2.431$, $p = .019$), that (3) the similarity of priorities within the team (i.e., mediator) had a positive effect on the accuracy of negotiation issue ranking (i.e., dependent variable; $\beta = 0.531$, $t(47) = 4.100$, $p < .001$), and that (4) collaborative preference awareness was not a significant predictor of the accuracy of negotiation issue ranking anymore when we controlled for the similarity of priorities within the team (i.e., mediator; $\beta = 0.114$, $t(47) = 0.878$, $p = .384$). This constitutes a full mediation (cf. Baron & Kenny, 1986). In addition, we confirmed that the indirect effect (0.981) was significant by using the bootstrapping method of Hayes (2012) with 5000 samples. The 95%-confidence interval for the indirect effect did not include the value of zero ($BCCal_{95} = 0.3465$ to 1.9637). For the unstandardized total effect, a value of 1.493 resulted. Hence, a representative who collaborated within the team during the negotiation preparation with preference awareness deviated 1.493 on average less from the accurate team ranking for the negotiation issues than a representative who prepared separately with preference awareness, and 0.981 of this deviation (i.e., 66%) can be explained by the indirect effect of the similarity of priorities within the team (i.e., mediator).

Thus, the mediation hypothesis can be confirmed: Representatives who collaborated within the team during the negotiation preparation with preference awareness could subsequently assess the importance of different negotiation issues for the team more accurately than representatives who prepared separately, because the former had more similar priorities within the team. Hence, the similarity of priorities within the team served as the mediator and constituted thereby the underlying mechanism for the relationship between collaborative preference awareness and the ability to judge the importance of negotiation issues more accurately. Fig. 3 holds a summary of the mediation. The regression coefficients are coded in such a way that a positive beta weight stands for a higher value of that variable (i.e., a higher similarity of priorities within the team and a higher accuracy of negotiation issue ranking) for representatives that could prepare with collaborative preference awareness (that is equivalent to a lower deviation score regarding these variables).

Furthermore, hypotheses H5 and H6 could be confirmed. Consistent with hypothesis H5, representatives who collaborated within the team

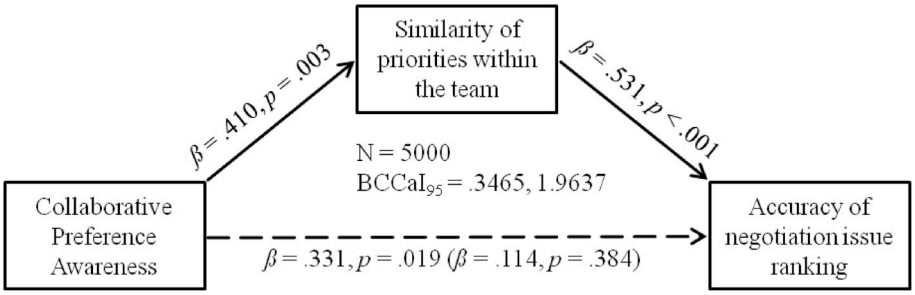

Fig. 3. Standardized regression coefficients for the relationship between collaborative preference awareness and accuracy of negotiation issue ranking as mediated by similarity of priorities. The standardized regression coefficient between collaborative preference awareness and accuracy of negotiation issue ranking, controlling for similarity of priorities within the team, is in parentheses.

during the negotiation preparation with preference awareness were more satisfied with the result of the negotiation preparation ($M = 6.06$, $SD = 0.60$) than representatives who prepared separately with preference awareness ($M = 5.28$, $SD = 0.58$, $t(48) = -4.665$, $p < .001$, $d = 1.32$). Further, they exhibited a more positive perception of each other within the team (H6). This was assessed by the following three measures: Representatives who collaborated within the team during the negotiation preparation with preference awareness perceived each other to be more honest ($M = 6.75$, $SD = 0.29$), likeable ($M = 6.41$, $SD = 5.36$) and competent ($M = 5.98$, $SD = 0.44$) within the team than representatives who prepared separately with preference awareness (honesty: $M = 5.71$, $SD = 0.67$, $t(48) = -7.103$, $p < .001$, $d = 1.96$; likeability: $M = 5.32$, $SD = 5.38$, $t(48) = -7.200$, $p < .001$, $d = 2.04$; competence: $M = 5.23$, $SD = 0.54$, $t(48) = -4.384$, $p < .001$, $d = 1.25$).

Each of the tested hypotheses remained significant after applying the Bonferroni-Holm-Correction. This method requires the assignment of increased level of significance (i.e., 0.007, 0.008, 0.01, 0.0125, 0.016, 0.025, and 0.05) for the sorted p-values (i.e., < 0.001, < 0.001, < 0.001, < 0.001, 0.001, 0.003, and 0.019).

Fig. 4 entails an overview of the results for each of the tested hypotheses to illustrate the effects of collaborative preference awareness.

For the additional data, we found that representatives who collaborated within the team during the negotiation preparation with preference awareness have used more time (given in seconds) for the negotiation preparation ($M = 863$, $SD = 234$) than representatives who prepared separately ($M = 474$, $SD = 117$, $t(48) = 7.438$, $p = < .001$). Further they perceived the preferences within the team as less diverse ($M = 3.74$, $SD = 0.55$) than representatives who prepared separately ($M = 4.60$, $SD = 0.58$, $t(48) = -5.360$, $p = < .001$). We also found that representatives who collaborated within the team during the negotiation preparation with preference awareness perceived each other as more cooperative and less competitive ($M = 6.27$, $SD = 0.47$) within the team than representatives who prepared separately and only received the preferences of the other team members via a spreadsheet on the computer ($M = 4.87$, $SD = 0.60$, $t(48) = 9.248$, $p = < .001$).

7. Discussion

The main findings of our study underline the importance of the collaborative activity within the team beyond the complete awareness of task-relevant information via computer (i.e., the preferences of the team members): Although provided with preference awareness in both conditions, only the representatives that could collaborate with the team members during the negotiation preparation phase moved more away from their own individual preferences, obtained more similar priorities within the team, and were able to assess the importance of different negotiation issues for the team more accurately. A higher satisfaction with the negotiation preparation and a more positive mutual perception within the team were further positive effects. With a mediation analysis, we could additionally identify that the higher similarity of priorities within the team served as the underlying mechanism for this ability.

Thus, our assumptions about the positive effects of active collaboration could be confirmed. Before discussing the implications of our results for theoretical as well as practical aspects of different research lines, we first aim to shed more light into what really could have contributed to the more successful negotiation preparation when representatives had the possibility to collaborate within the team by interpreting our data. In our hypotheses section, we mainly argued for two possible advantages collaboration could offer during the negotiation preparation. One argumentation was that active collaboration within the team could bring a *cognitive* advantage for the alignment of a variety of preferences of several team members, since it has been shown to have positive effects in other cognitive demanding tasks (e.g., Engelmann et al., 2010; Kooij-de Bode et al., 2008). In our additional data we found that representatives who collaborated within the team during the negotiation preparation with preference awareness have used almost twice as much time for the negotiation preparation than representatives who prepared separately. The fact that representatives in the collaborative condition reached a higher quality of results in every task-related variable could be an indication that at least parts of the additional time spent has been used for a deeper elaboration on

Collaborative Preference Awareness (vs. Non-collaborative Preference Awareness):	
H1: Higher movement away from initial individual preferences	✓
H2: More similar priorities within the team	✓
H3: Higher accuracy of negotiation issue ranking	✓
H4: Accuracy of negotiation issue ranking mediated by similarity of priorities within the team	✓
H5: Higher satisfaction with the result of the negotiation preparation	✓
H6: More positive mutual perception within the team	✓

Fig. 4. Results for each of the tested hypotheses to illustrate the effects of collaborative preference awareness.

preferences. Using more time has been shown to have positive effects on group performance (e.g., Karau & Kelly, 1992).

Yet, out of the data, we have more hints for the other main line of argumentation we discussed in the hypotheses section that we can summarize as *relational*, *motivational* and *consensus-oriented* influence of active collaboration within the team. We argued that without collaboration, the representative's motivation to pursue his or her own preferences and goals (cf. Brett et al., 2009; Thompson & Fox, 2001) won't be inhibited and he or she will be less cooperative. Further, we argued that conflicting preferences (e.g., Brett et al., 2009) could best be solved by active collaboration within the team (e.g., Hinds & Mortensen, 2005). Our data suggests that collaboration within the team indeed weakened the motivation of representatives to favor their own individual preferences when determining the priorities for the team because, in the end, they showed a higher movement away from them and expressed more similar priorities for the negotiation. This interpretation is underlined by the fact that our data further showed that collaboration led to a more cooperative and less competitive mutual perception within the team in comparison to the non-collaborative condition in which the preferences of the other team members were only received via computer. Thus, collaboration seemed to have fostered the more cooperative orientations of representatives that could have contributed to the resolution of preference conflicts (e.g., Brett et al., 2009) in order to move towards a team consensus. In line with that, further data support this consensus orientation in the collaborative condition. Though technically the degree of preference heterogeneity was visible the same in both conditions (via preference awareness), the representatives perceived the preferences within the team as less diverse in the collaborative condition. This indicates that active collaboration lead to higher focus on a team consensus about the team priorities. The more positive perception within the team that we found in our data further supports the positive influence of collaboration on relational aspects within the team. This also is expressed by the higher satisfaction with the negotiation preparation in the collaborative condition. Hence, our data suggest that the relational (i.e., better mutual team-perception within the team and higher satisfaction), motivational and consensus-oriented (i.e., higher movement away from initial individual preferences, higher perceived cooperation within the team, and lower perceived preference heterogeneity within the team) influence through active collaboration within the team plays a major role in the negotiation preparation of team representatives to make the priorities more similar within the team.

The results of our study have several implications for theoretical as well as practical aspects of different research lines. First of all, the results of our study have an important impact on the use of computers for information processing and the use of negotiation support systems. Advanced technologies offer increasing possibilities to process information and make decisions for humans as, for example, software agents that can fully conduct a whole negotiation for a client. At first sight the development of such tools can be regarded positively because the opportunities to use computers to take over complex group decisions or negotiation processes is considered to be practicable (e.g., Vahidov et al., 2014). Also the opportunity to support decision-makers with task-relevant information provided by other team members seems feasible. In our scenario, for example, experts who work in different departments could have benefited from a more efficient negotiation preparation by just providing all their preferences to the representative via computer. This would have saved time and resources. Yet, our study showed that the absence of active collaboration during important group decision processes (e.g., the alignment of team members' preferences during the negotiation preparation phase) can have a great influence on the outcomes of such processes. These did not only affect satisfaction and social measures in our study, but also task-relevant outcomes such as the consensus about the team priorities or the ability to judge the negotiation issues for the team accurately. Hence, even when it is technically possible and practicable to rely solely on computers to provide specific information or to fulfill different tasks, our results clearly indicate that effects of collaboration within the team should not be underestimated. We therefore recommend that – at least in team tasks in which motivational aspects could play a role for how the computer-provided information is used – to integrate the possibility to collaborate in decision processes, either face-to-face or virtually. Thus, the results have an important impact on numerous group decision situations in which this can be the case as, for example, in organizational decision-making contexts or political contexts.

Furthermore, the results contribute to the field of negotiation research. Especially, we could help to acquire more insights in the complicated role of representatives in the – to date – insufficiently investigated context of the negotiation preparation of teams (cf. Brodt & Thompson, 2001). Our results showed, that the negotiation preparation of representatives cannot be simplified as a pure information exchange task in which the team members only need to ensure that all task-relevant information (in this case: the preferences) are shared properly. Instead, we could identify collaboration as a crucial factor besides the awareness of the team members' preferences via computer and showed that it played a major role in how the available information about team members' preferences was used by representatives. The active influence of the other team members led to a higher movement away from their initial preferences and to a more cooperative orientation towards a higher team consensus, indicating a weakened motivation of the representatives to favor their own individual preferences due to the collaborative preparation phase. This higher consensus within the team about the team priorities is very important because a representative who enters a negotiation with priorities that are conjointly accepted and approved within the team can properly represent the *whole* team in the negotiation. Hence our study has demonstrated that motivational aspects should not be neglected in the negotiation preparation of representatives and that the possibility to collaborate can play a crucial role in the process of preference alignment beyond just being informed about team members' preferences. Additionally, we could establish the link between the negotiation preparation phase and the negotiation with the opposing party by showing that collaborative preference awareness enabled the representatives to assess more accurately the importance of different negotiation issues for the team. The ability to judge which negotiation issues are important or unimportant is crucial in order to be able to make mutually profitable trade-offs in favor of the team during integrative negotiations and is thereby an important indicator for the negotiation performance (e.g., Schei & Rognes, 2005). Within the mediation analysis, we could demonstrate that the similarity of priorities served as the underlying mechanism for the ability to accurately assess the importance of the negotiation issues, which further emphasizes the importance of the alignment of team members' preferences during the negotiation preparation of team representatives (cf. Brett et al., 2009).

Our results have also implications for group research in general. Prior group research has mainly focused on how groups can overcome collaboration barriers such as the bias for shared information and preferences (e.g., Kerr & Tindale, 2004) in order to enhance unshared information pooling (Toma & Butera, 2009) and to make use of the anticipated higher capacity of knowledge, skills, information, and resources within groups (e.g., Mesmer-Magnus & DeChurch, 2009). Yet, most of that research considered groups members to work cooperatively in decision-making tasks (Wittenbaum, Hollingshead, & Botero, 2004). But recent literature on group decision-making suggests that a mixture of cooperative and competitive motives affect the extent to which members not only share but also use information (for an overview see Toma & Butera, 2015). People tend to favor their own information (i.e., “ownership bias”; van Swol, Savadori, & Sniezek, 2003) and information consistent with their initial preferences (i.e., “preference effect”; Greitemeyer & Schulz-Hardt, 2003). In accordance, we could show that collaboration within the team can affect these tendencies: the willingness to move away from individual preferences was higher in

representatives that had been able to collaborate within the team. Further, collaboration led to a more cooperative and less competitive mutual perception within the team. Additionally, with preference awareness, we could clearly demonstrate that information sharing and information use are two different aspects and can be affected differently: Although we provided complete sharing of all information through preference awareness in both conditions, the information was not used for the decision about the team priorities by the representatives to the same extent. Collaboration within the team led to a more team-serving use of the same information. Hence, specific situations have to be considered (such as the negotiation preparation of representatives) in which fostering the exchange of unshared information and preferences via computer is insufficient, because collaboration and its influence on motivational and relational aspects also have an impact on how that information is used by decision-makers. The latter aspect also holds an important implication for the research field of group awareness, in which collaboration itself has never been considered to be an essential factor above awareness itself: Our results indicate that collaboration seems to be more important than it has been considered so far in awareness research. Sole awareness about task-relevant information is sometimes not enough. Rather, it has to be ensured that in specific situations – as, for example, in the negotiation preparation phase – conditions are established under which the use of that information is fostered in an intended way.

Considering all these aspects and the results of our study, we have also practical advice for managers of teams on how to manage situations, in which a representative has to conduct a negotiation on behalf of the team and computer-support is involved: The team manager must ensure that the representative not only receives the information electronically but prepares collaboratively with the team members, either face-to-face or via computer-mediated communication, as it was shown in our study.

A possible limitation of the current study is that the participants were students and not real members of an organizational negotiation team. Although reviews for negotiation literature suggest that the basic mechanisms and effects which occur in negotiations are stable over different samples and methods (De Dreu, Beersma, Steinel, & Van Kleef, 2007), it could be argued that the participants did not have to expect any long-term consequences regarding the relationships with the other team members, as is the case in real organizational teams. Especially in context of negotiations, people tend to have these aspects in mind (cf. Thompson, Wang, & Gunia, 2010). Whether or not these aspects lead to any decrease or increase in the willingness to align each other's preferences within the team needs to be investigated in a field study. There are two possible directions: On the one hand, the representative of an organizational team could be even more motivated to benefit the team because of the willingness to avoid detrimental long-term consequences. When provided with the full information about team members' preferences, the representative would then probably use all team members' preferences when determining the team priorities for the negotiation, even in absence of collaboration within the team in this process. On the other hand, the individual preferences could be even more important for the representative because he or she is highly motivated to benefit his or her own department. If the other team members work in different departments, the representative is possibly not motivated to consider their preferences. In such a situation, the representative would then probably favor his or her own preferences when determining the team priorities for the negotiation, and when there is no collaboration within the team, the other team members could not have an inhibiting effect on this tendency. We further assume that both could be possible and that this could be dependent on the situation as well as the motivational backgrounds of the representatives.

Therefore, we suggest that future research should identify more factors besides awareness and collaboration that could influence which priorities a representative is willing to pursue in a negotiation, especially if computer-mediated information processing is involved. An important influencing factor that should be addressed in future research is the diversity of the team members regarding different attributes. The members of negotiation teams usually do not only have differing preferences and goals (e.g. Brett et al., 2009), but also differ to a certain degree regarding attributes such as task-relevant knowledge, personality factors, or preference heterogeneity. Differences within the team regarding task-relevant knowledge and perspectives can, for example, increase the elaboration of task-relevant information and perspectives (Horwitz & Horwitz, 2007; Meyer & Scholl, 2009) if it does not lead to social categorizations (Meyer, Shemla, & Schermuly, 2011; van Knippenberg, De Dreu, & Homan, 2004). Hence, when team members are diverse regarding task-relevant knowledge and perspectives, this could probably foster the discussion intensity about the team members' preferences and help that a representative can enter the negotiation with well-balanced joint team priorities. In addition, one could investigate whether the degree of difference in preferences influences the alignment of team members' preferences and how a representative acts during the negotiation preparation. Strong preference divergences could, for example, inhibit an agreement about the team priorities, if it leads to too much task conflict (e.g., De Dreu & Weingart, 2003). Considering personality factors, team members could be diverse regarding traits such as extraversion, dominance or agreeableness. Extraversion leads, for example, to a higher eagerness and willingness to share knowledge and information (De Vries, van den Hooff, & de Ridder, 2006). Further in negotiations, it can lead to higher individual outcome (Ma & Jaeger, 2005). Extraverted representatives could therefore share and enforce their personal preferences in team discussions to a higher extent than introverted representatives and hence have a stronger influence on the decision about the team priorities. This could also apply to dominant representatives, since dominant team members have been shown to have an increased influence on team decisions (Anderson & Kilduff, 2009). An agreeable style is, just like extraversion, positively related to team members' willingness to share knowledge (De Vries et al., 2006). While this could be an advantage in problem solving tasks and collective agreeableness within the team may foster cooperation and consensus orientation (Halfhill, Nielsen, Sundstrom, & Weilbaecher, 2005), it could be disadvantageous for an individual team member if a team is diverse regarding this trait. A team that is, for example, composed of one more agreeable member and two more extraverted or dominant members, could maybe neglect the preferences of the more agreeable team member when establishing the team priorities. Yet one agreeable team member can contribute establishing a safe environment for sharing preferences within the team (Graziano, Jensen-Campbell, & Hair, 1996), which could help introverted team members to address their preferences and goals during the negotiation preparation. Hence, different team composition regarding these factors are possible which can develop their own dynamics that need to be examined. Future research should therefore also investigate different team composition of such diversity factors to get more insights about which factors influence the alignment of team members' preferences or serve as a mediator or moderator for other factors and under which constellations.

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Appendix

Table 1
Overview of the correlations between the used measures.

	Movement from individual preferences	Similarity of priorities	Accuracy of negotiation issue ranking	Satisfaction	Perceived honesty	Mutual likeability	Perceived competence
Movement from individual preferences		,127	,022	,189	,347*	,317*	,228
Similarity of priorities	,127		,577**	,388**	,366**	,374**	,257
Accuracy of negotiation issue ranking	,022	,577**		,168	,193	,175	-,022
Satisfaction	,189	,388**	,168		,499**	,496**	,349*
Perceived honesty	,347*	,366**	,193	,499**		,699**	,755**
Mutual likeability	,317*	,374**	,175	,496**	,699**		,576**
Perceived competence	,228	,257	-,022	,349*	,755**	,576**	

Pearson's correlation with pairwise-deletion. *p < .05, **p < .01.

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