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IMPACT OF THE ANTICIPATION OF MEMBERSHIP CHANGE ON TRANSACTIVE MEMORY AND GROUP PERFORMANCE

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ABSTRACT

The present study investigated whether the anticipation of membership change affects group performance. Thirty-two triads were asked to collaborate on an assembly task. We manipulated the anticipation of membership change by warning or not group members. As expected, results showed that the anticipated membership change interfered with team performance, due to the difficulty of building transactive memory. The anticipated membership change inhibited expertise specialization between group members from the start of the collaboration. These findings are consistent with the view that membership change is not always detrimental to group performance: its impact depends on whether it is anticipated or not.

INTRODUCTION

Today, work teams are no longer considered as static entities, but rather as dynamic systems that change over time (Arrow, Poole, Henry, Wheelan, & Moreland, 2004). Team functioning is affected by a number of factors (unpredictable environment, flexible task assignments). One of these factors, membership change, affects many work environments as a result of promotion, retirement or reassignment (Lewis, Belliveau, Herndon, & Keller, 2007). This phenomenon can also be explained by the increasingly temporary nature of teams, their more fleeting membership and permeable borders (Choi & Thompson, 2005). Thus, the change of team members has become a major issue in many organizations. In this study, we focus on one form, *partial membership change*, when one (or more) member joins or leaves the team.

Membership Change, Group Performance and Team Cognition

Most research has highlighted the detrimental effect of membership change on group performance. First, a problem of knowledge transfer arises when a member leaves the group (Arrow et al., 2004). Next, the initial members spend time socializing with the newcomers, thereby disrupting work and social routines (Arrow et al., 2004). Lastly, the initial members may find difficult to trust the newcomers' expertise (Kane, Argote, & Levine, 2005). Other studies have stressed the positive effect of membership change. The newcomers can bring new ideas and perspectives, which promotes an expertise diversification and increases the group's stock of knowledge (Choi & Levine, 2004). In summary, results on the relationship between membership change and group performance are inconsistent. Many studies have confirmed that the effect of membership change depends on the specific context in which it occurs (Arrow & McGrath, 1995; Levine, Moreland, Argote, & Carley, 2005).

Research on team cognition has also shown how membership change can affect group processes. Indeed, membership change threatens the team's cognitive structures and processes that members used to depend on (Moreland & Argote, 2003). Nevertheless, very few studies have specifically examined the influence of membership change on transactive memory (Levine et al., 2005; Lewis et al., 2007).

Membership Change and Transactive Memory

Transactive memory was first proposed by Wegner (1986) as a response to initial theories of *team cognition* (Janis, 1983; McDougall, 1920), underlining the potential negative effect of group decision making. Indeed, for Wegner (1986), the group is not a uniform construct, but rather a set of disparate people. Transactive Memory System (TMS) is a shared system of encoding, storing, and retrieving information from different knowledge domains (Wegner, 1986). Individuals, with close relationships, share responsibility for information processing, through implicitly developed systems based on mutual agreement on the distribution of knowledge within a group. With such a system, members know where expertise is located and rely on each other to contribute to the group's work, thus allowing expertise specialization in groups. Finally, when transactive memory is an individual memory but also a shared and distributed cognition within a group, TMS is composed of transactive memory, transactive processes and each group member's individual memories.

Initially explored within couples and families, the theory of transactive memory was later expanded to teams and organizations. Many studies emphasize the positive effect of transactive memory on team performance (Lewis et al., 2007; Liang, Moreland, & Argote, 1995). Other studies underline some conditions for the development of TMS (see Ren & Argote, 2011). For instance, TMS is developed through collective training and interactions between team members (Liang et al., 1995). TMS also has other antecedents, such as the cognitive and task interdependence (Wegner, Guiliano, & Hertel, 1985; Zhang, Hempel, Han, & Tjosvold, 2007), and the familiarity (Akgün, Byrne, Keskin, Lynn, & Imamoglu, 2005). Finally, only a few research focused on the team stability and its opposite *the membership change* (Levine et al., 2005; Lewis et al., 2007). Yet, membership change may alter these conditions of development of SMT.

The few existing studies indicate that membership change has a negative effect on transactive memory, indirectly impairing group performance (Akgün et al., 2005; Lewis et al., 2007). First, membership change alters the expertise within teams (Moreland, 1999). When a member leaves the group, some expertise is lost and the remaining members do not have access to it even though they depend on it (Levine et al., 2005). In partially reconstituted groups, the initial structure of transactive memory is still used despite the membership change and becomes inappropriate (Lewis et al., 2007). Secondly, membership change distorts group relationships. To be efficient, group members need to have confidence in their co-workers' expertise in order to rely on it and to be able to specialize in their own area of expertise (Liang et al., 1995). In a membership change situation, the group members are not willing to rely on the expertise of partners who may leave (Moreland & Argote, 2003).

The Effect of Anticipated versus Unanticipated Membership Change on Transactive Memory

Very few studies in the transactive memory literature have investigated the context in which the membership change occurs (Baumann, 2001; Levine et al., 2005). To our knowledge, only one experimental and unpublished study has addressed the relationship between membership change - whether anticipated or unanticipated - and transactive memory (Levine et al., 2005). They found the anticipation of membership change did not influence the development of transactive memory. There are several possible explanations for this unexpected result. Firstly, in their study, the newcomer trained alone. However, in real work teams, newcomers have their own specialization and their own representation of expertise distribution in the group. Thus, in our study, reconstituted groups were composed of collectively trained newcomers. Secondly, Levine and colleagues' study (2005) only examined the impact of the anticipated membership change during the information retrieval phase. However, there is evidence that the anticipated membership change inhibits the development of transactive memory from the start of the task (i.e., information encoding phase). Indeed, group members faced with an anticipated membership change showed little willingness to rely on the expertise of the co-worker who was going to leave (Moreland & Argote, 2003), which would limit group specialization and the emergence of transactive memory. To our knowledge, no study has been conducted on the information encoding phase.

THE PRESENT STUDY

We examined the impact of partial membership change on transactive memory and group performance, and whether that impact differed when the change was anticipated or unanticipated. Because transactive memory has positive effects on group performance (Liang et al., 1995), and because individuals are unwilling to rely on the expertise of co-workers who may leave (Moreland & Argote, 2003), we expected that the anticipated membership change would have a greater negative effect on group performance than the

unanticipated membership change, due to a difficulty of developing transactive memory from the start of the group collaboration.

METHOD

Participants and Design

Participants were 91 undergraduate students from a French University (*Mage*= 19.88). They were asked to complete a consent form. The participants, who did not know each other, were randomly assigned to same-sex groups of 3 members and to the 3 conditions of a single factor design. Our final sample was composed of 32 groups: 13 in the "anticipated membership change" condition (2 groups of men and 11 groups of women), 12 in the "unanticipated membership change" condition (12 groups of women), and 7 in the "no membership change" condition (4 groups of men and 3 groups of women).

Procedure

The participants were asked to work collectively; they were told that their performance would be rated and that there would be a collective reward. In the training phase (i.e., information encoding phase), groups were shown how to assemble the two arms of a Meccano® robot (see Michinov & Blanchet, 2015 for details). First, they watched a 10-minute video explaining the task. Then, each group worked together for 15 minutes to assemble the arms. Then, to avoid any recency effect, participants were asked to complete two interference tasks. In the performance phase (i.e., the information retrieval phase), group members were asked to recall the assembly procedure and write it down on a sheet of paper. Then, the groups assembled the robot again for 15 minutes, but without instructions, and their performance was rated. The training session was filmed with the participants' consent. Finally, participants completed an individual post-experiment questionnaire, were debriefed and thanked for their participation.

Manipulation of Anticipation of Membership Change

The initial members of each group trained together. In the "no membership change" condition, the composition of the group remained unchanged. In the "anticipated membership change" condition, the group members were warned prior to the training phase that one of them (not identified) would leave and would be replaced by someone who had trained with another group. In the "unanticipated membership change" condition, the group members did not receive this warning. In the two experimental conditions, the membership change occurred in the middle of the performance phase.

Measures

Performance. As in previous transactive memory studies using an "Assembly-Task paradigm" (Liang et al., 1995), we used an operational group performance measure, namely

assembly error. A ratio was calculated as follows: number of incorrectly placed or forgotten pieces / number of correct pieces. A higher score indicated worse group performance.

Transactive Memory System. We recorded each group during the training phase and coded the transactive memory system using Liang et al. 's coding scheme (1995). Two judges examined the videotapes individually and gave an overall rating of the group on expertise specialization, credibility and coordination. Due to a recording problem, two groups were discarded. The judges rated each group on a 7-point scale. A higher rating indicated a highly developed transactive memory. To check reliability, intraclass correlations (ICC) were computed. These were satisfactory, ranging from .80 for transactive memory system ($p < .0001$), .76 for expertise specialization ($p < .0001$), .57 for credibility ($p < .001$), and .84 for coordination ($p < .0001$).

Control Variables. Familiarity between group members, participants' gender and familiarity with Meccano tasks were checked in a post-test questionnaire. The results revealed no significant relationships between these control variables and the dependent variables, so we did not analyse their influence further. One group was removed from the analysis on the error ratio, as their score deviated from the mean value by more than three times the standard deviation.

RESULTS

Due to some students withdrawing, six groups were composed of two participants. Because of the non-independence of observations in a triad, our analyses were run at the group level (N= 32).

Effect of Anticipated vs. Unanticipated Membership Change on Transactive Memory and Group Performance

We tested our mediation hypothesis using a bootstrapping analysis [1]. As the independent variable was categorical with three modes, we followed the recommendations of Hayes and Preacher (2014). We created two dummy-coded variables. In the first (D1), the anticipated membership change condition was coded +1, and in the second (D2), the unanticipated membership change condition was coded +1. The no membership change condition was coded 0 in the two dummy-coded variables.

Anticipated Membership Change Condition. The analysis yielded no direct effect of the anticipated membership change on the error ratio, $b = .17$, $t = .47$, *ns* (Figure 1). Next, anticipated membership change had a negative effect on transactive memory, $b = -1.15$, $t = -2.53$, $p = .01$. As predicted, the groups with an anticipated membership change developed less transactive memory than the other groups. In line with the classical main effect reported in the literature, transactive memory had a negative effect on the error ratio, $b = -.40$, $t = -2.96$, $p = .007$. Groups with a high level of transactive memory were more efficient. Finally, in line with our hypothesis, the anticipated membership change hindered development of transactive memory and indirectly impaired group performance, $b = 0.46$,

bootSE = .22, BCa CI [0.12, 1.01]. The confidence interval excluded zero, indicating a significant indirect effect, and therefore mediation.

Unanticipated Membership Change Condition. The analysis indicated no direct effect of the unanticipated membership change on transactive memory, b = -.59, t = -1.29, *ns*, or on the error ratio, b = -.002, t = -.01, *ns*. In addition, the unanticipated membership change had no indirect effect on group performance via transactive memory, b = 0.23, bootSE = .16, BCa CI [0.00, 0.64].

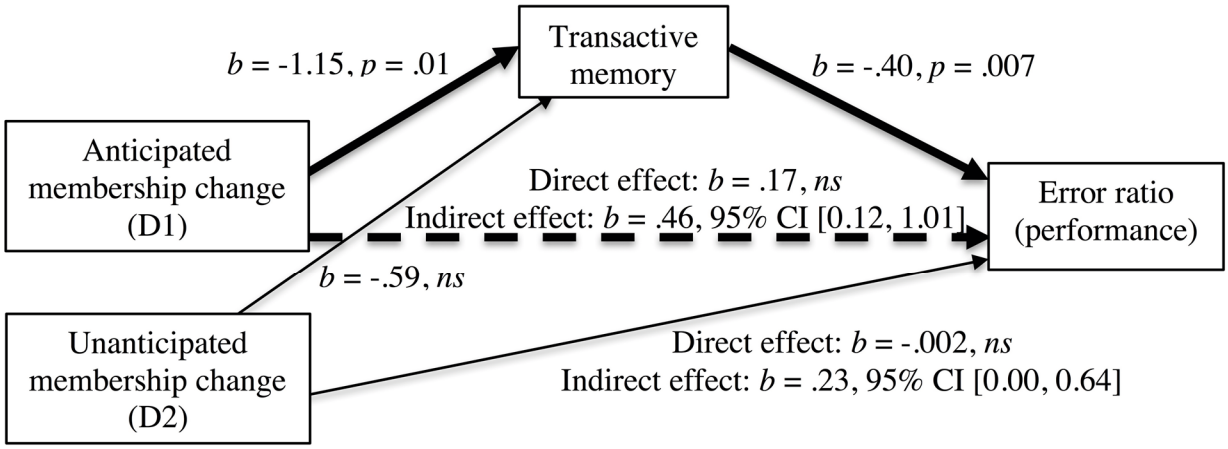

Figure 1. Impact of membership change, either anticipated or not, on the error ratio via transactive memory.

Effect of Anticipated vs. Unanticipated Membership Change on the Specialization Component and Group Performance

This mediating effect only appeared with the specialization component of transactive memory, and not with the credibility and coordination components. Only significant results are presented.

Anticipated Membership Change Condition. The analysis yielded no direct effect of the anticipated membership change on the error ratio, b = .17, t = .47, *ns.* Anticipated membership change had a negative effect on group specialization, b = -1.16, t = -2.67, p = .01. The groups with an anticipated membership change were less specialized than the other groups. Moreover, specialization had a negative effect on the error ratio, b = -.44, t = 3.24, p = .003. Specialized groups were more efficient. Finally, the anticipated membership change hindered group specialization and indirectly affected collective performance, b = 0.51, bootSE = .26, BCa CI [0.15, 1.23].

Unanticipated Membership Change Condition. The analysis indicated no effect of the unanticipated membership change on group specialization, b = -.36, t = -.83, *ns*, or on the error ratio, b = -.002, t = -.007, *ns*. The unanticipated membership change had no indirect

effect on group performance via specialization, $b = 0.16$, bootSE = .16, BCa CI [-0.07, 0.59].

DISCUSSION

The aim of the present study was to examine the impact of anticipated membership change on transactive memory and group performance. We expected that the anticipation of a membership change would have a greater negative effect on group performance than an unanticipated change, due to the difficulty of building up transactive memory at the start of collaboration.

Our findings confirmed this hypothesis. We found the mediating role of transactive memory - observed during the training phase - in the relationship between the anticipated/unanticipated membership change and group performance. The anticipated membership change hindered group performance by interfering with transactive memory. This mediating effect was observed only with the specialization component of transactive memory. The anticipated membership change inhibited the team's efficacy, due to the difficulty of specializing during the information encoding phase. When they are aware of a future membership change, group members do not specialize at the start of the collaboration, preferring to learn all the information about the assembly task. As pointed out by Moreland and Argote (2003), the members of these groups prefer to learn as much as possible about the task, given the uncertainty of relying on the expertise of co-workers who may leave.

The lack of mediation effect with credibility and coordination can be explained by the initial conceptualization of transactive memory (Wegner, 1986). Specialization is the first manifestation of transactive memory and is set up during the encoding phase, while the credibility and expertise coordination components develop later. Group members first find out "who knows what" (i.e., the collective awareness of the distribution of expertise) before developing effective coordination (i.e., who does what). This study shows that the anticipated membership change hinders specialization within groups, leading to difficulty in establishing expertise credibility and coordination.

Finally, this study shows that unanticipated membership change has no effect on transactive memory or group performance. With no awareness of a future membership change, the groups act in the same way as the group in the no membership change condition. Overall, our results complete those of Lewis et al. (2007). Whereas a partial and unanticipated membership change allows the development of transactive memory, which becomes inefficient after the group's reconfiguration, a partial and anticipated membership change hinders specialization within the group and impedes the development of transactive memory from the information encoding phase.

From a practical perspective, future research should investigate how the negative effect of anticipated membership change can be avoided. It would be fruitful to focus on communication skills, for example the assertiveness of group members, as the

communication of information facilitated by assertiveness promotes group specialization (Pearsall & Ellis, 2006), which is precisely what anticipated membership change hinders.

Our experiment involved groups of undergraduate students working together for a short time. Further studies should expand these experimental results to real work teams. Another limit comes from our sample which included only six groups of men. Our findings should be replicated with more male participants. Finally, we analysed the dynamics of groups who lost only one initial member and received only one newcomer. Other types of membership change exist, which should be investigated in future research, for example, changes in role within teams.

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ENDNOTES

[1] Following the Hayes' recommendations (2009), we didn't report the Sobel test for the mediation analysis. It's not necessary to report the results of both methods (i.e., bootstrapping and Sobel Test).

APPENDIX A

Table 1. Means, Standard Deviations and Correlations among Variables

Variables	*N*	*M*	*SD*	1.	2.	3.	4.
1. Conditions	31	2.16	.78	-			
2. Error ratio (performance)	31	1.10	.54	.16	-		
3. Transactive memory	29	13.21	4.73	-.17	-.50**	-	
4. Expertise specialization	29	4,31	1.93	-.08	-.53**	.91**	-

Note. ** $p < .01$.

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