Crossover of engagement in groups

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Abstract

Purpose – The purpose of this paper is to extend the current knowledge on psychological contagion and crossover by investigating the crossover of task-specific engagement (a positive, fulfilling state of mind) among group members. The paper also examines whether this crossover process is reinforced by strong group cohesion or by higher a priori levels of task engagement of the most engaged group member.

Design/methodology/approach – The authors operationalized crossover as within-group convergence on individual engagement over time. The authors studied this process in 43 newly formed groups performing a dynamic, interactive building task under controlled laboratory conditions, allowing the authors to observe the crossover process from a "zero" point, before any mutual influences had occurred.

Findings – Group member engagement scores indeed converged over time, supporting the proposed crossover effect of engagement, especially when the most engaged group member was highly engaged at the beginning of the group task. Unexpectedly, the explanatory role of group cohesion was not convincingly supported; the crossover of engagement was no stronger in groups with high cohesion.

Practical implications – These findings show that task-specific engagement is indeed transferred among group members, particularly when the most engaged group member is highly engaged.

Originality/value – Previous studies on psychological contagion and crossover were mainly focused on dyadic relationships and specific emotions or impaired well-being. The findings add to this literature by addressing the crossover of engagement – a more complex, beneficial psychological state – among group members and provide new input for developing and sustaining engagement in and of groups.

Keywords Team working, Work engagement, Crossover, Emotional contagion, Groups

Paper type Research paper

Our personal experiences are interwoven with the experiences of the people we interact with. Without even realizing it, we pass on our psychological states to those around us and are, in turn, affected by theirs. This process of interpersonal transference of psychological states has become known as emotional contagion or crossover. Emotional contagion reflects "the tendency to automatically mimic and synchronize expressions, vocalizations, postures, and movements with those of another person, and, consequently, to converge emotionally" (Hatfield *et al.*, 1994, p. 5). Basically, in this process, an emotion that is expressed by one individual is perceived by another and then transferred through a rapid, automatic process of mimicry and feedback that elicits a similar emotion in the interaction partner.

Extending this original view, researchers have demonstrated that people can also "catch" each other's psychological states in a more conscious way, by purposely tuning into their emotions and experiences (Bakker *et al.*, 2009; Barsade, 2002; Hsee *et al.*, 1990). Barsade (2002), for example, described this more conscious transfer in terms of social comparison processes, in which people interpret and use others' emotions as a social indication of how they should feel and act. Consistent with previous works (e.g. Bakker and Xanthopoulou, 2009; Song *et al.*, 2008; Westman, 2001), we use the label of "crossover" to denote this broader conception of the contagion process that comprises unconscious, automatic transfer mechanisms as well as conscious, more deliberate mechanisms, and that has been applied to basic emotions as well as to more complex psychological states.

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Much of the contagion and crossover research was focused on the dyadic crossover of psychological states, for example, between partners in spousal relationships (e.g. Bakker and Demerouti, 2009) or in leader-member interactions (e.g. Bono and Ilies, 2006). However, extending this dyadic perspective, scholars have argued that the transfer of psychological states also occurs in work groups. Studies on emotional contagion in groups show that emotions are indeed transferred among group members, that this process results in emotional convergence, and that it affects group behavior (e.g. Barsade, 2002; Bartel and Saavedra, 2000; Totterdell *et al.*, 1998). Similarly, studies on crossover in groups indicate that strain and burnout are transferred among group members (e.g. Bakker *et al.*, 2005; Westman *et al.*, 2011).

These studies yielded valuable insights into the crossover of positive and negative emotions and of impaired well-being in groups. The potential crossover of more complex beneficial psychological states among group members and the explanatory mechanisms of crossover in groups, however, remain largely unaddressed. With the current study, we therefore aim to extend previous research to the crossover of engagement in groups. Engagement reflects a positive, fulfilling state of mind, characterized by vigor, dedication, and absorption (Bakker, 2011) that has been linked to enhanced health, creativity, proactive behavior, and performance (Christian *et al.*, 2011; Demerouti and Cropanzano, 2010). Moreover, at the group level, collective engagement has been linked to group effectiveness (Costa *et al.*, 2014). In light of these benefits, it is important that we gain more insight into the occurrence of crossover of engagement in groups and the underlying explanatory mechanisms. By addressing this issue, we aim to extend current knowledge on the occurrence of crossover in groups, gain insight into the interpersonal effects of engagement, and identify conditions that may promote or inhibit the transfer of engagement among group members. In terms of practical relevance, our findings may help identify new opportunities for promoting engagement in and of groups.

To investigate crossover, we use an experimental design with newly formed groups. This approach complements the field study design that characterizes most previous studies on crossover with an important advantage: it allows observation of the crossover process from a "zero" point, before interaction or mutual influences among group members have occurred. This excludes many confounding factors that are difficult or even impossible to control in existing organizational work groups. Such factors include attraction-selection-attrition processes that are a major determinant of psychological convergence among group members (cf. George, 1990), as well as long-established interaction patterns or long-lasting shared exposure to contextual influences. To enhance the ecological validity of our study, we designed the group task to reflect key characteristics of group work in organizations, including task interdependence, shared goals, and intensive interaction (e.g. Mathieu *et al.*, 2008).

Crossover of engagement in groups

Although engagement was initially defined as an enduring, work-related affective-motivational state, subsequent research demonstrated that engagement can fluctuate from day to day and from task to task (Bakker, 2014; Sonnentag, 2003). Our current focus is on task-specific engagement, as the groups in our study work on a specific task over a limited period of time. As an active, positive psychological state, engagement may be particularly prone to be transferred among group members. Engagement is characterized by observable expressions that can easily be "caught" by others. Such expressions include an active alert posture, gesturing, talking fast, a positive open attitude, and a strong task focus. Engaged employees are often described as proactive, optimistic, and proud of their work. Bakker *et al.* (2006) suggest that these features yield a positive spiral of success that is communicated to others. These others might subsequently "catch" and internalize the high level of engagement through mimicry of facial expressions of enthusiasm and commitment as well as through

conscious processing of expressions of engagement that are displayed in conversations and other encounters. The findings of Tims *et al.* (2012) suggest that one's work engagement is indeed visible and observable to others, showing a strong correlation between self and other ratings of engagement. Moreover, previous findings suggest that active, positive psychological states such as engagement are transferred more easily than more passive or negative psychological states (Bartel and Saavedra, 2000; Westman *et al.*, 2013). Based on their study on group moods, Bartel and Saavedra (2000), for example, concluded that group members are more attuned to and can more accurately observe and interpret high-energy moods than low-energy moods. They attribute this to the more pronounced and dynamic expressions involved in high-energy moods, while lower-energy moods are expressed in a more subtle, constrained manner.

Previous research does provide some evidence for the idea that engagement is contagious. Bakker and Demerouti (2009) demonstrated that work engagement crosses over from women to men, especially when those men are high in perspective taking. Similarly, Bakker and Xanthopoulou (2009) demonstrated that engagement may be transferred among coworker dyads. Finally, in the only previous study on the crossover of engagement in teams, Bakker *et al.* (2006) showed that team-level work engagement is related to individual team-member work engagement, after controlling for individual working conditions. Building on this line of work, we expect that crossover of engagement among group members will occur. Crossover implies that, over time, group members become more similar in terms of their individual engagement levels. We therefore operationalize crossover in terms of convergence and predict that group members' levels of individual task engagement will converge during the group task:

H1. Group members' levels of individual task-specific engagement will converge over time, such that their engagement levels will be more similar after (vs before) the group task.

Previous studies demonstrated that the occurrence of crossover is contingent upon the intensity of the interaction among those involved (Bakker and Schaufeli, 2000; Bakker and Xanthopoulou, 2009; Hakanen *et al.*, 2014; Totterdell *et al.*, 2004). Bakker and Xanthopoulou (2009), for example, showed that engagement crossed over among employee dyads only on days on which the employees communicated more frequently than usual. We therefore used a highly interdependent group task that requires intensive interaction among group members.

The role of cohesion and the most engaged group member

Previous studies identified several factors that may affect the interpersonal transference of psychological states. Most of these factors relate to the ability to "infect" others or to the extent to which one is susceptible to emotional contagion (cf. Hatfield *et al.*, 1994). Factors that have been proposed to influence the ability to infect others include status and the pleasantness of the expressed emotion (e.g. Barsade, 2002; Bartel and Saavedra, 2000; Hatfield *et al.*, 1994; Westman *et al.*, 2013). Factors that have been proposed to affect susceptibility to emotional contagion include empathy, emotional intelligence, general susceptibility to emotions, and emotional regulation strategies (e.g. Bakker *et al.*, 2007; Hatfield *et al.*, 1994; Rempala, 2013; Westman *et al.*, 2013). In the present study, we extend this literature by examining factors that are specific to the group setting, focusing on group cohesion and the role of the most engaged group member.

Cohesion reflects "the resultant forces which are acting on the members to stay in a group" (Festinger, 1950, p. 274). The members of cohesive groups feel more connected, are more sensitive to each other, and are more likely to show pro-social behavior compared to members of less cohesive groups. In addition, cohesive groups tend to develop shared norms and expect members to adhere to these norms (Hackman, 1992; Kidwell *et al.*, 1997).

As a result, the members of cohesive groups tend to be more sensitive to social, affective, and cognitive cues that are displayed by other members and that may help them infer how they should feel, think, and act in the group. Such an environment may be expected to promote verbal and nonverbal mimicry, resulting in unconscious, primitive contagion, and encourage members to actively tune into each other's psychological states, resulting in more deliberate, conscious contagion. Previous research provides some support for this role of group cohesion. Bartel and Saavedra (2000), for example, found that social cohesion was positively related to mood convergence in groups. Similarly, Westman *et al.* (2011) found that cohesion promoted the transfer of exhaustion from the team to the individual members. We propose a similar effect of cohesion on the crossover of engagement in groups, such that the members of cohesive groups are more likely to "catch" each other's engagement compared to groups that are less cohesive:

H2. Group cohesion will affect the crossover of engagement in groups, such that within-group convergence on individual task-specific engagement will be stronger when group cohesion is high as compared to low.

So far, we have discussed crossover in groups without addressing the nature of group members' individual contributions to the crossover process. The general assumption in the literature on crossover in groups appears to be that all group members contribute equally to the crossover process. This perspective is in line with the more general tendency in group research to examine global group characteristics rather than group members' unique individual contributions. In other words, group research focuses more on the "sum" than on the "parts" (Li *et al.*, 2015; Mathieu *et al.*, 2008). Li *et al.* (2015) argue that this approach disregards the fact that individual members can differ considerably in terms of their influence on group processes and outcomes and call for attention for the potential disproportionate influence of special group members. Their focus is on "extra milers;" operationalized as those team members who display the most helping behaviors or voice. In a similar vein, we argue that specific individual group members may dominate the crossover process and that this is most likely to be the most highly engaged group member.

Above, we argued that engagement may be especially prone to crossover because active, positive states have been shown to take precedence over more passive and negative states in crossover processes. In addition, it has been proposed and demonstrated that expressiveness or intensity affects the likelihood and strength of crossover (e.g. Härtel and Page, 2009; Hatfield *et al.*, 1994; Wild *et al.*, 2001). Interestingly, if positive, active states are indeed more likely to cross over, crossover of engagement should be more pronounced at higher than at lower levels of engagement. After all, the observable expressions of engagement are salient only at relatively high levels of engagement. Individuals who are less engaged are characterized by more neutral expressions that are less intense and hence are more difficult to detect, observe, communicate, and "catch." We therefore propose that crossover of engagement in groups is most likely to be initiated and carried by the most engaged member. We predict that the more engaged this member is, the stronger the crossover process will be:

H3. The engagement level of the most engaged group member will affect the crossover of engagement in groups, such that within-group convergence on individual task-specific engagement will be stronger when this member is more engaged.

Method

Participants and procedure

Our sample included 43 student groups of three members each. The average age was 21.24 years (SD = 2.94) and 66 percent of the participants was female. The majority of participants were

psychology students (71.3 percent) who participated in exchange for course credits. The remaining participants were students from other programs. The participants signed up for the experiment by filling out an online survey that asked for informed consent, background information, and availability. Based on their availability, the participants were assigned to groups and invited to a lab session. They were told they would participate in a LEGO-building task but received no further information.

The experimental procedure included a warm-up "playing-with-LEGO" task, a baseline pre-task measure of individual engagement, a cohesion manipulation, the LEGO-building group task, and a post-task survey. Upon arrival in the lab, the participants were welcomed by the experimenter who accompanied them to the experiment room. The far end of the room featured three computer desks. A table with chairs was placed in the middle of the room. On the table were a 60×60 cm LEGO floor plate and 450 LEGO bricks of different sizes and colors. The participants were asked to take a seat at the table and were instructed about the warm-up task. This warm-up task was designed to allow a baseline measure of individual engagement that was task-specific yet unaffected by the group experience. The participants were given seven minutes to each build their own LEGO-robot, after which each participant took place at a computer desk and filled out the baseline individual engagement measure.

Next, we manipulated group cohesion. Groups were randomly assigned to the low- or high-cohesion condition. In the low-cohesion condition (22 groups), each participant was instructed to create an individual, personal logo that would symbolize three characteristics representing their uniqueness. In the high-cohesion condition (21 groups), the participants were instructed to collectively design a team logo that would symbolize three characteristics they had in common. They worked on these logos for five minutes after which they returned to their computer desk.

The computer screens now displayed instructions for the LEGO-building group task. The groups were instructed to build a LEGO house. The instructions explained the building rules and listed the building features that groups could choose to incorporate into their house. After reading the instructions, the participants worked together for 30 minutes to build a single house of LEGO bricks. This building task was designed to reflect key teamwork characteristics. Group members had shared goals, were interdependent, and needed to communicate intensively to get the task done. Finally, the participants completed the post-task survey, after which they were thanked and debriefed.

Measures

Individual task-specific engagement. The identical pre-task and post-task individual engagement measures were based on the 17-item Utrecht Work Engagement Scale (Schaufeli and Bakker, 2003). The pre-task measure was administered after the warm-up task when the participants had not yet been informed about the group task. The post-task measure was administered directly after the LEGO-building task. Items were adjusted to fit the LEGO-building task. Three items were removed because they seemed irrelevant to the current task (e.g. "When I get up in the morning, I feel like going to work"), resulting in a 14-item scale. Items were answered on a seven-point scale, ranging from (1) never to (7) all the time. For the engagement scale as a whole, pre-task and post-task α were both 0.96. Four items reflect vigor (e.g. "While building with LEGO, I felt bursting with energy"), four items reflect dedication (e.g. "Building with LEGO inspired me"), and the remaining six items reflect absorption (e.g. "Time flew when I was building with LEGO"). The three dimensions were strongly related (pre-task: average $r = 0.84$; post-task: average $r = 0.78$) and exploratory principal component analyses produced clear one-factor solutions. Therefore, we only report results for overall engagement.

Manipulation check. To verify that the participants had understood and remembered the instructions that we delivered to manipulate cohesion, we asked them to indicate whether they had created an individual or a team logo.

Analyses

We operationalized crossover as the convergence of group members' individual engagement levels. Convergence is reflected by a reduction in the differences in individual engagement among group members from pre-task to post-task. As a measure of within-group differences, we used the within-group SD of individual engagement for each group ($n = 43$), supplemented with ICC(1)-values (Bryk and Raudenbush, 1982). A significant reduction in within-group *SD* would indicate that group member responses were more similar after as compared to before the group task, demonstrating convergence. ICC(1) is commonly interpreted as the proportion of variance that is explained by group membership. An increase in ICC(1) from pre-task to post-task would indicate convergence.

To test *H2* and *H3*, we regressed the difference between pre-task and post-task SD of individual engagement on cohesion and on the maximum engagement score. This gain-score approach is fully equivalent to a repeated-measures approach with within-group SD of individual engagement as within factor (see, e.g. Anderson *et al.*, 1980). Our approach, however, has the advantage that it allows the inclusion of a continuous predictor (maximum engagement) and enables us to include control variables when testing *H3*. To assess the role of the most engaged group member (maximum score), we controlled for the partial group mean score on pre-task engagement (i.e. the mean group score excluding the maximum score; cf. Li *et al.*, 2015). This provides a test of the influence of the highest-scoring group member above and beyond the combined impact of the other members' pre-task engagement levels. Finally, the convergence score was computed as pretest within-group *SD* minus posttest within-group SD of individual engagement. Higher convergence scores are thus indicative of a stronger reduction in within-group differences in engagement, suggesting more crossover.

Results

Table I displays the descriptive statistics and the correlations among all variables.

Main crossover effect

H1 predicted crossover of individual engagement, reflected by within-group convergence. The average within-group SD of the individual engagement scores indeed decreased from 1.15 to 0.99. This decrease, however, was only marginally significant; $t(42) = 1.71$, $p = 0.094$. Inspection of ICC(1)-values did suggest a substantial overall increase in the proportion of variance explained by group membership from pre-task; ICC(1) = 0.05; $F(86,42) = 1.174$,

	Mean	SD	1	2	3	4	5	6
(1) Cohesion condition (0 = low; 1 = high)	na	na	–					
(2) Pre-task within-group SD engagement	1.15	0.55	−0.18	–				
(3) Post-task within-group SD engagement	0.99	0.57	−0.33*	0.44**	–			
(4) Pre-task partial group mean engagement	3.18	0.83	0.07	−0.15	−0.26***	–		
(5) Pre-task maximum engagement score	4.81	1.00	−0.17	0.62**	0.24	0.60**	–	
(6) Within-group engagement convergence[a]	0.82	0.79	−0.02	0.04	0.21	0.29***	0.27***	–

Notes: $n = 43$ groups. [a]The convergence score was computed as pretest within-group SD minus posttest within-group SD on individual engagement, such that higher scores reflect stronger convergence. *$p < 0.05$; **$p < 0.01$; ***$p < 0.10$

Table I. Descriptives and correlations

$p = 0.263$; to post-task; ICC(1) = 0.25; $F(86,42) = 1.982$, $p < 0.01$. Given the marginally significant *t*-test we cautiously conclude that, together, these findings provide tentative support for *H1*.

The role of cohesion and the most engaged group member

H2 concerned the explanatory effect of cohesion in the crossover process. We first examined the manipulation check. The results confirmed that participants had understood and remembered the cohesion instructions. In the high-cohesion condition, all participants correctly indicated they had been asked to design a team logo. In the low-cohesion condition, three participants (4.50 percent) mistakenly indicated that they had been asked to design a team logo. These three participants belonged to different groups. The remaining 63 participants correctly indicated they had been asked to create an individual logo. To test *H2*, we conducted a regression analysis with cohesion condition as predictor of within-group convergence on individual engagement. As can be seen in Table II (Step 1), the cohesion manipulation was not significantly related to within-group convergence on engagement ($\beta = 0.15$, $p = 0.327$). Notably, the cohesion manipulation was significantly related to the post-task within-team standard deviation on task engagement (see Table I: $r = -0.33$, $p < 0.05$). As such, after the task, groups in the high-cohesion condition were more similar in terms of task engagement compared to the groups in the low-cohesion condition, while there was no significant difference before groups started the task work. In addition, when the pre-task partial mean engagement score and the maximum engagement score were taken into account (Table II, Step 3), the regression weight for condition became marginally significant in the proposed direction ($\beta = 0.26$, $p = 0.088$). It is possible that the isolated main effect of the cohesion manipulation on within-group convergence on engagement did not reach significance due to subtle pre-task differences between conditions on engagement mean scores and within-team variances. Given the insignificant main effect, however, we conclude that these *post hoc* results fail to offer convincing support for *H2*.

H3 concerned the role of the a priori level of task-specific engagement of the most engaged group member. To test this hypothesis, we conducted a regression analysis with the pre-task maximum engagement score as the predictor of within-group convergence on individual engagement, controlling for cohesion condition and the partial pre-task mean engagement score (i.e. the group mean excluding the maximum score). As can be seen in Table II (Step 3), the pre-task maximum engagement score was indeed positively related to within-group convergence on individual engagement ($\beta = 0.53$, $p = 0.007$). This finding supports *H3*: the higher the pre-task engagement level of the most engaged group member, the stronger the crossover effect. To follow up, we examined the change

Table II.
Regression results for cohesion and maximum engagement as predictors of crossover

Predictors ↓	Within-group convergence on individual engagement (β)[a] Step 1	Step 2	Step 3
Cohesion condition (0 = low; 1 = high)	0.15	0.15	0.26***
Pre-task engagement partial group mean		0.11	−0.22
Pre-task engagement max score			0.53**
R^2	0.02	0.04	0.20
F (df)	0.99 (1,41)	0.72 (2,40)	3.31* (3,39)
ΔR^2		0.01	0.17
F-change		0.47	8.24**

Notes: $n = 43$ groups. [a]The convergence score was computed as pretest within-group SD minus posttest within-group SD on individual engagement, such that higher scores reflect stronger convergence. *$p < 0.05$; **$p < 0.01$; ***$p < 0.10$ (two-tailed)

in within-group *SD* separately for groups with a relatively high and a relatively low maximum engagement score. When the most engaged member scored above the median (> 4.86) at the pre-task engagement measure, the within-group SD of engagement decreased significantly from pre-task to post-task; $t(21) = 2.298$, $p < 0.05$. When the most engaged member scored below the median (< 4.86), however, there was a small, non-significant increase in within-group SD; $t(21) = -0.259$, $p = 0.798$. As such, group members converged in terms of their engagement levels only when the most engaged group member was highly engaged.

Discussion

With this study, we aimed to extend the current knowledge on psychological crossover and contagion by examining the crossover of task-specific engagement in newly formed groups under controlled conditions. This approach allowed us to observe the crossover process from a "zero" point, before any interaction or mutual influences had occurred. In ongoing groups that share a common history, psychological convergence or similarity can also be caused by, for example, attraction-selection-attrition processes, long-established interaction patterns, or common exposure to the same contextual influences. In the current study, groups had no common history that could confound potential crossover effects.

Crossover of engagement in groups

Our results provided tentative support for a main crossover effect of task-specific engagement among group members. The level of a priori, pre-task engagement of the most engaged group member affected this crossover process. The more engaged he or she was, the more similar the group members became in terms of their individual engagement. Follow-up analyses suggested that a significant crossover effect occurred only when the most engaged group member displayed high levels of a priori task engagement.

To date, much of the contagion and crossover research has focused on the transfer of basic emotions or adverse psychological states, and mostly in dyadic interactions. Our findings extend this body of research to the crossover of task-specific engagement in groups, a more complex, positive task-related psychological state. Moreover, in line with Barsade's (2002) seminal findings on emotional contagion in small, newly formed groups in the laboratory, our results suggest that crossover of engagement can occur even within a short time span and in ad hoc groups. Furthermore, we identified the most engaged group member as a driving force in the crossover of engagement in groups. When this group member is highly engaged, he or she may be able to motivate and energize the entire group. When the most engaged member is, however, less engaged, the group may lack the impulse that is needed to set the crossover process in motion. This finding supports the idea that a single member can exert a disproportional, unique influence on the group as a whole and underlines the importance of examining the influence of key members on group processes and outcomes (cf. Li *et al.*, 2015). It would be interesting for future research to examine the potential role of individual group members in the crossover process in more detail. In addition to examining the maximum score, future studies could look at more complex conceptualizations to examine the bottom-up influence of specific individual group members on the crossover process. A promising though highly demanding approach is offered by the social network perspective (cf. Humphrey and Aime, 2014; Li *et al.*, 2015). Such an approach would allow a more detailed scrutiny of the exact distribution of group member scores and their relative impact on the crossover process.

The role of cohesion was not convincingly supported. This was surprising, as previous research on crossover did link cohesion to crossover effects. Bartel and Saavedra (2000)

found that groups were more likely to show mood convergence when social interdependence increased, and Westman *et al.* (2011) found that cohesion promoted the crossover of exhaustion. Although these findings did not relate to engagement, it seems likely that cohesion will also facilitate crossover of engagement. Individuals in cohesive groups feel connected, identify with each other and with the group, and are more likely to engage in frequent interaction and information exchange (e.g. Hackman, 1992; Kidwell *et al.*, 1997). These factors may be expected to promote mutual influences among group members and result in faster and stronger psychological convergence.

Interestingly, *post hoc* inspection of our findings did show that, upon task completion, groups in the high-cohesion condition were more homogeneous in terms of engagement compared to the groups in the low-cohesion condition. What is more, when the pre-task partial mean engagement score and maximum engagement score were controlled for, the proposed difference in terms of crossover between conditions did materialize (albeit marginally significant). Given the convincing arguments for the role of cohesion in the crossover process as well as the *post hoc* observations that do seem to offer some support for an effect of cohesion, we tentatively conclude that the lack of direct support in our study may be due to subtle a priori (i.e. pre-task) differences between conditions in mean engagement scores and within-group variance and/or other methodological issues. Given the random assignment of groups to conditions, such pre-task differences reflect random fluctuations that occurred before any manipulation took place. This issue could be addressed by replicating and extending the current findings in a larger sample of groups, as the larger sample size should help balance out such random pre-task differences between conditions.

The nature of the cohesion manipulation could offer another potential explanation for the lack of convincing support for the role of cohesion. Although previous studies did apply similar manipulations (e.g. Turner *et al.*, 1992; Zaccaro and Lowe, 1988), the manipulation effect in the present study may have been reduced by the fact that most groups enjoyed working on the LEGO task. This collective enjoyment may have weakened the manipulation, resulting in overall high levels of group cohesion. In general, we would recommend that future studies include more extensive manipulation checks, including, for example, a survey measure to capture actual levels of cohesiveness as experienced by the team members. Ideally, to allow an unbiased check of the initial effect of the manipulation, such measures would be administered after the manipulation, but before the group starts the collective task work (cf. Zaccaro and McCoy, 1988). It is well possible that cohesion mainly affects the onset and strength of the crossover process early on. At later stages of the group work, the collective task enjoyment and upward engagement spiral might start overruling the original cohesion manipulation, making it hard to detect in a post-task survey measure of group cohesion. More generally, implementing an effective cohesion manipulation for groups working on experimental tasks that are interdependent and enjoyable may be a more general challenge. As such, future research on the role of cohesion in the crossover of engagement could consider using a measure of natural fluctuations in cohesion across groups rather than an experimental manipulation. Given the potential confounding of perceptions of cohesion and the crossover process that we discussed above, such a perceptual measure should also be administered before or at early stages of the group work.

Limitations and future directions

In addition to the lack of support for the explanatory role of cohesion, our study did have some other limitations. Our reliance on ad hoc student groups limits the direct generalizability of our findings to groups and teams in organizational settings.

We chose the rigor of a controlled laboratory setting to optimize the likelihood of capturing actual crossover effects and to exclude the confounding factors that abound in applied settings (e.g. attraction-selection-attrition processes, shared history, shared leadership, organizational culture, and past and ongoing convergence processes). Leading scholars have argued and demonstrated that engagement levels can be task-specific and can change within short time frames (Bakker, 2014; Sonnentag, 2003) and previous studies have successfully examined engagement in experimental settings (e.g. Ouweneel *et al.*, 2013; Vera *et al.*, 2014). In addition, studies on crossover and contagion in general show that psychological states are transmitted rapidly and that psychological convergence among group members does occur in experimental settings and within short time frames (e.g. Barsade, 2002; Cherulnik *et al.*, 2001). However, the groups worked together for a limited time span and were not embedded in a larger organizational system, as would be the case in organizational work groups. Our conclusions are restricted to this setting and we cannot rule out the possibility that crossover of engagement operates differently in organizational work groups. If this is the case, however, we would expect crossover to be more salient in work groups compared to the ad hoc groups. Organizational work group members experience more frequent and intense interpersonal exposure and will generally be more committed to the group and its task. This setting likely reinforces both the primitive, automatized processes and the more deliberate social comparison mechanisms that underlie the crossover effect. Nevertheless, future studies could consider different methodological approaches. Additional experimental work would be well-suited to further explore the mechanisms underlying crossover in groups. To enhance applied insight and ecological validity, we also call for field studies based, for example, on a quasi-experimental approach in which the crossover of engagement and/or contingency factors are manipulated to exclude potential confounding influences.

Finally, we focused solely on the crossover process itself, examining whether engagement is transferred among group members and to what extent this process is affected by the group setting. Although this focus reflects a novel perspective that complements and extends previous research, a next step would be to investigate the subsequent outcomes of the crossover process. Only few previous studies examined the potential outcomes of contagion and crossover in general. Barsade (2002) found that group members who experience positive emotional contagion report improved cooperation, less conflict, and increased performance. Moreover, Bakker and Xanthopoulou (2009) found positive effects of crossover on daily in-role performance. These are promising results that should be explored in more detail in future studies.

Implications and conclusion

Extending current insights in the interpersonal transference of psychological states, we demonstrated that group members catch each other's engagement, especially when the most engaged group member is highly engaged. This convergence effect coincided with a considerable increase in group members' individual task engagement. Individual work engagement has been linked to a range of performance indicators (Christian *et al.*, 2011; Demerouti and Cropanzano, 2010). Moreover, compared to less engaged individuals, highly engaged individuals are better able to craft their task environment to fit their needs, which may in turn sustain or further enhance their engagement levels (Bakker, 2011; Tims *et al.*, 2012). Crossover of engagement among group members may thus result in gain spirals at both the individual and group level, with higher levels of engagement resulting in more favorable working conditions that, in turn, foster sustained engagement.

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