Crossover of engagement in teams

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Abstract

The aim of the study was to investigate crossover of engagement within teams in an experimental setting. Using a 2x1 pre-posttest design, we examined the occurrence of crossover by analyzing the convergence of team members’ engagement over time. In addition, we tested the moderating effects of team cohesion, team members’ susceptibility to emotional contagion and empathy on the crossover process, and the effect of crossover on team performance. Thirty-three teams composed of three students participated in LEGO building experiment. The results show that engagement crossover occurred within teams. In particular, team members’ vigor and absorption converged during the task. Among the examined moderators, team members’ susceptibility to emotional contagion moderated the crossover engagement, particularly the absorption dimension. However, this was not true for team cohesion or team members’ empathy. Also, we did not find support for the proposed links between engagement and team performance. Results suggest that engagement crossover occurs within teams and that emotional contagion might play an important role in this process.

Key words

Team, engagement, crossover, emotional contagion
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In the present-day competitive world of work, high performance is what matters most. Companies search not only for talented employees, but also for the ones who are willing to engage their potential in their jobs to the fullest in order to reach and even exceed performance standards. To be competitive, contemporary organizations need employees who invest personal energy in their work, who are proactive and committed to high quality performance – employees who are engaged in their work. In addition, in order to confront the increasing competition in the work world, companies have been transforming their organizational structure. As teams enable more rapid, flexible and adaptive responses to work challenges than individuals, the team has become the basic building block of many organizations. Teams have become the strategy of choice when task complexity exceeds the capacity of an individual, when the task environment is ambiguous and stressful, when multiple and quick decisions are needed, and in other complex workplace situations (Salas, Cooke, & Rosen, 2008).

These ongoing changes in the world of work have captured the attention of researchers and are reflected by new research paradigms. Lately, the recognition that positive subjective experience is linked to a wide range of beneficial organizational outcomes has encouraged the research of positive phenomena, one of which is work engagement (Bakker & Schaufeli, 2008). Further, the ongoing transformation in work structure from more traditional ways of working to teamwork has been reflected by research interest in team processes and their connection to team effectiveness (e.g., Ilgen, Hollenbeck, Johnson, & Jundt, 2005; Marks, Mathieu, & Zaccaro, 2001). Recently, these lines of research have drawn attention to social aspects of positive subjective states of mind in organizational settings. It has been shown that individuals’ experiences at work are interwoven with the experiences of those they interact
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with. The research on this subject has been led by the idea that an individuals’ positive orientation towards work transfers to their team colleagues and consequently beneficially affects their performance. For example, it has been shown that positive affect can be transferred among team members by a process of emotional contagion (e.g., Barsade, 2002; Sy, Côté, & Saavedra, 2005). In a similar vein, it has been demonstrated that crossover of work engagement occurs in teams (Bakker, Emmerik, & Euwema, 2006). Crossover of work engagement in teams is of central concern in the current study.

Despite preliminary support for the occurrence of engagement crossover in teams, conceptual understanding of this phenomenon is in its infancy. It has been examined in the field, but to the best of our knowledge, there are no accounts of studies of engagement crossover within teams under controlled conditions in the laboratory. The current understanding of crossover has mainly been supported by insights from emotional contagion research, which is a process that is similar but not identical to work engagement crossover. Since work engagement entails not only affective but also cognitive and behavioral components, further corroboration of the occurrence of engagement crossover is needed. Moreover, findings about crossover of burnout in teams (e.g. Westman, Bakker, Roziner, & Sonnentag, 2011) contributed to the understanding of the crossover of engagement, since these are related constructs (Schaufeli, Salanova, Gonzalez-Roma, & Bakker, 2002). However, even though engagement is considered to be the positive antithesis of burnout, these states are independent and qualitatively different experiences. Positive experiences and feelings are not merely the absence of stress (Fredrickson, 2001). As the mechanisms of crossover of these states might be dissimilar, evidence of burnout crossover mechanisms cannot be taken as evidence for the crossover of work engagement processes. On that account, precise examination of crossover of each of them is essential.

Therefore, the purpose of the present research is to extend the current insight into the process of the work engagement crossover phenomenon. We aim to broaden the findings
of previous laboratory research on emotional contagion within teams and field studies on work engagement and burnout crossover in teams. Our aim is to investigate the mechanisms of engagement crossover within teams in controlled conditions. With this work, we aim to extend previous research in several ways. Firstly, our study may yield a valuable addition to the literature on affective sharing in teams, as it examines a complex psychological state that encompasses not only affective components but also cognitive and behavioral elements. Secondly, we expand the findings of cross-sectional studies of engagement crossover by analyzing this phenomenon over short time periods. Investigating the process over time can provide a better insight into the dynamics of engagement transference. Thirdly, in contrast to most of the previous research on work engagement, we examine engagement in a specific short-term task. By examining engagement as a short-term experience, the current study contributes to the new direction of engagement research, which considers engagement as both a relatively stable “trait” and also a temporary “state”. Finally, we include team performance in our research design, which could yield important input for understanding the relationship between engagement and performance in teams.

Crossover of engagement

Work engagement is a positively oriented psychological construct that has recently attracted considerable attention in the domain of Work and Organizational Psychology. According to Schaufeli and colleagues (2002, p. 74) the concept of work engagement can be defined as “a positive, fulfilling work-related state of mind that is characterized by vigor, dedication, and absorption”. Vigor refers to levels of energy and mental resilience while working, the degree of willingness to invest effort in one’s work, and the extent of persistence in the face of difficulties. Absorption denotes the degree of engrossment in one’s work. It refers to the extent to which employees feel fascinated about their work and attached to their
tasks. Dedication describes the degree of one’s involvement in the work and sense of significance, enthusiasm, inspiration, pride, and challenge. Based on the Job Demands-Resources Model (JDR Model), Bakker and colleagues (e.g., Bakker, Schaufeli, Leiter, & Taris, 2008; Bakker, 2011) posit that work engagement results from high job and personal resources, especially in the presence of high job demands. Job resources, such as performance feedback, social support, and job control, are assumed to drive engagement through their motivational function. They prompt the occurrence of work engagement by promoting employees’ growth and development or encouraging their willingness to dedicate efforts to their work. In a similar way, work engagement is driven by positive self-evaluations and feelings of control that characterize personal resources, such as optimism, self-efficacy, self-esteem, and resilience. These job and personal resources gain their motivational potential and “act as a buffer” when employees experience high job demands, such as high workload, disadvantageous physical environment, or demanding work conditions.

Early research on crossover focused on inter-individual transmission of negative emotions and attitudes, including anxiety (Westman, Etzion, & Horovitz, 2004a), depression (Katz, Beach and Joiner, 1999), dissatisfaction (Westman, Vinokur, Hamilton, & Roziner, 2004b), and burnout (e.g. Bakker & Schaufeli, 2000; Bakker, Westman, & Schaufeli, 2007). Crossover has been referred to as a process by which the psychological strain of one person affects the strain of the other person (Westman, 2001). Lately, as Westman (2001) suggested to broaden the crossover definition into contagion of both positive and negative events and feelings, more attention has also been devoted to crossover of positive states, such as life satisfaction (Demerouti, Bakker, & Schaufeli, 2005), flow at work (Bakker, 2005), and work engagement (e.g. Bakker, Demerouti, & Schaufeli, 2005a). Accordingly, Bakker & Demerouti (2009) define crossover as “a dyadic, inter-individual transmission of wellbeing between closely related individuals that occurs within a particular domain such as the workplace or the family”.

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Crossover of engagement has initially been examined in the work-family interface. Research of Bakker and his colleagues provided evidence for the crossover of work engagement among partners. In the research of Bakker and colleagues (2005a), wives’ engagement (vigor and dedication) predicted their husbands’ levels of engagement (vigor and dedication) and vice versa, also after controlling for the influence of demands at work and home. In addition, the results of the study of Bakker and Demerouti (2009) showed a positive effect of wives’ work engagement on their husbands’ work engagement. In a similar vein, Westman, Etzion, and Chen (2009) investigated the crossover of positive experiences from business travelers to their working spouses and found a positive relationship between the vigor of business travelers and the vigor of their spouses.

Reasoning that a person’s psychological state affects the states of other people in any social system (Moos, 1984), has prompted expansion of the crossover research scope from couples to individuals who interact at their workplace. There has been considerable evidence for crossover of burnout at the workplace among work teams, such as nurses (Bakker, Le Blanc, & Schaufeli, 2005b), general practitioners (Bakker, Schaufeli, Sixma, & Bosveld, 2001), teachers (Bakker et al., 2007; Bakker & Schaufeli, 2000), constabulary officers (Bakker et al., 2006), soldiers (Bakker et al., 2007), and employees of an employment agency (Westman et al., 2011).

On the other hand, research of work engagement crossover at the workplace has been much less extensive. For example, Bakker and Xanthopoulou (2009) found that engagement transmits within dyads of work colleagues on the days when they interact more frequently than usual. Daily work engagement of an employee was affected by the interaction of the daily work engagement of his colleague and the frequency of daily communication between them. Researching crossover in work teams, Bakker and colleagues (2006) found that team-level work engagement was related to individual team members’ engagement, after controlling for individual members’ job demands and resources. Officers working in teams with
a relatively high number of engaged members were more engaged than the ones working in teams with non-engaged members. To the best of our knowledge, there is no other research that directly addresses the crossover of engagement within teams, which is the central topic of this research. However, as the process of sharing and spreading of work engagement within a team can be conceptualized as the collective construction of team mood (Baker et al., 2006), indirect support for engagement crossover can be found in the literature about team affect. We look into this topic in the following paragraphs.

**Mechanisms of engagement crossover**

Understanding of mechanisms that underpin work engagement crossover has been built on the understanding of team affect. In this context, affect has mainly been conceptualized broadly and inclusively as a “subjective feeling state” that can range from diffuse moods to intense emotions, therefore also encompassing work engagement. The team affect phenomenon has been established on the notion that team members develop mutually shared moods and emotions in the course of executing their tasks. George (1990, p. 108) supported this idea of team-level affective phenomena by showing that teams develop so-called affective tones – “consistent or homogeneous affective reactions within the team”.

There have been many attempts to explain the development of team affect. The most exhaustive explanation of the mechanisms that underpin the spread and sharing of affect in teams was presented by Barsade and Gibson (1998). They argued that both top-down and bottom-up approaches could be used to explain the formation of team affect. Through top-down accounts, higher-level context (such as team norms or team cohesion) imposes, amplifies or constrains the ways in which individual members experience and express their emotions. In addition, by complementary bottom-up processes, individual moods and emotions are spread and composed into team-level affective phenomena.
Kelly and Barsade (2001) further explored the mechanisms of team affect development, presented in the model of Barsade and Gibson (1998). They proposed that “bottom-up” processes consist of two types of emotional sharing processes – implicit and explicit. Implicit processes include automatic transfer of affect among team members, whereas explicit processes depict deliberate attempts to influence the affect of co-members. They mention emotional contagion as one of the implicit emotional sharing processes. Emotional contagion refers to the processes of “catching” the emotions of others by subconscious mimicking and synchronizing of facial expressions, vocalizations, postures and movements (Hatfield, Cacioppo, & Rapson, 1994). As another example of implicit emotional convergence processes they list vicarious affective experience, which depicts experiencing emotions through the imagination of feelings or actions of another person.

In point of fact, based on the team affect literature, Bakker and colleagues (2006) proposed these processes of emotional contagion and empathic “tuning in” as the main mechanisms of engagement crossover. They suggested that a person’s engagement can be unconsciously perceived and automatically transferred to another person through the processes of emotional contagion. In addition, they proposed that engagement can also cross over through more cognitively effortful process of imagining how one would feel in the position of other. Westman (2001) regarded the latter as the process of emphatic crossover. Considering two suggested mechanism of engagement crossover, Bakker and colleagues (2006) argued that the vigor and absorption dimensions of work engagement seem to be candidates for unconscious emotional contagion. Vigor and absorption are expressed in a visible way through facial expressions, postures, and movements, which can be spontaneously mimicked. On the other hand, attitudinal component of work engagement – dedication – would be most likely to cross over in conscious way through emphatic processing of others’ pride, feelings of challenge, or sense of significance.
However, in addition to emotional contagion and empathic “tuning in”, Bakker and colleagues (2006) mentioned the third way of engagement crossover. They argued that team members might experience the same level of engagement due to similar responses to shared events. In their opinion this case does not count as a “true” crossover, since engagement is not transferred from one member to another but results from their common experience of job resources in a shared environment.

Research in naturalistic settings and in the laboratory supported the aforementioned affective team processes for positive affective states, which has been interpreted as indirect support for engagement crossover. Evidence for emotional contagion has been found in various studies. For example, in experimental studies, emotions of team members were influenced by emotions of the other team members (Barsade, 2002) or by the team leader (Sy et al., 2005). Support for the link between individuals’ affective state and affect of their team members (Ilies, Wagner, & Morgeson, 2007), or leader (Bono & Ilies, 2006) was also found in the field studies. In addition, several studies found evidence for mood convergence within teams. For example, collective team mood convergence was found to occur within nurse and accountant work teams (Totterdell, Kellet, Teuchmann, & Briner, 1998), or professional cricket teams, controlling for the team’s status in the game (Totterdell, 2000). In a broader study of work teams from different organizational contexts, mood convergence occurred across all dimensions of the affective circumplex – including high and low activation affect, and pleasant and unpleasant moods (Bartel & Saavedra, 2000).

Together, these diverse findings suggest that individual members’ positive affective states influence affective states of their team co-members in such a way that affective states converge. As engagement can be described as a positive affective state, these findings suggest that team members’ engagement will converge over time. Intuitively, it might be expected that team members’ engagement might converge toward the highest individual level of engagement within the team. High-intensity affective displays (such as engagement) might be
more dominant than low-intensity affects and therefore more influential in the context of crossover. However, research into the role of affect intensity on team affective processes does not support this reasoning. For example, Barsade (2002) found that emotional contagion was not affected by the energy level with which emotion was expressed. Also, in the research of Bartel and Saavedra (2000), different categories of individuals' moods converged, including the low activation ones. Thus, as affect-intensity does not seem to be a relevant factor in affective convergence process, we believe that the engagement crossover is best operationalized in terms of a simple convergence model.

In the present study, we examine the engagement crossover within ad hoc formed teams, whose task is to build a house from LEGO bricks. Based on the findings of affective convergence in teams and some demonstrations of crossover of engagement in teams, we expect that the levels of individual members’ engagement in playing with LEGO bricks would converge during their mutual task. Thus, we predict the following:

**Hypothesis 1**: Crossover of engagement among team members will occur. Team members’ engagement (vigor, absorption, and dedication) will converge during the task, so there will be smaller differences in team members’ engagement (vigor, absorption, and dedication) after the task than before the task.

**Moderators of engagement crossover**

Bakker, Westman, and Van Emmerik (2009) list some possible moderators of crossover effects. In their “illustrative rather than exhaustive” review they mention factors on the individual level such as empathy, susceptibility to emotions, similarity with others; factors on the dyadic level, for example frequency of exchanging views; and team-level factors such as climate. As the circumstances under which people should be likely to catch others’ emotions,
Hatfield et al. (1994) mention close attention to others and perception of interrelatedness. In a broad study of work teams Bartel and Saavedra (2000) found support for the idea that a team’s social system features, such as task and social interdependence, membership stability, and mood regulation norms, moderate the convergence of mood in teams.

In our study, we focus on two individual factors and one team-level factor that might moderate the crossover of engagement. We believe that examining the role of susceptibility to emotional contagion and empathy in crossover is important, since it contributes to understanding whether emotional contagion and empathic tuning-in indeed are the main mechanisms of engagement crossover. Bearing in mind that top-down mechanisms have also been proposed to play an important role in crossover, we chose to examine cohesion as the third possible moderator.

**Cohesion**

Cohesion is defined as “the resultant forces acting on the members to stay in the team” (Festinger, 1950, p. 274). Cohesion has been recognized as a multidimensional construct, encompassing factors such as attachment to the group (interpersonal attractiveness), shared commitment to the task (task commitment), and shared importance of being a group member (group pride) (Beal, Cohen, Burke, & McLendon, 2003; Mullen & Copper, 1994). In cohesive teams members tend to have frequent, intense, and close interactions, and are therefore influenced by those with whom they interact (Burt, 1987). Similarly, Griffith (2002) reasoned that cohesion affects team processes such as sharing information and cooperative interactions. Based on this perspective, Roberson and Colquitt (2005) argued that contagion in teams operates through cohesion processes.

In a similar vein, Walter and Bruch (2008) proposed that high quality of interpersonal relationships within a work team promotes affective sharing, thus increasing the
team’s level of positive affective similarity. They built their explanation on the fact that high quality interpersonal relationships are characterized by open affective expressions among team members (Dutton & Heaphy, 2003), which may constitute a crucial prerequisite for the occurrence of affective sharing. Moreover, trust, liking and mutual socio-emotional support, which represent good relationships, enhance the attentiveness shown between team members for affective expressions (Dutton & Heaphy, 2003), and strengthen team members’ motivation to empathize with others (Nelson, Klein, & Irvin, 2003), all contributing to the development of affective similarity within the team.

Indeed, affective convergence has accordingly been shown to be particularly pronounced for cohesive work teams (Bartel & Saavedra, 2000), and for individuals who share positive relations with other team members (Totterdell et al., 1998). Also, in a burnout crossover study Westman and colleagues (2011) found crossover of emotional exhaustion (the core characteristics of burnout) from team to individual members only in highly cohesive teams. Hence, the following is proposed:

**Hypothesis 2:** Crossover of engagement within teams will be moderated by team cohesion. There will be higher (vs. lower) convergence of team members’ engagement (vigor, absorption, and dedication) during the task in highly (vs. lowly) cohesive teams.

**Susceptibility to emotional contagion**

If emotional contagion is responsible (at least in part) for the crossover process, it follows that individual differences in susceptibility to emotional contagion should moderate the strength of the crossover. Susceptibility to others’ emotions has been proposed as an individual difference that influences the extent to which “emotional stimuli elicit an emotional
expression characteristics of the eliciting emotion” (Doherty, 1997, p. 134). In other words, susceptibility to emotional contagion affects the degree to which people are affected by the emotional expressions and affective states of others. Härtel and Page (2009) suggest that people may be more susceptible to emotional crossover due to their cognitions that intensify their emotional reaction to stimuli (e.g. their colleagues’ emotions).

Indeed, in the research of affective linkages within teams, Ilies and colleagues (2007) found that an individual team member’s affect is more strongly related to the average affective state of the other team members for those high in susceptibility to emotional contagion. This was true for both positive and negative affect. Moreover, research of burnout crossover supports the suggestion that individual susceptibility to emotional contagion moderates the crossover of burnout. Bakker and Schaufeli (2000) found that burnout contagion between teachers was more pronounced if teachers were more susceptible to emotional contagion. Also, in the research of burnout contagion among general practitioners, doctors who were susceptible to the emotions expressed by their colleagues reported the highest emotional exhaustion (Bakker et al., 2001).

Of course, processes of burnout crossover cannot be equated with those of work engagement crossover. However, as emotional contagion is regarded as one of the main mechanisms of work engagement crossover, it seems reasonable to assume that susceptibility to emotional contagion also plays an important role in the transmission of the positive antithesis of burnout. Therefore, we predict:

**Hypothesis 3:** Crossover of engagement within teams will be moderated by susceptibility to emotional contagion of team members. There will be higher (vs. lower) convergence of team members’ engagement (vigor, absorption, and dedication) during the task in teams with higher (vs. lower) average susceptibility to emotional contagion.
Empathy

According to Starcevic and Piontek (1997), empathy represents interpersonal communication that is predominantly emotional in nature. As one of the essential attributes of empathy they mention the ability to be affected by another’s affective state and ability to recognize in oneself what that affect has been. Similarly, Lazarus (1991, p. 287) defines empathy as “sharing another’s feelings by placing oneself psychologically in that person’s circumstances”. On the other hand, social learning theorists emphasize cognitive processes of empathic reactions (e.g., Bandura, 2001). According to that view, experiencing others’ feelings results from conscious processing of the other’s experience and imagining how one would feel in that position. Capturing cognitive and emotional aspects of empathy, Davis (1983) regards empathy as entailing social perspective-taking, imaginative self-involvement, and emotional responsiveness.

As empathy quite explicitly entails a component of emotion sharing, it has been proposed as one of the core underlying mechanisms of crossover (e.g. Westman, 2001). Bakker and Demerouti (2009) argued that the perspective-taking and emotional concern components of empathy might be important moderators of engagement crossover. As perspective-taking entails “the spontaneous tendency of a person to adopt the psychological perspective of other people” (Davis, 1983, p. 169), it might reinforce crossover through a process of cognitive attunement. On the other hand, empathic concern – “an individual’s tendency to experience feelings of warmth, compassion, and concern for others” (Davis, 1983, p. 169) – might influence crossover by emotional responsivity to others’ engagement. Indeed, Bakker and Demerouti (2009) showed that husbands’ emphatic perspective-taking moderates the crossover of work engagement to their wives. Accordingly, we predict that the cognitive and emotional aspects of empathy will also play important roles in engagement crossover within teams. We anticipate the following:
Hypothesis 4: Crossover of engagement within team will be moderated by team members’ empathy. There will be higher (vs. lower) convergence of team members’ engagement (vigor, absorption, and dedication) during the task in teams with higher (vs. lower) average empathy (perspective-taking, empathic concern).

Engagement crossover and performance

Engaged individuals approach their tasks with a sense of self-investment, energy, and passion, which translates to high performance (Kahn, 1990). Several studies have shown that work engagement is positively related to performance on an individual level (see Demerouti & Cropanzano, 2010). A positive relationship between work engagement and individual in-role performance, extra-role performance and innovativeness has been empirically supported (e.g. Schaufeli, Taris, & Bakker, 2006). Furthermore, it has been shown that work engagement predicts performance in shorter time frames – on a daily (Xanthopoulou, Bakker, Demerouti, & Schaufeli, 2009) and weekly basis (Bakker & Bal, 2010). Demerouti and Cropanzano (2010) suggested that vigor (energy, cognitive and emotional liveliness) is the engagement dimension that is most crucial for performance.

Indirect support for the connection of individual engagement and performance also comes from the affect literature. Experiencing positive emotions is supposed to prompt novel, inventive, and creative thought and behavior patterns (Fredrickson, 1998, 2001), stimulate employees’ action (Damen, 2007), and therefore positively affect performance. Positive affect has been shown to relate to a range of performance-related behaviors, including enhanced creativity, better cognitive processing, more efficient decision making, greater cooperation, and the use of more successful negotiation strategies (e.g., Forgas, 1998; Staw & Barsade, 1993).
Team performance on an interdependent task results from the combined effort of team members. Based on the aforementioned findings about the individual engagement – performance link, it is therefore plausible to expect that teams composed of engaged members perform better than teams with non-engaged members. Even though the research into the relationship between engagement and performance in a team context is scarce, there is some evidence that supports our reasoning. For example, team engagement was positively related to the supervisor’s view on team performance (Torrente, Salanova, Llorens, & Schaufeli, 2012). Moreover, the research of engagement crossover in co-worker dyads has shown that an individual’s engagement positively affects other employees’ performance (Bakker & Xanthopoulou, 2009). Furthermore, previous studies provide some indication that employee engagement promotes the development of team-level constructs, service climate for example, that positively affect performance (Salanova, Agut, & Peiró, 2005).

Indirect indications of a positive relationship between team members’ engagement and performance also come from the affect literature. For example, feeling positive affect has consistently been shown to lead to more helpful, cooperative and prosocial behavior at the workplace (George & Brief, 1992), which might promote team social processes and consequently performance. The research has indeed shown that positive affect in teams is related to performance on an individual and team level. For example, happy mood of teammates positively correlated with individual performance in sport teams (Totterdell, 2000). Also, positive affectivity in teams was related to beneficial team processes, such as cooperation, coordination, or low conflict (Barsade, Ward, Turner, & Sonnenfeld, 2000; Barsade, 2002; Sy et al., 2005). In addition, teams with an increase in positive moods perceived themselves as performing better (Barsade, 2002).

The findings described above suggest a positive relationship between engagement or positive affectivity and performance in teams. However, the literature suggests that not only the valence of affect but also affective diversity in teams might influence team
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Barsade and colleagues (2000) argued that affectively homogeneous teams experience greater cooperation and less conflict, and perform better than affectively heterogeneous teams. The results of their study partially supported the idea of an interaction effect of valence and diversity of affect on team performance. They found that teams with high positive affectivity showed high levels of cooperation and low levels of conflict, regardless of affective diversity. However, among the teams that were low on positive affect, the homogeneous ones showed better team processes than the heterogeneous ones. Reasoning about the beneficial effect of affective similarity has been put forward also by Walter and Bruch (2008). In their so-called “positive team affect spiral” model they propose that affective similarity and within-team relationship quality are reciprocally interrelated in a form of self-reinforcing spiral. In their view, affective sharing leads to team affective similarity, which - due to the similarity-attraction principle - increases the quality of relationship among team members. Further, good relationships strengthen affective sharing and result in greater affective similarity, which then continues this spiraling relationship. Building on this reasoning and literature on beneficial effects of positive team affect, it would be plausible to anticipate that, through upward spirals, positive affective similarity leads to high performance. This would imply that the combination of positivity and similarity of affect in teams promotes team performance.

Taken together, empirical findings show that an individuals’ engagement positively affects their performance and the performance of their colleagues, even in short time periods, which is relevant for our study. Furthermore, it has been shown that positive affect in teams is positively linked to individual and team performance. Based on this we would expect a positive relationship between engagement and performance in teams. In addition, it has been suggested that affective similarity is to some extent positively related to performance. As we operationalize crossover as convergence of engagement, we would expect that teams with
more similar engagement scores after the task perform better than teams with less similar engagement scores after the task. Taken together, we expect the following:

**Hypothesis 5:** After the task, team member’s engagement (vigor, absorption, and dedication) similarity will interact with team engagement (vigor, absorption, and dedication) in predicting team performance, such that teams with greater similarity in members’ engagement combined with higher team engagement will perform better than teams with smaller similarity in members’ engagement and lower team engagement after the task.
Method

Participants

Ninety-nine students of a university in the Netherlands participated in the study, who received credit points for participation. The sample consisted of 31 males and 68 females. On average the participants were 21.12 years old ($SD = 3.22$). Ninety-three percent of the sample represented psychology students and 97 percent were of Dutch nationality.

The participants were assigned to 33 teams based on their availability for specific time slots. The teams were composed of three members. Relating to the sex distribution, the majority of the teams was mixed, 27.3 percent were female-only and three percent were male-only. Relating to the familiarity among the team members, in 81.8 percent of teams at least one member indicated that he had worked with at least one of the co-members prior to the experiment, and in 36.4 percent of teams at least one member indicated that he regularly meets at least one of the co-members.

Research design

We used an experimental design in this study. The experiment was a 2x1 pre-posttest design, with team cohesion as the between-subject factor and time as the within-subject factor. Teams were randomly assigned to one of two experimental conditions. Eighteen teams participated in the low cohesion (LC) condition and 15 teams in the high cohesion (HC) condition. The dependent variable was team-level engagement, which was measured at two times. In addition, team performance as another dependent variable was measured at the end of the experiment.
Procedure

An overview of the procedure is presented in Figure 1. A detailed description of each of the steps is provided in the text below.

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<td>⇒ Empathy scales</td>
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<td>⇒ Experience with LEGO</td>
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<td><strong>Experiment session</strong></td>
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<td>3. Engagement manipulation</td>
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*Figure 1.* Overview of the procedure. Text in italics represents the measures taken at each step.

**Pre-experiment session**

Before the experiment session the participants filled in an online questionnaire, which included demographic questions, questions about their experience with teamwork and playing with the LEGO bricks, and the empathy and the susceptibility to emotional contagion scales. In an online form participants also indicated their availability for the actual experiment.
session. Based on this information, they were contacted by the experiment leaders to schedule an appointment for the experiment session.

*Experiment session*

Participants arrived at the experimental session knowing that they would participate in an experiment involving building with LEGO bricks. They were asked to sit at the table, on which there was a pile of the LEGO bricks. In order to not impose the sitting arrangement of the team members, there were four chairs at the table, two at each side, and participants were free to choose their own seats.

The experiment was composed of four parts: a warm-up “playing with LEGO bricks” activity, the team cohesion manipulation, the engagement manipulation, and the main LEGO building task. The whole experiment session was video-recorded.

1. **LEGO warm-up activity**

   In the beginning of the experiment, participants were given a task to individually build a simple robot from the LEGO bricks put in the middle of the table. The purpose of this warm-up activity was to give the participants the opportunity to experience LEGO building before the actual task. Having the experience with LEGO building enabled them to report their base level of engagement in LEGO building, which was the next step in the experiment. Hence, after the individual warm-up, the participants randomly took a place at one of the three computers placed in the same lab, and individually filled in the pre-task engagement scale.

2. **Team cohesion manipulation**

   Next, the cohesion manipulation took place. Three components of team cohesion (Beal et al., 2003) can be manipulated: interpersonal attraction, task commitment and team
pride. Our research focused only on interpersonal attraction as task cohesion might overlap with engagement.

Cohesion was manipulated through a task of creating a logo. The participants in the low cohesion condition received the instructions for the cohesion manipulation task individually on the computer, whereas the ones in the high cohesion condition gathered at the table and received one hard copy of the instruction together. In the LC condition, team members were asked to think of three characteristics that represent their uniqueness, and individually create a personal logo symbolizing these characteristics. In the HC condition, team members thought of three characteristics that they have in common and collectively designed a team logo that symbolized that. The task lasted for 5 minutes; a notice was given 2 minutes before the end.

3. Engagement manipulation

After the logo creation the participants were asked to read the instructions for the next task – the LEGO building task – individually on the computer. The task of the team was to build a house with the LEGO bricks. The instructions explained the building rules and listed the house features that would yield points. The performance criteria were incompatible and mutually exclusive, so the team would have to decide which house elements to build in order to get as many points as possible.

The instructions were also used to induce differences in engagement among the group members. Engagement of one of the team members was manipulated in order to make one participant a little more engaged and create more diversity in the teams. One member received the instructions to be really enthusiastic, act vigorously, and be immersed in the task. Furthermore, the instructions for the manipulated team member were written in an enthusiastic way, with catchy positive sentences added (e.g., “Can you feel the energy? Of course, LEGO rock!”). Also, a photo of a team building with LEGO bricks in an engaged manner
was added to the instructions. The other two team members received neutral instructions accompanied by a photo of a team building with LEGO bricks in a neutral way, showing no specific affect. The complete instructions are displayed in Appendix A.

4. **LEGO building task**

Once all participants had individually read the instructions on the computers, they gathered at the table and began the LEGO building task. They received a hard copy of the neutral instructions for this task with the list of performance criteria, which they could look at during the building. Material that they could use for the building included 450 LEGO bricks of different sizes and colors and a LEGO plate (size 60 × 60). Teams were given 30 minutes for this building task; a notice was given 15 and 5 minutes before the end.

After the task, participants were asked to individually complete a questionnaire on a computer, which included the same engagement items they rated in the beginning of the experiment (the post-task engagement scale). Besides, the questionnaire also included the manipulation-check items. In addition, participants were also asked to what extent they knew their fellow team members before the experiment. After the participants individually completed the questionnaire, they were asked to fill in the team engagement questionnaire, the team cohesion questionnaire (and some other questions not included in the current study) together with their co-members.

At the end of experiment the participants were thanked for their participation and asked for permission to save the video-recordings of the experimental session.

After the participants left, the experiment leader assessed the house that was built by the team, based on the performance criteria. In addition, the product was precisely captured using a camera in order to assess performance later if needed.
I. Toni

Crossover of engagement in teams

Measures

Engagement

Engagement was measured with the Dutch version of the Utrecht Work Engagement Scale (UWES; Schaufeli, 2006), which is a scientifically derived and validated measure of work engagement. However, as UWES is designed to measure work engagement in the field, some adjustments were made. In order to measure the participants’ engagement in the LEGO building task, the phrases related to the work situation (e.g., “at my work”) in the scale items were converted into phrases relating to the task (e.g., “while building with LEGO bricks”), in a similar way that has been done in previous studies (e.g., Salanova, Llorens, Cifre, Martínez, & Schaufeli, 2003). Furthermore, items that describe emotions or attitudes that take a longer time to develop (e.g., pride – “I am proud of the work that I do.”) and were therefore not relevant for a short 30-minute task, were excluded from the scale.

The adjusted engagement questionnaire consisted of 14 items that describe particular feelings experienced when building with LEGO bricks. Three dimensions of engagement were assessed – vigor and dedication with four items, and absorption with six. Example items are: “While building with LEGO bricks, I felt bursting with energy.” (Vigor), “Time flew when I was building with LEGO bricks.” (Absorption), and “Building with the LEGO bricks inspired me.” (Dedication). Participants rated how often they felt this way on a 7-points scale from 0 (never) to 6 (always). Internal reliability of the adjusted scales ranged from .86 to .94 (Cronbach’s $\alpha_{\text{Pre-task Vigor}} = .86$; Cronbach’s $\alpha_{\text{Post-task Vigor}} = .91$; Cronbach’s $\alpha_{\text{Pre-task Absorption}} = .92$; Cronbach’s $\alpha_{\text{Post-task Absorption}} = .94$; Cronbach’s $\alpha_{\text{Pre-task Dedication}} = .87$; Cronbach’s $\alpha_{\text{Post-task Dedication}} = .87$).

In addition to the measurement of individual engagement, team engagement was also assessed by the team format of the scale. The questionnaire was adjusted from individual to team referent, in a similar way to that which has been done in previous studies (e.g.,
I. Toni

Crossover of engagement in teams

Llorens, Schaufeli, Bakker, & Salanova, 2007; Salanova, Llorens, Cifre, Martinez, & Schaufeli, 2003; Torrente et al., 2012). Team members together rated how often they experienced particular feelings while building with LEGO bricks. Internal reliability of the team-level scales ranged from .76 to .89 (Cronbach’s α_{Team Vigor} = .87; Cronbach’s α_{Team Absorption} = .89; Cronbach’s α_{Team Dedication} = .76).

Susceptibility to emotional contagion

We used a Dutch translation of the Emotional Contagion scale (Stiff, Dillard, Somera, Kim, & Sleight, 1988) to assess susceptibility to emotional contagion. The scale includes seven items measuring the tendency to experience the affect of other people as a result of observing their display of emotions (Cronbach’s α = .70). The scale includes items such as: “I tend to lose control when I am bringing bad news to people”. Items were rated on a 5-point scale ranging from 1 (completely disagree) to 5 (completely agree).

Empathy

Empathy was assessed using two scales from the Interpersonal Reactivity Index (Davis, 1980), translated into Dutch. We chose to use Davis’s perspective-taking and empathic concern sub-scales as they have already been used in previous research of engagement crossover by Bakker and Demerouti (2009). The empathic concern sub-scale includes seven items measuring the tendency to feel compassion and concern for others. A sample item is: “When I see someone being taken advantage of, I feel kind of protective toward them.” (Cronbach’s α = .79). The perspective-taking sub-scale includes seven items measuring the tendency to adopt the perspective of others and see things from their point of view (Cronbach’s α = .67). A sample item is: “I believe there are two sides to every question and try
to look at them both”. All items were rated on a 5-point scale that ranged from 1 (completely disagree) to 5 (completely agree).

Team performance

The experiment leader scored the houses that the teams built on ten criteria at the end of the experiment session. Points were given for the surface, height, roof, number of rooms, windows, doors, window-/door-frames, stairs, and features that were built from the same color bricks. In addition, points were subtracted if the building rules were not followed or a house element was only half built. The total team performance was reflected in the sum of the points. In case the experiment leader was not confident in the accuracy of his scoring, she consulted his co-researchers.

Background information

Experience with LEGO bricks

We assessed experience with LEGO bricks with five items, measuring engagement related feelings, attitudes and behaviors experienced when playing with LEGO bricks in the past (Cronbach’s α = .88). An example item is: “When I played with LEGO bricks, I forgot everything around me”. Items were rated on a 5-point scale ranging from 1 (completely disagree) to 5 (completely agree), including a “non-applicable” option.

Experience with teamwork

We assessed experience with teamwork using two items – “I have experience with working in a team outside my studying activities” and “I like to work in a team”. We asked the
participants to indicate their agreement with the items on a 5-point scale ranging from 1 (completely disagree) to 5 (completely agree).

**Familiarity with the co-members**

Familiarity with co-members was checked with two items. We asked the participants with how many co-members they regularly meet and how many had they worked with prior to the experiment.

**Manipulation check**

**Team cohesion**

The effectiveness of the cohesion manipulation was checked with a direct manipulation check question about the logo creation task. At the end of the experiment, the participants were asked to indicate whether they had created an individual or a team logo. In addition, for the purposes of the manipulation check an adjusted version of Classroom Cohesion Questionnaire (Rosenfeld & Gilbert, 1989) was used (Cronbach’s α = .86). As the shared experience of team cohesion was measured, the referent was changed from individual to team. One of the eight items is: “There was a feeling of unity and cohesion in this team”. Participants responded on a 5-point response format ranging from 1 (completely disagree) to 5 (completely agree).

**Engagement**

The effectiveness of the engagement manipulation was checked with a direct-manipulation check question about the instructions for the LEGO building task. At the end of the experiment, the participants were asked whether the instructions included specific
manipulation elements. On a scale from 1 (*completely disagree*) to 5 (*completely agree*), participants rated items such as: “In the instructions for the LEGO building task it was mentioned that I should have fun”.

**Data analysis**

In order to analyze the data at the team level, we aggregated the data obtained on the individual level into team-level measures.

For the purpose of testing the engagement crossover hypothesis we combined the individual engagement scores into a within-team standard deviation score. We computed the population standard deviation of the engagement scores in each of the teams. By comparing within team standard deviations before and after the task, we could check the extent of individual scores’ convergence.

We also averaged susceptibility to emotional contagion, empathy, experience with teamwork, and experience with LEGO bricks in order to obtain team-level measures. Although researchers typically verify within-team agreement prior to aggregating measures to the team level (Van Mierlo, Vermunt, & Rutte, 2009), this is not required for the procedure we used. After all, we did not aggregate these measures with the aim to compose reliable and valid team-level constructs, but rather to create variables that provide an overall summary of team members’ individual scores.
Results

Descriptive statistics

Table 1 presents the means, standard deviations, and correlation coefficients for all variables included in the study. The table shows that the team-level engagement scores on different engagement dimensions are highly correlated among each other. Furthermore, the team-level scores on the different engagement dimensions before and after the task were also strongly related. This table also shows that performance scores are highly variable among teams.

Preliminary analysis

There was no difference between the LC and HC conditions in terms of average susceptibility to emotional contagion ($F(1, 31) = .173, p = .680$), average empathic concern ($F(1, 31) = 1.686, p = .204$), and average perspective-taking ($F(1, 31) = .035, p = .853$). Also, teams in the two conditions did not significantly differ in gender composition (percentage of male and female members; $F(1, 31) = 2.166, p = .151$). Furthermore, there was no difference between the two conditions in terms of familiarity of co-members prior to the experiment – teams in the two conditions did not significantly differ in the number of members that regularly meet with at least one fellow member ($F(1, 31) = .034, p = .854$), or in the number of members that had worked with at least one fellow member prior to the experiment ($F(1, 31) = .041, p = .841$). However, the results show that the participants in the HC condition reported higher enthusiasm for playing with the LEGO bricks in their youth than the participants in the LC condition ($F(1, 31) = 5.063, p = .032$). We can conclude that, as intended, the random assignment resulted in groups equivalent on the aforementioned characteristics with the
### Table 1
*Means, standard deviations, Cronbach’s α’s, and correlations between the team-level variables (N = 33)*

<table>
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<td>11 Experience with teamwork</td>
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<td>-.21</td>
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<td>.46**</td>
<td>.09</td>
<td>.19</td>
<td>.83**</td>
<td>.78**</td>
<td>(.76)</td>
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<td>-.09</td>
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<td>.53**</td>
<td>.40*</td>
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</table>

**Note.** EC = Emotional contagion. Cronbach’s α’s are displayed between parentheses on the diagonal (α’s are computed on the individual level for the variables 7 to 10 and on the team level for the variables 13 to 16).

**p < 0.01 level (2-tailed). * p < 0.05 level (2-tailed)**
exception of experience with LEGO bricks. As - in the contemporary view on ANOVA - statistically controlling for a-priori differences in groups is inappropriate and invalid (Miller & Chapman, 2001), we did not take the teams’ differences in experience with LEGO bricks into account when conducting our analysis. However, we address this issue in the discussion of the results.

**Manipulation check**

**Team cohesion**

At the end of the experiment we asked the participants whether they had been involved in the creation of an individual or a team logo during the experimental session. All participants in the HC condition reported that they created a team logo, which indeed was the manipulation task in this condition. Of all the participants in the LC condition, 96.3 % said they created an individual logo, which was the manipulation task in LC condition, and the rest reported they designed a team logo. Analysis confirmed that the answers about the manipulation task were not distributed randomly between two conditions ($\chi^2(21) = 91.277, p < .001$). However, teams in the two conditions did not differ in the level of cohesiveness measured at the end of the experiment ($F(1, 31) = .641, p = .429$). We can conclude that the manipulation procedure was understood as intended, however the manipulation did not result in a different level of team cohesiveness in two conditions.

**Engagement**

At the end of the experiment we asked the participants whether the instructions for the LEGO task instructed them to be engaged. The participants who read the HE instructions noticed that they were instructed “to forget everything around them” ($t(97) =
6.363, \( p < .001 \) and “to have fun” (\( t(97) = 7.099, \ p < .001 \)) (indicative of absorption and vigor, respectively) to a greater extent than the ones who read the neutral instructions. However, the participants with HE instructions did not perceive to be instructed “to accept the challenge” (indicative of dedication) more than the participants with the neutral instructions (\( t(97) = .732, \ p < .466 \)). Due to significant differences on items indicative of two engagement dimensions we can conclude that in general the participants understood and remembered the instructions, which were used for the manipulation.

**Hypotheses testing**

**Hypothesis 1**

Hypothesis 1 predicted that the team members’ engagement scores converge during the task. We operationalized convergence as a decrease in within-team SD on the engagement dimensions. We tested this hypothesis for each engagement dimension separately. We used repeated ANOVA with time as the within-subject factor and within-team SD of the engagement dimension as the dependent variable. In addition, we controlled for cohesion as a between-subject factor. A significant main effect of time (with differences in within-team SD in the expected direction) would support our hypothesis.

The results in Table 2 show that there was a significant main effect of time on within-team SD of vigor and absorption, but not on within-team SD of dedication. As seen in Figure 2, within-team SD of vigor and absorption decreased with time. However, this pattern is not seen for within-team SD on dedication. The results indicate that team members’ vigor and absorption scores significantly converged during the task. However, this was not true for team members’ dedication scores.
Table 2
* * 
Mixed ANOVA with within-team SD of engagement dimensions as dependent variables (N = 33 teams)

<table>
<thead>
<tr>
<th>Effect</th>
<th>Vigor</th>
<th>Absorption</th>
<th>Dedication</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>F(1, 31)</td>
<td>Partial η²</td>
<td>F(1, 31)</td>
</tr>
<tr>
<td>Time</td>
<td>5.284*</td>
<td>.146</td>
<td>4.778*</td>
</tr>
<tr>
<td>Time × cohesion</td>
<td>.052</td>
<td>.002</td>
<td>.109</td>
</tr>
<tr>
<td>Cohesion</td>
<td>10.502**</td>
<td>.253</td>
<td>1.610</td>
</tr>
</tbody>
</table>

** p < 0.01 level * p < 0.05 level

*Figure 2. Within-team SD of engagement before and after the task in two conditions (with 95% within-subject confidence intervals).
As a complementary test of the first hypothesis, we compared the intraclass correlation coefficients (ICC1) of individual team members’ engagement scores before and after the task. ICC1 was computed as a comparison of between-group and within-group variance of engagement, team in our experiment being the group variable and individual score of engagement dimension being the dependent variable. As ICC1 indicates the variance that is accounted for by group membership (Bliese, 2000), higher ICC1 scores would imply more similar engagement scores within the teams than between the teams. Therefore, higher ICC1 after the task than before the task would support our first hypothesis.

The results in Table 3 show that the ICC1-values after the task were higher than before the task for all engagement dimensions. This indicates that after the task there was a greater degree of similarity of individual vigor, absorption, and dedication scores within teams (relative to between-teams) than before the task. The difference in ICC1 before and after the task was the smallest for dedication. This indicates that the degree of similarity of individual dedication scores within teams increased to a lesser extent during the task than for vigor and absorption. In summary, these results mirror the results obtained with the repeated ANOVA, reported in Table 2.

Table 3
Intraclass correlation coefficients (ICC1) with individual scores of engagement before and after the task as the dependent variable

<table>
<thead>
<tr>
<th></th>
<th>Engagement dimension</th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Vigor</td>
<td>Absorption</td>
<td>Dedication</td>
</tr>
<tr>
<td>HC</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Before the task</td>
<td>.32*</td>
<td>.19</td>
<td>.30*</td>
<td></td>
</tr>
<tr>
<td>After the task</td>
<td>.51**</td>
<td>.45**</td>
<td>.38**</td>
<td></td>
</tr>
<tr>
<td>LC</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Before the task</td>
<td>.00</td>
<td>.01</td>
<td>.00</td>
<td></td>
</tr>
<tr>
<td>After the task</td>
<td>.12</td>
<td>.25*</td>
<td>.12</td>
<td></td>
</tr>
</tbody>
</table>

** p < 0.01 level * p < 0.05 level
Taking the repeated ANOVA and ICC1 analysis together, the results partially support our first hypothesis: Crossover of engagement occurred during the task for vigor and absorption dimensions, however the crossover of dedication was not significant.

**Hypothesis 2**

Hypothesis 2 predicted higher convergence of the team members’ engagement scores during the task for the teams in the high cohesion condition than for the ones in the low cohesion condition. This hypothesis was also tested for each engagement dimension separately. We used mixed ANOVA with time as the within-subject factor, cohesion as the between-subject factor, and within-team SD of the engagement dimension as the dependent variable. A significant interaction effect between time and cohesion (with differences in within-team SD in the expected direction) would support our hypothesis.

The results in Table 2 show that the interaction effect between cohesion and time on within-team SD of engagement dimensions was not significant. This indicates that the convergence of the team members’ vigor, absorption, or dedication did not significantly differ between low and high cohesion teams. Therefore, our second hypothesis was not supported: Crossover of engagement within teams was not significantly moderated by team cohesion.

We had no a-priori expectations about the main effect of cohesion on the within-team SD of engagement. However, it is interesting to note that the analysis showed a significant main effect of cohesion on the within-team SD of vigor and dedication. As seen in Figure 2, there was lower within-team SD on vigor and dedication in the high cohesion condition than in the low cohesion condition. This indicates that regardless of the time of measurement, there were smaller differences in team members’ vigor and dedication scores in the high cohesion condition than in the low cohesion condition. These results are also mirrored in the results of the ICC1 analysis. As seen in Table 3, there were generally lower ICC1
in the LC condition than in the HC condition. This indicates that regardless of the time of measurement, there was greater similarity of individual engagement scores within teams in HC condition than in LC condition.

**Hypothesis 3**

Hypothesis 3 predicted higher convergence of the team members’ engagement scores during the task for the teams with higher average susceptibility to emotional contagion than for the ones with lower average susceptibility to emotional contagion. The hypothesis was tested for each engagement dimension separately. We used the repeated ANCOVA with time as the within-subject factor, average susceptibility to emotional contagion as the covariate, and within-team SD of the engagement dimension as the dependent variable. A significant interaction effect between time and average susceptibility to emotional contagion (with differences in within-team SD in the expected direction) would support our hypothesis.

The results in Table 4 show that there was a significant interaction effect between time and average susceptibility to emotional contagion on the within-team SD of absorption, but not of vigor or dedication. As seen in Figure 5, the higher the average susceptibility to emotional contagion, the greater the difference between the pre-task and post-task within-team SD of absorption. That is, the higher the average susceptibility to emotional contagion, the greater the decrease of within-team SD of absorption during the task. This indicates that team members’ absorption scores converged more in the teams that were in average higher on susceptibility to emotional contagion than the ones lower on susceptibility to emotional contagion.
Table 4
Repeated ANCOVAs with within-team SD of engagement dimensions as dependent variables (N = 33 teams)

<table>
<thead>
<tr>
<th>Effect</th>
<th>Engagement dimension</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Vigor</td>
</tr>
<tr>
<td></td>
<td>F(1, 30) Partial $\eta^2$</td>
</tr>
<tr>
<td>Time × Susceptibility to EC</td>
<td>1.297 .032</td>
</tr>
<tr>
<td>Time × Emotional concern</td>
<td>.795 .026</td>
</tr>
<tr>
<td>Time × Perspective-taking</td>
<td>.485 .016</td>
</tr>
</tbody>
</table>

**p < 0.01 level * p < 0.05 level

Figure 3. Relationship between average susceptibility to emotional contagion and within-team SD of engagement dimensions before and after the task.
Even though the same pattern is seen in Figure 3 for the relationship between susceptibility to emotional contagion and within-team SD of vigor and dedication, the interaction effect was not significant for the other two engagement dimensions. Taken together, these results partially support our third hypothesis: Average susceptibility to emotional contagion significantly moderated the crossover of absorption, but not vigor or dedication.

**Hypothesis 4**

Hypothesis 4 predicted higher convergence of the team members’ engagement scores during the task for the teams with higher average empathy than for the ones with lower average empathy. We tested this hypothesis in the same way as hypothesis 3 – we used the repeated ANCOVA with time as the within-subject factor, average empathy scores (emotional concern and perspective-taking) as covariates, and within-team SD on engagement dimension as the dependent variable. A significant interaction effect between time and average empathy scores (with differences in within-team SD in the expected direction) would support our hypothesis.

The results in Table 4 show that the interaction effect between time and each of the two empathy scales on within-team SD of absorption was not significant. This indicates that there was no significant difference in the convergence of team members’ engagement scores among teams with different average empathy (emotional concern and perspective-taking). Therefore, our forth hypothesis was not supported: Crossover of engagement within teams was not significantly moderated by average empathy (emotional concern and perspective-taking) of team members.
**Hypothesis 5**

Hypothesis 5 predicted that teams with greater similarity in members’ engagement combined with higher team engagement after the task will perform better than the teams with smaller similarity in members’ engagement and lower team engagement after the task. The hypothesis was tested for each engagement dimension separately.

To test this hypothesis, we artificially divided the sample in two groups based on the within-team SD of the engagement dimension measured after the task. Using the median split we obtained two groups – one with high and one with low within-team SD of the engagement dimension. We compared these groups based on their team performance using ANCOVA, with within-team SD category (i.e., high/low) as the between-subject factor, post-task team-level engagement as the covariate, and team performance as the dependent variable. A significant interaction effect between the within-team SD category and team-level engagement (with differences in performance in the expected direction) would provide support for our hypothesis.

The results in Table 5 show that the interaction effect between the within-team SD of engagement (high/low) and post-task team engagement on performance was not significant. This indicates that the relationship between team engagement and team performance was the same in the two groups. That is, teams with a low within-team SD of engagement did not show a different relationship between team engagement and performance than groups with high within-team SD. Therefore, our fifth hypothesis was not supported: teams with greater similarity in members’ engagement combined with higher team engagement after the task did not perform better than the teams with smaller similarity in members’ engagement and lower team engagement after the task.
Table 5
*ANCOVA with team performance as the dependent variable (N = 33 teams)*

<table>
<thead>
<tr>
<th>Effect</th>
<th>Engagement dimension</th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Vigor</td>
<td>Absorption</td>
<td>Dedication</td>
</tr>
<tr>
<td></td>
<td></td>
<td>$F(1, 28)$</td>
<td>Partial $\eta^2$</td>
<td>$F(1, 28)$</td>
</tr>
<tr>
<td>Within-team SD of engagement</td>
<td>.002</td>
<td>.000</td>
<td>.511</td>
<td>.018</td>
</tr>
<tr>
<td>Team engagement</td>
<td>1.110</td>
<td>.038</td>
<td>.184</td>
<td>.007</td>
</tr>
<tr>
<td>Within-team SD of engagement x Team engagement</td>
<td>.057</td>
<td>.002</td>
<td>1.233</td>
<td>.042</td>
</tr>
<tr>
<td>Cohesion</td>
<td>1.241</td>
<td>.042</td>
<td>1.087</td>
<td>.037</td>
</tr>
</tbody>
</table>

*Note. Within-team SD of engagement = Low vs. high within-team SD of the engagement dimension.*

**p < 0.01 level  * p < 0.05 level
I. Toni
Crossover of engagement in teams
Discussion

The aim of our study was to investigate the crossover of engagement within teams in an experimental setting. We examined the moderating effects of team cohesion, team members’ susceptibility to emotional contagion and empathy on the crossover process, and the effect of crossover on team performance. The results show that engagement crossover occurred within teams. In particular, team members’ vigor and absorption converged during the task. Among the examined moderators, team members’ susceptibility to emotional contagion moderated the crossover engagement, particularly the absorption dimension. However, this was not true for team cohesion or the empathy of team members. Also, we did not find a significant interaction effect of team engagement and individual members’ engagement similarity after the task on team performance.

Our results support the idea that team members’ engagement becomes similar with time. However, we did not find support for convergence of all engagement dimensions. The vigor and absorption dimensions converged during the task, whereas this was not true for dedication. We could base the explanation of these results on the differences among engagement dimensions. As one’s energy, liveliness and enthusiasm (indicative of vigor), and captivation, full concentration, and engrossment in the task (indicative of absorption) are expressed in visual ways, through facial expression, postures, and movements, they might be unconsciously transferred from one person to another through mimicking. On the other hand, pride, inspiration, and feelings of challenge (indicative of dedication) represent attitudinal aspects of engagement, which might be transferred through cognitive processes. We could speculate that unconscious transmission of vigor and absorption could happen during a 30-minute task, whereas crossover of dedication through cognitive processing might need more time to occur. Attitudes captured in the dedication dimension might crossover through conversations between team members and consciously understanding each other’s
perspectives toward the work, which might be more likely to happen in longer-term interactions. Support for the importance of interaction and communication between “sender” and “receiver” in the process of crossover has been found in the context of burnout contagion. Bakker and colleagues (2000) found that burnout contagion is more likely when teachers frequently talk with burned-out colleagues, suggesting that greater transference of psychological states might be expected in the case of repeated interactions. Frequent interaction might be of greater importance for transference of cognitive-based states, such as dedication. Dedication seems to be an intrinsic, task-related state, due to which deeper processing might be required for its transmission.

We examined individual and team level moderators of engagement crossover, in particular team members’ empathy, susceptibility to emotional contagion, and team cohesion. We found evidence for contingence of engagement crossover upon individual characteristics of team members. Our results show that team members’ susceptibility to emotional contagion moderated the crossover of engagement, in particular absorption. In teams with members being more prone to mimic or synchronize others’ facial expressions and gestures, the team members’ absorption converged to a greater extent than in teams with members less susceptible to emotional contagion. These results suggest that emotional contagion might be an important mechanism of engagement crossover. Nonetheless, not all aspects of engagement may transmit in this way. Vigor and dedication might crossover through different mechanisms. This reasoning is in line with the suggestion of Bakker and colleagues (2006) that different processes might play a role in engagement crossover, and that different aspects of engagement may transfer through different mechanisms. A similar argument has also been put forward by researchers of goal contagion (Aarts, Gollwitzer, & Hassin, 2004; Dik & Aarts, 2007; Fast & Tiedens, 2010), who discriminate between two different processes of contagion – behavioral imitation of observable expressions and automatic interpretation of behavior. They suggest that psychological states can be automatically adopted as a consequence of mimicking
movements, postures, or expressions, or as a consequence of encoding behaviors and activating the same cognitive representations. Indirect evidence of various mechanisms of the crossover process has also been found in the context of burnout contagion (Bakker et al., 2000), supporting the idea that several processes play a role in the transference of psychological states.

However, examining individual-level moderators, we did not find a significant effect of team members’ empathy on engagement crossover. There was no difference in convergence of engagement scores in teams with different average levels of empathic concern or perspective-taking. These results are not in line with previous research on engagement crossover within couples, where perspective-taking was found to be an important moderator of crossover (Bakker & Demerouti, 2009). The effect of empathy might not manifest in our case because the nature of relationships between team members may be different from relationships between intimate partners. Team members spent only a short period of time together, and they did not know each other well, which is why they might have not empathized with each other as they would with close friends or family members. Also, some of the participants may have joined the experiment only for the purpose of receiving credit points, due to which they might have not been motivated to emotionally relate to their fellow members or try to understand their point of view. Indeed, dispositional empathy may be expressed to a different degree in various social contexts and interpersonal interactions (e.g., Staats, Long, Manulik, & Kelley, 2006). Taken together, field research on team members with meaningful relationships might be more suitable for studying the moderating role of empathy on crossover than laboratory studies.

Another explanation of the insignificant effect of empathy on the crossover might be that the effect of empathy was diffused. Fellow members could convey different or even conflicting emotional signals to the empathic team member, which might hinder the process of emotional convergence within the team. Also, it might be possible that empathic team
members empathized only with specific team members, due to which convergence within the whole team did not occur. The suggestion that people are more likely to catch emotions from some senders than others has been put forward also by Bakker and colleagues (2007). Their finding that the crossover of burnout between soldiers was moderated by the similarity of sender and receiver, suggests that similar others will be preferred for empathic identification. Future research might address the moderating effect of the status of team members on the crossover of engagement to their fellow members. Engagement of crossover from team leaders (emergent or formal) to their followers would definitely be an interesting area for research.

We also examined a group-level moderator of engagement crossover – team cohesion, but did not find a significant effect. Convergence of the team members’ vigor, absorption or dedication did not significantly differ between teams in the low and high cohesion conditions. These results are not in line with findings of pronounced affective convergence in cohesive teams (Bartel & Saavedra, 2000). The reason for not repeating these results may be that our cohesion manipulation was not effective. Even though previous laboratory studies have used similar ways to manipulate cohesion (e.g., Turner, Pratkanis, Probasco, & Leve, 1992; Zaccaro & Lowe, 1986), the task of creating a logo (based on team members’ similarities or individual members’ uniqueness) might not have been effective in our case. Affective sharing and, consequently, affective convergence occurs in cohesive groups because of the quality of the relationships among team members (Walter & Bruch, 2008). Even though our manipulation-check results demonstrated that the participants understood manipulation instructions, our manipulation might not have been effective in creating differences in the relationship quality within teams in the two conditions. As a matter of fact, the measures of team cohesiveness after the task showed that teams in high and low cohesion conditions did not differ in the level of cohesiveness. In general, all teams scored relatively high on cohesiveness. We could suspect that the nature of the task itself promoted the
development of bonds among team members. Closely interacting with team members while engaging in a funny LEGO building task could have led to high cohesiveness of all teams, thus overruling the cohesion manipulation, which is a probable reason for not finding a significant cohesion effect. This suggests that engaging teams in an exciting task and effectively manipulating their cohesion at the same time might be a challenging task for lab researchers. The role of team cohesion in crossover might be best examined in the field by testing the effect of natural variation of team cohesiveness.

Another plausible explanation for the insignificant effect of cohesion on the crossover lies in the a-priori differences among teams in the two cohesion conditions. The results showed that despite random assignment, team members were more similar in terms of engagement (in particular, vigor and dedication) in the high cohesion compared to the low cohesion condition, even before the cohesion manipulation was introduced. In addition, preliminary data analysis showed that despite random assignment to the conditions, participants in the high cohesion condition reported higher engagement in playing with LEGO bricks in their youth than participants in the low cohesion condition. These results indicate that high and low cohesion teams were not equivalent prior to the cohesion manipulation, due to which the effect of team cohesion may have been be confounded. The high enthusiasm about playing with LEGO bricks in childhood demonstrated by the participants in the high cohesion condition might have resulted in high similarity of team members’ engagement even before the LEGO building task. The reason for not finding a significant cohesion effect might be that in the high cohesion condition, due to high similarity in team members’ engagement prior to the task, there was no additional room for a significant convergence of team member engagement. As statistically controlling for a-priori differences in groups is inappropriate and invalid (Miller & Chapman, 2001), future studies should assure the equivalence of teams in high and low cohesion on relevant variables in order to effectively test this hypothesis.
We also examined the effect of crossover on team performance. We expected the best performance from teams with high similarity of individual engagement scores and high team engagement after the task, but our results did not support this hypothesis. Neither the combination of team members’ engagement similarity and team engagement, nor the separate components significantly affected team performance. These results suggest that other factors might be more important in influencing team performance in our task than the level of engagement. Perhaps factors such as time management, planning, or LEGO building skills affected performance in the LEGO task. Furthermore, the insignificant effect of team engagement on performance might be in line with the reasoning that the consequences of engagement are not always positive (Bakker, Albrecht, & Leiter, 2011; Halbesleben, 2011). To perform well in the LEGO building task, team members had to take into account elaborate building instructions and a detailed list of features that would yield points. But highly engaged team members might have been too excited to pay attention to these details in the instructions and consequently did not perform so well. Indeed, arousing emotions can have a distracting effect on performance (Beal, Weiss, Barros, & MacDermid, 2005). Moreover, highly engaged teams that enjoyed working together on the LEGO building task were not necessarily motivated to perform well. Probably teams liked the task, enjoyed working together and building a house, but might not have really been concerned about how many points they would earn. Their motivation to join the experiment was probably to obtain the credit points, which they did regardless of their performance in the LEGO building task. We could argue that groups had fun and did not pay much attention to their performance, due to which we did not find the proposed link between the team engagement and performance. Group research indeed showed that highly united groups with members that enjoy being together do not always perform well – if the collective expectation is to be minimally productive, cohesiveness may undermine performance (Berkowitz, 1954; Schachter, 1951).
On the other hand, methodological issues might have been the reason for not finding the proposed link between team engagement and performance. Criteria for team performance in the LEGO task were determined arbitrarily by the researchers, and therefore the team performance measure might have not represented the team performance validly. In addition, measurement of the performance might not be discriminative enough to capture the differences in performance among teams. Taken together, choosing appropriate experimental task and validly measuring teams’ performance might be a challenging task for lab researchers. Future laboratory research should devote more attention to these issues in order to validly examine the link between team engagement and performance.

**Limitations and future research**

One of the main limitations of our study is a small sample size. A sufficient sample is necessary for detecting significant effects (Field, 2009). Hypothesis testing with a small sample size increases the risk of a Type II error – rejecting the hypothesis when in fact the effect is there. In order to detect an effect of size .1 using repeated measures ANOVA with two groups and two measurements, a sample size of 392 units is considered adequate (G*Power, (Erdfelder, Faul, & Buchner, 1996). An adequate sample size for detecting small effects is often too ambitious to achieve, especially in team research, which is why also the research on the small samples, such as ours, must be taken as a valuable contribution to science. However, future research should aim to corroborate our findings using bigger samples.

Secondly, we tested our hypothesis on a very specific sample – three-member teams composed of students of psychology, which might limit the generalizability of our findings. Even though some teamwork processes occur generally in all teams (Marks et al., 2001; Salas, 2005), there might be differences in the functioning of various team types or sizes. In addition, we examined the crossover processes in teams working on a very specific task,
which might not be representative of tasks that real teams are working on. Further studies should illuminate whether the present findings can be generalized to work teams and other team types and teams of different sizes.

Thirdly, as already mentioned above, we observed difficulties with the cohesion manipulation in our experiment. Manipulation might have been unsuccessful in developing differences in relationship quality within teams in two conditions, because the interaction during the experimental task itself promoted the development of cohesiveness. As the challenge of a valid cohesion manipulation in the experimental setting has been noted elsewhere (Esser, 1998; Turner et al., 1992), the moderating role of cohesion of the engagement crossover might be best studied in the field by examining the natural variation of cohesiveness.

As a matter of fact, we call for research of engagement crossover in the field at various points in the discussion above. The experimental setting offers many advantages for studying the crossover processes within a team – we were able to examine the dynamics of engagement transference over time within similar teams working on the same task in the same conditions. However, teams are complex systems, embedded in a multilevel setting (Kozlowski & Ilgen, 2006). As individuals are nested in teams, which in turn are nested in organizations, which exist in environments, it is necessary to understand the team processes in relation to this context. The role of empathy on the engagement crossover might be better examined in real-life teams, where the relationships between team members are deeper than in ad-hoc composed teams. Moreover, as team performance is contingent upon contextual factors (Ilgen et al., 2005; Mathieu, Maynard, Rapp, & Gilson, 2008), examination of the effect of crossover on team performance in the “wild” would be valuable. However, when calling for more field studies into engagement crossover, the pitfalls of field research should be pointed out. Examination of temporal order effects in the field is difficult as team processes are observed at a random point in the teams’ history. Therefore, it is difficult to discriminate
between different possible causes of team members’ engagement similarity – team members might experience similar a level of engagement because of the crossover, or because they were already similar beforehand due to the selection effect, or the similarity resulted from shared experience. Future research should aim to overcome the pitfall of laboratory and field studies by combining strong points of both approaches. Bringing real teams into the lab setting for studying crossover on a task unrelated to their normal work, or studying the effect of intervention on crossover in the field, might be fruitful approaches.

Furthermore, at various points during the discussion we emphasized the importance of considering time when examining the crossover. The necessity of including time in team research has been underlined by various team researchers (e.g., Kozlowski & Bell, 2003; Marks et al., 2001). As crossover occurs over time, different aspects of engagement might spread within a team at different rates. Further research should explore the role of time in the crossover process, for example the time needed for crossover to occur, or the dynamics of engagement spreading over time. Also, our study examined the crossover of short-term engagement, which might be a different process than the transference of longer-term work engagement. Future research may also further investigate these differences.

Finally, we defined engagement crossover as convergence of team members’ engagement over time. Different operationalizations of crossover would be an interesting topic for future research.

**Theoretical and practical implications**

The present study showed that engagement crosses over among team members. It offered additional support for the idea that not only negative but also positive psychological states transfer between individuals, and confirmed the notion that crossover occurs in various social contexts – not only in the family context (Bakker et al., 2005a; Bakker & Demerouti,
2009), but also within performance-oriented teams. Furthermore, our findings support the notion that various mechanisms play a role in the crossover process, emotional contagion in all probability being one of them. These findings extend past research showing that emotional contagion is an important mechanism of crossover of both burnout (Bakker et al., 2001; Bakker & Schaufeli, 2000) and engagement. Moreover, our study extended past research of work engagement crossover by demonstrating that not only long-term “trait” work engagement but also momentary task engagement can transfer between individuals.

To conclude, the present study suggests that engagement is not limited to individuals, but can unconsciously spread among team members and affect the whole team. Thus, it seems important to develop awareness of these processes when managing teams. Team members’ attention to unconscious expressions of engagement should be encouraged during team building activities. Awareness that contagion might occur and understanding its possible consequences on group dynamics might promote the sharing of positive experiences and contribute to the development of a positive team climate.
References


Schaufeli, W. B. (2006). The measurement of work engagement with a short questionnaire: A cross-


Appendices

Appendix A: LEGO building task instructions

The text in italics was added to (or replaced in) the neutral instructions for the manipulation of engagement. Only one member in the team received the instructions with the text in italics. Also, the instructions for the manipulated member contained a different photo than the neutral instructions.

Task instructions

Accept the challenge! Do you already feel energetic? Of course you do, LEGO rocks!! 😊

The task of your team is to build a realistic house with LEGO bricks. There are some building rules you should follow, which are described below. Your goal is to build a house that brings you as much points as possible. Points are given for the house features listed below. Are you excited?

* Photo in the high engagement instructions
Firstly, read the instructions individually. After this you will get the opportunity to discuss with your team mates how and what you will build in order to get as many points as possible. Be active, seize initiative and take the challenge!

Building rules
* What are the building rules?
The house has to have at least four walls and one door (1). Walls have to be at least five bricks of LEGO in height (2). Each room you build should be accessible, therefore it has to have a door (3). Only one door can be placed in each wall (4). Also, windows can only be placed in the outer walls (5). 

Keep the rules in mind, but also don’t forget to have fun!

Earning points
* Earn points!

<table>
<thead>
<tr>
<th>Feature</th>
<th>Description</th>
<th>Points earned</th>
</tr>
</thead>
<tbody>
<tr>
<td>House surface</td>
<td>Area of the house</td>
<td>1 per knob</td>
</tr>
<tr>
<td>House height</td>
<td>Height of the lowest outer wall</td>
<td>100 for each block in height</td>
</tr>
<tr>
<td>Room</td>
<td>Space in the house, which is closed by walls</td>
<td>80</td>
</tr>
<tr>
<td>Window</td>
<td>Rectangular hole in the outer wall that does not touch the ground</td>
<td>20</td>
</tr>
<tr>
<td>Door</td>
<td>Rectangular hole in a wall that touches the ground</td>
<td>30</td>
</tr>
<tr>
<td>Window/door frame</td>
<td>Frame around the hole in a wall that is of a different color than the wall around</td>
<td>40</td>
</tr>
<tr>
<td>Stairs</td>
<td>A set of steps</td>
<td>150</td>
</tr>
<tr>
<td>Roof</td>
<td>A structure completely covering the house</td>
<td>750</td>
</tr>
<tr>
<td>Furniture</td>
<td>E.g. table, chairs, couch, bed, toilet, bath, kitchen, decoration etc. in the house</td>
<td>40 per item</td>
</tr>
<tr>
<td>Aesthetic look</td>
<td>Outside house features (e.g., walls, doors, windows, roof) built from the same color blocks</td>
<td>10 per feature</td>
</tr>
</tbody>
</table>

Important thing to keep in mind is that everything that you build has to have a purpose. For instance, stairs that do not lead anywhere are not functional and will not bring you points. Also, it has to be clear for an outsider what you have built. For example, if an object that you consider to be a chair is not recognized so by an outsider, you will not receive points for it.

Losing points
* Be careful not to lose points!
If your house will not be built in concordance with the rules, you will lose 500 points for each of the rules you have not followed. Also, if you fail to finish building a specific feature of the house,
you will lose 5 times the amount of points you could have won with this feature built. If you, for instance, start building an extra door and you cannot finish in time, you will not earn but lose points. Furthermore, if you build something that is not on the feature list, you will earn no points for it.

You have 30 minutes for building. The experimenter will give you a notice 5 minutes before the end of the game. *Forget about everything around you and get carried away. Feel like you are five years old all over again!*

After you and your teammates read the instructions, you will get together to start building. *After you and your teammates read the instructions, you will now all finally get together to face your challenge. Let the building begin!*