Making Teams More Resilient: Effects of Shared Transformational Leadership Training on Resilience

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Resilience is of great importance to teams operating in complex environments, such as command and control teams. Team resilience is the ability of teams to respond to sudden, unanticipated demands for performance quickly and with minimum decrement of performance. The objective of this study was to design and test a training intervention to make teams more resilient. In a between-subjects design utilizing a sample of 35 three-person teams, two training manipulations were compared to each other and a control group. Higher levels of team resilience were found when shared leadership was enforced through brief training of transformational-leadership behaviors. This study demonstrated the effectiveness of a relatively small training intervention in boosting resilience.

INTRODUCTION

Teams often need to respond to sudden, unanticipated demands for performance and then return to normal operating conditions as quickly as possible and with a minimum of performance loss (cf. Cook & Nemeth, 2006). Team resilience serves to provide teams with the ability to meet a wide variety of demands and rebound from failure, setbacks, conflicts, or any other threat to well being that a team may experience (Morel, Amalberti, & Chauvin, 2008; West, Patera, & Carsten, 2009).

Leadership has been identified as a key leverage point for increasing the level of team resilience (Kozlowski & Ilgen, 2006). So far, several leadership competences and behaviors that are correlated to resilience of subordinates have been identified (e.g., Bartone, 2006; Harland, Harrison, Jones, & Reiter-Palmon, 2005). However, to our knowledge, no study has yet explicitly intended to enhance resilience through the training of leadership skills. Moreover, the emergence of new organizational forms, such as networked and virtual organizations, has a strong impact on leadership in teams. The nature and characteristics of these new organizational forms require the sharing of leadership roles and activities between team members (Fair, Connaughton, & Daly, 2004). The purpose of this study was to experimentally demonstrate the utility of a shared leadership training to enhance team resilience.

Team Resilience and Adaptation

Resilience has many commonalities with adaptation, i.e., the ability to adapt to potential damage, take advantage of opportunities, or cope with the consequences (cf. Burke, Hess, & Salas, 2006). However, as Woods (2006) points out, all systems adapt. What makes resilience special is that it refers to the capacity of a system to handle disruptions and variations that fall outside of the base mechanisms for being adaptive as defined within that system.

Interest in team adaptation and resilience has increased over the last couple of decades. This is not without reason; several studies acknowledge that one of the most important aspects of teamwork is the ability to adapt to environmental opportunities and constraints (Kozlowski, 1998; LePine, 2005; Serfaty, Entin, & Volpe, 1993). Teams consist of more than one expert, all with their own experiences, competences, and networks to draw upon when engaging in change (Stagl, Burke, Salas, & Pierce, 2006). This means that teams are by nature well-positioned to adapt. Teams have a profound reservoir of capacities to adjust to potential damage, to take advantage of opportunities, or to cope with the consequences (Burke, Hess et al., 2006).

In general, team adaptation is beneficial because it allows institutions, systems, and individuals to adjust to potential damage, to take advantage of opportunities, or to cope with the consequences (see also Burke, Hess et al., 2006). However, there is a broad lack of understanding of how to help teams adapt in the right manner, especially in circumstances in which the team has to continue to work despite some unforeseen change that creates a situation for which the team has had limited experience or training (LePine, 2005).

Mechanisms to Increase Team Resilience

Several mechanisms to increase team adaptation to unforeseen change have been proposed (for an overview, see Burke, Stagl, Salas, Pierce, & Kendall, 2006). For example, leadership has been identified as important to the creation of adaptive capacity and resilience. Harland et al. (2005) have identified certain types of individual (or vertical) leadership to be important predictors of resilience. Harland et al. (2005) utilized Bass and Avolio's Full Range Leadership Theory (FRLT) (Avolio, 1999) to investigate its impact on subordinate resilience. Although their study was not set up to establish a causal relationship between leadership behaviors and subordinate resilience Harland et al. did show that the transformational FRLT dimensions and Contingent Reward were positively related to subordinate resilience. Management-by-Exception Active, Management-by-Exception Passive, and Laissez-Faire leadership were not or negatively related to subordinate resilience. More recently, Hardy et al. (2010) found that an additional one day interactive transformational leadership intervention resulted in statistically significant higher levels of self-reported resilience after 15 weeks of

training as compared to UK Royal Marine recruits that received the normal recruit trainer training at the start of their tour of duty.

Burke, Stagl et al. (2006) argue that shared leadership, in contrast to the traditional leader-subordinate relation, allows teams to more appropriately tweak their activities to the particular contingencies encountered and, hence, become more resilient. At the same time it is hypothesized that when team members are given little autonomy, they fail to experience a sense of responsibility for their performance and thus are less likely to engage in critical team processes (cf. Hackman & Oldham, 1980).

We propose that teams can collectively display a transformational leadership style, whereby members of the team share in influencing each other to perform for the good of the team (cf. Avolio, Sosik, Jung, & Berson, 2003). We expect that by enforcing shared leadership of Transformational-leadership behaviors and Contingent Reward team resilience will increase. Further, by promoting Management-By-Exception Passive, Active, and Laissez-Faire leadership team resilience will decrease or, at least, no effect will be seen on team resilience as compared to teams receiving no training.

METHOD

Participants and Task

A total of 105 students (64 females, 41 males) from various colleges and universities were recruited via advertisements. The participants' age ranged from 18 to 35 years (M = 24.4, SD = 4.0). Participants were randomly assigned to three-person mixed-gender teams. Each participant was paid €45 for their participation. An additional €90 prize was promised to the team that performed best in each condition to enhance motivation to perform well. None of the team members knew each other prior to the experiment.

Participants worked on a naval command-and-control scenario of the TIDE² (Team Interactive Decision Exercise for Teams Incorporating Distributed Expertise) simulation task (see Figure 1). TIDE² is a software program for a decision-making simulation (for a more elaborate description of the software, see Hollenbeck, Ilgen, Sego, Hedlund, Major, & Phillips, 1995). This task environment was chosen because of its capabilities to investigate adaptation of teams in response to unforeseen change (see also LePine, 2005).

Teams were given feedback automatically about their consensus decision, the correct decision, and every team members' individual recommendations along with aggregate information on how the team had performed over the time. Each individual trial lasted no longer than 120 seconds.

Procedure

Upon arrival participants were randomly assigned to one of two experimental team resilience training groups or a control group. Team resilience training was manipulated to examine its effects on team processes and performance. It is important to note that training was used to induce specific sets of team leadership behaviors of interest and not to validate particular training programs (cf. DeChurch & Marks, 2006). These behaviors were selected based on the Harland et al. (2005) results about leadership behaviors and subordinate resilience. Below we discuss the resilience training manipulations in more detail.

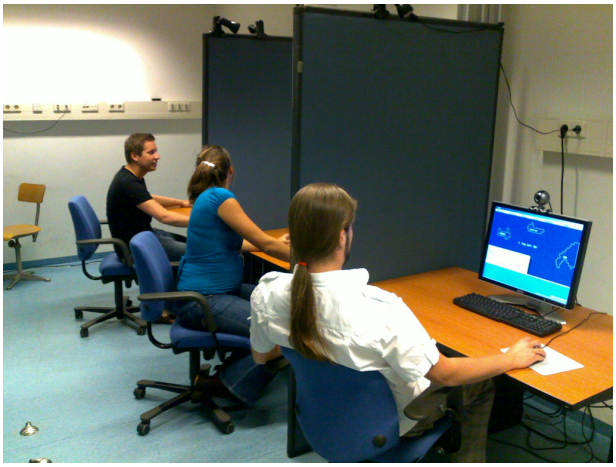

Figure 1. Experimental setup.

Transformational team resilience training. A training module was developed to train team members to engage in resilient behaviors. Learning objectives were for all team members to understand the team behaviors provided in a briefing and to exercise these behaviors during the experiment. Harland et al. (2005) identified team leadership behaviors that highly correlated with resilience. All were behaviors from the transformational leadership dimension from Bass and Avolio's FRLT along with contingent reward behaviors. Eight behaviors with high correlations with resilience were extracted from the Multifactor Leadership Questionnaire (Bass & Avolio, 2000) and explained to the participants in the briefing. It was also mentioned that a team bonus was awarded to the team exercising these behaviors the best. Examples of these behaviors are: display confidence in each other during task performance; clearly communicate what each member needs to do to accomplish the task; provide each other with assistance in exchange for each member's effort. After the instructions, participants were handed out a sheet with a bulleted list, listing the eight transformational leadership behaviors in random order. Participants were then given ten minutes to discuss how they were to perform these behaviors as a team during the experiment to come.

Transactional team resilience training. Before the task introduction was given to the participants, participants received the same training as in the previous group. However, this training consisted of training in behaviors that negatively correlated with resilience in the Harland et al. (2005) study. In general, these were behaviors from the transactional leadership dimension from Bass and Avolio's FRLT along with some laissez-faire behaviors. Examples of these behaviors are: wait until things have gone wrong before taking action; closely monitor each other's performance for errors; allow perform-

ance to fall below minimum standards before trying to make improvements.

No training control. In this last group, participants did not receive any training, but were given an equal amount of time as a team to discuss the relevance of eight solutions to traffic jams proposed by the experimenter. This group allowed us to examine whether transactional team resilience training would hinder team resilience as compared to a teams without specific training. Moreover, the control group allowed us to distinguish between general leadership training effects versus specific leadership behaviors. If transformational and transactional behaviors both result in significantly different performance from the no training control group, while at the same time transformational and transactional training does not result in significantly different performance from each other, the results should be attributed to a general leadership training effect rather than a specific leadership training effect.

Following the experimental manipulation the participants received a short introduction to the task and were given practice trials and feedback on their training performance by the experimenter. After successful completion of the task training, participants received 10 trials in which randomly calculated targets needed to be identified. These 10 trials were used to assess base-line performance. Unbeknownst to the participants a change was then introduced to assess the resilience of the team (cf. LePine, 2005). The weights of each combination rule were changed so that instead of the team decision being an average of the three individual decisions, one team member now had all the information needed to make the correct team's decision (see also LePine, Colquitt, & Erez, 2000). The participants needed to find out themselves within 20 trials what had changed in their environment and adapt accordingly.

Dependent Variables

Task Performance. Task performance was defined as the average score on the TIDE² simulation over the first ten trials. Hence, these trials took place before the distortion. TIDE² determines the squared difference between the consensus team decision and the correct decision. MSE scores range between 0 and 36. For example, a consensus score of 2, while the correct answer should be 5 will result in a Mean Square Error (MSE) score of 9 ([5-2=3]²). Because MSE is a measure of accuracy, lower scores reflect higher decision-making performance.

Recovery time. The first resilience measure was the recovery time. Recovery time was defined as the number of trials it took teams to recognize and adapt to the introduced change in weights of combination rules. Video analysis and performance data were used to determine the exact number of trials for each team. Successful adaptation was completed when baseline performance levels were again reached by the team after the initial decline in performance due to misalignment.

Rate of adaptation. The performance trajectories of resilient teams typically follow a nonlinear pattern where some level of acceptable performance is followed by a transition period due to an unexpected disturbance denoted by a decline in performance due to misalignment, which is in turn followed by a subsequent realignment (i.e., recovery) that serves to increase performance (Burke, Stagl et al., 2006, p. 1201; Chen & Ployhart, 2004). This unfolding pattern can be illustrated by plotting team performance levels as a function of time. Once plotted, team performance should follow a negatively accelerated monotonic curve. The slope of the curve (i.e., rate of change) is indicative of team resilience, in that teams with steeper curves are more resilient in recognizing and responding to unanticipated perturbations signaling the need for change. The rate of adaptation was determined by calculating the slope of the regression line over 20 trials after the unexpected change in weights of combination rules.

Perceived resilience. A questionnaire was developed and administered at the end of the experiment to capture the perceived resilience. The scale items were based on Woods' (2006) definition of resilience to recognize, adapt to, and handle unanticipated perturbations. The questionnaire was pretested and found to be reliable, simple to administer and to take little time for participants to complete. Questionnaire items were measured on seven-point Likert scales in which a score of 1 corresponded to the most negative option and a score of 7 corresponded to the most positive option. An example question is 'As a team we were very much capable of anticipating surprising task disturbances' (5 items, Cronbach's $\alpha = .85$).

RESULTS

A one-way between-subjects analysis of variance (ANOVA) was conducted at an alpha level of .05 to compare the effects of feedback strategies on our dependent variables. Table 1 summarizes the means and standard deviations for the dependent variables across conditions.

Table 1. Means and standard deviations.

	Condition		
Dependent	Transformational	Transactional	No training
Task Performance [a]	.58 (.43)	.51 (.34)	.45 (.83)
Rate of Adaptation	3.80 (.53)	3.60 (.32)	3.44 (.58)
Recovery	13.5 (2.76)	16.42 (1.83)	15.33 (2.81)
Perceived Resilience [b]	5.13 (.76)	4.86 (.88)	4.85 (1.17)

Note. Values enclosed in parentheses represent standard deviations.
[a] The values represent scores obtained by the Mean Squared Error method in which a lower score predicts a better decision-making accuracy across team and individual scores.
[b] The values represent mean scores on seven-point Likert scales.

Task Performance

No differences were found of training condition on task performance, $F(2, 102) = 1.301$, $p = .26$, $\eta_p^2 = .03$, meaning that the training did not affect team performance. All teams

had comparable performance scores on the task before the distortion was introduced. Although research has repeatedly demonstrated that Transformational Leadership is linked to team effectiveness (e.g., Avolio et al., 2003; Judge & Piccolo, 2004; Lim & Ployhart, 2004), in this specific setting this link could not be empirically established.

Rate of Adaptation

The ANOVA showed a significant effect of training condition on the rate of adaptation for the three conditions, $F(2, 102) = 4.877$, $p < .01$, $\eta_p^2 = .19$. Post-hoc comparisons using the Bonferroni adjustment indicated that the Transformation training condition (M = 3.80; SD = .53) was significantly different from the Transactional training condition ($M = 3.60$; $SD = .32$) and the no-training condition ($M = 3.44$; $SD = .58$). This finding is consistent with our expectation that providing shared transformational leadership training increases the resilience of teams, as compared to teams that receive no training. However, the Transactional training condition did not significantly differ from the control condition. It should be noted, however, that our experimental design is limited in that it is not suitable for ruling out the possibility that positive effects of training compensated for the negative effects of our Transactional training manipulation.

Recovery

As expected, the ANOVA indicated significant differences between training conditions on recovery, $F(2, 102) = 12.42$, $p < .01$, $\eta_p^2 = .19$. Post-hoc comparisons using the Bonferroni adjustment indicated that the Transformation training condition ($M = 13.5$; $SD = 1.90$) was significantly faster in recovering from the distortion than teams in the Transactional training condition ($M = 16.40$; $SD = 2.76$) and the no-training condition ($M = 15.40$; $SD = 2.72$). However, contrary to our expectation, the Transactional training condition did not significantly differ from the no-training condition. Thus, our expectation that teams receiving shared transactional training would perform worse than teams receiving no training at all, was not supported.

Perceived Resilience

No differences were found between conditions on perceived resilience, $F(2, 102) = 1.863$, $p = .08$, $\eta_p^2 = .03$. This result was inconsistent with our expectations. Although perceived resilience is significantly correlated with the rate of adaptation ($r[103] = .21$, $p = <.05$), teams in the Transformation training condition did not report higher levels of resilience as compared to teams in both other conditions.

DISCUSSION

The present research was conducted to demonstrate the utility of a shared leadership training to enhance resilience in teams. In a between-subjects design two training manipulations were compared to each other and a control group. It was found that by enforcing shared leadership of Transformational-leadership behaviors and Contingent Reward through brief training the level of team resilience increased. This result suggests that teams can collectively display a transformational leadership style, whereby members of the team share in influencing each other to perform for the good of the team. No such causal relationships were previously demonstrated. Thus, this study was the first to explicitly enhance team resilience through the training of specific leadership behaviors previously identified as related to resilience of subordinates. Moreover, these results add to the general resilience literature by suggesting that training is a powerful mechanism to increase the ability of teams to respond to sudden, unanticipated demands for performance quickly and with minimum decrement of performance. Finally, these results may have practical implications for team training. This study demonstrated clearly the effectiveness of a relatively small training intervention in boosting resilience at the team level (cf. Hardy et al., 2010).

Nonetheless, these effects of shared leadership training only hold for the recovery time and rate of adaptation. No effect was found whatsoever of training on the perception of team members' resilience. This means that, although teams that received the Transformational-leadership and Reward training were more resilient as objectively observed in faster recovery and rate of adaptation, they did not subjectively perceive themselves to be more resilient. The most logical explanation is that teams failed to correctly evaluate their performance level after the introduced disturbance to some sort of preset norm. First, teams were not given feedback about their performance level. Second, all teams in this group correctly noticed the moment the disturbance took place and almost all teams correctly adapted before the end of the experiment. Therefore, teams were, generally speaking, satisfied with their ability to handle unforeseen change. This explanation was confirmed by our observations, in debriefing sessions, and is reflected in relatively high scores on the resilience questionnaire.

Finally, we found that the transactional leadership group performed significantly worse than the transformational-leadership group, but not significantly different than the no training control group. Given that the transactional-leadership group performed better, though not significantly so, than the control group, we cannot conclude that a transactional training actually impairs performance. If anything, it slightly improves performance.

A direction for future research is not demonstrating how to surmount or prevent performance hurdles, but rather trying to understand the performance hurdles itself. In this study, teams had to respond to a specific sudden, unanticipated demand for performance. During the task, we changed the rules of the game. In this manner, we introduced ambiguity to which the team had to adapt. The team had to figure out the new rules of the game as quickly as possible and with a minimum of performance loss. The performance domain of teams entails demands of various kinds. It would be interesting, therefore, to investigate the effects of these various distortions on the relation between training and performance.

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