

CHAPTER 7

COOPERATION AND COMPETITION

The Effects of Team Entrainment and Reward Structure

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In the last several years, there has been a great deal of interest in the use of teams within organizations (Alper, Tjosvold, & Law, 1998; Johnson, Hollenbeck, Humphrey, Ilgen, & Jundt, 2004; Wageman & Baker, 1997). Just as culture and values differ across organizations, so does the design of work teams. Often, organizations will create cross-functional teams comprised of individuals from a variety of departments, locations, or functions in order to tackle complex problems requiring a multidisciplinary approach. Another common scenario is for organizations to partner with other companies to fill gaps in expertise and enhance their market capabilities. When organizations create teams, the individual members bring not only their unique expertise to the table, but they also carry with them their individual past experiences and expectations with respect to reward

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structures. The current study seeks to examine the effects of these past experiences and expectations through an empirical investigation. The study focuses on the impact of reward structure on task performance and how the prior exposure of individual team members affects a team's ability to complete a simple task.

REINFORCEMENT AND ENTRAINMENT

Patterns of behavior in individuals and groups can be impacted by the nature of how that behavior is reinforced. Operant conditioning or reinforcement theory states that behavior is influenced by the consequences associated with it. Behaviors that elicit positive consequences are strengthened and reinforced. In organizational settings behavior often translates to both task work and performance, whereas consequences or positive outcomes are often only associated with rewards. A meta-analysis conducted by Jenkins, Mitra, Gupta, and Shaw (1998) found a significant relationship between performance (defined as quantity) and financial incentives. Jenkins et al. argue that this relationship lends credibility to the application of reinforcement theory in organizational settings.

Behaviors that are consistently reinforced will likely be repeated, and will often take on somewhat of a recurring pattern. The rhythmic nature of these patterns is often referred to as entrainment. The term entrainment generally refers to a "process by which one internal (or endogenous) rhythmic process is captured and modified by another (endogenous or exogenous) rhythmic process" (Kelly, 1988, p. 89). Entrainment occurs when patterns of behavior that are initially established as a result of an external force are maintained over time. An extension of this notion of rhythmic influence is social entrainment. Social entrainment posits that the temporal and rhythmic nature of individual behavior can also occur collectively in groups (Kelly).

In an examination of social entrainment in four-person groups, Kelly and McGrath (1985) found that time limits initially imposed during a first trial influenced group performance on subsequent trials. Basically, the pattern of behavior developed by each group (taking their initial time allocation into consideration) persisted throughout the following two trials even though the time allocation for completing the tasks differed in subsequent trials.

Ancona and Chong (1996) extended the notion of entrainment to organizations. They posit that worker behavior is greatly impacted by the temporal pacing and cyclical nature of work activities. Due to the structured nature of work, employees adjust their rhythms to synchronize with the external forces imposed by work. Often times the rhythmic patterns

individuals develop remain even when the external pacer subsides. When a pattern of behavior persists despite changes in influencing conditions, entrainment is said to have taken place. Once behaviors are entrained, they can become somewhat difficult to change. In the case of groups or teams, patterns of behavior are established early on and eventually become the norm of the group (Tuckman, 1965). These norms dictate the manner in which teams interact and may become entrained in individual team members. As part of the transition or norming process, teams establish goals, strategies, and performance standards (Marks, Mathieu & Zaccaro, 2001). Furthermore, teams are influenced by their reward structures. In turn, the nature of how a team is rewarded may become entrained, which may affect team members' ability to adapt to reward structures.

Social Interdependence Theory

There has been widespread interest in how organizations should structure teams, what rewards/incentives should be offered, and how performance should be measured (Alper et al., 1998; Beersma, Hollenbeck, Humphrey, Moon, Conlon, & Ilgen, 2003; Tauer & Harackiewicz, 2004). Social interdependence theory states that "the way goals are structured determines how individuals interact, and the interaction pattern determines the outcomes of the situation" (Stanne, Johnson, & Johnson, 1999, p. 134). The type of goals established can dictate whether or not individuals will seek to work collaboratively towards collective accomplishment or individually towards gaining personal benefit.

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The two major elements of social interdependence theory are cooperation and competition. Within a cooperative team design, team members' goals are positively linked, which means that as one person moves toward goal attainment, other members come closer to their goals as well (Alper et al., 1998; Stanne et al., 1999). A cooperative team's success is based upon the success of all members. Within cooperative teams, members can have individual goals as well as team goals. As one member reaches their individual goal, each and every other member of the team approaches individual success as well, which means that one member's effectiveness helps all other team members reach their goals. Cooperative systems emphasize group accomplishments, and are created through mutual assistance and the exchange of needed resources (Alper et al., 1998; Beersma et al., 2003).

Within a competitive environment, individuals' goals are separate. As one person attains his/her goals others are precluded or at least hindered from attaining theirs (Alper et al., 1998). Stanne et al. (1999) noted individuals engaged in a competitive system perceive their own goal success

to be tied to the failure of their colleagues' goal attainment. As a result, individuals place their own goals above those of the team or the larger organization. Stanne et al. posit that competitive systems reinforce coercive action, manipulation of power, and conflict.

Cooperative and competitive teams, by their very nature, each emphasize different characteristics and goals. Competitive systems accentuate individual success, whereas cooperative teams strive for collective success. The cooperative drive for collective success can be characterized by team members sharing information, developing strategies, and exchanging ideas in order to maximize the effectiveness of all members. The discussion and transfer of knowledge from one team member to another ensures that all team members possess the information relevant and necessary to complete a task. However, this active interchange between members can be incredibly time-consuming (Beersma et al., 2003). In a competitive system, the knowledge and information possessed by one individual is not readily shared with other members. Withholding this information increases the likelihood of the individual's success while decreasing the potential for their teammates' success. Due to the reduced level of communication and exchange, competitive teams may encounter more difficulty in accomplishing tasks. However, for these same reasons competitive teams may actually operate faster (Beersma et al.). Researchers have found that cooperative systems tend to promote accuracy while having a negative effect on speed. On the other hand, competitive systems promote speed and have a negative effect on accuracy (Beersma et al.; Stanne et al., 1999). Historically, research has been supportive of cooperative group designs citing such benefits as increased group productivity, stronger positive relationships, and better psychological health (Stanne et al.).

In further examining social interdependence theory, Johnson et al. (2004) found supporting evidence indicating that cooperative teams tend to achieve a higher level of accuracy in goal attainment than competitive teams, yet they take much longer. Thus, cooperative teams are slower and more accurate, whereas competitive teams are faster and less accurate. The Johnson et al. finding highlights the influence of reward structure in devising organizational work teams.

Most notably, Johnson et al.'s (2004) findings indicate that team members become entrained to reward structures, and do not readily change their behavior in response to a new reward structure. A key open question then concerns the malleability of team reward structures. In Johnson et al.'s study, the reward structures of intact teams were changed. One intervention that may alleviate this entrainment and promote adaptation to the new reward structure is changing composition. To an organization wanting to change a team that is operating too competitively, Johnson et

al.'s research suggests it is not enough to simply change the reward structure.

In the current study, we examine the effects of combining a change in reward structure with a change in composition. To do this, we examine teams at two points in time. First, we impose either a cooperative or competitive reward structure on the team and ask them to perform a task under the imposed reward structure in order to entrain members to either a cooperative or competitive reward structure. Next we reassigned teams so that they were comprised of either all competitive members, all cooperative members, or half cooperative and half competitive members. Teams were then asked to perform the same task with their new teammates under a cooperative reward structure, and we examined the ability of each type of team to adapt to the cooperative structure. Consistent with Johnson et al.'s (2004) findings, we expect teams that are initially rewarded competitively to continue to operate with greater speed but less accuracy than their cooperative counterparts.

Hypothesis 1: Competitively entrained teams will perform faster and less accurately than both cooperatively and mixed entrained teams.

Johnson et al. (2004) found information sharing was a key mediator of this relationship. Another potential mediator of this relationship is collaboration. Collaboration describes the extent to which team members work collectively towards a common goal. We expect cooperatively rewarded teams to engage in more collaboration than competitively rewarded teams, and we expect differences in collaboration to explain why team reward structure affects task performance (speed and accuracy).

Hypothesis 2a: Reward structure entrainment will affect the level of cooperation such that cooperatively entrained teams will engage in more collaboration than both competitively entrained teams and teams comprised of both cooperatively and competitively entrained members ("mixed teams").

Hypothesis 2b: Collaboration will mediate the relationship between reward structure entrainment and task performance (speed and accuracy).

The fast paced nature of modern business dictates that individuals will be exposed to a variety of organizational reward structures. Whether changing careers or being merged with new colleagues in an acquisition, workers will continually face the challenges of adapting to new environ-

ments. As part of this adaptation, reward structures will change requiring workers to adjust quickly to be successful. The current study was designed to offer a first look at how changing team composition affects adaptation to a new reward structure.

METHOD

Participants

Participants included 240 undergraduate psychology students at a large Southeastern University. Participants ranged from 16 to 60 years old, and 70% were female. Participants were randomly assigned to four-person teams. Students received course credit for participation.

Design and Procedure

The experiment consisted of three conditions (cooperative, competitive, and mixed-cooperative/competitive). These conditions were created by first having teams complete a task and become entrained to either a cooperative or competitive reward structure. Teams were then mixed so that a new set of teams comprising all cooperative, all competitive, or a mixture of cooperative and competitive team members. During the experimental task (time 2) all teams operated under a cooperative reward structure. Therefore our conditions refer to the composition of team members based on their reward structure at time 1. In the cooperative condition all four team members had worked under a cooperative time 1 reward structure. In the competitive condition all four team members had worked under a competitive time 1 reward structure. The mixed condition teams were comprised of two cooperatively and two competitively rewarded team members. At time 2 all teams had experienced a membership change from time 1, and operated under a cooperative reward structure.

Each condition consisted of participants randomly assigned to teams that were run two at a time. All teams engaged in the same type of task throughout the experiment. At time 1, teams in the first condition operated under a cooperative reward system, the teams in the second condition operated under a competitive system, and in the third condition half of the teams were cooperatively and half were competitively rewarded. At time 2, two members from each team within the specified conditions were switched to form two new teams within that condition. In the third condition, each team was comprised of an equal number of members from both

cooperatively and competitively entrained teams. As an overall result, at time 2 there was a competitively entrained team, a cooperatively entrained team and a mixed entrainment team, all operating under a cooperative reward structure. At time 2, all teams were read instructions detailing a cooperative reward structure.

Task

The primary researchers were responsible for providing instructions, administering the task, keeping time, and tallying completion results. The raters charged with observing and rating information sharing and collaboration behaviors were trained by the primary experimenters and remained blind to both the hypotheses and conditions. Participants engaged in a puzzle building exercise designed to facilitate high interdependence. The task apparatus consisted of four individual, 25 piece, inset jigsaw puzzles. Each individual was charged with the completion of their respective puzzle.

Team members were each assigned to a corner of a room where one inset puzzle board and 25 pieces had been placed. Of the 25 pieces in each corner, 13 pieces were correct for that corner puzzle, while the remaining 12 pieces were comprised of four pieces from each of the three other puzzles. Participants were allotted a 2-minute period to examine their puzzles. After determining which pieces were incorrect for their puzzles, members were allowed to trade puzzle pieces with teammates during one of three exchange meetings. If teams negotiated pieces successfully, all members were able to complete their respective puzzles.

The task was chosen for the experiment based on a number of important considerations. Of paramount concern was the ability to measure individual and team performance in terms of speed and accuracy, which was easily done. In addition, the task required the team members to work together to succeed.

Manipulation

The participants in the cooperative condition (time 1) were told that their group scores would be determined by a combination of their team speed and the percentage of correct puzzle pieces for all four puzzles. Each teams' combined score was compared across the cooperative condition to determine an overall winning team, which was awarded a \$40.00 cash prize to be split evenly between the four teammates. These same instructions were also provided to all time 2 conditions.

The participants in the competitive condition (time 1) were told that their individual scores would be determined by a combination of their team's speed and the percentage of correct puzzle pieces that each participant had upon completion of the task. The individual with the highest completion percentage and the fastest group time was the overall winner for the competitive condition, and was given a \$20.00 cash prize. Thus, depending on condition, the goal was to either complete all four puzzles accurately in the shortest amount of time (cooperative reward structure), or for each individual to attempt to complete their individual puzzle regardless of the other team members (competitive reward structure).

Manipulation Check

Participants completed a manipulation check at time 1 to verify comprehension of the target reward structure for the purposes of entrainment. The manipulation check consisted of two items: (1) "Rewards for this task will be based solely on my own individual performance" and (2) "Rewards for this task will be based on how my group performs." Both items were rated on a 1- to 5-Likert scale anchored by 1 = "Strongly disagree" and 5 = "Strongly agree." An independent samples *t* test was conducted comparing the cooperative condition with the competitive condition for the first question (individual reward). The results for the cooperatively entrained teams indicated that the mean score for participants ($M = 2.17$, $SD = 1.15$) was significantly lower than the mean score for the competitively entrained teams ($M = 3.57$, $SD = 1.12$), $t(238) = -9.56$, $p < .001$. An independent samples *t*-test was also conducted comparing the cooperative condition with the competitive condition for the second question (group reward). The results for the cooperatively entrained teams indicated that the mean score for participants ($M = 4.51$, $SD = .83$) was significantly higher than the mean score for the competitively entrained teams ($M = 3.74$, $SD = .97$), $t(238) = 6.60$, $p < .001$. The results of the manipulation check verified that overall participants correctly perceived the intended reward structure.

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Measures

Team Performance

Team performance was operationalized as a combination of speed and accuracy. Speed was measured by the total time it took the team to complete all three of their exchange meetings. A team's accuracy was

determined as the total number of correct pieces for all four team members combined. Individual accuracy scores were calculated as the number of correct pieces each team member had for their respective puzzles.

Information Sharing and Collaboration

Information sharing and collaboration were assessed through both experimenter observation and self-report. Three items were developed to assess the extent to which team members shared information: (a) "Individual team members shared the theme of their puzzle with the team"; (b) "Individual team members shared their four pieces with the team"; and (c) "Individual team members shared exact descriptions of puzzle pieces needed." Four items were developed to assess the amount of collaboration between members: (a) "Individual team members verbalized a strategy for coordinating the exchange of puzzle pieces"; (b) "The group agreed to work collaboratively in deciding how to exchange pieces"; (c) "The group collaboratively determined when to terminate each group exchange meeting"; and (d) "The group collaboratively determined when to convene each group exchange meeting." The items for information sharing were completed by both individual team members and independent raters. The independent raters also completed ratings for the four collaboration items. All responses were made on a 5-point Likert scale in which 1 = "Not at all" and 5 = "To a great extent." Coefficient alpha was .86 for the self-report measures. Within group agreement (rwg) was calculated for information sharing at time 1 (rwg = .75) and time 2 (rwg = .93).

Data Aggregation

Since information sharing was measured at the individual level through participant self-report, the data was first analyzed for within group agreement and reliability before aggregating to the group level. Measures were aggregated in order to assess each construct at the team level. High agreement and reliability were found for all measures of both experimenter observation and participant self-report.

RESULTS

A one-way ANOVA was conducted comparing the differences in speed and accuracy between cooperative, competitive, and mixed teams at time 2. The omnibus F for speed was 1.02 ($df = 2, 59, p > .05$) indicating no

Table 7.1. Analysis of Variance for Performance

| <i>Source</i> | <i>SS</i> | <i>df</i> | <i>F</i> | η^2 | <i>p</i> |
|----------------------|--------------|-----------|----------|----------|----------|
| <i>DV = Speed</i> | | | | | |
| Reward structure | 67,902.43 | 2 | 1.02 | .03 | .37 |
| Error | 1,896,036.90 | 57 | | | |
| <i>DV = Accuracy</i> | | | | | |
| Reward structure | 142.43 | 2 | 4.47 | .14 | .02* |
| Error | 907.75 | 57 | | | |

Note: * $p < .05$.

significant mean differences between conditions. The omnibus F for accuracy was 4.47 ($df = 2, 59, p < .05$) indicating the presence of significant mean differences (see Table 7.1). Upon further analysis cooperatively entrained teams ($M = 93.10, SD = 4.68$) were found to be significantly more accurate than competitively entrained teams ($M = 90.05, SD = 3.09$) with a mean difference of 3% ($p < .05$). Mixed teams ($M = 93.50, SD = 4.05$) were also found to be significantly more accurate than competitively entrained teams ($M = 90.05, SD = 3.09$) with a mean difference of roughly 3.5% ($p < .05$). There was no significant difference in accuracy between mixed and cooperatively entrained teams. These results provide partial support for Hypothesis 1.

To examine Hypothesis 2a, the differences in observed collaboration across the three time 2 conditions were analyzed through the use of a one-way ANOVA. The omnibus F for collaboration was 4.68 ($df = 2, 59, p < .05$) indicating the presence of significant differences in collaboration (see Table 7.2). Results of post hoc analyses revealed that cooperatively entrained teams ($M = 4.25, SD = 0.69$) were found to be significantly more collaborative than competitively entrained teams ($M = 3.53, SD = 0.75$). However, mixed teams ($M = 4.01, SD = 0.82$) were not significantly different than either competitively or cooperatively entrained teams. The results provide partial support for Hypothesis 2a.

To further examine the impact of collaboration, a mediated regression analysis was conducted to investigate the potential for collaboration as a

Table 7.2. Analysis of Variance for Collaboration

| <i>Source</i> | <i>SS</i> | <i>df</i> | <i>F</i> | η^2 | <i>p</i> |
|------------------|-----------|-----------|----------|----------|----------|
| Reward structure | 5.34 | 2 | 4.68 | .14 | .01* |
| Error | 32.54 | 57 | | | |

Note: * $p < .05$.

mediating variable in the relationship between reward structure and accuracy. Speed was not examined due to lack of a significant difference between conditions. In order to test the accuracy model, the two entrained reward structures (cooperation and competition) were dummy coded as vectors. To test the mediation hypothesis the steps proposed by Baron and Kenny (1986) were followed. First, the proposed mediator, collaboration, was regressed on reward structure. This yielded a significant beta weight, $t(59) = 3.23, p < .01$. Next, the dependant variable, accuracy, was regressed on reward structure, which yielded a significant beta weight for the first of the two vectors (cooperative), $t(59) = -2.14, p < .05$, but not for the second vector (competitive), $t(59) = -0.65, p > .05$. Third, accuracy was regressed on both collaboration and reward structure, which revealed that collaboration accounted for 15% of the variance in accuracy and reward structure added less than 7% beyond collaboration, which was not significant (see Table 7.3). When collaboration was controlled for, reward structure did not explain significant incremental variance in accuracy across the two vectors (cooperative entrainment and competitive entrainment) beyond that already explained by collaboration. The results provide partial support for Hypothesis 2b.

The differences in observed information sharing across the three time 2 conditions were analyzed through the use of a one-way ANOVA. The omnibus F for observer rated information sharing was 0.90 ($df = 2, 59, p > .05$) indicating no significant differences. The differences in self-reported information sharing across the three time 2 conditions were also analyzed by a one-way ANOVA. The omnibus F for information sharing was 0.02 ($df = 2, 59, p > .05$) indicating no significant differences in self-reported information sharing.

Table 7.3. Summary of Hierarchical Regression Analysis for Variables Predicting Accuracy ($N = 60$)

| <i>Independent Variable</i> | <i>B</i> | ΔR^2 | <i>Total R²</i> |
|-----------------------------|----------|--------------|----------------------------|
| Step 1 | | — | .15** |
| Collaboration | .39** | | |
| Step 2 | | .07 | .22** |
| Collaboration | .31* | | |
| Reward structure | — | | |
| Vector 1 | | | |
| Reward structure | — | | |
| Vector 2 | | | |

Note: * $p < .05$, ** $p < .01$

DISCUSSION

Overall, the current study provides support for the notion that reward structure impacts team performance. At time 2 both the cooperatively and competitively entrained teams appeared to carry their expected patterns of performance forward, suggesting that entrainment had taken place. Teams initially exposed to cooperative reward structures were more accurate than teams initially exposed to competitive reward structures. Mixed teams also fared better than their competitive counterparts achieving essentially the same level of performance as the cooperatively entrained teams. Thus, it appears that teams composed of members who initially operated under a competitive reward structure had a more difficult time adapting to the cooperative reward structure at time 2. This finding provides support for Johnson et al.'s (2004) notion of cutthroat cooperation. However, teams comprised of members with prior exposure to both cooperative and competitive reward structures (two from each condition) did not have any difficulty in adjusting, with respect to accuracy. The differences in performance between the two sets of teams illustrates the effects of entrainment and lends partial support for the findings reported by Beersma et al. (2003) and Johnson et al. (2004).

In addition, the researchers also set out to examine the influence of collaboration in the reward structure-performance relationship. More specifically, the researchers examined the mediating role of collaboration between prior reward structure entrainment and accuracy. Speed was not examined due to its nonsignificant relationship with reward structure. Collaboration was found to be a critical mechanism in defining the relationship between a team's entrained reward structure and their ability to produce accurate results. This would suggest that the institution of a cooperative reward structure engenders an environment of collaboration that promotes more accurate team performance.

An examination of information sharing revealed no differences between the time 2 conditions. Based on the literature, the researchers expected to see higher levels of information sharing in the cooperatively entrained teams as compared to the competitive and mixed teams. One explanation for this unexpected result may be the presence of a learning effect. Based on researcher observation, it appeared that the teams assigned to the time 1 competitive condition realized that their lack of communication and sharing of information hindered their performance. In order to effectively complete the puzzles, at least some level of information sharing was important. When faced with the second trial, where all conditions (teams) were cooperatively rewarded, the competitively entrained teams had the impetus to share more information. However, as illustrated in the results, the level of collaboration still differed, thus

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pointing out that even though competitively entrained teams were sharing more information, they were doing it somewhat begrudgingly.

Limitations

The generalizability of these results is somewhat limited. The participants in our study were all undergraduate students who participated for course credit as well as the opportunity for a cash prize. The age, level of experience, and maturation of the participants differs from that of a typical organization. Another issue regarding the participants is the fact that they were 70% female and 71% Hispanic, which is assuredly not representative of the typical populations within organizations across the country. Overall, the size and representativeness of the sample used could be improved to strengthen the findings.

Each session was conducted back-to-back, which meant that teams would go through their time 1 exposure (cooperative or competitive reward structure) and then move immediately to their time 2 exposure (cooperative reward structure). This rapid progression allowed for only limited initial exposure to a particular reward structure. This limited exposure may have inhibited the ability of team members to become fully entrained in their respective reward structures before progressing to the next set of conditions. As a result, the entrainment was likely too weak to have the type of impact one would expect from an employee who had been operating under the same reward structure day-in and day-out for a number of years. A final limitation could be the general lack of discrepancies concerning accuracy scores. Participants began each task with 13 out of 25 correct pieces for their respective puzzles, and thus each team had a floor for total accuracy scores around 50%. Therefore all accuracy scores were already confined to the range between 50-100, and ultimately the range shrunk to 78-100.

Future Research

The results of this study provided partial support for the research of both Beersma et al. (2003) and Johnson et al. (2004), as well as opened up some possible avenues of future research. The study could be modified by adding another session to the task, so as to ensure participants are fully immersed into their reward structure so that entrainment can take place. Having this additional session would allow for strategy development and learning to occur between time 1 and time 2. Then teams could be switched and mixed for a time 3 trial where changes could be measured.

Another opportunity for researchers would be to examine various aspects of team composition, leadership, and shared mental models and how they impact a team working in either a cooperative, competitive, or mixed group. Having teammates with relatively high levels of cognitive ability, agreeableness, and extraversion may increase the communication and coordination between members, which in turn enhances performance. Training a team on various strategies may cause them to have a similar mental model, and thus improve the coordination between members and their overall performance. A final opportunity for future researchers could be to further examine the decision-making processes and abilities of cooperative, competitive, and mixed teams. It may be prudent to develop a more decision-oriented and intensive situation to effectively study how reward structures influence a team's decision-making processes and overall accuracy.

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