

# **Effect of team cohesion on team member effectiveness**

**Jiafu Niu**

Department of Mathematics and Statistics  
Purdue University  
West Lafayette, USA  
[njiafu@purdue.edu](mailto:njiafu@purdue.edu)

**Behzad Beigpourian**

School of Engineering Education  
Purdue University  
West Lafayette, USA  
[bbeigpou@purdue.edu](mailto:bbeigpou@purdue.edu)

**Mathew W. Ohland**

School of Engineering Education  
Purdue University  
West Lafayette, USA  
[ohland@purdue.edu](mailto:ohland@purdue.edu)

**Daniel M. Ferguson**

School of Engineering Education  
Purdue University  
West Lafayette, USA  
[dfergus@purdue.edu](mailto:dfergus@purdue.edu)

## **Abstract**

Nowadays, engineering curriculum has a strong emphasis on teamwork skills. Improving teaming skills among engineering students reduces the time and budget that engineering managers should spend on new engineers' training. However, students for learning proper teaming practices should work in the effective teams, and for making teams effective, we should have a good team climate. Cohesion is one of the team climates which have taken much attention in organizational behavioral psychology, but not in many studies in engineering education. Cohesion in teams includes task commitment, interpersonal relationship, and task attraction. In this study, we used backward stepwise multilinear regression to predict team member effectiveness based on three dimensions of cohesion. Task attraction was the only dimension that significantly predicts the team member's effectiveness, showing that if engineering students enjoy and like the teaming task, they will have higher effectiveness in teams. Implications and future directions are provided in the paper.

## **Keywords**

Team cohesion, Team effectiveness, Task commitment, Task attraction, Interpersonal cohesiveness.

## **1. Introduction and Literature Review**

Cohesion has been of interest to many scholars from many years ago (Mullen & Copper, 1994). Festinger (1950) defined cohesion as a force that makes individual members of the teams as a group. Team cohesiveness was also expressed as the extent to which team members liked each other and the extent of willingness they wanted to maintain the team's original composition. Cohesion is defined as a multidimensional construct rather than a unitary (Carless & De Paola, 2000).

Team cohesion is a prerequisite of desirable team performance (Lott & Lott, 1965). Although there are many studies about team cohesion, there are conflicting results and opinions about how cohesion influences team performance (Drescher, Burlingame, & Fuhrman, 2012). Mullen and Copper (1994) concluded that there were three components of cohesion – performance effect, which are interpersonal attraction, commitment to task, and group pride. They found that just commitment significantly affects group performance. Also, Zaccaro (1991) found that different components of cohesion have different effects on team performance. However, a study proved that all cohesion's components influence group performance (Beal, Cohen, Burke, & McLendon, 2003).

There is a mutual relationship between cohesion and team performance (Mathieu et al., 2015). Mullen and Copper (1994) claimed that the influence of performance on team cohesion is stronger than the effect of team cohesion on team performance. However, Mathieu et al. (2015) disagrees and states that team cohesion - performance effect increased as time passed, but performance – cohesion effect was stable after it reached a certain level. Michalisin, Karau, and Tangpong (2004) had different viewpoints on the relationship between team cohesion and team performance. Based on their study, team cohesion is independent of team performance and depends on other teams' attributions.

The relationship between cohesion and performance can be influenced by several factors, such as psychological safety and sharing the leadership in teams, which might result in better team effectiveness (Appelbaum et al., 2020; Mathieu, Kukenberger, D'innocenzo, & Reilly, 2015). Also, when team members work separately and accomplish the task without any communication, the team's performance is not related to team cohesion because the team goal is achieved by the aggregation of each individual's work (Beal et al., 2003). Team cohesion can predict team effectiveness when the team is task-oriented, but it could not predict the team effectiveness when teams are social-oriented (Carless & De Paola, 2000). When teams are social-oriented, high cohesiveness might harm team effectiveness (Dick & Basu, 1987). Team members might avoid new ideas to keep team cohesion, which may result in low team effectiveness (Janis, 1972).

Despite much research in cohesion and its importance, cohesion has not been studied in engineering education, and this research aims to fill this gap. Also, based on literature about team cohesion, this research is going to focus on team effectiveness rather than team performance and investigate this research question:

RQ: To what extent different components of team cohesion (task attraction, interpersonal cohesiveness, and task commitment) influence the team member effectiveness?

## **2. Purpose of the Study**

There are many teaming projects in engineering classrooms, and it is crucial to make these teaming experiences more effective. Cohesion, as a team climate, might have a significant role in team member effectiveness, which leads to team learning. The result of this study act as a guide for engineering instructors to increase cohesion and team member effectiveness in their classrooms.

## **3. Methods**

### **3.1 Participants**

Participants of this study were from a first-year engineering course who attended a large Mid-Western University. In this course, students completed a project in eight weeks, and they conducted peer evaluation to assess their teammates. In total, 1682 students in 425 teams participated in this study. Teams had 4 or 3 team members. The demographics of the participants are provided in Table 1 and Table 2:

**Table 1.** Gender distribution in the sample

Gender	Number	Percent (%)
Female	350	20.8
Male	1193	70.9
Other	7	0.4
Declined to answer	132	7.9

**Table 2.** Race/ethnicity distribution in the sample

Race/ethnicity	Number	Percent (%)
Asian	431	25.6
Black	23	1.4
Hispanic	91	5.4
White	931	55.4
Other	74	4.4
Declined to answer	132	7.9

### **3.2 Data Collection**

We collected our dataset using CATME (Comprehensive Assessment of Team Member Effectiveness), a non-profit recharge center at Purdue University. CATME is a web-based tool for team formation and peer evaluation (Ohland et al., 2012). In this study, students evaluated the effectiveness of their members in five dimensions; contributing to the team's work, interacting with teammates, keeping the team on track, expecting quality, and having relevant knowledge, skills, and abilities. The team member's effectiveness is measured in a behaviorally anchored rating scale (BARS) from 1 (the lowest rating) to 5 (the highest rating). Then, students answered three sets of cohesion questions. They were asked to rate, using 5 points Likert scale, their perceptions about their; teams' task attraction in three statements; "Being part of the team allows team members to do enjoyable work", "Team members get to participate in enjoyable activities", and "Team members like the work that the group does". Team's interpersonal cohesiveness is collected in three statements; "Team members like each other", "Team members get along well", and "Team members enjoy spending time together". Finally, team's task commitment is collected in three statements; "Our team is united in trying to reach its goals for performance", "I am unhappy with my team's level of commitment to the task", and "Our team members have conflicting aspirations for the team's performance" (Carless & De Paola, 2000; Loughry & Tosi, 2008). We reversed the last two questions in task commitment and averaged these statements to calculate the three dimensions of the team's cohesion.

### **3.3 Result**

After collecting the data, we calculated the team member's effectiveness by averaging the five CATME's dimensions. We also calculated the team's task attraction, task commitment, and team's interpersonal cohesiveness. Then, after checking the assumptions, we ran a backward stepwise multilinear regression. Team member effectiveness as our dependent variable and team's task attraction, team's task commitment, and team's interpersonal cohesiveness were our independent variables. This model's purpose was to investigate which dimension of cohesion is more related to team member effectiveness. The results are summarized in Table 3. The results are presented in three models; the first model considered the three dimensions of cohesion but found only task attraction significant. Interpersonal cohesiveness is removed from the second model. Finally, both interpersonal cohesiveness and task commitment were removed from the third model due to not being significant in the first model.

**Table 3.** *Perceived effectiveness of teams based on the team’s task attraction, task commitment, and interpersonal cohesiveness*

**Step 1:** *Initial Regression with the team’s task attraction, task commitment, and interpersonal cohesiveness*

Variable	B	SE B	$\beta$
Intercept	2.936*	0.088	–
Task attraction	0.221*	0.07	0.391
Task commitment	0.042	0.059	0.081
Interpersonal Cohesiveness	-0.023	0.071	-0.043
R2		0.174	
F for change in R2		30.71	

**Step 2:** *second regression with the team’s task attraction, task commitment*

Variable	B	SE B	$\beta$
Intercept	2.932*	0.087	-
Task attraction	0.207*	0.055	0.367
Task commitment	0.032	0.051	0.062
R2		0.175	
F for change in R2		46.112	

**Step 3:** *Final Regression with only the team’s task attraction*

Variable	B	SE B	$\beta$
Intercept	2.945*	0.085	-
Task attraction	0.238*	0.025	0.423
R2		0.177	
F for change in R2		9	
		1.948	

#### **4. Discussion**

As a critical building block of team climate, compliance with our findings through the literature review process, team cohesion does function as a predictor of team member’s effectiveness. However, not all three components of team cohesion significantly contribute to the prediction of team member’s effectiveness, rather only task attraction is effective. According to Table 1, both interpersonal cohesiveness and task commitment exert tiny effect on team member’s effectiveness. This result of our study conflicts with what Mullen & Copper (1994) found that only commitment to task affect team cohesion - performance affect. The possible reason to explain this divergence occurred is that we use the different standards to measure team cohesiveness, and we focus more on team member’s effectiveness rather than team performance.

Actually, from Table 3, interpersonal cohesiveness shows a slightly negative influence on team members' effectiveness, which indicates that over-high interpersonal cohesiveness may be harmful to the team members' effectiveness. This

result generated from our study partially supports the claims by some scholars, that cohesiveness could impose undesirable influence on team member's effectiveness under certain situation. In our experiment, we didn't analyze if the student team is task-oriented or social-oriented, but based on our generalized analysis, which means we ignore the orientation of the student teams, interpersonal cohesiveness exerts negative effects on team member's effectiveness, even though the magnitude is negligible.

Despite the team cohesion can predict the team members' effectiveness, it functions only to a small extent. From Table 3, the highest  $R^2$  occurred when task attraction is the only regressor, which means the other two components of team cohesion don't contribute to the team member's effectiveness statistically. What's more, even at that time,  $R^2$  is only equal to 0.177, which bespeaks that limited amount of variance in team member effectiveness, explained by team cohesion.

## **5. Conclusion**

Team cohesion could be a proper reference when the team member's effectiveness is studied. However, there are two major issues which researchers should pay more attention. The first problem is that since only task attraction affects team member's effectiveness, the researcher should pay attention on which component makes the team cohesion level high or low. In another word, if a team's cohesion level is high and the main reason is the level of task attraction is high, it could be a positive signal of great team member's effectiveness. But as we claimed above, team cohesion only influences team member effectiveness on small magnitude, so the second issue would be that researchers need exam more potential factors, which can affect the team member's effectiveness rather than just rely on team cohesion to predict team member's effectiveness. Finally, the tiny negative coefficient of interpersonal cohesiveness implies that the relationship between team cohesion and team member's effectiveness is not always positive, which means high team cohesion could decrease the team member's effectiveness theoretically.

## **6. Implication**

How to build an appropriate and productive team climate to enhance team members' effectiveness is always an essential question considered by team managers and supervisors. Our study provided a glimpse of to what extent, team cohesion can affect team member's effectiveness, therefore, according to our findings, enriching task attraction is a reasonable approach to increase team member's effectiveness. Also, because of the potential negative influence brought by interpersonal cohesiveness, the supervisors may want to prevent the abnormal high interpersonal cohesiveness from forming among team members, even though it is hard to be monitored, but at least the supervisors could be aware of this possible problem in advance.

## **7. Limitation and Future Studies**

For this study, we just investigated first-year engineering student teams for an 8-weeks-long project, and the team size was moderated. Since team size could be a factor which partially determines magnitude of the effect that team cohesion imposed on team member's effectiveness, more studies conducted on teams with longer life span and various team sizes are meaningful and necessary.

The formation and development of team cohesion are dynamic processes. In this study, we assumed the directionality from team cohesion to team member's effectiveness, but we didn't exam the possible versus relationship, which is the influence of team member's effectiveness to team cohesion. It is reasonable to posit that the relationship between team cohesion and team member's effectiveness is mutual rather than unitary. Therefore, the future study could invest more effort to uncover mechanics how these two subjects influence each other.

The purpose of study is to offer a basic idea that to what extent cohesion would affect team member's effectiveness, so that we didn't focus on the orientation of the team and pay too much attention on working flow of the teams. However, as mentioned in the literature review above, these factors also make the call on the "quality" of team cohesion.

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## Biographies

**Jiafu Niu** is an undergraduate student at Purdue University and he is double major on Actuarial Science and Applied Statistics. Currently, Mr. Niu is working as an intern in CATME’s research department.

**Behzad Beigpourian** is a Ph.D. candidate and Research Assistant in Engineering Education at Purdue University. He earned his master’s in Structural Engineering from Shahid Chamran University in Iran, and his bachelor’s in Civil Technical Teacher from Shahid Rajaei Teacher Training University in Iran, Tehran. He has been official Technical Teacher at Ministry of Education in Iran from 2007 to 2018, and received many certificate in education such as Educational Planning, Developing Research Report, and Understanding School Culture. Mr. Beigpourian currently works in the CATME project, which is NSF funding project, on optimizing teamwork skills and assessing the quality of Peer Evaluations.

**Matthew W. Ohland** is Professor of Engineering Education at Purdue University. He has degrees from Swarthmore College, Rensselaer Polytechnic Institute, and the University of Florida. His research on the longitudinal study of engineering students, team assignment, peer evaluation, and active and collaborative teaching methods has been supported by the National Science Foundation and the Sloan Foundation and his team received Best Paper awards from the Journal of Engineering Education in 2008 and 2011 and from the IEEE Transactions on Education in 2011 and 2015. Dr. Ohland is an ABET Program Evaluator for ASEE. He was the 2002–2006 President of Tau Beta Pi and is a Fellow of the ASEE, IEEE, and AAAS.

**Daniel M. Ferguson** is CATME Managing Director and the recipient of several NSF awards for research in engineering education and a research associate at Purdue University. Prior to coming to Purdue he was Assistant

Professor of Entrepreneurship at Ohio Northern University. Before assuming that position he was Associate Director of the Inter-Professional Studies Program [IPRO] and Senior Lecturer at Illinois Institute of Technology and involved in research in service learning, assessment processes and interventions aimed at improving learning objective attainment. Prior to his University assignments he was the Founder and CEO of The EDI Group, Ltd. and The EDI Group Canada, Ltd, independent professional services companies specializing in B2B electronic commerce and electronic data interchange. The EDI Group companies conducted syndicated market research, offered educational seminars and conferences and published The Journal of Electronic Commerce. Dr. Ferguson is a graduate of Notre Dame, Stanford and Purdue Universities, a special edition editor of the Journal of Engineering Entrepreneurship and a member of Tau Beta Pi.