Measuring the mediating effect of shared leadership on team mental models and team effectiveness

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17-06-2022

Word count: 4937

Abstract

In this study, the importance of team mental models in relation to shared leadership and team effectiveness is explained. Team mental models and shared leadership may have an impact on team effectiveness. In addition, shared leadership could mediate the relation between team mental models and team effectiveness. The study hypothesizes that (a) team mental models positively relates to team effectiveness, (b) shared leadership positively relates to team effectiveness, and (c) the relation between team mental models and team effectiveness is mediated by shared leadership. To investigate these hypotheses, a questionnaire has been used. This questionnaire has been completed by various specialists working in medical teams from the University Medical Center Utrecht, performing operations in the operation room. Data have been analyzed using a multi-level analysis. According to the data, Team mental models partly relates to team effectiveness. No direct and indirect effect has been found between shared leadership and team mental models and team effectiveness.

Keywords: Team mental models; Operation Room; Shared Leadership; Team processes

Measuring the mediating effect of shared leadership on team mental models and team effectiveness

‘’I am forever stuck with glasses, in order to read and see far. Too bad’’ (Van Gaalen., 2021)

Research shows that in 13% of the patient treatments at hospitals, something went wrong, such as a wrong diagnosis, the provision of medication or treatment (van Gaalen., 2021). According to the Dutch Federation of patients, important reasons for wrong treatments have been communication and collaboration (Patiëntenfederatie Nederland., 2021). This seems to be especially so in teams that perform in stressful conditions (Salas et al., 2005), such as medical teams that operate in the Operation Room (OR).

Medical teamwork involves multiple complex interprofessional interactions between specialists, such as surgeons, anesthetists, and nurses. In complex interprofessional collaboration, a shared understanding becomes important for effective collaboration, because team members should be able to anticipate on each other's decisions (McIntyre & Foti., 2013). In addition, medical teams operating in the OR experience a high degree of task independence, which makes a shared understanding important (Mathieu et al., 2005). This shared understanding could also be explained as team mental models (TMMs), which enable teams to effectively coordinate tasks in a way that caters to the values and beliefs of each professional while achieving common goals (Webber et al., 2000).

According to Salas et al. (2005), effective team leadership has an important role in effective teamwork and the development of TMMs. In addition, leaders play a significant role in influencing group processes (McIntyre & Foti., 2013). Effective leaders ensure individuals on the team to understand their interdependence and the benefits of working together. For that reason, Salas et al. proposed that the relationship between team leadership and team effectiveness is mediated by other factors. Team leadership affects team effectiveness not by handing down solutions to the team but rather by facilitating team problem solving through cognitive processes. TMMs are one of these cognitive processes which individuals use to organize information about dynamic team environments and the response patterns needed to manage these dynamics (McIntyre & Foti., 2013). Due to the high degree of task independence and the interprofessional environment in the OR, leadership in the OR could be characterized as Shared Leadership (SL). SL refers to an emergent team property of mutual

influence and shared responsibility among team members, whereby they lead each other toward goal achievement (Carson et al., 2007). Due to SL, a clear and unifying direction arises within the team. This unifying direction facilitates the development of accurate TMMs (Kozlowski et al., 2009).

At this moment, there has been little investigation into the relationship between SL and TMMs variables in teams (McIntyre & Foti., 2013). As such, this research could contribute to the empirical and theoretical knowledge regarding the relationship between SL and TMMs and the effect on team effectiveness. In addition, previous research focused on teams formed in lab-settings to investigate TMMs in relation to team effectiveness (McIntyre & Foti., 2013). Therefore, the current study examines the relation between TMMs and team effectiveness in an ecological valid setting by studying medical teams while they work in the OR. When considering social relevance, Ayoko and Chua (2014) raised the question of the relationship between TMMs, SL, and intra-team conflicts. Results of this study could lead to awareness among leaders to invest in the development of TMMs, which could lead to fewer conflicts and increased team effectiveness.

In conclusion, this study could have an important contribution regarding improved team effectiveness and understanding how SL leadership may influence TMMs. This study hopes to explain the relationship between SL and TMMs, and the effect of this relationship on team effectiveness

Literature Review and Hypotheses

Team Mental Models and Team Effectiveness

When members of a team organize their knowledge of team tasks, equipment, roles, and goals in a similar way, they share TMMs (Lim & Klein., 2006). According to Mathieu et al. (2000), TMMs could include both taskwork and teamwork. Webber et al. (2000) defined taskwork as the understanding of activities and action sequences that must be carried out to the team's task. Teamwork refers to the communication needs, performance monitoring, coordination strategies, and compensatory behavior. According to Fransen et al. (2011), team members require similar TMMs, regarding the task and team aspects to be able to carry out the task successfully.

Two characteristics have been relevant for measuring TMMs correctly, namely: similarity and accuracy. *Similarity* reflects to which extent TMMs model the task and performance domain in the

same way, whereas *accuracy* reflects to which degree their TMMs represent how TMMs correspond to the ideal way of working or behaving (Resick et al., 2010). Burtscher et al. (2011) stated that the absence of TMMs similarity is related to decreased team effectiveness. In addition, Westli et al. (2010) have found that indicators of TMMs (e.g., poor communication and offering information) have been related to team effectiveness. In line with these studies, Undre et al. (2006) reported that poor communication led to errors in teams where TMMs were less developed. All these studies highlight the importance of TMMs as an essential mechanism in relation to team effectiveness.

Several studies suggested that TMMs influences team effectiveness (Mathieu et al., 2010; Smith-Jentsch et al., 2005; Santos & Passos., 2013). And even though previous results like these have been promising for healthcare, investigating in the natural healthcare environment has not been considered. Therefore, studying how TMMs affect team effectiveness in an ecological valid setting contributes to the generalization of results towards real-life settings. Because of all these studies that stated a positive relation between TMMs and team effectiveness (Mathieu et al., 2010; Smith-Jentsch et al., 2005; Santos & Passos., 2013), this study may formulate the following hypothesis:

H1: Team mental models are positively related to team effectiveness in the OR.

Shared Leadership and Team Effectiveness

Shared Leadership (*SL)* refers to an emergent team property of mutual influence and shared responsibility among team members, whereby they lead each other toward goal achievement (Carson et al., 2007). SL entails that an individual's role repeatedly shifts from leader to follower and vice versa, primarily during activities that require unique expertise (Friedrich et al., 2009). SL applies especially to medical teams where interprofessional collaboration takes place and different specialisms work together. Each member of the team has a specialized task during an operation, which means that multiple members may show leadership when asked for. As a result, the team must depend on each other's knowledge to effectively perform an operation.

In most cases, researchers have found that SL predicts team effectiveness (Ensley et al., 2006; Hoch & Kozlowski, 2014). Ensley et al., explain that SL predicts team effectiveness better, compared

to vertical leadership (e.g., transformational- or transactional leadership). Some researchers argue that vertical leadership could be adapted for an SL setting, but DeRue (2011) states that in certain situations (e.g., team members lead each other), current leadership theories may not be sufficient. Practically, the statement of DeRue means that SL differs vertical leadership. For that reason, SL should not be measured in the same way as vertical leadership. Therefore, SL should be measured by nature of its own.

SL could be seen as a network influencing and shaping both team and individual activities and outcomes (Carson et al., 2007). Gibb (Gibb, 1954, cited by Carson et al., 2007), distinguished two forms of SL, namely: distributed and focused. Distributed leadership involves two or more individuals that share roles, responsibilities, and functions of leadership, whereas focused leadership involves that only one individual shows leadership. Carson et al. provide a continuum based on the number of leadership sources (e.g., number of team members that show leadership) having a high degree of influence throughout the entire team. The low end of the continuum shows focused leadership. At the high end, the continuum shows distributed leadership.

Based on several studies (Carson et al., 2007; Ensley et al., 2006; Hoch & Kozlowski., 2014; Small & Rentsch., 2010), which stated that SL has a direct effect on team effectiveness, this study may formulate the following hypothesis:

H2 Shared Leadership is positively related to team effectiveness in the OR.

Shared Leadership and Team Mental Models

So far, few studies have investigated the relationship between SL and TMMs. Kozlowski and Ilgen (2006) stated that leaders could play a key role in shaping TMMs by linking task cycles or episodes to a regulated learning process. According to McIntyre and Foti (2013), the presence of multiple leaders within a group has both positive and negative consequences. In the study of McIntyre and Foti, teams with a coordinated SL perception (more leaders in a team) showed significantly stronger TMMs than teams with centralized leadership. Dionne et al. (2010) found that participative leaders promoted mental model convergence. When a leader values all other members of the team,

other team members follow to do the same. This valuing could lead to a fully connected network and strong TMMs. Furthermore, leading-following interaction among team members (e.g., like SL) could help the team develop collective team cognitions, such as TMMs (Zhu et al., 2018). Zhu et al. also advised that further research regarding SL and team effectiveness should focus on exploring mediating mechanisms. All this research shows a strong tendency that SL influences the creation of TMMs, and therefore influences team effectiveness. Therefore, this study may formulate the following hypothesis:

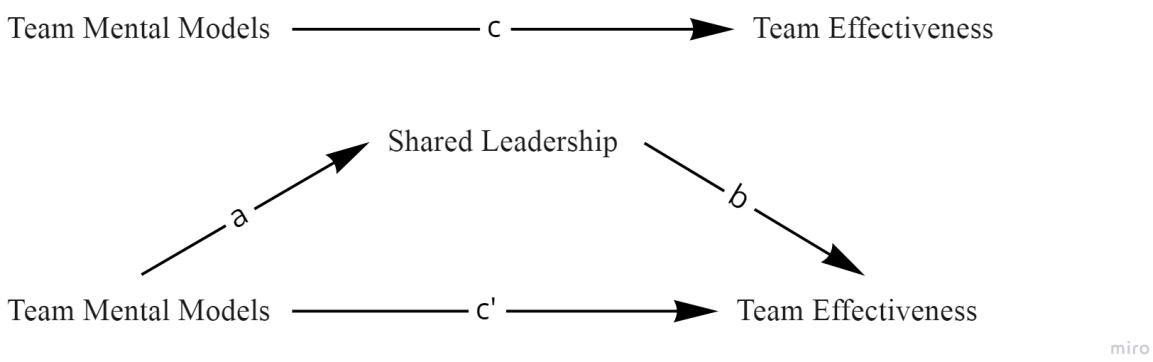
H3 The relations between team mental models and team effectiveness in the OR is mediated by shared leadership

Method

Research Design

This study has an explanatory design because the hypotheses in this study have been focusing on explaining a relation between several constructs (Kennedy., 2021), displayed in Figure 1. Eventually, this study tries to fill a knowledge gap. Quantitative data have been collected to answer the hypothesis.

Figure 1.



A conceptual model of the hypotheses tested in this study.

Participants

Participants for this study were 31 specialists working in medical teams from the University Medical Center Utrecht, performing operations in the OR. Team sizes ranged from 2 to 7 members.

Due to the specificity of the teams, simple random sampling have been used to find respondents. Simple random sampling creates external validity because every team has an equal chance of being selected for the study, regardless of the motivation or convenience of the team (Morling., 2018). The power analysis assumed a power of .90, an effect size f^2 of .149, a confidence interval of .95, using G*Power 3.1. This analysis showed that a sample size of 59 participants is required. This effect size is chosen, because there were no effect sizes found in previous research. In situations like this study, Hinkle et al. (1988) recommend using a medium effect size. Numbers of participants per team did vary because not all teams had the same number of employees and not every employee completed the survey. Table 1 represents the descriptives statistics of the participants, including Age, Gender and Profession.

Table 1 Descriptives Statistics of the study (N=31)

Variable	N (%)	M (SD)
Age (Years)	31	36,6 (10,5)
Gender		
Men = 1	9 (29%)	
Woman = 2	22 (71%)	
Profession		
Nurse anesthetist	6 (23,1%)	
Operating assistant table	1 (3,8%)	
Operating assistant bypasser	4(15,4%)	
Surgeon in training	1(3,8%)	
Surgeon	3(11,5%)	
Anesthetist	5(19,2%)	
Anesthetist in training	6(23,1%)	

Instrumentation

Demographics

In this study, several demographic statistics have been collected. The operating room number is requested, to know which participants form a team. This was necessary for aggregating individual scores to scores on team level. Together with the end time of filling in the questionnaire, teams have become recognizable. In addition, gender and age have been collected. We wanted to prevent

participants from filling in the scenario several times. For this reason, it was decided to include age and gender in the questionnaire, so that we were able to find earlier results on the scenarios from several participants.

The Independent Variable: Team Mental Models

TMMs have been measured using a questionnaire and a scenario-based assignment. Regarding the ecological validity it would have been better to measure the actual behavior during the operation. Due to the corona pandemic, it was not possible to observe at the OR.

TMMGeneral. First, a scale from previous research by Taskiran and Baykal (2021) including seven items have been used. The 5-point Likert scale ranged from 1 to 5. In addition, this questionnaire has been translated into Dutch, which may have influenced the validity. A native speaker has been involved in translating the questionnaire, to maintain the construct validity. The reliability of the scales was $\alpha = 0.79$

Similarity and Accuracy. Based on the work of Webber et al. (2000), one scenario (See appendix A) in the context of health care (e.g., like the appendix of Webber et al.) have been created with the help of subject matter experts (SMEs). Participants must grade a set of actions, that in their opinion could hurt or vital the success of the team in this scenario. To maintain reliability and validity, the procedure of Webber et al. has been followed as closely as possible. According to Webber et al., this measurement is flexible and could be used in different contexts.

TMMs similarity have been assessed using two indicators: interrater agreement and coefficient alpha. Both measurements have been aggregated to team level. In order to calculate the coefficient alpha, raw data has been transposed, so that team members were treated as items and actions were treated as cases. For each team, a unique alpha has been calculated. A high level of coefficient alpha indicates higher levels of within-team interrater consistency (Webber et al., 2000). Interrater agreement is calculated using the formula of Lindell et al. (1999). A high level of interrater agreement indicated higher levels of interrater agreement within teams. After the calculation of individual interrater agreement scores, the scores have been aggregated to team level. Previous research showed

that the average interrater agreement across teams and scenarios was .73, which is sufficient for aggregation (Webber et al., 2000).

TMMs accuracy have been assessed by calculating the absolute difference in scores between each team member and the experts (SME's).The SME's have been a surgery assistant, anesthesiologist and two nurse anesthetists. This means that not every profession has been taken into consideration, because researchers sticked close to the original research from Webber et al. (2000). First, the individual scores were averaged. After that, the scores were reduced by the mean scores of the SME's. This showed the absolute difference between the participant and the SME's.

The Dependent Variable: Team Effectiveness

In this study, team effectiveness has been measured using the self-perceptions of team members. Group members evaluate team effectiveness using a single item measurement (Michinov et al., 2008) on a scale from 1 to 10: *'Estimate the quality of work in our* team'. Self-perceptions could be valuable even when team members disagree. Disagreement says something about the extent to which team members mutually agree about the operation. Due to practical constraints, the scale consisted of one item. In consultation with the SMEs, we concluded that multiple questions only could have caused confusion among the respondents, because the quality of an operation could have been interpreted differently. In addition, according to experts, it was not possible to talk to patients about the quality of the operation. This seemed unjustified from an ethical perspective.

The Mediating Variable: Shared Leadership

To measure SL, every team member has rated each of his/her colleagues on a scale from 1 to 5, on the following question: *'' To what degree did your team rely on this individual for leadership?''* At first, this study wanted to measure centralization and density using a social network analysis. Previous research has used this approach (Carson et al., 2007; Mehra et al., 2006). Ultimately, This approach was not possible, because the data was not complete enough. Participants should have indicated which position they filled in themselves, so that relationships could be established between the degree of leadership experienced by one participant in relation to another participant from the team. This study could not establish these relationships, which made it not possible to calculate

Density and Centralization scores. For that reason, In consultation with researchers, there has been decided to calculate the mean and standard deviation per individual. A high average show that someone experiences a lot of leadership from team members. In addition, a low standard deviation shows that there is not much variation in the perceived leadership of a participant. By subtracting the standard deviation from the mean, a kind of absolute score is created that must represent SL.

Procedure

First, the complete questionnaire was developed in consultation with a researcher from the UMC. After this, we ran a pilot among employees of another hospital. Several improvements were made to this, which improved the clarity of the questionnaire. Then we started recruiting participants. Participants have received the questionnaire during the day. Ideally, the questionnaire was completed immediately by the participants, but due to the hectic pace of the operation room, participants were also allowed to complete the questionnaire later. Informed consent has been asked, prior to the start of the questionnaire. In the perfect situation, participants were given a QR code to complete the questionnaire on the phone. Failing this, they could complete the questionnaire by going to a link. To guarantee anonymity and privacy, data have been extracted with Qualtrics and stored in a secured YODA file. Only researchers involved in this study had access to this folder. Also, because of the personal data, researchers have pseudonymized the data. After pseudonymization, the OR number have been replaced with a team number. The key file has been stored on YODA in a separate folder and will be locked with a password.

Data analysis

Multilevel Analysis (MLA)

Multilevel analyses were used to examine the multilevel mediation effects in the study. All analyses were conducted using SPSS 28. The assumptions for conducting a multilevel analysis were checked (linearity, homogeneity of variance, residuals normally distributed). Analyses were conducted using maximum likelihood (Field, 2018). To test the multilevel effects, MLMs were constructed for a direct effect of independent variables on the dependent variable (See table 2) Also, MLM analyses were constructed for the relation between the mediating variable and dependent variable (See table 3).

For the mediation effect (See tables 4, 5, 6, 7), this study has used the steps of Baron and Kenny (1986), which resulted in the following steps: In the first step, only the direct effect of the independent variable has been included. In the second step, the relation between the independent variable and mediating variable has been calculated. In the third step, the relation between the mediating variable and the dependent variable have been calculated. In the fourth step, the mediating effect of SL on TMMs and team effectiveness have been calculated.

Ethical Considerations

The study has been approved by the Ethics Review Board of the Faculty of Social & Behavioural Sciences

Results

In this section, the results of analyses are described. Variables of Interrater Agreement and Coefficient Alpha contained some missing data. This data was entered by inserting the average scores of other respondents on the variables.

Team Mental Models and Team Effectiveness

Three Multilevel analyses were conducted to determine the impact of TMMs on team effectiveness (See Table 2). This table shows the parameter estimates from the analyses. It shows that TMMgeneral positively improved the quality of the operation, β = 1.23, t(4.17), p =<.*001*. The positive β shows team effectiveness was higher when TMMs were higher. Also, similarity was measured using Coefficient Alpha (ß = -0.76, t(-1.13), p = .269) and Interrater Agreement (ß = -0.37, t(-0.38), p =.706). Both indices show a negative relationship with team effectiveness but also statistically nonsignificant. In addition, Accuracy was measured (ß = 0.47, t(1.01), p =.321), which showed a positive relationship with team effectiveness, but statistically nonsignificant. Therefore, hypothesis 1 is partially supported.

Table 2 Multilevel model of Fixed and Random effects for Independent variables of TMMs on Team Effectiveness

Parameter	*β*	*SE*	*df*	*t*	*p*	*Covariance*

Level 1 (Individuals-specific)					
TMM general	1.23	0.30	27.23	4.17	<.001***
Accuracy	0.47	0.46	29	1.01	.321
Level 2 (Team-specific)					
Coefficient Alpha	-0.76	0.67	29	-1.13	.269
Interrater Agreement	-0.37	1.38	29	-0.38	.706

** = p <.05; **= p <.01; *** = p=<.001*

Shared leadership and Team Effectiveness

A Multilevel analysis was conducted to determine the impact of SL on Team Effectiveness (See Table 3). This table shows the parameter estimates from the analyse. It shows a negative relationship between SL and Team Effectiveness, but statistically nonsignificant (*ß* = -0.84, *t*(0.40), p =.690). Therefore, Hypothesis 2 is not supported.

Table 3 Multilevel model of Fixed and Random effects for Leadership on Team Effectiveness

Parameter	*β*	*SE*	*df*	*t*	*p*	*Covariance*
Level 1 (Individuals-specific)						
SL	-0.84	0.25	29	0.40	.690	

** = p <.05; **= p <.01; *** = p=<.001*

Mediating effect of Shared Leadership on Team Mental Models and Team Effectiveness

To investigate whether SL mediates between TMMs and team effectiveness, several multilevel analyses were performed. During these separate multilevel analyses, one construct of TMMs (TMMgeneral, Interrater agreement, Coefficient Alpha or Accuracy) was included per analysis in the calculation (See tables 4, 5, 6, 7). Step 4 of tables 5, 6 and 7 shows that Interrater Agreement (*ß* = -0.08, *t(*-0.37), *p* =.714), Coefficient Alpha (*ß* = -0.79, *t(*-1.18), *p* =.249) and Accuracy (*ß* = 0.50,

*t(*1.08), *p* =.290). had no direct effect on team effectiveness. Also, the indirect effect of SL was not statistically significant in any of these analyses.

Table 4 shows that the direct relationship between TMMgeneral and team effectiveness has increased, when both TMMgeneral and SL has been used (*ß* = 1.31, t(4.31), *p* = <.001). This shows that SL have an indirect effect on TMMs and team Effectiveness. Nevertheless, this effect is an increasing factor for TMMs, rather than a decreasing factor. This means that there is no mediation of SL on the relationship between TMMs and team Effectiveness. In Addition, the indirect effect of SL is nonsignificant. The results that have been described in this section shows that no support is found for hypothesis 3.

Table 4 Multilevel model of Fixed and Random effects for TMMGeneral (X) and Leadership (M) on Team Effectiveness (Y)

Parameter	*β*	*SE*	*df*	*t*	*p*	*Covariance*
Step 1 X - Y:						
Level 1 (Individuals-specific)						
TMMgeneral	1.23	0.30	27.23	4.17	<.001***	
Step 2 X- M:						
Level 1 (Individuals-specific)						
TMMgeneral	-0.52	0.31	29	-1.67	.105	
Step 3 M-Y:						
Level 1 (Individuals-specific)						
SL	-0.84	0.21	29	-0.41	.689	
Step 4 X-M-Y:						

Level 1 (Individuals-specific)					
TMMgeneral	1.31	0.30	27.20	4.31	<.001***
SL	0.14	0.17	28	0.83	.412

** = p <.05; **= p <.01; *** = p=<.001*

Table 5 Multilevel model of Fixed effects for Interrater Agreement (X) and Leadership (M) on Team Effectiveness (Y)

Parameter	*β*	*SE*	*df*	*t*	*p*	*Covariance*
Step 1 X-Y:						
Level 2 (Team-specific)						
Interrater Agreement	-0.53	1.38	29	-0.38	.706	
Step 2 X-M:						
Level 1 (Individuals-specific)						
TMM	.0.64	1.19	29	0.54	.593	
Step 3 M-Y:						
Level 1 (Individuals-specific)						
SL	-0.84	0.21	29	-0.41	.689	
Step 4 X-M-Y:						
Level 1 (Individuals-specific)						
SL	-0.48	1.38	28	-0.34	.734	
Level 2 (Team-specific)						

Interrater Agreement	-0.08	0.21	28	-0.37	.714	

** = p <.05; **= p <.01; *** = p=<.001*

Table 6 Multilevel model of Fixed effects for Coefficient Alpha (X) and Leadership (M) on Team Effectiveness (Y)

Parameter	*β*	*SE*	*df*	*t*	*p*	*Covariance*
Step 1 X-Y:						
Level 2 (Team-specific)						
Coëfficiënt Alpha	-0.76	0.67	29	-1.13	.269	
Step 2 X-M:						
Level 2 (Team-specific)						
Coefficient Alpha	-0.31	0.59	29	-0.53	.599	
Step 3 M-Y:						
Level 1 (Individuals-specific)						
SL	-0.84	0.20	29	-0.41	.689	
Step 4 X-M-Y:						
Level 1 (Individuals-specific)						
SL	-0.11	0.20	28	-0.52	.605	
Level 2 (Team-specific)						
Coefficient Alpha	-0.79	0.67	28	-1.18	.249	

** = p <.05; **= p <.01; *** = p=<.001*

Table 7 Multilevel model of Fixed effects for Accuracy (X) and Leadership (M) on Team Effectiveness (Y)

Parameter	*β*	*SE*	*df*	*t*	*p*	*Covariance*

Step 1 X - Y:					
Level 1 (Individuals-specific)					
Accuracy	1.23	0.30	27.23	4.17	<.001***
Step 2 X- M:					
Level 1 (Individuals-specific)					
Accuracy	0.37	0.40	29	0.92	.365
Step 3 M-Y:					
Level 1 (Individuals-specific)					
SL	-0.84	0.21	29	-0.41	.689
Step 4 X-M-Y:					
Level 1 (Individuals-specific)					
Accuracy	0.50	0.47	28	1.08	.290
SL	-0.12	0.21	28	-0.55	.582

** = p <.05; **= p <.01; *** = p=<.001*

Discussion

The purpose of this study was to examine the conceptual model, described in Figure 1. The study aimed to examine the relationship between TMMs and SL, and the effect of this relationship on team effectiveness.

Findings of this study contribute to the literature regarding TMMs and team effectiveness (Mathieu et al., 2010; Smith-Jentsch et al., 2005; Santos & Passos., 2013). Specifically, this study partly suggests that TMMs are beneficial for the effectiveness of teams in the OR. Unlike the study of

Burtscher et al. (2011), this study has not found a negative relationship between TMMs similarity and team effectiveness. A possible explanation for this could be the method that has been used to measure similarity and accuracy. Although the researchers have tried to follow the same steps as Webber et al. (2000), only one scenario has been created to measure similarity and accuracy. Due to fewer scenarios, the results could have led to unprecise scores. By assessing more scenarios, the scores would have been more reliable.

Based on findings of this study, the data suggest no relationship between SL and team effectiveness, which is not in line with previous research (Ensley et al., 2006; Hoch & Kozlowski, 2014). An explanation for this may be the method used to measure SL. Originally, we wanted to measure SL through a social network analysis. Because of practical constraints which have been described earlier, this was not possible. Because of these constraints, a different approach has chosen. This approach may lack reliability and validity. To date, no other study has measured SL in this way. Other research used a questionnaire or social network analysis (Reuveni & Vashdi, 2015). It would be wise to consider a social network analysis for measuring SL, according to several studies (Carson et al., 2007; Mehra et al., 2006). Due to this research, the researchers hope that other researchers get stimulated and interested to study the relationship between SL, TMMs and team effectiveness.

This study adds to the empirical and theoretical domain of the mediating effect of SL on TMMs and team effectiveness. At this moment, little investigation has been done on the mediating effect of SL (Zhu et al., 2018). Our study suggest that SL has no mediating effect on the relationship between TMMs and team effectiveness. On the opposite, an interesting result of this study was that a component of TMMs (TMMgeneral) is enhanced by SL, which could mean that SL is a moderating variable. Future research could investigate the moderating effect of SL on TMMs and team effectiveness. In addition, SL has been measured in a different way than most studies suggest, the question regarding the mediating effect of SL on TMMs and team effectiveness remains unanswered. For that reason, measuring this unresolved issue in follow-up studies would be recommended.

Limitations

The generalizability is limited by the nature of the sample. All the participants included in this study were employees from the University Medical Center in Utrecht. In future research, researchers could consider using several medical centers throughout the county.

Another limitation of this study is the difference regarding the sizes of the teams. Some teams consisted of two participants. This makes it possible to wonder whether a team from this size still provides value data. In addition, Mathieu et al. (2019) stated that team sizes have been an influencing factor for team effectiveness. To make a reliable comparison between different teams, future research should focus on achieving equal numbers of participants per team.

The current study has taken a relatively new step in identifying the relationship between SL and TMMs and team effectiveness. For that reason, only two leadership styles have been taken into consideration, namely distributed- and coordinated leadership. In the future, the mediating role of other leadership styles, such as transformational leadership could also be explored. In addition, a method like observations could be used to meet the ecological validity in the future. Also, the complexity and the experience of the employees could be included as variables. The complexity of the operation could be related to the team effectiveness that is achieved (Mathieu et al., 2019).

Implications

As a result of this study, a practical implication could be that hospitals create more awareness among the teams to be involved in the creation of TMMs. Part of this study indicates that TMMs can lead to a higher team effectiveness. According to Ayoko and Chua (2014), this awareness could result in fewer conflicts in the OR

Previous research has shown that collaboration affects the quality of operations. An important factor influencing collaboration are TMMs (McIntyre & Foti., 2013). Therefore, it would be wise to pay attention regarding the creation of TMMs. This could be done by having teams discuss what a good operation entails, looking at improvement and points of excellence, and looking at a clear division of tasks before the operation starts. By having teams discuss these topics before the operation,

every member knows what is expected of each other. These interventions could lead to the creation of TMMs, which enables an improved collaboration. An improved collaboration could lead to fewer wrong treatments.

To conclude, This study has tried to explain the relationship between SL and TMMs, and the effect of this relationship on team effectiveness. The results found no direct effect between SL and TMMs. In addition, no indirect effecter of SL on TMMs and team effectiveness have been indicated.

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APPENDIXES

Appendix A
Scenario 'Strategic Team Mental Model Measure'

Je bent met collega's bezig met de tweede spoedoperatie tijdens een weekenddag. Deze ingreep duurt normaal gesproken nog 1 uur. Het team bestaat uit een anesthesiemedewerker, twee operatieassistenten, waarvan er eentje aan tafel staat, een tweedejaars chirurg in opleiding, een chirurg en een anesthesioloog. Kort na de incisie komt het bericht van de recovery dat de vorige patiënt die jullie hebben geopereerd een nabloeding heeft en met spoed opnieuw geopereerd moet worden. De patiënt is hierbij hemodynamisch instabiel. Dit kan alleen op jullie operatiekamer.

Hieronder staan een aantal mogelijke acties. Geef per actie aan hoe bijdragend je denkt dat deze actie is. Het doel is om zo snel en goed mogelijk te starten met de re-operatie.

-3 Deze actie zou het succes van ons team ernstig schaden.

0 Deze actie zou het succes van ons team noch helpen noch schaden

+3 Deze actie is essentieel voor het succes van ons team.

Mogelijke acties (in willekeurige volgorde)	Cijfer
1. Een tweede chirurg oproepen	
2. Een tweede team in huis roepen (let op: een tweede operatiekamer is niet mogelijk)	
3. Bloed bestellen voor de eerste patiënt	
4. Dat de operatieassistent die omloopt benodigde sets en materialen klaar gaat zetten	
5. De huidige operatie afbreken	
6. Stil zijn om zo snel mogelijk te kunnen opereren	
7. De huidige operatie voltooien zoals oorspronkelijk gepland	
8. Een plan maken met het hele team voor de volgende patiënt	
9. De chirurg in opleiding de operatie af laten maken zodat de chirurg naar de eerste patiënt kan	
10. Medicatie klaarleggen voor algehele anesthesie	
11. In EZIS een preoperatief screeningsformulier aanmaken	
12. Bij de patiënt op de recovery bloed afnemen en versturen voor laboratoriumonderzoek	
13. Concentreren op de huidige operatie	
14. Stolling optimaliseren bij de eerste patiënt	
15. Geen pauze nemen	

16. De eerste patiënt inleiden op de recovery	
17. De tweede patiënt slapend op de recovery neerleggen (en dus niet uitleiden op de operatiekamer)	
18. De huidige operatie zoveel mogelijk inkorten	