Team composition, goal priorities and performance; an experimental study of multi-team systems

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INTRODUCTION

Teams play a vital role in the workplace, enabling individuals to collaborate to solve complex and challenging issues (Salas, Shuffler, Thayer, Bedwell & Lazzarra, 2015). This is especially true for teams operating in extreme and challenging environments, in which decisions can have life or death consequences (Bell, Fisher, Brown & Mann, 2016). Our research is interested in teamwork during major emergency incidents, in which multiple component teams must work interdependently to deliver an effective coordinated response (Power, 2018). This is referred to as a multi-team system (MTS), wherein teams are working together to achieve separate but related objectives in the context of over-arching collective goals (Shuffler, Jiminez-Rodriguez & Kramer, 2015). Previous research has demonstrated the importance of team composition to support team performance. Specifically, evidence has demonstrated the benefit of familiarity amongst team members (Harrison, McGrath, Florey & Vanderstoep, 2003) and homogeneity of individual traits (e.g., personality and values) (Morgenson, Reider & Campion, 2005). However there has been little empirical evidence of how composition might support teamwork in MTS. Furthermore, researchers have theorised about how changing goal hierarchies and the needs of individual component teams can interact with MTS functioning (Shuffler et al., 2015), with little experimental evidence to test this. In this study we aim to explore how team composition and goal priorities impact the ability of an MTS to work effectively. Specifically, we hypothesise that familiar teams will communicate and coordinate more effectively during a simulated major incident and they will show more goal congruence in the latter stages of the simulation that non-familiar teams. In addition, we hypothesise that homogeneity in traits/values will also interact with team behaviour and that this may interact with familiarity.

METHOD

Participants

Participants (n=100) were aged over 18 and students at Lancaster University. They were split into 22 multi-agency teams, each with either 4 or 5 members. Of the 22 teams, 11 were familiar and 11 were unfamiliar.

Procedure and simulation scenario

Familiar teams were recruited from University sports teams and soceities. Unfamiliar team were recruited online using SONA. Before the start of the study, all participants were informed that they would be taking part in a simulated major incident response and were given a short overview of the sturcture of incident response in the U.K. Following this, consent was obtained and participants were asked to complete an online questionnaire. Participants were also given a decision log to monitor changes in individual and team goals during the simulation. The simulation lasted between 39 minutes and 53 minutes ($M = 46.14$, $S.D = 4.19$), dependent on the level of discussion in the teams. Following the simulatiuon participants were asked to complete a further online questionnaire and were de-briefed by the research team. Each simulation was audio and video recorded.

The simulation was developed by the researchers, with input from subject matter experts in the emergency services. It was designed to be suitable for students, whilst still reflecting the challenges typical of a major incident. The scenario was based on the tactical response to a terrorist attack at the finish line of a marathon in a city in the North of England. At the start of the simulation, team members opened an envelope on the table at random. The envelope they selected determined their role (Police, Fire, Ambulance, Mayor and Marathon Organiser). During the simulation participants were presented with injects (see table 1) in a number of different formats.

Materials

Questionnaires

The pre-simulation questionnaire was designed to measure the composition of each team and included demographic questions (e.g., age). Personality was measured with the Ten Item Personality Measure (Gosling, Rentfrow & Swann, 2003) and the Portrait Value Questionnaire (Schwartz, 2006) was used to measure the values and attitudes of participants. Decision logs were provided to measure team member goals at set time points during the simulation. Participants were asked to state their 5 main individuals goals following inject 1 and inject 8 (see Table 1). Following inject 2, they were then asked to discuss as a group and state their 5 main goals as a team. Following the simulation, participants were asked to complete a short online survey. Team performance was measured using a 12-item Likert scale based on three core elements of teamwork identified in the literature;

communication, coordination and cooperation (Power, 2018). Cohesion was measured using a 6-item Likert scale (Mathieu, 1991).

Audio and video recording

The simulations were audio and video recorded to capture the interactions between team members. Relying solely on self-report measures is problematic with MTS, as they do not adequately capture the richness of team based processing (Shuffler & Carter, 2018).

Table 1. Simulation injects

Inject	Format	Description
1	Phone call	Participants receive a phone call from the emergency services control centre, outlining that there has been an explosion at the finish line of the marathon and there is approx. 2000 individuals in the immediate area. Participants are asked to state their 5 main goals individually (e.g., save life, evacuate surrounding area).
2	Written message	The researchers ask participants to introduce themselves (in their role) to the other team members and requesting that they, as a team, communicate their 5 main goals.
3	Radio	Operational police commander on scene sends a radio message requesting assistance zoning the incident ground.
4	Phone call	Participants receive a phone call from the Strategic lead of the incident instructing them to begin sending out coordinated media messages
5	Twitter feed	Tweets criticising the response of the emergency services. Designed to increase the sense of urgency
6	Radio	Participants receive a phone call from Ambulance commander. Non-specialist responders are treating casualties in a high-risk zone. Participants must decide whether to follow procedure and pull back the responders.
7	Phone call	The Council Emergency Planning committee call to request that participants identify an appropriate reception for those involved in the incident and their family members.
8	Phone call	Participants receive a second phone call from the Strategic lead asking them to state their 5 main goals individually

PROPOSED ANALYSIS AND OUTCOME

The primary aim of the research is to compare how familiar and unfamiliar MTS operate in stressful conditions. To do this we will compare the network structures (social network analyses), instances of positive and negative indicators of teamwork (thematic analysis of transcripts) and the goal congruency of the familiar and unfamiliar teams (decision logs). We hypothesise that familiar teams will have more distributed communications (e.g., lower centrality), more indicators of positive teamwork and will show higher goal congruency in the latter stages of the simulation than unfamiliar teams. The second aim of the research is to explore how shared personality traits/values effect teamwork and to what extent this interacts with familiarity. We anticipate that the findings of this research will provide empirical evidence to test theoretical models of how MTS operate in stressful conditions.

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