Decisive Action vs. Joint Deliberation

Chapter · June 2010

DOI: 10.1201/EBK1439834978-c24

4 authors, including:

Franziska Tschan
Université de Neuchâtel
109 PUBLICATIONS **4,138** CITATIONS
SEE PROFILE

Norbert Semmer
Universität Bern
228 PUBLICATIONS **11,510** CITATIONS
SEE PROFILE

Stephan Marsch
269 PUBLICATIONS **7,953** CITATIONS
SEE PROFILE

Decisive action vs. joint deliberation: Different medical tasks imply different coordination requirements

Franziska Tschan[1], Norbert K. Semmer[2,] Sabina Hunziker[3], Stephan Marsch[3]

[1]University of Neuchâtel
Neuchâtel, Switzerland

[2]University of Bern
Bern, Switzerland

[3]University Hospital Basel
Basel, Switzerland

ABSTRACT

Medical emergency teams have to act in a coordinated manner. One might assume that the behaviors necessary for good team coordination are the same across many different situations. In contrast, we hypothesized that coordination behaviors have to match task requirements, which may be different across tasks. In a medical simulator we studied performance of medical professionals in two different scenarios. In the cardiac arrest scenario requiring resuscitation, the diagnosis is clear, and task requirements are prescribed by guidelines. This situation calls for decisive action with minimal delays; it should profit from directive leadership. In the diagnostic task scenario the diagnosis was difficult, as conflicting cues were present. This calls for joint reflection and weighing all available evidence; it should therefore profit from explicit reasoning and from involving the whole group by “talking to the room”. Micro-analysis of coordination behaviors revealed that clear leadership was related to performance in the resuscitation, but not the diagnostic task. In contrast, "talking to the room" was related to performance in the diagnostic, but not the

resuscitation scenario.

Keywords:
Medical teams; coordination requirements; group performance

INTRODUCTION

Many medical emergencies are treated by ad-hoc formed temporary action teams (Faraj & Xiao, 2006); their members may or may not have collaborated before (Fiedor, Hunt, & DeVita, 2006; S. Marsch et al., 2003; S. C. Marsch et al., 2001). Such ad-hoc teams often cannot count on previous common experiences, nor do the team members have prior knowledge about the level of expertise of the other group members; which may well influence performance (Sabina Hunziker et al., 2009; S. U. Marsch et al., 2004).

Different medical emergencies require very different skills from ad-hoc emergency teams. For example, treating a sudden cardiac arrest may not be very problematic to diagnose, and treatment is prescribed by a clear algorithm. This situation requires a team to perform highly coordinated actions under high time pressure (Nolan, Deakin, Soar, Bottiger, & Smith, 2005). In contrast, if a patient presents ambiguous symptoms in an emergency situation, the primary task of a team may be collective decision making in order to reach the correct diagnosis. This latter situation requires coordinating 'thoughts', and integrating information and expertise, whereas less emphasis is given on coordinating actions as long as the diagnosis is not clear.

TASK COORDINATION REQUIREMENTS

Given that emergency teams are confronted with different task types, different coordination mechanisms may be crucial for high performance in these different situations (McGrath, 1984; F. Tschan & von Cranach, 1996; M. J. Waller, 1999; Xiao, Seagull, Mackenzie, & Klein, 2004). Indeed, a recent study on cockpit crews (Grote, Kolbe, Zala-Mezö, Bienefeld-Seall, & Künzle, 2010) not only showed that coordination behaviors varied between phases of the flight in accordance with changing task requirements. It also revealed that the same coordination behavior (leadership) was positively related to performance in some, but negatively related to performance in other phases of the flight. This finding underlines the importance of a contingency approach in the study of group processes and group performance that relates task coordination requirements to specific coordination behavior.

Coordination-requirement analysis of group tasks (F. Tschan et al., in press) is a method based on hierarchical task analysis (Annett, Cunningham, & Mathias-Jones, 2000), which permits developing hypotheses concerning which coordination behavior may be especially important for high performance for a given task.

Coordination requirements of a cardiac resuscitation task

Coordination requirements of a cardiac resuscitation task including ventricular fibrillation (pulseless uncoordinated rapid electrical activity of the heart) can be derived from resuscitation algorithms (Nolan et al., 2005; F. Tschan et al., in press). In terms of a hierarchical task analysis, resuscitation guidelines consist of three general goals, each with several subgoals: Goal (a) refers to the diagnosis of the cardiac arrest and includes the subgoals of "checking pulse", "checking breathing" and "checking consciousness". Goal (b) is to ensure oxygenation of the brain despite the fact that the patient has no own circulation and includes the subgoals of opening airways, performing ventilation, and performing cardiac massage. Goal (c) is related to reestablishing spontaneous circulation and includes the subgoals defibrillation and administering drugs (epinephrine).

Coordination requirements for this task include rapid transitions from goal (a) to goals (b) and (c), which are performed in alteration. Further coordination requirements are a gapless alternation between (b) and (c), as well as assuring smooth coordination between the two group members who ventilate and perform cardiac massage (subgoals of b), and the coordination of all group members present during defibrillation (subgoal of c). Thus, coordination requirements of this task include coordinated and rapid changes between subgoals as well as coordinated pacing of the different activities of three or more people. It can therefore be hypothesized that direct leadership and clear task distribution are crucial for high performance of a resuscitation task.

Coordination requirements for a group diagnostic task

For a diagnostic task in an ambiguous situation, coordination requirements are very different. Coordination requirements can be derived from a task analysis of the diagnostic process. In the medical literature (Bowen, 2006; Patel, 2002; Swartz, 2006), the diagnostic task is described as consisting of three main steps that can also be seen as goals: Goal (a) is data collection, with subgoals of collecting data based on patient history, physical exams, and other information sources. Goal (b) is to integrate this information in order to generate a hypothesis about a possible diagnosis. Subgoals are integrating information, and comparing information with illness scripts. Goal (c) is to confirm the initial diagnosis; subgoals are considering and testing plausible alternative hypotheses.

Thus coordination requirements for a diagnostic task performed in a group imply explicitly sharing information and knowledge in the group. This is a prerequisite for an informed discussion aimed at integrating this information. Thus, a further coordination requirement relates to integrating information, impyling explicitly relating pieces of information to each other. Based on this sharing and integrating information, a preliminary, and then a final, diagnosis can be reached.

Previous research shows that these coordination requirements are not easy to fulfill in groups. For example, groups often do not collect expert information from

individual group members and thus rely too heavily on information initially known by all group members (Stasser & Stewart, 1992; Mary J. Waller, Gupta, & Giambatista, 2004). Groups also are reluctant to explicitly plan and develop strategies (Hackman, Brousseau, & Weiss, 1976). Furthermore, in discussions, group members often simply state facts but do not relate different pieces of information to one another, thus not integrating information (cf. Kerr, 2004). This latter finding may not be restricted to diagnoses made in groups. Indeed, studies examining physicians who individually diagnosed patients found important and frequent shortcomings in the individual reasoning process (Elstein, 2002; Graber, Franklin, & Gordon, 2005), and particularly an underuse of explicit reasoning (Elstein, 2002; Eva, 2005).

A behavior that may help overcome these shortcomings in groups is "talking to the room", which has been investigated by Artman and Waller (cf. Artman & Waern, 1999; M. Waller & Uitdewilligen, 2009). In their studies of emergency situations, group members spoke in a louder voice, and did not address a specific colleague but the whole room when explaining their assessment of the situation. This behavior increases the chance of getting the attention of the whole group and also invites group members to participate in a mutual problem solving process (M. Waller & Uitdewilligen, 2009). Talking to the room has been shown to correlate with explicit reasoning, as indicated by the occurrence of words such as “therefore, because” and the like (F. Tschan et al., 2009). It can therefore be hypothesized that talking to the room is related to higher performance in groups confronted with ambiguous diagnostic tasks in emergency situations.

COORDINATION AND PERFORMANCE IN A RESUSCITATION AND A DIAGNOSTIC TASK

We present results of two studies investigating groups of medical professionals who were confronted with either a resuscitation task or an ambiguous diagnostic situation. As shown above, coordination requirements are very different for these tasks; we therefore expect that clearer directive leadership is related to higher performance in the resuscitation, but not in the diagnostic tasks. Conversely, we expect that behavior aimed at fostering the integration of information (talking to the room) is related to performance in the diagnostic, but not the resuscitation tasks. We draw on results of earlier studies as well as on additional analyses.

Resuscitation task: leadership, talking to the room and performance

In several studies, we confronted groups of medical students (S. Hunziker et al., 2010), general practitioners, nurses and hospital physicians (Sabina Hunziker et al., 2009; S. C. U. Marsch et al., 2004; F. Tschan et al., 2006) with a resuscitation task. The scenario involved a witnessed cardiac arrest: At the beginning, the patient was alert, but after two minutes, he complained of dizziness and suffered a cardiac arrest

requiring an advanced resuscitation intervention. The scenario presented had the same basic structure but was adapted to the circumstances students or physicians may encounter in their daily life. Performance was measured as percentage of time the patient had no pulse and received appropriate care (cardiac massage, defibrillation, and intubation). Leadership behavior was assessed as the number or percentage of leadership utterances.

In accordance with the contentions developed above, we hypothesized that directive leadership behavior would be related to performance of groups confronted with a resuscitation task. Indeed, in all studies involving the resuscitation task, more directive leadership was related to higher performance. These results also corroborate findings from other studies (Cooper & Wakelam, 1999; Künzle, Kolbe, & Grote, 2010).

We hypothesized that behavior that aims at sharing and integrating knowledge would be less important for high performance in the resuscitation task. To test this hypothesis, we analyzed the relationship between talking to the room and resuscitation performance for twenty groups of three physicians each (general practitioners and hospital physicians) who were confronted with the resuscitation task described above.

Talking to the room was coded as all utterances that were expressed in a loud voice, did not address a specific group member but "the room", and referred to general aspects of the patient state or the procedure rather than specific aspects such as clear commands. Performance was assessed as the percentage of time the pulseless patient received adequate treatment (cardiac massage, intubation, defibrillation).

Mean group performance was 54.7% (SD = 15.5), and in 9 of the 20 groups (45%), at least one group member engaged in talking to the room. Performance of groups that did engage in talking to the room was not higher (52.5%) than performance of groups that did not engage in talking to the room (57.4%; $t(18) = .692$, $p = .498$). This result supports the hypothesis that talking to the room does not enhance performance in the resuscitation task.

Diagnostic task: talking to the room, leadership and performance.

Using the same high fidelity patient simulator, we confronted groups of physicians with an ambiguous diagnostic task (F. Tschan et al., 2009). The main goal was to relate the reasoning process to diagnostic performance. For the current paper, we ran additional analyses to test the hypothesis that in this situation, leadership would not be related to performance.

Procedure and simulation scenario

A total of 53 experienced physicians participated, working in groups of two (7 groups) or three (13 groups). In this scenario, the physicians were handed over a patient suffering from left sided pneumonia by an emergency physician who was a

research confederate. Participants were given basic patient information and history, were informed that medication treatment had already started (penicillin), and were handed the patient file containing additional information. The physician handing over the patient also informed the group about a failed attempt to insert a subclavian catheter (a vein access below the collarbone).

The scenario unfolded as follows. First, the patient complained about the pain caused by the failed attempt to insert the subclavian catheter; he then started complaining about increasing difficulties to breathe, and about dizziness. The surveillance monitor showed a gradual increase in heart and respiratory rate, and a gradual decrease in blood pressure and blood oxygen saturation. Breathing sounds, which could be auscultated with a stethoscope, became more 'obstructive' (indicating possible fluid in the lung) over time, but were present on both sides. These symptoms match the typical symptoms of an anaphylactic shock (a severe allergic reaction), which was the correct diagnosis.

This situation is ambiguous because some of the symptoms (increased heart rate, low oxygen saturation and difficulties breathing) are also typical symptoms of a tension pneumothorax, a collapsed lung. As a tension pneumothorax is a possible complication after an attempt to insert a subclavian catheter (Mansfield, Hohn, Fornage, Gregurich, & Ota, 1994), and as the symptoms developed gradually, both diagnoses should be considered. However, the patient also presented symptoms that make a tension pneumothorax unlikely. First, breathing sounds were present on both sides; in case of a tension pneumothorax, they would be absent in the affected lung. Second, the patient declined being in pain, and the decrease of the patient's state was very rapid; both aspects are not typical for a tension pneumothorax. Finally, the fact that the patient was allergic was stated in the patient file.

Diagnostic performance

The physicians collaborating in a group had never worked together before participating in this study. A scripted nurse was also in the room. He answered questions, but only participated in the medical treatment when explicitly instructed by the physicians. If groups did not correctly diagnose the anaphylactic shock, two levels of help were provided. First, the confederate nurse was instructed to provide cues pointing to the anaphylactic shock diagnosis (e.g. by mentioning that the patient's skin turned red, or by drawing attention to the fact that penicillin was administered). Groups that did not find the correct diagnosis even with the help of the nurse received a phone call from the 'emergency department' informing them that the patient's wife had alerted them to the allergy.

Based on this procedure, we found that six groups (30%) declared the correct diagnosis without help from the confederate nurse; 14 groups (60%) did not find the correct diagnosis without help; of these 8 diagnosed the anaphylactic shock after having received additional information from the confederate and 6 groups only after having received an outside phone call).

Reasoning, talking to the room, leadership and performance

Based on the video-tapes and word-by word transcripts of all communication, we coded *explicit reasoning* each time two or more diagnostic information were related using conjunctions such as "therefore", "because", etc., thus explicitly relating pieces of diagnostic information to each other. *Talking to the room* was coded as a dummy variable based on whether at least once a physician communicated in a loud voice, and did not address another group member directly. Leadership was coded as a dummy variable (present / absent) based on a coding of whether one physician was taking a more dominant leadership position. All variables were double coded by two independent researchers. Cohen's kappa for each category was higher than .75.

Groups that engaged in talking to the room were significantly more likely to find the diagnosis on their own, and so were groups that engaged in more explicit reasoning (F. Tschan et al., 2009). When explicit reasoning and talking to the room were entered into a regression analysis simultaneously, talking to the room remained a significant predictor ($\beta = .392$, $p = .026$, one-tailed), whereas explicit reasoning was no longer significant ($\beta = .308$, $p = .092$, one-tailed). The two were correlated substantially ($r = .51$; $p = .029$); an index combining the two was significantly associated with performance.

We had predicted that directive leadership would not be crucial for performance in the diagnostic task. Indeed, a Chi2 test was not significant ($p = .826$); parametric and nonparametric correlations yielded the same result. Our hypothesis that directive leadership is not crucial for this task is supported

DISCUSSION

Based on the assumption that coordination requirements in medical emergency groups are related to task type, we assessed the relationship of (a) directive leadership and (b) talking to the room (indicating information integration) to performance in two different tasks. One task (cardiopulmonary resuscitation) was well structured and required the "coordination of acts"; the second taskinvolved an ambiguous diagnostic task requiring the "coordination of thoughts". In accordance with our hypotheses, leadership was related to performance in the resuscitation but not the diagnostic task, and talking to the room was related to performance in the diagnostic but not the resuscitation task.

Our results have implications for theory, research approaches, and application and training. Regarding theory, our results suggest that it is important for the group to match the specific coordination requirements of the task. Identifying a limited set of variables assumed to be important for all groups and all tasks will therefore be possible only on a very general level. For example, Salas and colleagues (2005) suggested a set of five basic coordination mechanisms for teams (team leadership, mutual performance monitoring, backup behavior, adaptability, and team orientation), proposing “that the coordinating mechanisms will be needed in all

cases and will have little variance across the team type or task" (p. 564). We feel that this position can be upheld only if the five concepts are defined in a very general manner; for instance, by regarding talking to the room as a form of indirect leadership. Thus, we would go further than Salas et al., who state that task type, group development stage, and maturity may render some of the aspects more important; we would emphasize the specifics (i.e. directive vs. indirect leadership) and their match to task requirements more strongly.

From a research point of view, we feel it is necessary to develop better methods for defining and assessing coordination requirements of different tasks. Well-known known task typologies (e.g. McGrath, 1984; Steiner, 1972) or broad distinctions between coordination and collaborative tasks (Salas et al., 2005) may not be specific enough to derive specific coordination requirements. We believe that a task analysis that specifies coordination requirements (Annett et al., 2000; F. Tschan et al., in press) can be useful in guiding researchers to assess the pertinent coordination variables, and may also help to integrate conflicting results (Künzle et al., 2010).

Finally, if tasks indeed require different coordination behaviors, this has implications for group training. Specifically, training should go beyond teaching general skills (e.g., in terms of the big five of teamwork and include a focus on identifying conditions under which specific coordination behaviors may be useful, irrelevant, or even damaging.

REFERENCES

Annett, J., Cunningham, D., & Mathias-Jones, P. (2000). A method for measuring team skills. *Ergonomics, 43*(8), 1076-1094.

Artman, H., & Waern, Y. (1999). Distributed cognition in an emergency co-ordination center. *Cognition, Technology & Work*(1), 237-246.

Bowen, J. L. (2006). Educational strategies to promote clinical diagnostic reasoning. *The New England Journal of Medicine*(355), 2217-2225.

Cooper, S., & Wakelam, A. (1999). Leadership of resuscitation teams: `Lighthouse Leadership'. *Resuscitation, 42*, 27-45.

Elstein, A. S., & Schwarz, A. (2002). Evidence base of clinical diagnosis: Clinical problem solving and diagnostic decision making: selective review of the cognitive literature. *BMJ, 324*, 729-732.

Eva, K. W. (2005). What every teacher needs to know about clinical reasoning. *Medical Education, 39*(1), 98-106.

Faraj, S., & Xiao, Y. (2006). Coordination in fast-response organizations. *Management Science, 52*(8), 1155-1169.

Fiedor, M. L., Hunt, E. A., & DeVita, M. A. (2006). Teaching organized crisis team functioning using human simulators. In M. A. DeVita, K. Hillman & R. Bellomo (Eds.), *Medical Emergency Teams. Implementation and Outcome Measurement* (pp. 232-257). New York, NJ: Sptinger.

Graber, M. L., Franklin, N., & Gordon, R. (2005). Diagnostic error in internal medicine. *Archives of Internal Medicine, 165*(13), 1493-1499.

Grote, G., Kolbe, M., Zala-Mezö, E., Bienefeld-Seall, N., & Künzle, B. (2010). Adaptive coordination and heedfulness make better cockpit crews. *Ergonomics, 53*, 211-228.

Hackman, R. J., Brousseau, K. R., & Weiss, J. A. (1976). The interaction of task design and group performance strategies in determining group effectiveness. *Organizational Behavior and Human Performance, 16*, 350-365.

Hunziker, S., Bühlmann, C., Tschan, F., Balestra, G., Legret, C., Schumacher, C., et al. (2010). Brief leadership instructions improve cardiopulmonary resuscitation in a high fidelity simulation: a randomized controlled trial. *Critical Care Medicine, 38*, 1-4.

Hunziker, S., Tschan, F., Semmer, N., Zobrist, R., Spychiger, M., Breuer, M., et al. (2009). Hands-on time during cardiopulmonary resuscitation is affected by the process of teambuilding: a prospective randomised simulator-based trial. *BMC Emergency Medicine, 9*(1), 3.

Kerr, N. L., & Tindale, R. S. (2004). Group performance and decision making. *Annual Reviews of Psychology, 55*, 623–655.

Künzle, B., Kolbe, M., & Grote, G. (2010). Ensuring patient safety through effective leadership vehaviour: A literature eeview. *Safety Science, 48*, 1-17.

Mansfield, P. F., Hohn, D. C., Fornage, B. D., Gregurich, M. A., & Ota, D. M. (1994). Complications and failures of subclavian-vein catheterization. *The New England Journal of Medicine, 26*, 1735-1738.

Marsch, S. C., Marquardt, K., Conrad, G., Spychiger, M., Eriksson, U., & Hunziker, P. R. (2001). The success rate of cardiopulmonary resuscitation depends on the quality of team building. *Intensive Care Medicine*, abstract.

Marsch, S. C. U., Müller, C., Marquardt, K., Conrad, G., Tschan, F., & Hunziker, P. R. (2004). Human factors affetc quality of cardiopulmonary resuscitation in simulated cardiac arrests. *Resuscitation, 60*(1), 51-56.

Marsch, S. U., Hunziker, P., Spychiger, M., Breuer, N., Semmer, N., & Tschan, F. (2004). *Teambuilding delays crucial measures in simulated cardiac arrests.* Paper presented at the Schweizerische Gesellschaft für Intensiv Medizin; 12.-15. Mai 2004, Interlaken.

McGrath, J. E. (1984). *Groups, interaction and performance*. Englewood Cliffs, NJ: Prentice-Hall.

Nolan, J. P., Deakin, C. D., Soar, J., Bottiger, B. W., & Smith, G. (2005). European resuscitation council guidelines for resuscitation 2005: Section 4. Adult advanced life support. *Resuscitation, 67*(Supplement 1), S39-S86.

Patel, V. L., Kaufman, D. R., & Arocha, J. F. (2002). Emerging paradigms of cognition in medical decision making. *Journal of Biomedical Informatics*.

Salas, E., Sims, D. E., & Burke, C. S. (2005). Is there a "Big Five" in teamwork? *Small Group Research, 36*(5), 555-599.

Stasser, G., & Stewart, D. (1992). Discovery of hidden profiles by decision-making groups: Solving a problem versus making a judgement. *Journal of Personality and Social Psychology, 93*(3), 426-434.

Steiner, I. D. (1972). *Group processes and productivity*. New York: Academic Press.

Swartz, M. H. (2006). *Textbook of Physical Diagnosis, 5th edition*. Oxford: Elsevier.

Tschan, F., Semmer, N. K., Gautschi, D., Spychiger, M., Hunziker, P. R., & Marsch, S. (2006). Leading to recovery: Group performance and coordinating activities in medical emergency driven groups. *Human Performance, 19*, 277-304.

Tschan, F., Semmer, N. K., Gurtner, A., Bizzari, L., Spychiger, M., Breuer, M., et al. (2009). Explicit reasoning, confirmation Bias, and illusory transactive Memory: A simulation study of group medical decision making. *Small Group Research, 40*(3), 271-300.

Tschan, F., Semmer, N. K., Vetterli, M., Gurtner, A., Hunziker, S., & Marsch, S. U. (in press). Developing observational categories for group process research based on task analysis: Examples from research on medical emergency driven teams. In M. Boos, M. Kolbe, P. Kappeler & T. Ellwart (Eds.), *Coordination in human and primate groups*. Berlin: Springer.

Tschan, F., & von Cranach, M. (1996). Group task structure, processes and outcome. In M. West (Ed.), *Handbook of Work Group Psychology* (pp. 95 - 121). Chichester: Wiley.

Waller, M., & Uitdewilligen, S. (2009). Talking to the room. Collective sensemaking during crisis situations. In R. A. Roe, M. J. Waller & S. R. Clegg (Eds.), *Time in Organizational Research* (pp. 186-203). London: Roudledge.

Waller, M. J. (1999). The timing of group adaptive behaviors during non-routine events. *Academy of Management Journal, 42*, 127-137.

Waller, M. J., Gupta, N., & Giambatista, R. C. (2004). Effects of adaptive behaviors and shared mental model creation on control crew performance. *Management Science, 50*(11), 1534–1544.

Xiao, Y., Seagull, F. J., Mackenzie, C. F., & Klein, K. (2004). Adaptive leadership in trauma resuscitation teams: a grounded theory approach to video analysis. *Cognition, Technology & Work, 6*, 158-164.