Interplay of group threat and task complexity affects group diversity and performance

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Rationale

Studies of effects of group threat on performance show inconsistent results. Groups under threat often become more homogeneous, possibly because group members are more likely to enforce social norms, ostracize members that behave differently, and/or denigrate divergent outgroup sources. However, it is not clear whether threat influences group performance: groups under threat sometimes perform better and sometimes worse than groups not under threat (Stein, 1976; Doosje & Ellemers, 1997; Rempel & Fisher, 1997; Turner & Virick, 2008; Turner & Patkanis, 2014).

One possible explanation is that the effects of threat depend on the complexity of tasks that groups need to solve. Task complexity has not usually been studied in the literature on group threat. However, in a separate line of literature on team performance, it has been shown that individual exploration and the resulting diversity of ideas tend to improve performance on complex tasks with many potentially good solutions (Gavetti & Levinthal, 2000; Goldstone, Wisdom, Roberts, & Frey, 2013; Barkoczi & Galesic, 2006; Derex & Boyd, 2016). In contrast, for simple tasks with an obvious solution, exploitation or copying of other members' solutions can lead to the fastest group convergence on the best solution.

Research questions and hypotheses

How do task complexity and group threat affect 1) the diversity of individual solutions and 2) group performance?

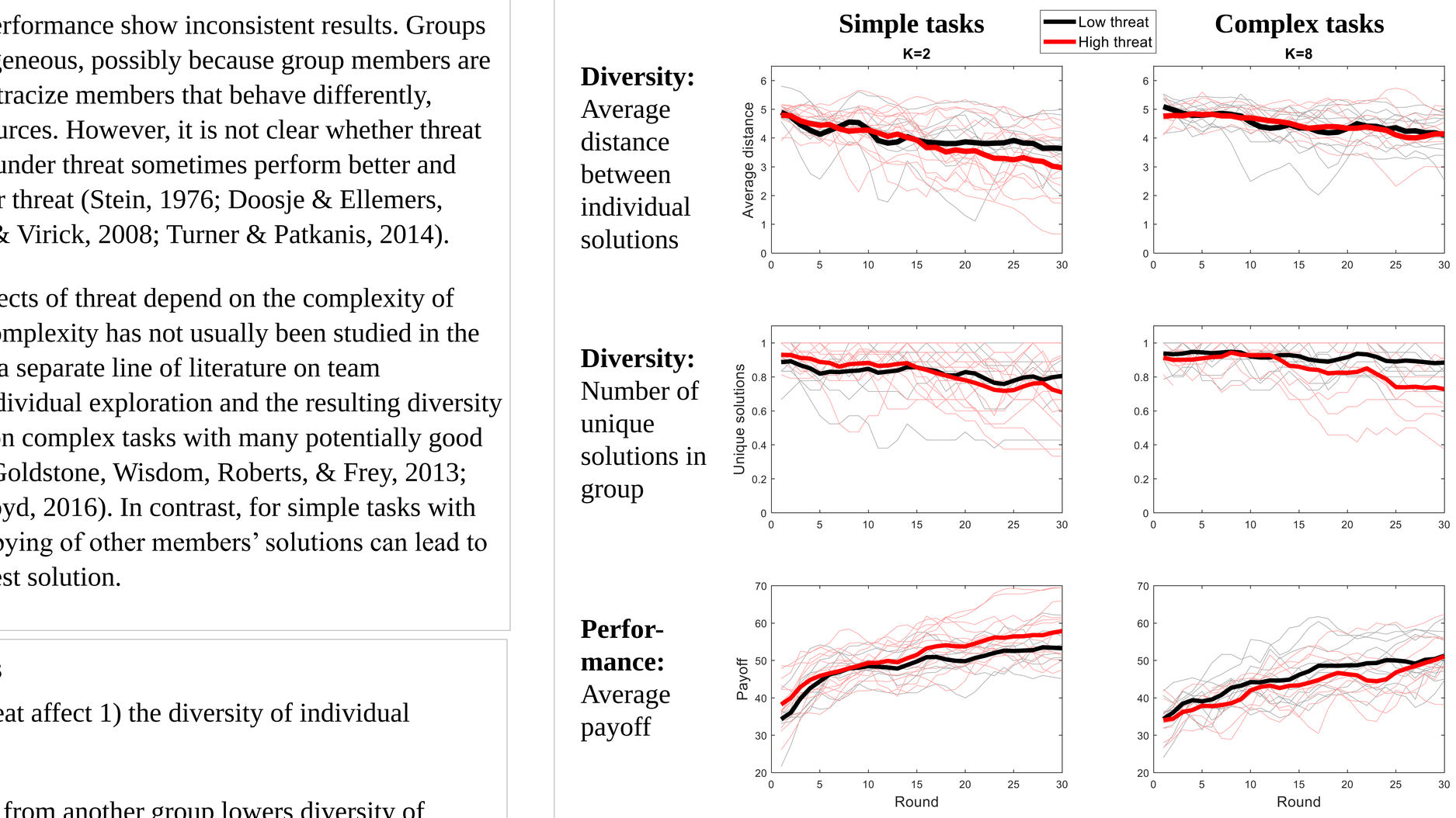
To the extent that experiencing a threat from another group lowers diversity of opinions in a group, we hypothesize that group threat will negatively affect group performance for complex tasks, in which diversity is beneficial. For simple tasks, group threat will not affect or will even increase group performance.

Methods

Computational modeling: Groups of individuals search for best solutions on more or less complex task landscapes created using NK framework (Kauffman & Levin, 1987), by either exploring on their own (with probability proportional to their current payoff) or copying solutions of others. We model the effect of group threat by assuming that individuals preferentially copy those group members whose solutions diverge least from the rest of the group. When not under threat, we assume that individuals copy a random other individual. We assume groups of 7 individuals solving a task over 30 rounds. We explore different levels of copying. We replicate each variant of the simulation 100 times and present average results.

Group experiments: We again use NK framework to construct the tasks. We conduct 41 group sessions with 5-9 participants who together solved **simple (K=2) or complex (K=8)** tasks over 30 rounds. Participants had to find the best combination of N=10 symbols. They could explore on their own or copy solutions of other group members. We manipulate group threat by instructing participants' that their payoffs depend on performance of a competing group. In high threat condition, the performance of the other group is always better than that of their own group; and in the low threat condition the other group is always worse.

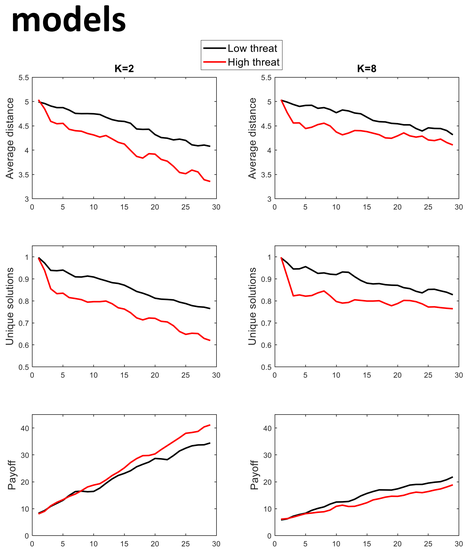
Results of group experiments



Thin lines show results for different groups. Thick lines are average results for experimental groups in Low and High threat conditions.

Experimental interface

Results of computational models



Probability of copying = .3

Summary of results

Computational modeling and group experiments suggest that diversity of solutions within groups decreases when groups feel under threat from another group. However, this does not need to impair their performance. In simple tasks, group threat can lead to better performance, while in complex tasks group threat can have a negative influence.

Contact

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