# Modeling Identity and Sentiments in Collaborative Groups

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INTRODUCTION

Affect Control Theory (ACT) is a mathematically formalized theory which links social perception with identity, behavior, and emotion in interpersonal interaction. This research project is aimed at understanding self-organized online collaborative software development with ACT-based social simulations. These simulations emphasize the aspect of hierarchical vs. egalitarian structures in groups, which are an important and ubiquitous facet of work culture. Group Simulator is a turn-based agent-based model (ABM) that extends ACT to model group interactions. Users can set up an identity profile for each group member, with group sizes ranging from three to twenty-five members. The model simulates a relational process of mutually compatible meaning-making based on deflection-minimization as the optimization mechanism. Group simulator predicts the distribution of interpersonal behaviors across Interaction Process Analysis categories, a taxonomy of group behavior.

METHOD
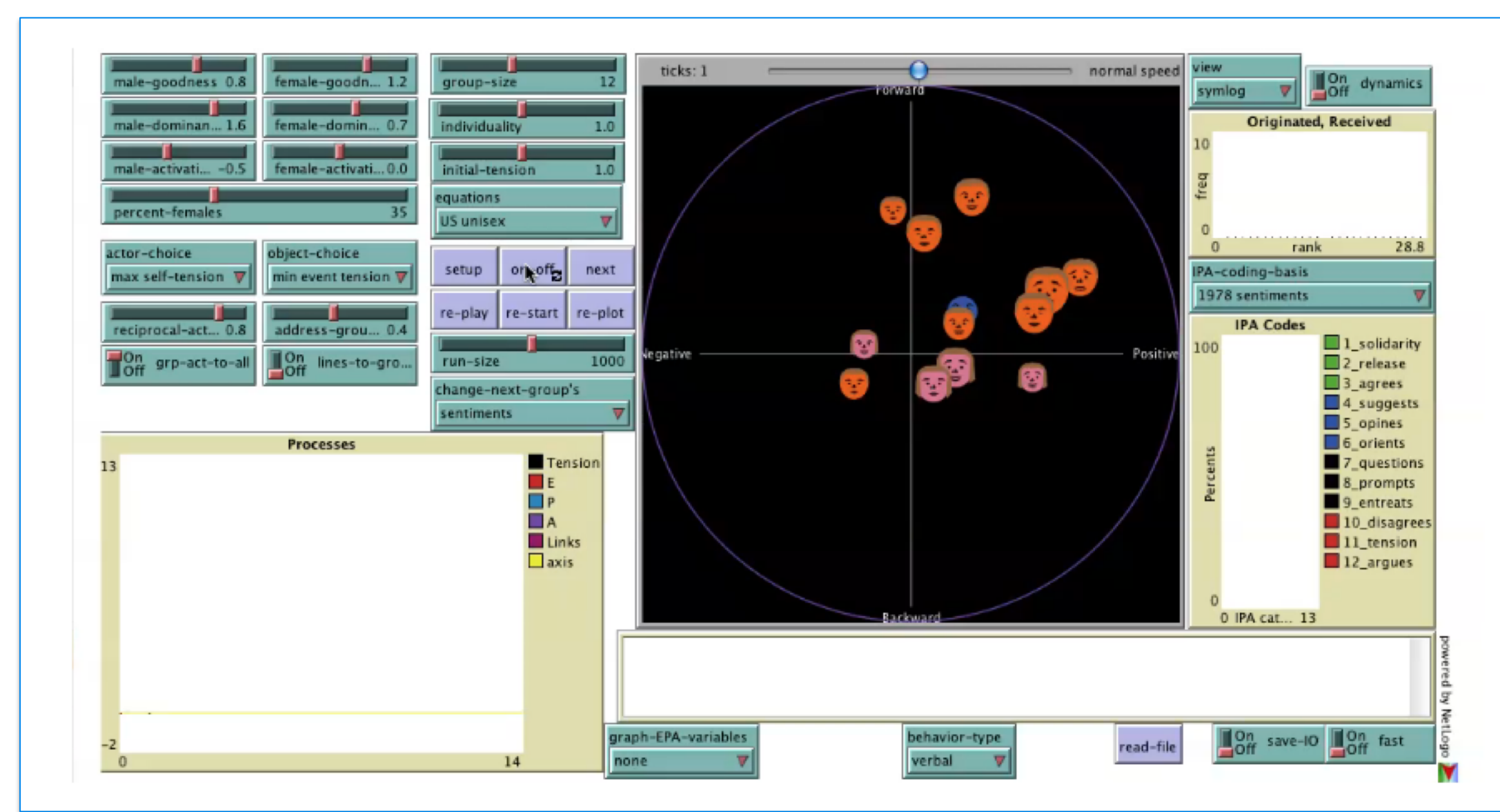
In the first simulation experiment, we compared predicted behavior patterns and deflection levels for egalitarian and hierarchical groups with different address-to-group probabilities. We conducted 20 simulations, which examined 10 deciles of increasing address-to-group probability for each group type. The reciprocity level was held constant at 0.8 for each simulation, following commonly observed rates of reciprocity in discussion groups.

In the second simulation experiment, we conducted 20 simulations that examined 10 deciles of increasing reciprocity probability for each group type. The percentage of actions directed at the group (address-to-group probability) was held constant at 0.4.

Table 1. Simulation Description, Parameter Settings for Study 1 and 2.

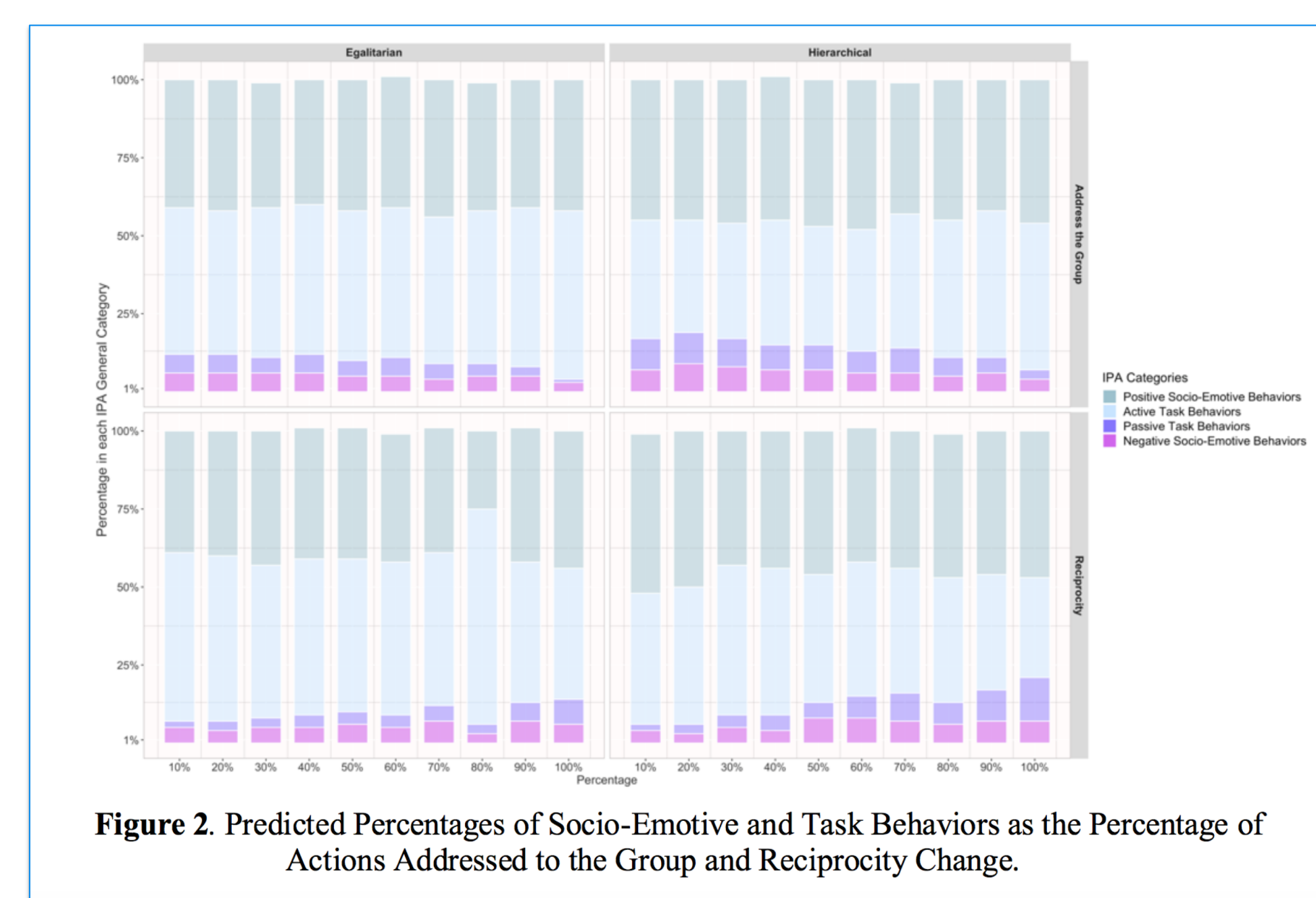| Group	E	P	A	Label	Addressing Group %	Reciprocity %
Egalitarian	1	1.5	1	Man (3)	*Varying*	0.8
Hierarchical	1	2.5	1	Boss (1)	*Varying*	0.8
	1	0.5	1	Client (2)		
Egalitarian	1	1.5	1	Man (3)	0.4	*Varying*
Hierarchical	1	2.5	1	Boss (1)	0.4	*Varying*
	1	0.5	1	Client (2)		

Note: The identity labels come from U.S. sentiment data collected between 2002 and 2004 [26].

We collected preliminary validation data from GitHub on acceptance vs. rejection of group members' project contributions and compared them to our simulation findings.

RESULTS
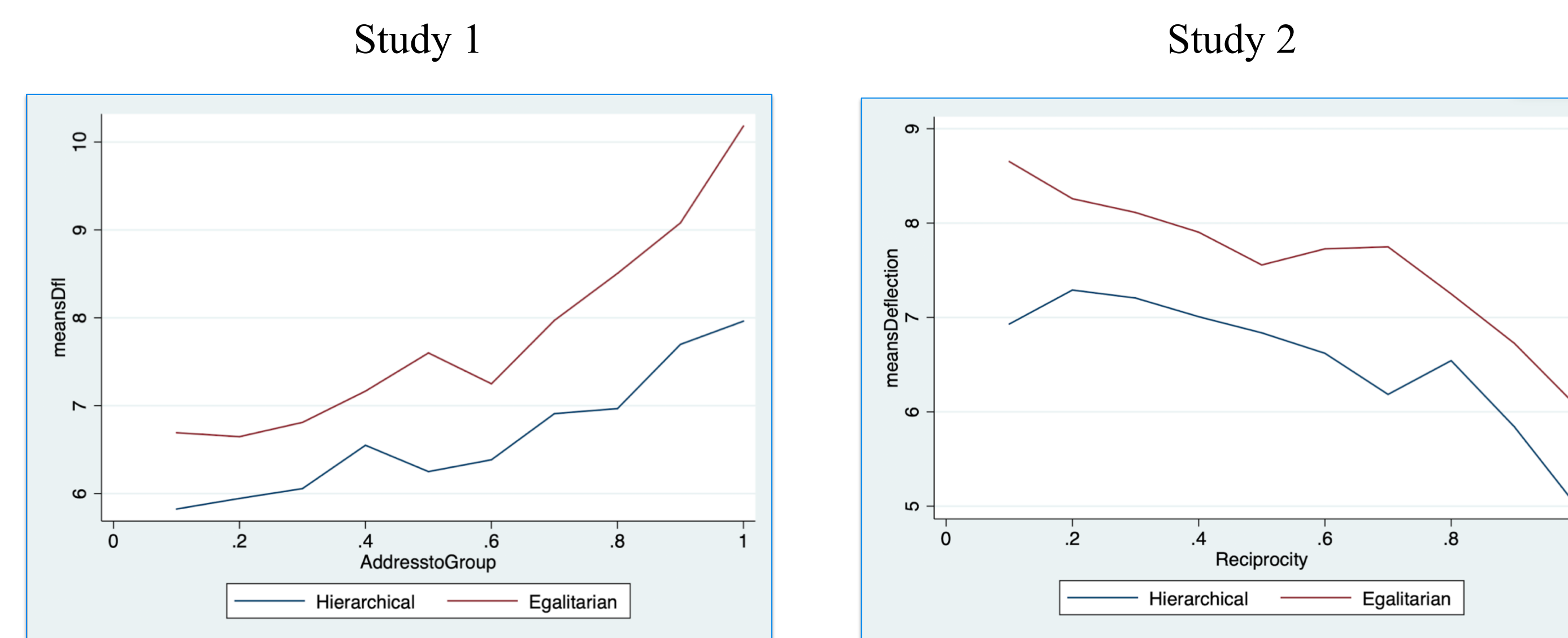
Hierarchical groups experienced less deflection than egalitarian groups in both studies. Deflection was higher when a greater proportion of actions were addressed to the group vs. individual group members and in groups with lower levels of reciprocity.

Figure 2. Predicted Percentages of Socio-Emotive and Task Behaviors as the Percentage of Actions Addressed to the Group and Reciprocity Change.

In our simulation results, the proportion of both negative socio-emotive and passive task behaviors tends to be greater for hierarchical groups than that of egalitarian groups.
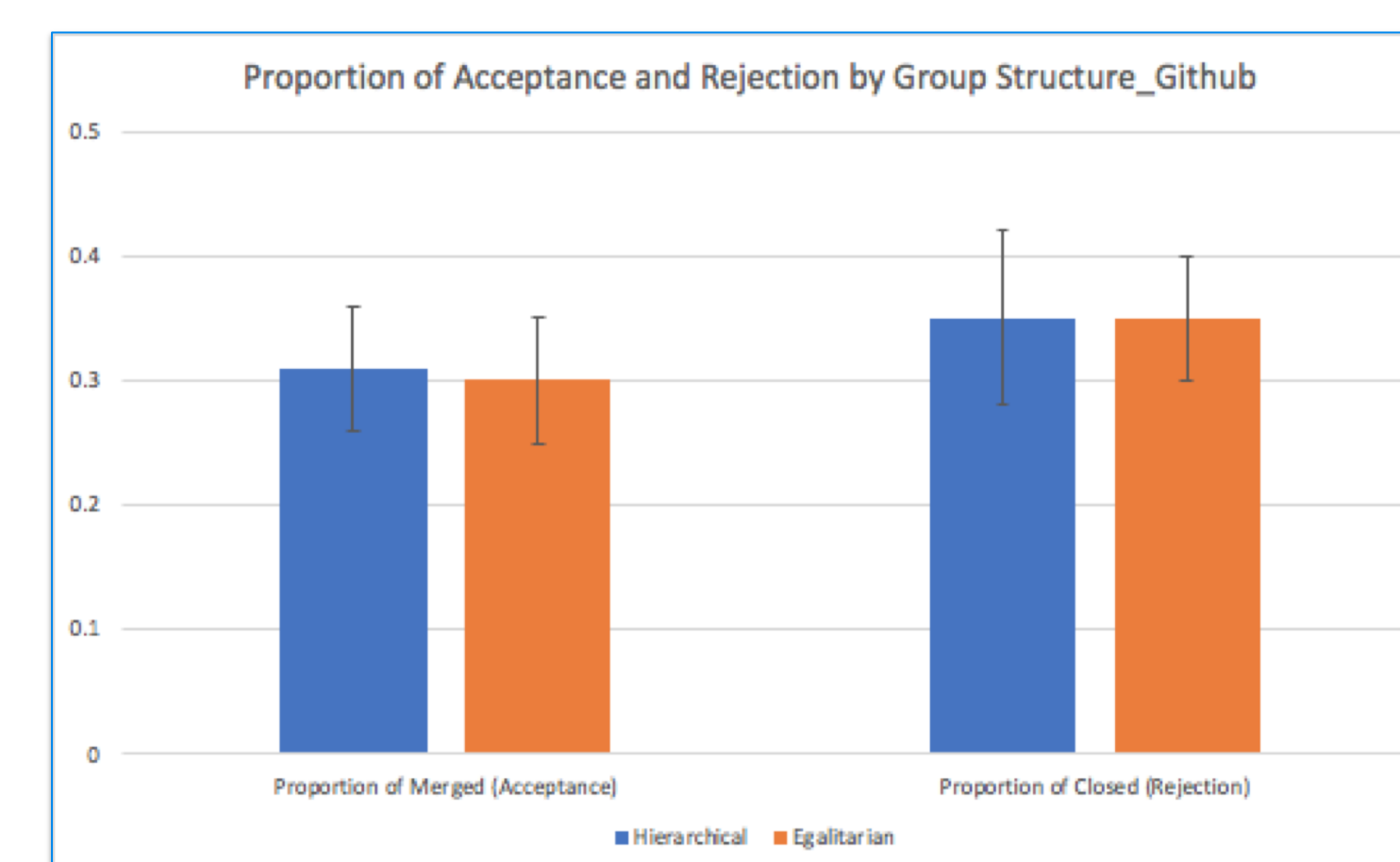
However, validation data from GitHub does not show a significant difference in the behaviors (i.e., rejection of a pull-reject vs. acceptance of a pull-request) that occur within the hierarchical and egalitarian group structures.

CONCLUSIONS

Our simulations demonstrate how role configurations and relational norms influence group behavior by setting role expectations and moderating the extent to which group members can affirm their roles. People experience more negative emotions in hierarchical than egalitarian groups, raising new questions about the relationship between identity maintenance and emotion in group settings.

Generally, as the address-to-group probability increases, group members' deflection levels also increase in both hierarchical and egalitarian groups. Conversely, as the reciprocity probability increases, group members' deflection levels decrease in both types of groups. These findings suggest that group members are better able to limit their deflection when they have more interaction opportunities at the dyadic level. When interactions are highly reciprocal, group members' behavior tends to be less extreme and more neutral. In other words, agents' behavior is nicer but also more dominant in groups with lower levels of reciprocity. Preliminary validation data from GitHub on the acceptance vs. rejection of members' project contributions did not support the findings from our simulations.

FUTURE DIRECTIONS...

An acknowledged limitation of the current study is that our simulations have focused only on studying interactions among groups of English speakers. We are currently running simulations that use Chinese impression-formation equations to determine whether differences in cultural norms for event processing affect the outcomes of group interactions on GitHub. Another limitation is simulated group size, which is currently restricted to only three participants. This will be expanded as the project goes on to explore larger-scale interactions that better approximate the experiences of actual groups on the site.

Additional work is also underway in validating our simulation results with data from actual group interactions on GitHub. We will be analyzing data from groups with different network structures and examining different types of actions taken by users on the site to understand their relationship to social scientific theory and our simulation results. We also plan to use natural language processing to examine the semantic content of group members' interactions on the site around project-related issues, which are perhaps a better reflection of the behaviors we wish to understand.

ACKNOWLEDGEMENTS