

# Social Preferences in Relational Contexts

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## Abstract

This paper reports the results of an empirical investigation of the ways in which task-dependencies and inter-personal relationships influence the social preferences and outcomes of two-party negotiations. The investigation used a game, Colored Trails, configured for two-players in an ultimatum-game-like arrangement, but with more task context. It varied the player(s) who needed assistance and a friend-stranger relationship between the two players. The results indicate that friends play the game differently from strangers; player-dependence status affects some outcomes, but not all; and, therefore there is a need to explore additional potential influencers of behavior in negotiation.

## 1 Introduction

The scientific study of negotiation comprises two complementary streams of research. The decision-making approach considers negotiation to be a game that includes strategies and payoffs for all players (Axelrod, 1984, Binmore et al., 1995). In contrast, the social psychology approach to negotiation has focused on the effects of individual differences and motivational factors on negotiators' choices (Conte and Castelfranchi, 1995; Rusbult and Van Lange, 2003). These two approaches concentrate on different causes of behavior in strategic environments and thus do not always agree in their predictions. For example, social psychology has found people to be more generous to friends than to strangers in some types of interaction (Mannix et. al 1994), whereas the game theoretic approaches do not easily accommodate this distinction.

In recent empirical work in behavioral economics, people have been shown to exhibit preferences for choices that benefit others as well as themselves (Lowenstein et al., 1989; Gal et al., 2004). Although such social preferences have been studied extensively within the game-theoretic framework (Camerer 2003), the interaction of these preferences with those that arise from inter-personal relationships has not received similar formal or empirical treatment.

Game theoretic formalisms represent the dependencies between players as outcomes in a payoff matrix, a formal approach that abstract away at least some

of the real-life decision-making context that has proven important to social psychology studies. On the other hand, social psychology research on the effect of such social factors as inter-personal and task-dependency relationships has been limited to dispute-type scenarios and qualitative rather than quantitative analyses.

This paper presents an empirical investigation of the effect of task-dependency and inter-personal relationships on the social preferences of people in a negotiation game. The game used, Colored Trails (CT) (Grosz, Kraus et al. 2004) establishes an environment in which players have goals, require resources to reach their goals, but may not have sufficient resources on their own to succeed. The players may trade resources, leading to interesting negotiation scenarios. Thus, CT differs from the games commonly used in behavioral economics in several ways. It provides a clear analogue to negotiation settings and similar real life goal-related interactions; players have many possible trades to suggest, and thus many possible strategies, raising reasoning as well as decision-making challenges; different task-dependencies may be represented in the game configuration.

Our general hypothesis was that personal relationships and task-dependencies between people would influence their negotiation strategies and choices in CT in several ways: the types of deals that players propose to each other; the types of deals that are accepted; and the scores that players achieve.

The next section of the paper provides a detailed description of the CT framework and the particular configuration used for this experiment. We then describe the experimental set-up. Subsequent sections present the specific hypotheses we investigated and the results obtained. The final section discusses the implications of these results and suggests future research.

## 2 The Colored Trails (CT) game

CT is played on a board of colored squares with a set of chips in colors chosen from the same palette as the squares. One square is designated as the "goal square" and each player has a piece on the board, initially located in one of the non-goal squares. The players have a set of colored chips. To move a piece into an adjacent square a player must turn in a chip of the same color as the square. Chips may be exchanged by the players, and the conditions of exchange may be varied to model different decision-making situations.

For this study, we used a version of CT in which two players played on 4x4 boards with a palette consisting of 4 colors. Each player had full view of the board as well as the other player's chips. At the beginning of the game, the two players were randomly placed at two locations on the CT board and each was allocated four chips at random, which could include any color in the palette. The distribution of chips was designed such that it is likely that the game is

“interesting”, where a game is considered to be interesting if (1) it was not the case that both players could reach the goal without trading; (2) at least one of the players could reach the goal after trading with the other player.

A player's outcome was determined solely by her own performance. The score was computed as follows: 100 points bonus for reaching the goal; 5 points for each chip left in a player's possession; 10 points deducted for any square in the path between the player's final position and the goal-square, with path computed by the Manhattan distance. The score was defined so that while getting to the goal was by far the most important component, if a player could not get to the goal it was preferable to get as close to the goal as possible.

In each game, each player was designated one of two roles, which determined the possible actions that were available during the game. One player was the proposer, the other player was the responder. The proposer was allowed to make an offer for exchange of chips to the responder. The responder could either accept or reject the proposer's offer. If the proposer did not make an offer, then both players were left with their initial allocation of chips. The responder was not allowed to counter the proposer's offer with another proposal. Each game consists of a one-shot negotiation deal between the two players, and a responder's reply to the exchange proposed by the proposer completely determined the final outcome of the game. The score that each player received if no offer was made was identical to the score each player received if the offer was rejected by the responder.

In some ways, CT is similar to traditional games used in behavioral economics (e.g., the ultimatum game), since it provides an abstraction of “real-life” domains. However, CT abstracts less than typical economic games do, and in general, can provide an analogue for more complicated task settings. In fact, many types of settings, such as joint goals and private information, can be mapped to CT instances.

### 3 Experimental Setup

A total of 16 subjects participated in the experiment. Participants were given a 20 minute tutorial of the game, consisting of an explanation of the rules, the scoring function and a practice game. No subject was paired up with any other subject more than once in the same role capacity. Subjects could not observe the terminals of other subjects, and they were not told about the identity of their partner. Participants' payment was correlated with the scoring function. For example, a score of 130 points gained in a round represented a \$1.30 that was attributed to that player. A running score was kept for each subject, revealed at the end of the experiment.

Subjects played consecutive CT games against each other. Each subject played 12 CT rounds, making for a total of 96 games played. The initial settings (board layout, chip distribution, goal and starting point positions) were different in each game, so no two games were alike. For each round of the game, we recorded the board and chip settings, as well as the proposal and the response made by the players.

We manipulated two types of relationships between players:

1. Dependency relationship: In the Player Independence (PI) condition, one of the players, termed the independent player, had sufficient chips to get to the goal at the onset of the game, while the other player did not. In the Player Dependence (PD) condition, neither player could get to the goal at the onset of the game.

2. Social relationship: In the Friends condition, the game is played between two people who were part of a pre-recruited group including four persons who knew each other. In the Strangers condition, the game is played between two people who did not know each other. Each game was played by people who belonged to the same type of social relationship. Thus, friends played the game against other friends, and strangers played the game against other strangers.

#### 4 Empirical Investigations

In general, we expected players to be more helpful to each other in the friends condition than in the stranger condition. In stating more specific hypotheses we will use the following terms:

The *no-negotiation-alternative* score for a player is the score a player would receive in the game if no proposal is offered, or if the proposal is rejected. The *proposed outcome* for a particular proposal to a player is the score that player would receive if the proposal is accepted. We say an offer is *beneficial* to a player, if the proposed outcome for the player associated with the offer is larger than the no-negotiation-alternative. We say an offer requires a *sacrifice* from a player when the proposed outcome to that player for accepting the offer is lower than the player's no-negotiation-alternative. We say an offer is *altruistic* for a player, if that offer is not beneficial to that player, but is beneficial for the other player.

We present separate hypotheses for the behavior of the proposer, the behavior of the responder, and the score of both players in the game. As shown in table 1, we expected offers in the friends condition to be more beneficial to the responder than offers in the strangers condition; we also expected proposers to make offers that benefit themselves less in the friends condition than they would in the strangers condition.

	Friends	Strangers
Benefit to responder	High	Low
Benefit to proposer	Low	High

Table 1 – hypothesis regarding proposal benefit to responder vs. proposer for each friendship condition

As shown in table 2, when proposers are the independent player, we expected them to make more altruistic proposals in the friends condition than they would in the strangers condition. When responders are the independent player, we expected them to accept more altruistic proposals (i.e., make a sacrifice) in the friendship condition than they would in the strangers condition.

	Friends	Strangers
Number of altruistic proposals made by independent proposer	Many	Few
Number of sacrifices made by independent responder	Many	Few

Table 2 – hypothesis regarding number of altruistic proposals made/accepted in the PI condition.

As shown in table 3, we expected proposals to be accepted more often in the friends condition than in the strangers condition, across all dependency conditions.

	Friends	Strangers
Number of accepted proposals	Many	Few

Table 3 – hypothesis regarding number of proposals accepted for each friendship condition

As shown in table 4, we expected responders to achieve a higher score in the game in the friends condition, then they would in the strangers condition.

	Friends	Strangers
Responder score	High	Low

Table 4 – hypothesis regarding score in game for proposers vs. responders in each friendship condition

## 5 Results

Our data consists of 92 games, distributed across relationships as described in Table 5.

	PI		PD	Total
	Proposer independent	Responder independent		
Friends	17	9	20	46
Strangers	17	9	20	46
Total	34	18	40	92

Table 5 – Number of games played

As described in the table, 46 games were played by friends and 46 games by strangers. For both friends and strangers, 9 games were played in the PI condition, where the responder was the independent player; 17 games were played in the PI condition, where the proposer was the independent player; 20 games were played in the PD condition.

### 5.1 Behavior of Proposer

Table 6 gives the average benefit to proposers vs. responders in each friendship condition. In general, proposals are beneficial both to proposers and to responders, but proposers tend to be more helpful to their responders in the friends condition than in the strangers condition. (t-test  $p < 0.15$ ). In addition, proposers are satisfied with less benefit in the friends condition than in the strangers condition.

	Stranger	Friend
Benefit to proposer	23.04	13.36
Benefit to responder	8.04	18.8

Table 6 – Average proposal benefit for strangers vs. friends

Table 7 presents the average proposal benefit for proposers and responders for each dependence condition. The average benefit to the proposer was significantly greater in the PD condition than in the PI condition (t-test  $p < 0:11$ ). Likewise, the average benefit to the responder was significantly higher in the PD condition than in the PI condition (t-test  $p < 0:05$ ). Thus, proposals in the PD condition benefited both players more than proposals in the PI condition.

	PD	PI
Benefit to proposer	26.12	11.96
Benefit to responder	24.75	6.6

Table 7 – Average proposal benefit for each Dependency type

Table 8 lists the average benefit to the responder for each dependence relation, separating out the strangers and friends condition.

	Stranger	Friend
PI	-1.53	10.96
PD	18.5	31.5

Table 8 – Average proposal benefit for each Dependency type

In the PI condition, strangers made proposals which required a sacrifice from the responder (average proposal benefit  $-1.53$ ), while friends made proposals that were beneficial to the responder (average proposal benefit  $10.96$ , t-test  $p < 0:12$ ). In the PD condition, strangers made proposals that were beneficial to the responder, but the average benefit in this condition was less than in the friends condition.

Although results shown in Table 9 show the number of proposals in PI in which proposers asked for sacrifice.

	Stranger		Friend	
PI	11	Average of sacrifice requested = - 28,18	10	Average of sacrifice requested = - 9,5

Table 9 – number of requests to the responders for sacrifice in PI and average of sacrifice

## 5.2 Behavior of Responder

We also examined the situations under which friends and strangers accepted proposals. The following table lists the number of accepted proposals for friends and for strangers in both the PI and the PD condition.

	PI			PD	Total
	Proposer independent	Responder independent	Total		
Friends	9 accepted	5 accepted	14 accepted	8 accepted	22 accepted
	6 declined	4 declined	10 declined	10 declined	20 declined
	2 no offer	0 no offer	2 no offer	2 no offer	4 no offer
Strangers	5 accepted	4 accepted	9 accepted	13 accepted	22 accepted
	10 declined	4 declined	14 declined	7 declined	21 declined
	2 no offer	1 no offer	3 no offer	0 no offer	3 no offer
Total	14 accepted	9 accepted	23 accepted	21 accepted	44 accepted
	16 declined	8 declined	24 declined	17 declined	41 declined
	4 no offer	1 no offer	5 no offer	2 no offer	7 no offer
	34 games	18 games	52 games	40 games	92 games

Table 10– Number of acceptances

Although there was no overall difference in the rate of acceptances of proposals, in the PD condition, friends accepted significantly fewer proposals (8 out of 20) than strangers (13 out of 20). Six of these declines in the friend PD condition were for proposals which offered very little benefit to the responder. Furthermore, in the proposer-independent condition, friends accepted significantly more proposals than strangers (14 out of 26 vs. 9 out of 26).

### 5.3 Performance in the Game

Table 11 shows the average score achieved by proposers and responders for the strangers and friends condition.

	Stranger	Friend
Responder	66.63	88.58
Proposer	102	100.86

Table 11 – Average score for each relationship dependency

Interestingly, the average score for responders in the friends condition (88.58 points) was significantly higher than the average score for responders in the strangers condition (66.63 points, t-test  $p < 0.05$ ). However, there was no

significant difference between the average score of proposes in the friends and strangers conditions. As might be expected, proposers overall received higher scores than responders, yet the difference in favor of the proposers was higher in the strangers condition (35.37) than in the friends condition (12.28).

Table 14 focuses on the average scores achieved by proposers and responders in the PD condition; for both there are significant differences between strangers and friends.

	Stranger	Friend
Responders	74.75	51.50
Proposers	42.75	64.50

Table 12 – Average score for friends/strangers in PD condition

In the PD condition, stranger responders score higher in the game than friend responders. However, this trend is reversed for the proposers. (t-test,  $p < 0:05$ ).

## 6 Discussion and Future Work

Although the results of this initial experiment confirmed several of our hypotheses, other results were inconclusive but suggest several opportunities for future research. We discuss these in several categories:

### 6.1 Behavior of Proposer

Table 6 confirms our hypothesis that in the friends condition proposers offered better deals to responders than in the strangers condition. Furthermore, proposals were less beneficial to the proposer in the friends condition than in the strangers condition. Although this last observation was not significant in the 95% confidence interval range, the trend was convincing. A possible explanation for this behaviour is that proposers are less selfish and more willing to help others in the friends condition than they are in the strangers condition. However, as shown by the table, even friends, and much less strangers, are not willing to engage in altruistic behavior.

As shown by table 7, proposers care more about the benefit for themselves and for the responders in the PD condition than they do in the PI condition. This implies that when one player needs the other, proposers “higher” the stakes, regardless of their personal relationship. Surprisingly, this was true whether or not the proposer was independent. A possible explanation is that proposers are more selfish when they are independent than they are when they are not independent. Also shown in table 7, in the PI condition, strangers seek a sacrifice from the

responder, regardless of whether or not they are the independent player. Here, friendship has an effect on players' choices, since friends do not ask sacrifices from each other in the PI condition.

## 6.2 Behavior of Responder and Performance in game

As shown in Table 11, our hypothesis that responders score significantly higher in the friends condition than in the strangers condition was confirmed. Surprisingly, stranger proposers score significantly higher than friend proposers only in the PD condition. This suggests that when one player is independent of the other, friendship does not have an effect on responders' tendency to accept or reject proposals. It seems that in this case, dependency overrides friendship.

Again shown in Table 11, proposers score higher in the game than responders, regardless of friendship. This is logical, given the fact that proposals are more beneficial to the proposer than the responder for each friendship condition, as described in Table 7. However, the difference in favor of the proposers was higher in the strangers condition than in the friends condition. This makes sense, since proposers were more selfish when playing with strangers and since the likelihood of acceptance was not different for strangers and friends, strangers came out ahead.

We could not find an explanation for the fact that friends were less likely to accept proposals in the PD condition than strangers. Since most of these declines offered little benefit to the responder, we hypothesize that other motivational factors could explain this behavior. For example, these declines might represent friends' regret at having not met their expectations of receiving highly beneficial offers. It has been shown that regret and expectation influence peoples' choices in negotiation (Castelfranchi and Lorini, 2002). Strangers might not have been feeling this regret since they did not expect very beneficial offers, and thus they tended to accept more offers than friends. Another possible explanation is that players' personalities affected their choices. It has been shown that the personality of people affects the behavior of players in CT (Gal et al. 2004); it would be interesting to see in future work if personality affects friends differently than strangers for different types of task-dependencies.

## 7 Acknowledgements

This work was supported by NSF grant IIS-0222892 and, partially, by the project TICCA: joint research venture between the Italian National Research Council CNR- and Provincia Autonoma di Trento.

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