Planned vs. Actual Attention*

Ala Avoyan,† Mauricio Ribeiro,‡ Andrew Schotter,‡§
Elizabeth R. Schotter,¶ Mehrdad Vaziri,‖ Minghao Zou**

April 28, 2021

Abstract

When time is scarce, we need to plan how to allocate our attention across decision tasks. To study this problem, we present subjects with pairs of games between which they have to allocate a fixed amount of decision time (attention). We then let subjects play each pair of games without time constraint and use eye-tracking to measure how much time subjects spend playing each game in a pair. We find that subjects' planned and actual attention allocation differ. We identify the determinants of this difference and show that this discrepancy can be payoff relevant in games where choice is time-dependent.

JEL Classification: C72, C91, C92;

Keywords: Attention Allocation, Game Theory, Eye Tracking.

*We thank Andrew Caplin and Guillaume Frechette for their helpful feedback; Anwar Ruff for technical and programming assistance. Funding: Work on this project was provided by National Science Foundation grant #SES 1724550 "Collaborative Research: Attention in Games and Decisions," awarded to Andrew Schotter and Elizabeth R. Schotter. The work of Anwar Ruff, Maurcio Ribeiro and Minghao Zou was supported by the Center for Experimental Social Science at New York University (CESS).

†Department of Economics, Indiana University. E-mail: aavoyan@iu.edu

‡Department of Economics, New York University. E-mail: mauricioribeiro@nyu.edu

§Center for Experimental Social Science (CESS). E-mail: andrew.schotter@nyu.edu

¶Department of Psychology, University of South Florida. E-mail: eschotter@usf.edu

‖School of Geosciences, University of South Florida. E-mail: mehrdadv@mail.usf.edu

**Department of Economics, Princeton University. E-mail: mzou@princeton.edu

1 Introduction

Managers in complex organizations are often faced with the problem of allocating their scarce time or attention across multiple tasks or situations. While many of these tasks are simple one-person decision problems, some involve strategic aspects as well. Failure to appropriately allocate her attention may affect a manager's performance on the job because the quality of decision-making is affected by the amount of time we allocate to a decision and the procedure we use to decide. These two factors are related. As noted by Kahneman (2003), Rubinstein (2007, 2016), and others,[1] the amount of time spent making a decision may lead to different choices. This is particularly true in games since strategic considerations may lead us to change our mind about what strategy to play. However, time constraints are usually neglected in models of decision-making. Such constraints imply that we need to allocate our time between different tasks. By allocating our time, we are, in fact, allocating our attention to different problems. Thus, the study of time allocation between tasks can be seen as a proxy for the study of attention allocation.

While there has been some consideration of how managers allocate their time or effort across decision problems (see Radner and Rothschild (1975)), less attention has been paid to how managers allocate their attention across strategic situations. This problem is one faced often by managers in the workplace every day. For instance, on a given day, a sales manager has to decide the sales strategy, motivate her team to implement it, report the strategy to the sales director and discuss with other managers what she will need from them in order to implement the strategy. When deciding the sales strategy, she has to consider the sales strategies of other companies in the market. When meeting with her team, she has to provide the right incentives to motivate her team to carry out the sales strategy. When reporting the strategy to the sales director, she has to be persuasive and argue in favor of her choice, which might involve strategically selecting what to highlight to get the director's approval. When talking with other managers, she has to use her bargaining skills to get the support she will need from the other teams. Therefore, when planning her workday, the manager has to estimate how much time to spend on each of these strategic tasks. Moreover, she will not usually have much time to accomplish this.

A natural question that emerges from these examples is how people (instinctively) allocate their time —and hence their attention— between strategic tasks? We conjecture that people use the following procedure. They first instinctively assess the value and the complexity of the tasks they have to complete. They then decide how much time to allocate to each task based on these assessments.[2] If the assessments are incorrect, people may end up allocating too much (or too

[1] See Rand et al. (2012), Arad and Rubinstein (2012), Lindner and Sutter (2013), Agranov et al. (2015), Kessler et al. (2017), and Schotter and Trevino (2020) for evidence of time-dependence in choices in number of games. Various applications of response time in economics are discussed in Spiliopoulos and Ortmann (2018).

[2] The value and complexity of a task play a role in determining how much time one should spend to make a

little) time to a task, which can affect the quality of their decisions in it.

In this paper, we investigate attention allocation using a simplified version of the problem of allocating scarce time between strategic decisions (games).[3] We are mainly interested in the following three questions: q

1. **Planned versus Actual Attention**: are decision makers good at instinctively planning their time/attention?

2. **Why Does Planned and Actual Attention differ**: if planned and actual time/attention allocation differ, what could explain this discrepancy?

3. **Time and Choice**: in which games are decision makers' choices time-dependent?

To address these questions, we conduct two experiments.[4] In Experiment 1, subjects are first presented with pairs of games for 10 seconds and asked what fraction of a fixed amount of time they want to allocate to thinking about each game. After this planning phase is over, we let subjects play both games in each pair presented without time constraints. Using eye-tracking, we estimate how much time a subject spent paying attention to a game and use this as a proxy of how much time they actually spent thinking about the game.[5] Eye-tracking also allows us to identify the salient features of the game that attracted a subject's attention both in the planning stage and in the playing stage. In Experiment 2, a different pool of subjects plays each game presented to the subjects in Experiment 1. We let subjects play each game for 60 seconds and use the "choice process" protocol introduced by Agranov et al. (2015) to track their decisions throughout the 60 seconds.

Experiment 1 allows us to answer Questions 1 and 2. We find that people are not good (instinctual) planners, i.e., they form inaccurate estimates of the time they will spend attending to each game in a pair. We show that these discrepancies between planned and actual time allocation are linked to the fact that salient attributes in a game might be a misleading indicator of its complexity and value. The subjects focus their attention on the best and worst possible outcomes in games in the planning stage. These appear to be the salient features of the games that attract subjects' attention. On the other hand, the subjects focus more on the differences between their own and their opponents' payoffs and strategic differences while playing.

decision. In this paper, we do not consider extreme cases; however, one could imagine dividing their time between the two following games. The first game is a complex game that has low payoffs. And the second game—a simple game with huge payoffs. Just because the first game is complicated, it does not automatically imply that subjects should allocate most of their time to that game.

[3] Avoyan et al. (2020) study time allocation in one-person decision problems. This paper focuses on a strategic environment—2 x 2 games.

[4] Instructions used in both experiments are in appendices D and E.

[5] Eye-tracking data in the study of normal form games has been used increasingly in economics, see Devetag et al. (2016) for an example related to our paper.

Experiment 2 allows us to identify in which (types of) games a subject's choice changes significantly due to the time spent attending to it. This provides an answer to Question 3. There are certain games in which planning errors are inconsequential. However, for the majority of the game types studied in this paper, subjects' choices are time-dependent. In these games, therefore, our finding that people are bad planners may have significant welfare consequences.

2 Experimental Design

The paper includes two experiments. Experiment 1 (62 subjects) is the main experiment. We use the data from this experiment to examine the relationship between planned and actual attention and study what subjects focus on in each environment. Experiment 2 (40 subjects) is an auxiliary experiment which we use to reveal the time-dependence of choices in the games used in this paper.

All of the experimental sessions were conducted at the experimental lab of the Center for Experimental Social Science (CESS) at New York University during the Spring of 2018 (Experiment 1) and Fall of 2019 (Experiment 2), using the software z-Tree (Fischbacher (2007)) for Experiment 1 and using the software oTree (Chen et al. (2016)) for Experiment 2. Subjects were recruited using the ORSEE recruitment program (Greiner (2015)) from the general undergraduate population. Eye movement data were collected via a Gaze Point eye tracker Model GP3 attached to the computer screen.

2.1 Experiment 1 (planned vs actual attention)

After providing consent, the instructions were read aloud and the paper copies were given to the subjects. The subjects were told that a device would track their eyes and that they should keep their head as still as possible during the experiment. Other than that, the eye tracker was unobtrusive.[6]

The experiment consists of three parts. In Part 1, there were 12 rounds in which subjects were shown a pair of 2 x 2 matrix games on the computer screen for 10 seconds.[7] In each matrix each subject has two choices (A or B: the top or bottom row, respectively).[8] All of the subjects played the role of the Row player. Within each cell of the matrix, the top left entry is the payoff for the subject, and the bottom right entry is the payoff for the opponent. The order in which a subject observed the 12 pairs of games was randomized at the subject level. The games used in the

[6] Of the total of 62 subjects in Experiment 1, we discarded 13 observations due to issues with unrecorded eye-tracking data caused by excessive head movements.

[7] We purposefully did not allow our subjects to have much time when they planned explicitly to prevent them from solving each game. If they did, then their time allocation would be irrelevant since they would already know how they wanted to behave. While ex-ante, we did not know that 10 seconds was a suitable amount of time, ex-post we calculate that the average amount of time spent on a game is around 9 seconds. Therefore, on average, the subjects need 18 seconds to solve both games in a pair. Hence, the 10-second constraint we impose is well below the average time they need to solve both games, and therefore, it is binding. See Appendix A Table 7 for amount of time, on average, spent on each game.

[8] A generic pair (without numbers) is presented in Figure 4a Appendix B.

experiment represented a broad class of 2 x 2 games, including Prisoners' Dilemma (PD), Mixed Strategy games (MS), Games of Chicken (Ch), Battle of the Sexes (BoS), and others. The full list of games and game pairs presented to the subjects are in Appendix A.

In Part 1, subjects are not asked to play these pairs of games but rather make planned attention decisions. The subjects are given a time budget of X seconds. They are asked to decide what fraction of these X seconds they want to allocate to each game.[9] Because the subjects do not know the value of X, their decision amounts to a proportion of X seconds they want to allocate to Game 1 (with the remaining fraction allocated to Game 2). We call this fraction of time allocated to the first game (game on the left side), α_{ik}, for subject i in game pair $k \in \{1, 2, ..., 12\}$.

Part 2 of the experiment provides subjects with an incentive to allocate their time optimally in Part 1. We told subjects that one of the game pairs from Part 1 would be chosen to be played in Part 2. Their answer in Part 1 would determine the amount of time they would have to play each game. Hence, their time allocations in Part 1 were payoff relevant since any given pair of games could be chosen. All subjects in Part 2 played Game Pair 1, and this game pair was excluded when subjects moved on to Part 3.

In Part 3, subjects played the remaining 11 pairs ($k \in \{2 : 12\}$) of games in random order. Both games appeared on the screen simultaneously, in the same arrangement as they appeared in Part 1. The subjects were not constrained in this part of the experiment; they could take as long as they needed to make their strategy choices. Once they were done attending the two games, they hit a button, which brought them to a new screen where they entered their strategy choices (clicked the corresponding buttons).

The experiment lasted about 40 minutes, and subjects earned, on average, a payoff of \$27, which included a \$10 show-up fee. In this experiment, the payoffs in the games were denominated in points (units) called Experimental Currency Units (ECU's). For purposes of payment each ECU was converted to US dollars at the rate of 1 ECU = \$0.025. The payoffs were based on one of the two games played in Part 2 and one of the games in Part 3, drawn randomly. A critical feature of the payoffs was that subjects were told that they would not play these games against other subjects in the current experiment, but rather against a randomly chosen subject from a set of subjects who had played the game previously, without any time constraints.[10] Their payoff would be determined by both their choice and the choice of the other subject. This was done to prevent our subjects from playing a time-allocation game with the other subjects in the lab where the amount of time

[9] We did not reveal the value of X because the amount of time that subjects take to make their strategic choices in games varies greatly. Hence, if we announced X then some of them would think it was an excessive amount of time to solve both problems and allocate their attention equally, while others might think X was so short that they would have to allocate all of their time to only one problem. Hence, announcing X might yield a set of (0.5,0.5) or (1,0) (0,1) allocations — corner solutions.

[10] The column choosers were a set of students in an undergraduate class at NYU who played as the column chooser with no time constraints placed on them.

they allocate to a game could depend on their beliefs about what the others will allocate.

2.2 Experiment 2 (choice time-dependence)

In order to obtain an objective measure of how subjects' choices would vary as a function of time spent contemplating their decisions, we ran Experiment 2 with a new set of subjects. We use the data generated from this experiment to examine how the subjects' decisions varied with time. If choice in a given strategic situation is independent of the time allocated to it, the fact that people allocate their time incorrectly would have no cost associated with it. Poor planning can affect welfare only if the choice is time-sensitive.

The design in Experiment 2 used the "choice process" protocol introduced in Agranov et al. (2015). In this experiment, we presented subjects with the 19 unique games used in Experiment 1.[11] Each game was displayed separately on a computer screen for one minute. The subjects were told to make a selection (strategy A or B) by clicking on a button with that label and they could change their selection at any point during 60 seconds by clicking the other button. On the screen there was a timeline that depicted their choice history.[12] To incentivize the subjects to select the best choice at any moment, they were told that we would randomly choose a point in time, and their payoff-relevant choice would be the active selection at that moment. Hence, this experiment generated a time profile for each subject and each game representing the choice that a subject thought was the best at that point in time.

The experiment lasted about 50 minutes, and subjects earned, on average, a payoff of $20, which included a $7 show-up fee. In this experiment, the payoffs in the games were denominated in points (units) called Experimental Currency Units (ECU's). For purposes of payment each ECU was converted to US dollars at the rate of 1 ECU = $0.01. The payoffs were based on randomly drawn 4 games and 1 second chosen in each game. Similar to Experiment 1, the decision of the subject's opponent was a randomly picked choice of a set of subjects who played these games in a previous experiment. These opponents had unlimited time to make a decision and they made the decision only once. The subjects in Experiment 2 were informed of this in the instructions.

[11] Due to a programming error, Game 16 from Experiment 1 was coded as Game 16′ in Experiment 2. We exclude these two games from calculations wherever the difference is relevant.

[12] During the 60 seconds, subjects can change their choice without any frictions, but they can not see any additional information, such as an opponent's choice. A growing literature studies choice updating with and without frictions as subjects observe opponents' choices over time in various games. See, for example, Deck and Nikiforakis (2012), Friedman and Oprea (2012), Leng et al. (2018), He and Zhu (2020). In contrast to these papers, in which subjects get information about their opponents' choices, in our paper, any changes in subject's choices result from introspection–subjects thinking about the best strategy for them without any additional information.

3 Results

We tracked the subjects' eye movements during the entire Experiment 1. Using the data from Part 3 of Experiment 1, for every game pair, we calculate the fraction of time a subject spent looking at each of the games. Let β_{ik} be the fraction of time spent on the first game by subject i in game pair k. Therefore, β_{ik} is the objective measure of *actual attention* on the first game (obtained in Part 3). As indicated before, α_{ik}, is subject i's self-reported measure of *planned attention* for the first game in game pair k (obtained in Part 1 of Experiment 1). The relationship between α_{ik} and β_{ik} indicates the alignment between planned and actual attention.

Planned and Actual Attention: *Are decision makers good at planning their attention?*

Figure 1 presents a correlation between α_{ik} (planned attention) and β_{ik} (actual attention) for each game pair separately, while the last graph on the panel depicts the correlation for all game pairs pooled together. Looking at the last graph in Figure 1, we see there is no relationship between planned and actual attention in aggregate. When we disaggregate the data by game pair the correlation is again very low (i.e., the absolute value is uniformly below .2 and not statistically significant). We conclude from this that subjects are not particularly skilled at instinctively allocating their time across games in a manner that correctly anticipates how much time they will ultimately take to decide.

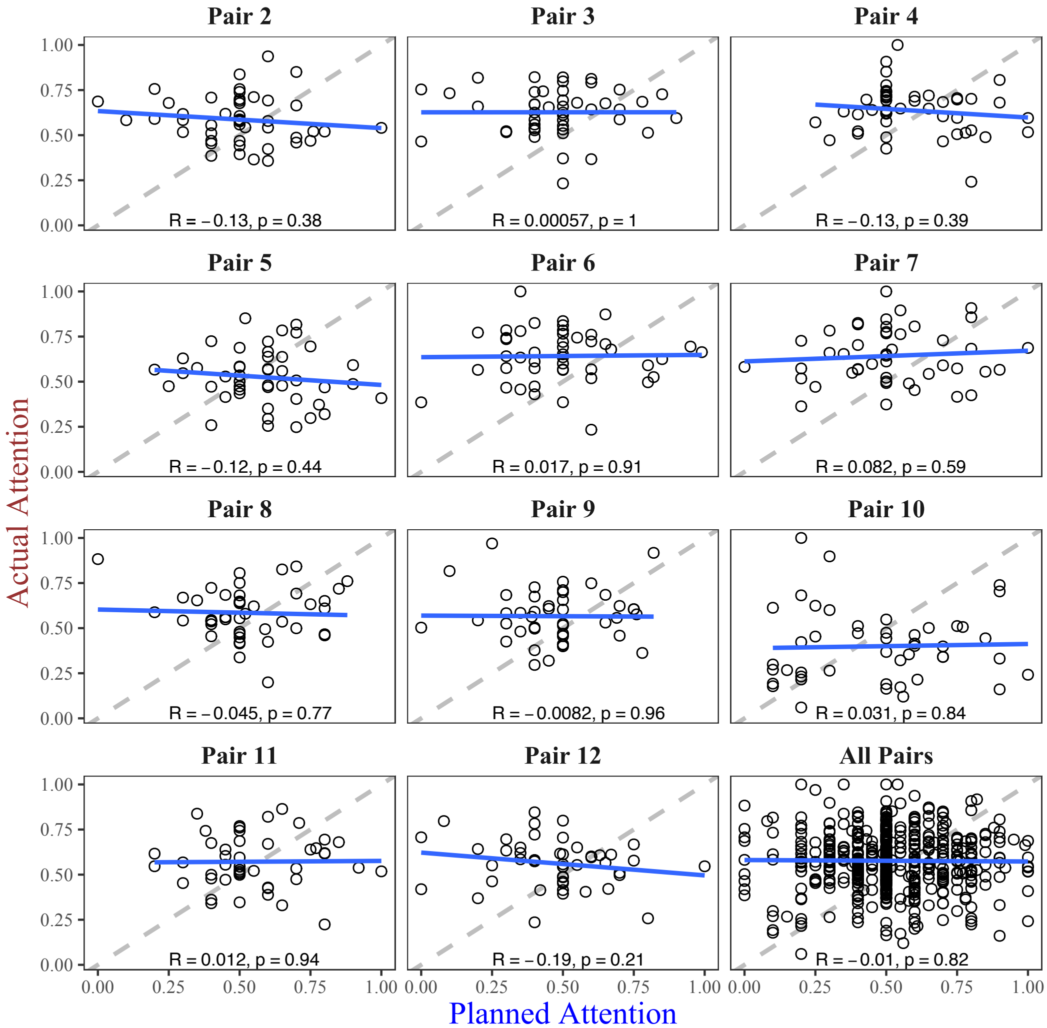
It is possible that only a small fraction of subjects fail to predict the fraction of time they will spend on a game, and these are the subjects driving the results presented above. Let us look at the subject level decisions and define an *error* between planned and actual attention if the discrepancy between the fractions is more than 10%. Out of all 11 pairs, all subjects made errors at least in 4 pairs (36% of the time). The mean and median number of errors is 8 (72%) out of the possible 11. These results indicate that while some subjects are more skilled at predicting the time they will need for each game, all subjects make a considerable number of errors. In addition to heterogeneity across subjects, there is also heterogeneity across game pairs. For some, the correlation is positive, while for others, it is negative (despite the lack of statistical significance, Figure 1).

The results above raise two further questions: (1) why do planned and actual attention differ; and (2) whether such a divergence is potentially costly for the subjects. Let us examine each of these two questions separately.

Why Does Planned and Actual Attention differ?

We hypothesize that the reason for this poor planning is that when planning and playing, subjects consider different aspects of the games. We purposefully did not allow our subjects to have much time when they planned their time allocation explicitly to prevent them from solving each game (if they did, then their time allocation would be irrelevant since they would already know how they

Figure 1: Planned vs Actual Attention



wanted to behave). Such time constraint leads subjects to consider the games' salient features, such as their payoffs.[13] These might indicate how valuable the game is to them. However, when subjects actually play the games in Part 3 of Experiment 1, they are not constrained, so they have time to consider all of the game's strategic aspects. Hence games with shiny objects such as big payoffs that attract a lot of attention in the planning stage may turn out to be strategically irrelevant (i.e., part of a dominant strategy) in the playing stage and consequently require little attention. If we had all the time we needed when planning, there would be no time misallocation since everything would be resolved. We make mistakes when we plan because we are time constrained.

To investigate our hypothesis, we examine several features of games that could affect the time allocated and time spent playing a given game. We run two regressions, one to explain the fraction

[13] See Leland and Schneider (2015), where the authors present an analysis of salience in the play of 2x2 games.

of time planned to be spent on a given game in a game pair and one to explain the actual fraction of time spent on it. As explanatory variables we include feature of games being compared, such as maximum payoff, minimum payoff, interaction term and the equity concerns in the comparison.[14] To capture strategic difficulty of a game, we include the number of rationalizable pure strategies in each game. We estimate the following regression

$$a_{ik} = \gamma_1^a x_{1k} + \gamma_2^a x_{2k} + \gamma_3^a x_{1k} x_{2k} + \gamma_4^a x_{3k} + \delta^a y_k + \varepsilon_{ik} \tag{1}$$

where $a \in \{\alpha, \beta\}$, and α_{ik} and β_{ik} are as defined above; x_{1k} is the difference between the maximum payoffs in dollars in the first and second games in pair k; x_{2k} is the difference in the minimum payoffs in dollars in the first and second games in pair k; x_{3k} is the payoff difference in dollars between the first game and the second game average inequity[15] in pair k; y_k is the difference between the number of rationalizable pure strategies in pair k.

Table 1: Discrepancies between planned and actual attention

(a) Estimation Results

	Planned	Actual
ΔMax	0.44***	-0.05
	(0.126)	(0.109)
ΔMin	0.46***	0.53***
	(0.173)	(0.166)
ΔEquity	0.74*	0.77***
	(0.385)	(0.229)
ΔStrategy	-1.57	8.32***
	(2.926)	(2.234)
ΔMax×ΔMin	0.06***	0.05***
	(0.016)	(0.016)
# of obs.	539	539

Note: The standard errors are in parenthesis and they are clustered at the subject level; * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

(a) Game Types

	Planned		Actual
PC	48	>***	36
BoS	52	<***	64
WD	47	<***	57
SD	50	>***	40
PD	54	∼	56
MS	51	<***	62
Ch	53	<***	58

Note: The average fraction of time planned and spent (actual) on each game type aggregated over all subjects and all pairs that the games appear in;
The significance results in the table are a result of Wilcoxon rank sum tests;
The significance levels:
* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

As we see in Table 2a, in the planning stage, the subjects focus on the best and the worst possible outcomes in games. These appear to be the salient features of the games that attract

[14] Avoyan and Schotter (2020) study features of games that may affect time allocation. Several features studied in that paper are not relevant in the current paper. For example, the authors change the matrix size of games and systematically change some payoffs to zeros keeping other specific features intact. However, given the research question in this paper and the games used, some of the features from Avoyan and Schotter (2020) are not included in this paper.

[15] To capture 'equity concerns' in a game, we calculate the average difference between own and opponent's payoffs (in dollars) for each strategy profile. We refer to it as *average inequity*.

subjects' attention. We can see these results in the first regression, where the coefficients for variables ΔMax and ΔMin are statistically significant. To calculate the full effect of increasing the maximum payoff difference on planned attention we need to consider both pure effect of ΔMax coefficient as well as the interaction term. The full effect of ΔMax is given by:

$$\frac{\partial \alpha_{ik}}{\partial x_{1k}} = \gamma_1^{\alpha} + \gamma_3^{\alpha} x_{2k}$$

As the partial derivative above is a function of x_{2k}, we can calculate the effect locally—for example, at the average of this variable. A five-dollar increase in the maximum difference from the average of x_{2k} leads to 2% increase in the time allocated to the game with a greater maximum. A similar result holds for a minimum. An increase in the first game minimum (a decrease in the second game minimum) leads to an increase in planned attention for the first game. The equity measure looking at discrepancies between own and opponents' payoffs is only marginally significant. The strategy variable capturing the difference in strategic difficulty is not significant, even marginally (10% significance level).

When we turn to the regression on actual attention, we see that differences in minimum payoff remain significant, but differences in maximum payoff no longer are. The equity variable is also statistically significant. To understand how equity concerns might play a role, consider a game such as the Battle of the Sexes. When subjects are time-constrained, they may fail to recognize the distributional consequences of their choices. However, when they play, these distributional consequences may loom more considerably.

As argued above, in certain games strategic complexity might be hard to spot in the planning stage, but become relevant in the playing stage. This seems to explain why the strategy variable is both significant and sizable. In fact, suppose the first game has two pure rationalizable strategies, while the second game has one. In that case, the first game receives 8.3% more time compared to the case when both games have the same amount of pure rationalizable strategies. In summary, while planning, subjects consider the games' salient features; however, when playing, they focus more on strategic aspects of the games more. Hence, salient attributes are not always a good indicator of task complexity and value.

One question that arises is whether the planning-playing mismatch is different across games in different game classes. To investigate this question, we look at a fraction of the time allocated to all games in a given game class (Table 3a). We classify all games into seven game-classes depending on their structure. The seven classes are: Pure Coordination (PC), Battle of the Sexes (BoS), Weak Dominance (WD), Strict Dominance(SD), Prisoner's Dilemma (PD), Mixed Strategy (MS), and Chicken (Ch). We further discuss the classification of games into these classes later in this section.

As we see in Table 3a, for some game classes, subjects allocate more time when planning, while for others, the opposite is true. These differences are informative. Looking at the Pure Coordination and the Strict Dominance games, we see that in both game classes, a larger fraction of time was allocated in the planning stage (Part 1) than used in the playing stage (Part 3). What might look like a complicated game at first can turn out to be quite simple when thought about. For example, in the SD games (Games 6, 10, and 14 in Appendix A), the fact that there is a strictly dominant strategy may not be evident in the planning stage. However, it may become apparent when a subject analyzes the game when they play. The same is true for the pure coordination games (Games 1 and 12), where the fact that one equilibrium Pareto dominates the other may not be clear at first but might become so later on. Hence subjects allocate more time than they eventually need.

For other game classes, such as BoS, WD, MS, and Ch, a smaller fraction of time was allocated in the planning stage than used in the playing stage. The subjects were surprised by games that they thought were relatively straightforward that turned out to be complicated. In many of these game classes, such as BoS and MS games, distributional concerns only dawn on the subjects when they play them. These games present subjects with an unexpectedly strategically complicated situation that they did not anticipate in the planning stage. One anomaly in Table 4 is the Prisoners' Dilemma class, where there is no statistical difference between planned and actual time.

Time and Choice: *Do decision makers' choices change over time?*

The failure to plan appropriately would have payoff consequences only if the choices that subjects make when playing our games are time-dependent. To investigate the time-dependence of choice, we used the data generated in Experiment 2 to create the aggregate time profile of choices for each game. To illustrate, consider Figures 2a and 2b. On the x-axis, we have time [0 to 60 seconds], while on the y-axis, we have the fraction of subjects choosing strategy B at each second. Note that in Game 11 (Battle of the Sexes game), the time profile is roughly monotonic and increasing as people think more about this game, the fraction of subjects choosing strategy B increases. While in the beginning, a subject is likely to choose strategy B 12% of the time, in the end, subjects who think for the full 60 seconds end up choosing B 55% of the time. Hence, if we choose a random subject who planned to spend only 5 seconds on making the decision but spent more time instead when actually playing, then, as we see in Figure 2a, the likelihood of choosing strategy B will be drastically different.

The situation is different if we look at the time profile of Game 12 (a pure coordination game), Figure 2b. In this game, any discrepancy between planned and actual attention of a subject is not likely to translate into a difference in the likelihood of choosing strategy B. Planning mistakes are innocuous. As a result, the consequences of our subjects' planning mistakes are dependent on the game they are playing (see Appendix C for the time profiles of all games).

To further demonstrate the time-dependence of the subjects' choices, we compare the choices

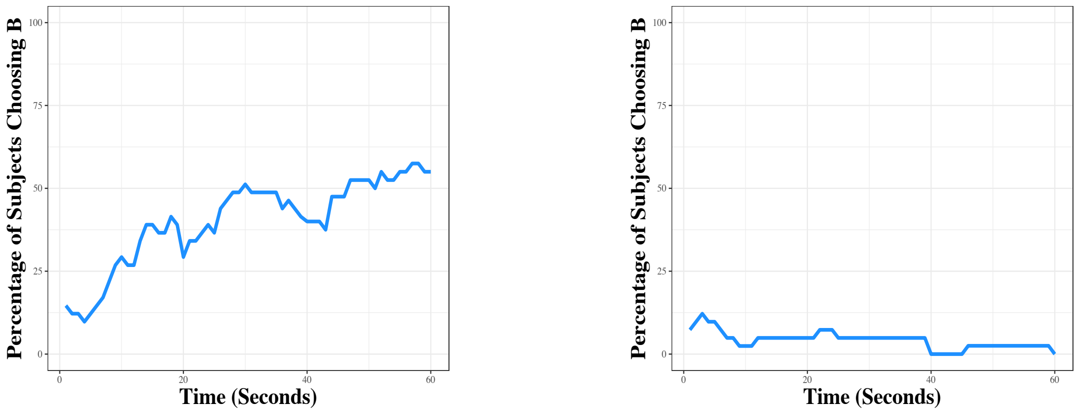
Figure 2: Time profile of two selected games.

Game 11

	A	B
A	$800, 500$	$0, 0$
B	$0, 0$	$500, 800$

Game 12

	A	B
A	$800, 800$	$0, 0$
B	$0, 0$	$500, 500$



(a) Battle of the Sexes

(b) Pure Coordination

made at the first and last second (Table 4), that is, we compare subjects' fast (instinctive) and slow (contemplative) choices. Looking at Table 4, we see number of games in which the first-second and 60th second choices are not significantly different. Most of these games are strict dominance and pure coordination games—games with unambiguously best strategies. Hence, one might be tempted to conclude that games with dominant strategies have instinctual choices that coincide with their contemplative choices and, as a result, their choices do not change over time. However, Games 3 and 9, while possessing strictly dominant strategies, are games in the Prisoners' Dilemma class in which such dominant choices lead to inefficient outcomes for both players. For these games, the pattern is different. In these games, subjects start out choosing strategy B (i.e., the dominant-defect strategy) less often (38% and 23% of the time, respectively), since they observe that the joint choice of the dominated strategy A might be better for both of them. However, by the end, they defect to choosing strategy B the majority of the time (70% and 68%, respectively) because they realize that while jointly the choice of A is best for their small two-person society, privately, they can do better by defecting to B. Therefore, subjects who allocate less time to playing Prisoners' Dilemma games are more likely to play cooperatively.[16]

Another way to compare time sensitivities is to study differences across game classes instead of game by game. The results of this comparison are presented in Table 5. We group our 19 games[17]

[16] Similar results in public goods game are documented in Rand et al. (2012).

[17] We do not include the Test/Control game (Game 15) in these calculations since this is a test game and one could argue which class this game should belong to. However, the results do not change if we include Game 15 to PC game

Table 4: Fraction of B choices at 1st and 60th Second

Game	*Type*	*1st second*	*60th second*	*p-value*
Game 1	Pure Coordination 1	0.08	0.05	1.000
Game 2	Battle of the Sexes 1	0.15	0.45	0.007
Game 3	Prisoners' Dilemma 1	0.38	0.70	0.007
Game 4	Mixed Strategy 1	0.17	0.45	0.016
Game 5	Mixed Strategy 2	0.32	0.57	0.043
Game 6	Strict Dominance 1	0.23	0.20	1.000
Game 7	Chicken Game 1	0.15	0.38	0.042
Game 8	Chicken Game 2	0.27	0.15	0.270
Game 9	Prisoners' Dilemma 2	0.23	0.68	0.000
Game 10	Strict Dominance 2	0.24	0.14	0.380
Game 11	Battle of the Sexes 2	0.15	0.55	0.001
Game 12	Pure Coordination 2	0.07	0.00	0.240
Game 13	Weak Dominance 1	0.53	0.60	0.400
Game 14	Strict Dominance 3	0.05	0.05	0.650
Game 15	Test/Control	0.08	0.15	1.000
Game 17	Mixed Strategy 4	0.23	0.60	0.000
Game 18	Weak Dominance 2	0.28	0.57	0.002
Game 19	Weak Dominance 3	0.34	0.45	0.013

Note: The p-values are the result of proportion tests.

into 7 game classes ($c \in \{PC, BoS, WD, SD, PD, MS, Ch\}$) and we calculate the absolute percentage difference in strategy between first and last 1, 5, 10 and 30 second choices. Let $\sigma_{it}^{g} \in \{0,1\}$, $(A=0,\, B=1)$, be subject i's strategy in game $g \in \{1,2,...,19\}$ at time $t \in \{1,2,...,60\}$. We calculate

$$\Delta_m^g = \left| \frac{1}{n}\frac{1}{m}\sum_{i=1}^{n}\sum_{t=1}^{m}\sigma_{it}^{g} - \frac{1}{n}\frac{1}{m}\sum_{i=1}^{n}\sum_{t=61-m}^{60}\sigma_{it}^{g} \right|.$$

We then find the average of Δ_m^g for all game gs in a specific game class c. For example, Δ_5^c shows how different subjects choices are in the last 5 seconds compared to the first 5 seconds in game class c. That is, Δ_5^c shows, in the game class c, how likely a subject is to change their strategy away from what they chose initially in the first five seconds of their decision time.

As we can see in Table 5, there are significant differences between the early and late choices of our subjects, depending on the game class. Pure coordination games and games with strictly dominant strategies are the least time-sensitive. In contrast, Prisoners' Dilemma, Battle of the Sexes, and games with mixed strategy equilibria are the most time-sensitive. Games of Chicken and ones with weakly dominant strategies are in the middle. However, it is important to highlight that the three classes of most time-sensitive games are so for probably different reasons. For the PD

class.

Table 5: Absolute change between first and last 1,5, 10 and 30 second strategies

Game Type	Δ_1	Δ_5	Δ_{10}	Δ_{30}
Pure coordination	5	6	5	4
Battle of the Sexes	35	37	31	17
Weak Dominance	16	10	6	3
Strict Dominance	4	7	8	4
Prisoners' Dilemma	39	36	28	14
Mixed Strategy	30	26	23	12
Chicken	17	18	16	10

games, subjects seem to initially think that cooperation is the most salient strategy only to switch to defect later on. Hence there is a kind of aha moment that overcomes them as they think about the problem and find the dominant strategy.

On the other hand, the Battle of the Sexes game involves two equilibria, one favoring them and the other the opponent. As subjects think more, some switch to the strategy favoring the opponent to possibly avoid a mismatch. In contrast, the mixed strategy games could be too complicated for the subjects initially. They change their proposed strategy as they work their way through the logic of mixed strategies or, perhaps, an additional level of reasoning.

In conclusion, it appears as if the mismatch between planned and actual attention is not innocuous. For certain types of games, in those with greater time sensitivity in choice, the lack of correlation between planned and actual attention can significantly impact welfare. This is because players fail to allow themselves enough time to fully consider the strategic situation. In other games, they quickly realized that the game they thought would require a lot of contemplation time became simple to solve. Games with flat time profiles incur no such costs except to the extent that they draw attention away from more complex games.

Going back to our manager example, if part of what makes a manager successful is her ability to efficiently allocate her attention across strategic situations, she must be able to distinguish how time-sensitive those situations are and incorporate that into her planning decision.

4 Conclusion

This paper focuses on the relationship between planned and actual attention in strategic decision making. We find (using eye-tracking) that subjects are not good at planning how much attention to allocate across pairs of strategic decisions.

Examining the features that affect planned and actual attention, we infer that the divergence between planned and actual attention stems from the fact that subjects pay attention to different aspects of games when planning as opposed to playing them. While planning subjects pay attention to the best and the worst possible outcomes in games when the same subjects actually play these games, strategic concerns are more salient.

Our results suggest that the disconnect between planned and actual attention can have payoff consequences if the strategies subjects use in these games are time-dependent. While in most games we present to our subjects, a planning mistake would have payoff consequences; in some games (those where choice is not time-dependent), planning errors can be inconsequential.

References

Agranov, M., Caplin, A., and Tergiman, C. (2015). Naive play and the process of choice in guessing games. *Journal of the Economic Science Association*, 1(2):146–157.

Arad, A. and Rubinstein, A. (2012). The 11–20 money request game: a level-k reasoning study. *American Economic Review*, 102(7):3561–3573.

Avoyan, A., Ribeiro, M., and Schotter, A. (2020). Personal lotteries and time allocation. *Working Paper*.

Avoyan, A. and Schotter, A. (2020). Attention in games: An experimental study. *European Economic Review*, 124. 103410.

Chen, D. L., Schonger, M., and Wickens, C. (2016). otree—an open-source platform for laboratory, online, and field experiments. *Journal of Behavioral and Experimental Finance*, 9:88–97.

Deck, C. and Nikiforakis, N. (2012). Perfect and imperfect real-time monitoring in a minimum-effort game. *Experimental Economics*, 15(1):71–88.

Devetag, G., Di Guida, S., and Polonio, L. (2016). An eye-tracking study of feature-based choice in one-shot games. *Experimental Economics*, 19(1):177–201.

Fischbacher, U. (2007). z-tree: Zurich toolbox for ready-made economic experiments. *Experimental Economics*, 10(2):171–178.

Friedman, D. and Oprea, R. (2012). A continuous dilemma. *American Economic Review*, 102(1):337–63.

Greiner, B. (2015). Subject pool recruitment procedures: organizing experiments with orsee. *Journal of the Economic Science Association*, 1(1):114–125.

He, S. and Zhu, X. (2020). Real-time monitoring in a public goods game. *Available at SSRN 3548418*.

Kahneman, D. (2003). Maps of bounded rationality: Psychology for behavioral economics. *American economic review*, 93(5):1449–1475.

Kessler, J., Kivimaki, H., and Niederle, M. (2017). Thinking fast and slow: generosity over time. *Preprint at http://assets. wharton. upenn. edu/˜ juddk/papers/KesslerKivimakiNiederle_GenerosityOverTime. pdf.*

Leland, J. W. and Schneider, M. (2015). Salience and strategy choice in 2$\times$ 2 games. *Games*, 6(4):521–559.

Leng, A., Friesen, L., Kalayci, K., and Man, P. (2018). A minimum effort coordination game experiment in continuous time. *Experimental Economics*, 21(3):549–572.

Lindner, F. and Sutter, M. (2013). Level-k reasoning and time pressure in the 11–20 money request game. *Economics Letters*, 120(3):542–545.

Radner, R. and Rothschild, M. (1975). On the allocation of effort. *Journal of Economic Theory*, 10(3):358–376.

Rand, D. G., Greene, J. D., and Nowak, M. A. (2012). Spontaneous giving and calculated greed. *Nature*, 489(7416):427–430.

Rubinstein, A. (2007). Instinctive and cognitive reasoning: A study of response times. *The Economic Journal*, 117(523):1243–1259.

Rubinstein, A. (2016). A typology of players: Between instinctive and contemplative. *The Quarterly Journal of Economics*, 131(2):859–890.

Schotter, A. and Trevino, I. (2020). Is response time predictive of choice? an experimental study of threshold strategies. *Experimental Economics*, pages 1–31.

Spiliopoulos, L. and Ortmann, A. (2018). The bcd of response time analysis in experimental economics. *Experimental economics*, 21(2):383–433.

Appendix

A Game Pairs and Games

Table 6: Game Pairs used in Experiment 1

Pair 1	Game 1	vs	Game 2
Pair 2	Game 3	vs	Game 4
Pair 3	Game 5	vs	Game 6
Pair 4	Game 7	vs	Game 8
Pair 5	Game 9	vs	Game 4
Pair 6	Game 5	vs	Game 10
Pair 7	Game 11	vs	Game 12
Pair 8	Game 7	vs	Game 10
Pair 9	Game 13	vs	Game 14
Pair 10	Game 15	vs	Game 16
Pair 11	Game 17	vs	Game 16
Pair 12	Game 18	vs	Game 19

Note: The order in which the pairs appeared was randomized at the subject level.

Table 7: Game labels and Seconds Spent in Part 3

Game	*Label*	*Secs*	*Game*	*Label*	*Secs*
Game 1	Pure Coordination 1	NA	**Game** 11	Battle of the Sexes 2	8.2
Game 2	Battle of the Sexes 1	NA	**Game** 12	Pure Coordination 2	3.9
Game 3	Prisoners' Dilemma 1	13.3	**Game** 13	Weak Dominance 1	8.3
Game 4	Mixed Strategy 1	10.2	**Game** 14	Strict Dominance 3	6.2
Game 5	Mixed Strategy 2	12.0	**Game** 15	Test/Control	4.5
Game 6	Strict Dominance 1	6.1	**Game** 16	Mixed Strategy 3	9.2
Game 7	Chicken 1	12.1	**Game** 17	Mixed Strategy 4	10.8
Game 8	Chicken 2	5.9	**Game** 18	Weak Dominance 2	9.3
Game 9	Prisoners' Dilemma 2	9.9	**Game** 19	Weak Dominance 3	8.1
Game 10	Strict Dominance 2	5.2			

Note: Column Secs (seconds) presents the average amount of time spent on each game in Part 3 (recovered from the eye-tracking data).

Figure 3: List of Games Used in Experiment 1 and Experiment 2

Game 1

	A	B
A	$800, 800$	$100, 100$
B	$100, 100$	$500, 500$

Game 2

	A	B
A	$800, 500$	$100, 100$
B	$100, 100$	$500, 800$

Game 3

	A	B
A	$300, 300$	$100, 400$
B	$400, 100$	$200, 200$

Game 4

	A	B
A	$400, 100$	$100, 400$
B	$100, 400$	$400, 100$

Game 5

	A	B
A	$300, 100$	$200, 200$
B	$100, 400$	$400, 300$

Game 6

	A	B
A	$300, 300$	$400, 400$
B	$200, 100$	$200, 300$

Game 7

	A	B
A	$800, 800$	$500, 1000$
B	$1000, 500$	$400, 400$

Game 8

	A	B
A	$800, 800$	$500, 1000$
B	$1000, 500$	$0, 0$

Game 9

	A	B
A	$800, 800$	$100, 1000$
B	$1000, 100$	$500, 500$

Game 10

	A	B
A	$800, 800$	$900, 900$
B	$700, 600$	$700, 800$

Game 11

	A	B
A	$800, 500$	$0, 0$
B	$0, 0$	$500, 800$

Game 12

	A	B
A	$800, 800$	$0, 0$
B	$0, 0$	$500, 500$

Game 13

	A	B
A	$0, 600$	$900, 600$
B	$400, 500$	$400, 500$

Game 14

	A	B
A	$700, 800$	$500, 500$
B	$600, 200$	$400, 500$

Game 15

	A	B
A	$500, 500$	$500, 500$
B	$500, 500$	$500, 500$

Game 16

	A	B
A	$400, 500$	$400, 400$
B	$600, 600$	$300, 700$

Game 17

	A	B
A	$300, 600$	$600, 300$
B	$600, 300$	$300, 600$

Game18

	A	B
A	$200, 0$	$200, 0$
B	$200, 400$	$199, 900$

Game 19

	A	B
A	$0, 300$	$600, 300$
B	$100, 200$	$100, 200$

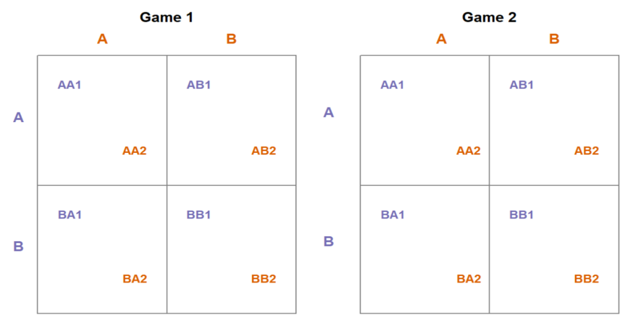
Game 16$'$

	A	B
A	$400, 500$	$400, 400$
B	$600, 600$	$500, 500$

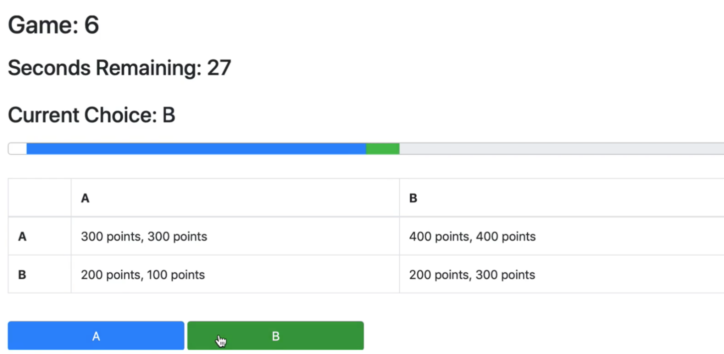
Due to a programming error in Experiment 2, subjects played Game 16$'$ instead of 16.

B Screenshots

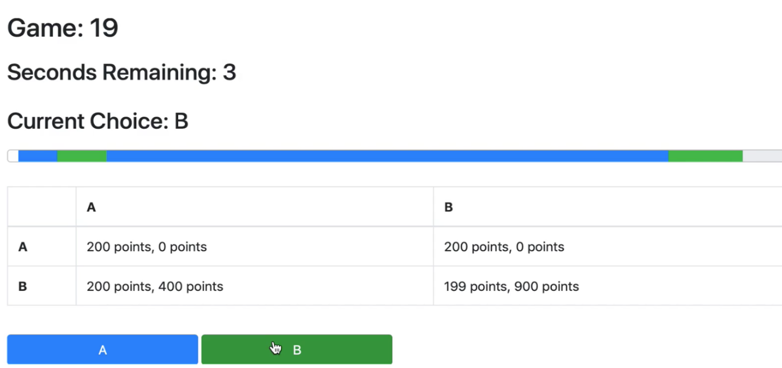
Figure 4: Sample Screens from both experiments



(a) Sample Screen (Experiment 1)



(b) Sample screen of playing Game 6



(c) Sample screen of playing Game 19

C Time Profiles (Experiment 2)

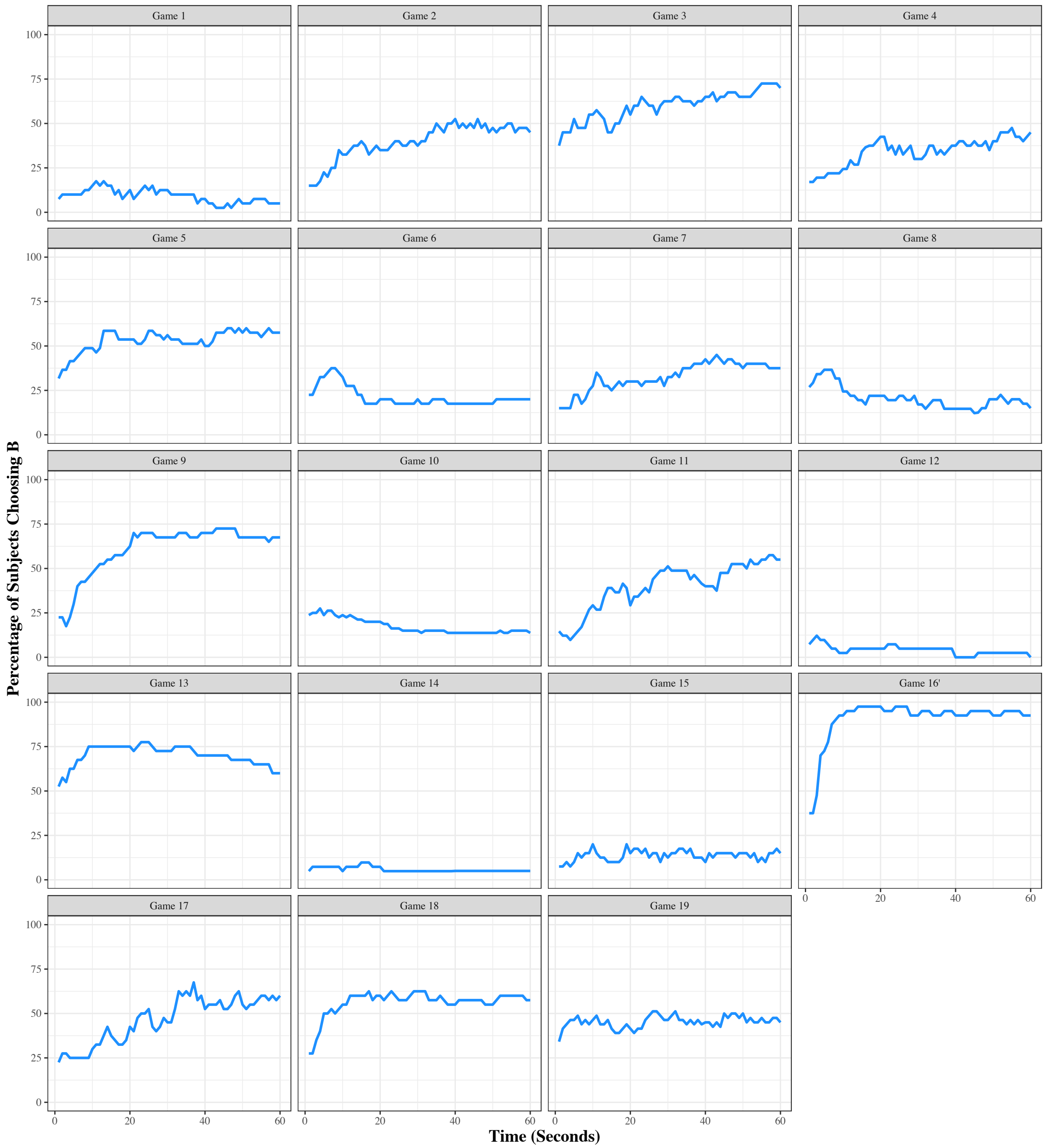


Figure 5: Time profile for all games in Experiment 2

D Instructions for Experiment 1 (For online publication)

Instructions

This is an experiment in decision making. Funds have been provided to run this experiment and if you make good decisions you may be able to earn a substantial payment. The experiment will be composed of three tasks which you will perform one after the other.

All of the tasks below will require the use of an eye tracker which is a device that records your eye movements as you look at the computer screen during the experiment. The eye tracker we use is non-intrusive in that nothing will be attached to you or your eyes in any way. The eye tracker is simply a small instrument that sits on the computer desk as you engage in the experiment and keeps track of where your eyes are focusing. The only constraint that the eye tracker places upon you during the experiment is the requirement that you keep your head relatively still during the experiment and try not to move your head in order to keep your eyes on the screen in front of you. Before, and during, the experiment we will have an assistant help you and tell you if you need to adjust your head position so as to better focus on the screen

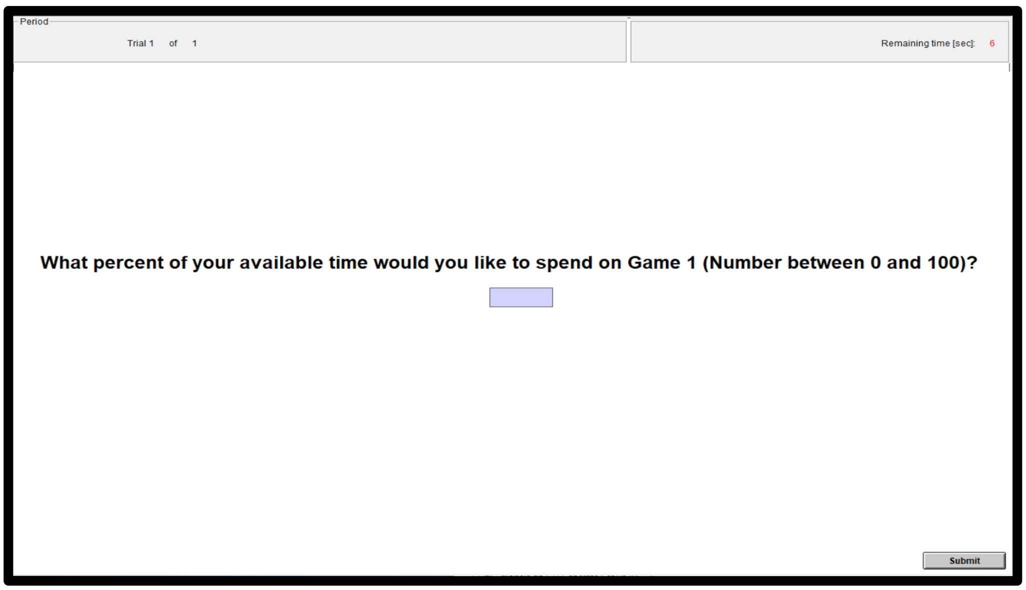
Task 1: Time Allocation

In all of the rounds in the experiment you will be presented with a description of two decision problems or games, Game 1 and Game 2. Each game will describe a situation where you and another person have to choose between two choices which jointly will determine your payoff and the payoff of the other player. These games will be presented to you as “payoff matrices” describing the choices of you and your opponent and the associated payoffs. We will go into more detail later.

In the beginning of any round the two games will appear on your computer screen and you will be given 10 seconds to inspect them. When the 10 seconds are over you will not be asked to play these games by choosing one of the two choices for each of the games, but rather you will be told that at the end of the experiment, if this particular pair of games you are looking at is chosen to be played, you will have X seconds to decide on what choice to make in each of them. The exact pair of games chosen will be determined randomly. Your task now is to decide what fraction of these X seconds to allocate to thinking about Game 1 and what fraction to allocate to thinking about Game 2. To do this after the 10 seconds allowed for inspecting the two games are over a new screen will appear also for 10 seconds. In this screen there will be a box into which you will need to enter a number between 0 and 100 representing the percentage of the X seconds you would like to use in thinking about what choice you want to make in Game 1 (the remaining fraction will be used for Game 2).

If you do not enter a number within the 10 second limit, you will not be paid for that game if at the end this is one of the games that count for your payoff. In other words, be sure to enter your number or numbers within the time given to you.

The screen will appear as follows:

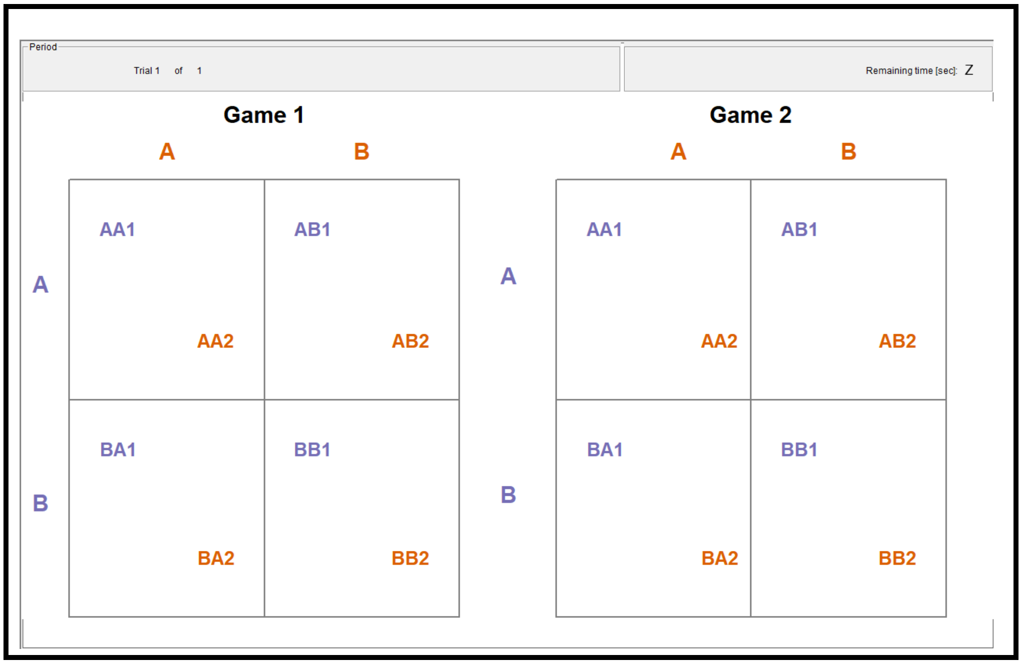


In this screen you will need to enter a number between 0 and 100 representing the percentage of your time X that you will want to devote to thinking about Game 1 when it is time for you to play that game if it is one of those chosen.

The total amount of time you will have, X seconds, to think about both games you will be playing, will not be large but we are not telling you what X is because we want you to report the relative amounts of time you'd like to use of X to think about each problem.

The Games

You will be asked to allocate time between two games represented as game matrices which will appear on your computer screen as follows:



In this screen we have two game matrices labeled Game 1 and Game 2. Each game has two choices for you and your opponent, A and B. ***You will be acting as the Row chooser (Player 1) in all games so we will describe your payoffs and actions as if you were the Row player.***

Take Game 1. In this game you have two choices A and B. The entries in the matrices describe your payoff and that of your opponent depending on the choice both of you make. For example, say that you and the person you are playing with both make choice A. If this is the case the cell in the upper left hand corner of the matrix is relevant. In this cell you see letters AA1 in the upper left hand part of the cell in and AA2 in the bottom right corner. The first payoff in the upper left corner is your (the Row chooser's or Player 1) payoff (AA1), while the payoff in the bottom right hand corner (AA2) is the payoff to the column chooser, your opponent. The same is true for all the other cells which are relevant when different choices are made: the upper left hand corner payoff is your payoff while the bottom right payoff is that of the person you are playing against. Obviously in the experiment you will have numbers in each cell of the matrix but for descriptive purposes we have used letters.

After you are finished making your time allocation for a given pair of games, you will be given a wait screen which will allow you to rest before moving on to a new pair of games. When you are ready for the next game pair click the continue button and you will be shown a new pair of games.

Please pay attention to your screen at all times since you will want to be sure that you see the screen when a new pair of games appear. Also, between games try not to move your head too much so as to keep the eye tracker in alignment.

During Tasks 1 and 2, where there are time limits placed on your actions, you will see a timer on the top of the screen. This timer will count down how much time you have left for the task you are currently engaged in. For example, on the screen shown above it says you have Z seconds left before the screen goes blank and you are asked to make a time allocation.

Task 2:

In Task 2 you will play one and only one of the pair of games you saw in Task 1 by choosing a Row (A or B) for each game. . Someone else will choose the column (we will describe later how your payoffs in the experiment will be determined). You will play these games sequentially one at a time starting with Game 1 and you will be given an amount of time to think about your decision here equal to the amount of time you allocated to it in Task 1. So if in the Task 2 game pair you decided to allocate a fraction α to thinking about Game 1, you will have $Time_{Game1} = \alpha \cdot X$ seconds to make a choice for Game 1 before that time elapses and the remaining time, $Time_{Game2} = X - \alpha \cdot X$, left when Game 2 is played. We will have a time count down displayed on the top of your screen so you will know when the end is approaching.

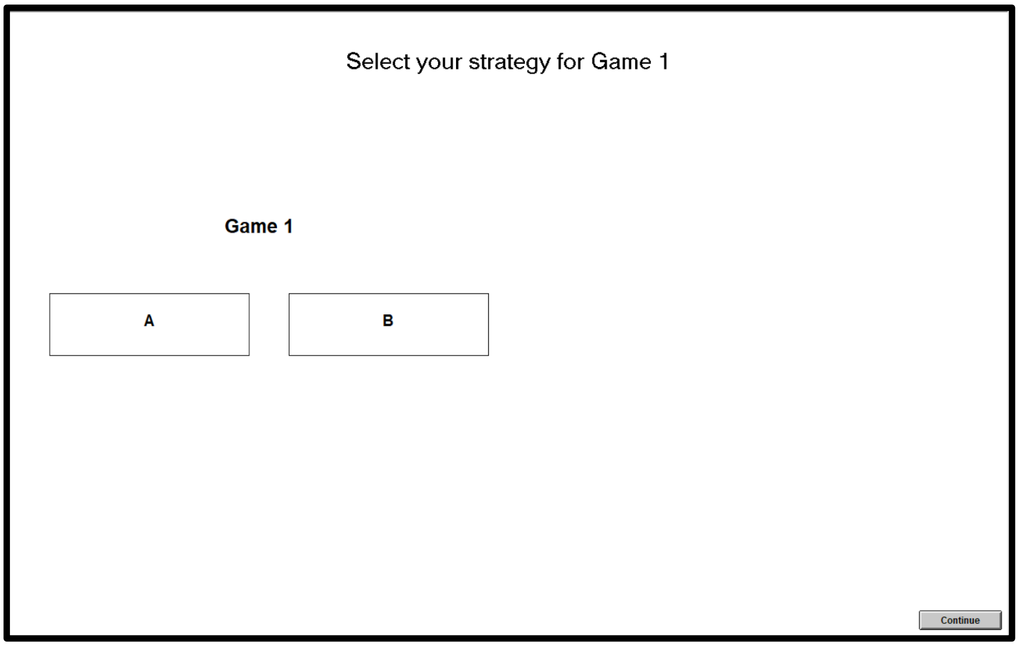
When you go to play Game 1 you will see the following screen.

Remaining time [sec] = Z

	A	B
A	AA1 AA2	AB1 AB2
B	BA1 BA2	BB1 BB2

Enter Strategy

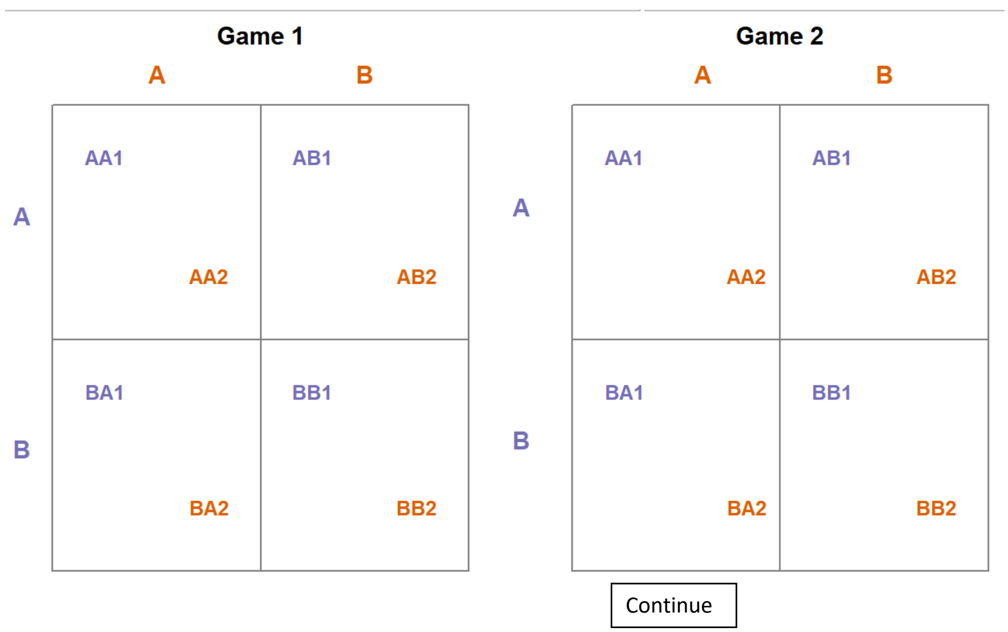
To enter your choice you simply click on **Enter Strategy** button at any time before the allotted time expires**.** Note again that on the top of the screen will be a counter which will tell you how much time you have left to enter your choice. If you fail to make a choice before the elapsed time, then your decision will not be recorded for that game. Once you press the button you will be taken to the next screen where you can enter your strategy.



You will then play Game 2 and have your remaining time to think about it before making a choice for that game.

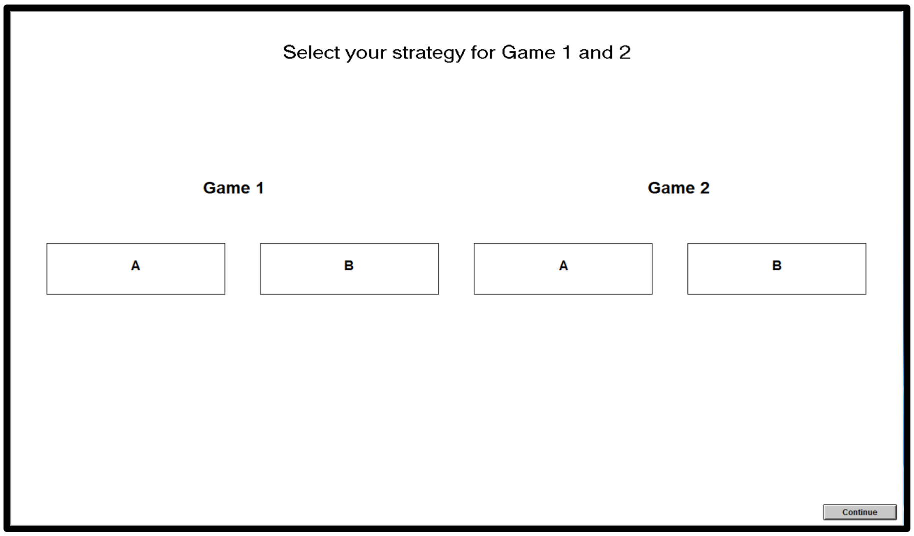
Task 3: Game Playing

When you are finished with Tasks 1 and Task 2 we will move on to Task 3. The game pairs you play in this task will be the same games you saw in Task 1 (except for the one pair of games you already played in Task 2) but they will be shown to you in a random order. For each game you will have to choose a Row (A or B). Someone else will choose the column (we will describe later how your payoffs in the experiment will be determined). You will not be time constrained here so you can take as much time as you want. Your screen will appear as follows for any pair of games.



In Task 3 you can take as much time as you wish in deciding what choice to make in each game but when you have decided you must hit the continue button at the bottom of the screen. When you do a new screen will appear with two windows where you can enter your row choices for Games 1 and 2. In other words, you must enter either row A or row B into the corresponding windows for each game. ***Note that in this task instead of having one game on the screen at a time you will have both games shown to you and when you are ready to make a choice in both games, you will click the continue button.***

The screen for making choices in these games will appear as follows:



When you do this and hit the continue button at the bottom of the screen, there will be a wait screen. When you are ready to proceed to the next game pair hit the continue button and you will be presented with the next pair of games. You will then repeat the exercise just described for a new pair of games and make your choices for these games. You will do this for each pair of games except the one you already played in Task 2. ***Remember that you we will use the eye tracker during the entire experiment so try to keep you head still.***

Payoffs

Your payoff in the experiment will be determined as follows:

1. Before you did this experiment we had a group of other subjects play these games and make their choices with no time constraints on them. In other words, all they did in their experiment was to make choices for these games and could take as much time as they wanted to choose. Call these subjects "Previous Opponents".
2. You will be paid what you earn in the one of the games played in Task 2 and one of the games played in Task 3 (drawn at random). Since you do not know what games will be chosen for payoffs, it is to your advantage to allocate your time the across game pairs in Task 1 in a way that you feel is best. Likewise, when making choices in Task 3, since any one game may be relevant for your payoff, you also have an incentive to choose as best you can.
3. To determine your payoff in this experiment, we will take your choice of a row in each game selected and match it against the choice of a column by one Previous Opponent playing the opposite role as you in the game.

4. To determine your payoff we will then divide the subjects in the room into two groups called Group 1 and Group 2. Subjects in Group 1 will receive the payoff they just determined by playing against their Previous Opponent. However, Group 2 will be given the payoff of the Previous Opponent matched with a member of Group 1 rather than their own payoffs. Since you do not know which group you will be in, Group 1 or Group 2, it is important when playing the game that you make that choice which you think is best given the game's description.

   Finally, the payoff in the games you will be playing are denominated in units called Experimental Currency Units (ECU's). For purposes of payment each ECU will be converted into US dollars at the rate of 1 ECU = 0.025 $US. You will also be paid $10 for showing up to the experiment.

   YOU WILL HAVE THREE PRACTICE ROUNDS THAT WILL NOT COUNT TOWARD YOUR PAYOFF BEFORE YOU START THE EXPERIMENT.

E Instructions for Experiment 2 (For online publication)

Instructions

This is an experiment in two-person decision making. You will be able to earn more money depending on the decisions you make in the experiment and the decisions made by others.

There will be 20 rounds in the experiment, each round lasting for 1 minute. In each round you will be presented with a two-person decision problem (or game) in which you will be asked to choose between two actions labeled A and B. You will face another person who also will be choosing between two actions A and B and depending on your choice and that of your pair member, each of you will earn money.

To illustrate what a decision problem will look like, consider Table 1 below. (This is just a hypothetical example; the payoffs in your decision problems will not be for the amounts portrayed here):

		Your Opponent's Decision	
		A	**B**
Your Decision	**A**	1000, 225	5, 25000
	B	80, 10,000	225, 10,000

In this and every other decision problem you will be the player choosing the rows and your opponent will choose the columns. In this game you have two choices: Row A and Row B. The entries in the table describe your payoff and that of your opponent in points, depending on the choice both of you make. These points will be converted into dollars at the end of the experiment at the rate of 1 point = $ 0.01. For example, say that you and your opponent both make choice A. Then the cell in the upper left hand corner of the table is relevant since it is the cell in the table associated with the choice if A for both you and your opponent. In this cell you see two dollar amounts, 1000 points and 225 points. The first payoff on the left is your (the Row chooser's) payoff (1000), while the payoff to the right (225) is the payoff to the column chooser, your opponent. The same is true for all the other cells which are relevant when different choices are made: the first payoff is your payoff while the second payoff is that of your opponent's. For example, if you choose Row B and your opponent chooses Column A, then the cell in the lower left hand corner of the table is relevant and you will receive a payoff of 80 points while your opponent will receive a payoff of 10,000 points.

In each round of the experiment, after you hit a button to start that round, you will have a new decision problem (game) placed on the screen and it will remain on the screen for

1 minute. At each instant during that minute we ask you to think of what choice you would like to make (Row A or Row B). To enter your decision hit the A or B button placed below the decision problem. Put differently, as you look at the game during the 1 minute you have you may start out thinking that a particular decision is best but later change your mind about which row to choose. We will allow you to change your mind by hitting the button associated with what you consider to be the better choice. At the end of the minute, however, instead of using your last decision as your final choice, we will choose one instant (one second) at random and enter the choice you made at that second as your payoff-relevant choice for the game to be used against the choice of your opponent.

In each round of the experiment, after you hit a button to start that round, you will have a new decision problem (game) placed on the screen and it will remain on the screen for 1 minute. At each instant during that minute we ask you to think of what choice you would like to make (Row A or Row B). To enter your decision hit the A or B button placed below the decision problem. Put differently, as you look at the game during the 1 minute you have you may start out thinking that a particular decision is best but later change your mind about which row to choose. We will allow you to change your mind by hitting the button associated with what you consider to be the better choice. At the end of the minute, however, instead of using your last decision as your final choice, we will choose one instant (one second) at random and enter the choice you made at that second as your payoff-relevant choice for the game to be used against the choice of your opponent.

Because the computer will choose one second in the 1 minute interval and look at the choice you made there to determine your payoff, it is in your interest at every second to make sure that you enter the row that you think is best given your deliberations. So always make sure you have entered that decision that you think is best as time goes on. You are free to change your mind as time proceeds.

There are several things to note about this experiment.

1. If at any time you do not have a decision entered and the computer chooses that time as payoff relevant, then you will receive a zero payoff in that game. This is only relevant at the very beginning of the round before you have made your very first choice. For example, say you take 3 seconds to make your first choice and the computer chooses your decision at second 2 as the payoff-relevant one. Since at that time you had not made a choice, you will get zero dollars for that game. To avoid such a thing happening, we urge you to make a first decision as fast as you can when a new round starts so as to avoid a zero payoff. You can change it at any time if you want to.

2. The opponent you face will be taken from a set of randomly chosen people who played these games without any time limit but who made only one choice and did not have to decide, as you do, during 1 minute. So for each such game your opponent thought about the game and made one choice of a column. Your decision of a row will be matched with their column choice.
3. Between rounds we will not tell you what your payoff is. You will have to finish all 20 rounds before we tell you your payoffs.
4. Finally, although you engage in 20 decision problems, we will randomly choose 4 of those problems as relevant for your payoff. For each game we choose we will match your decision (as described above) with that of your opponent and you will receive the sum of your payoffs in those games as your final payoff in the experiment. In addition, you will be paid $7.00 show-up fee.