

Supplementary Appendix

Appendix Table 1: Summary of Results across Subject Pools in the 2 x 2 Game - By Rounds

Source:	Levitt, List & Reiley					
Test:	College Students		Bridge Players		Poker (Overall)	
	1st Half	2nd Half	1st Half	2nd Half	1st Half	2nd Half
#Pairs of Players	11	11	7	7	22	22
#Pairs of Roles	22	22	14	14	44	44
I. Minimax play at aggregate level						
Chi-square test for minimax play:						
Pursuer	<0.001	<0.001	<0.001	0.046	<0.001	<0.001
Evader	<0.001	0.001	0.002	0.150	<0.001	<0.001
Joint play	<0.001	<0.001	<0.001	0.105	<0.001	<0.001
II. Minimax play at individual level						
Rejections at 5 percent:						
Pursuer	40.91%	63.64%	42.86%	28.57%	52.27%	47.73%
Evader	54.55%	31.82%	7.14%	28.57%	36.36%	38.64%
Joint Play	54.55%	59.09%	28.57%	35.71%	56.82%	61.36%
Neither Player	27.27%	27.27%	0.00%	14.29%	20.45%	20.45%
III. Equality of Success Rates Across Strategies and to the Equilibrium Rate						
Rejections at 5 percent	47.73%	43.18%	28.57%	25.00%	39.77%	46.59%
IV. Runs Tests						
Rejections at 5 percent	9.09%	2.27%	5.36%	3.57%	7.95%	3.41%

Appendix Table 1 continued

Appendix Table 1 compares the first half of play to the second half of play for the 2x2 matrix game that is based on a game used by Rosenthal et al (2003). Columns correspond to the different subject pools tested and to the half of play being analyzed. Rows report results for each test. As each pair plays 75 rounds before switching roles, the first half of play is defined as the first 37 rounds in each role while the second half of play is defined as the last 38 rounds. Panel I shows p-values from Pearson's Chi-square test for goodness of fit of aggregate frequencies to minimax predictions. P-values for the marginal frequencies of the pursuer and evader are shown in the first two rows, while the third row shows p-values for combinations of plays by both players. The test uses one degree of freedom for the marginal distribution of play and three for the joint distribution. Panel II shows the percentage of individuals (or pairs) that we reject at the 5% level for this same chi-square test. Panel III shows the percentage of individuals for whom we reject the null hypothesis that success rates are equal across strategies and equal to the equilibrium success rate. The Pearson test statistic is also used in this case, but with winning and losing probabilities for each play rather than with frequencies. Thus, it is a chi-square test with 3 degrees of freedom. Panel IV presents the percentage of players for whom we can reject the null hypothesis of no serial correlation in actions, based on the runs test of Gibbons and Chakraborti (1982) which has the following distribution:

$$f(r | n_B^i, n_R^i) = \begin{cases} 2 \binom{n_B^i - 1}{(r/2) - 1} \binom{n_R^i - 1}{(r/2) - 1} / \binom{n_B^i + n_R^i}{n_B^i} & \text{if } r \text{ is even} \\ \left(\binom{n_B^i - 1}{(r-1)/2} \binom{n_R^i - 1}{(r-3)/2} + \binom{n_B^i - 1}{(r-3)/2} \binom{n_R^i - 1}{(r-1)/2} \right) / \binom{n_B^i + n_R^i}{n_B^i} & \text{if } r \text{ is odd} \end{cases}$$

Where r is the number of runs, and n_B^i and n_R^i are the number of black and red choices.

The serial independence hypothesis will be rejected at the 5 percent level if there are too few or too many runs, that is if $F(r | n_B^i, n_R^i) < 0.025$ or if $F(r - 1 | n_B^i, n_R^i) > 0.975$, where $F(r | n_B^i, n_R^i) = \sum_{k=1}^r f(k | n_B^i, n_R^i)$.

Appendix Table 2: Summary of Results across Subject Pools in the 4 x 4 Game - By Rounds

Source:	Levitt, List & Reiley							
	College Students		Bridge Players		Poker (Overall)		Soccer Pros	
Test:	1st Half	2nd Half	1st Half	2nd Half	1st Half	2nd Half	1st Half	2nd Half
# Pairs of People	12		11		26		16	
# Pairs of Roles	24		22		52		32	
I. Minimax play at aggregate level								
Chi-square test for minimax play:								
Row Player	0.534	0.472	0.362	0.642	0.060	0.869	0.007	0.057
Column Player	0.101	0.053	0.006	0.028	0.019	0.086	0.032	0.003
Joint play	0.183	0.375	0.030	0.466	0.013	0.428	0.046	0.002
II. Minimax play at individual level								
Rejections at 5 percent:								
Row Player	12.50%	16.67%	31.82%	22.73%	19.23%	19.23%	21.88%	28.13%
Column Player	25.00%	33.33%	13.64%	27.27%	19.23%	32.69%	12.50%	15.63%
Joint Play	25.00%	20.83%	22.73%	22.73%	19.23%	28.85%	15.63%	31.25%
Neither Player	4.17%	8.33%	9.09%	0.00%	1.92%	7.69%	6.25%	3.13%
III. Equality of Success Rates Across Strategies and to the Equilibrium Rate								
Rejections at 5 percent	33.33%	22.92%	36.36%	15.91%	25.00%	25.96%	23.44%	28.13%
IV. Runs Tests								
Rejections at 5 percent	8.33%	5.21%	9.09%	5.68%	3.85%	7.21%	3.13%	6.25%

Appendix Table 2 continued

Appendix Table 2 compares the first half of play to the second half of play for the 4x4 matrix game that is based on a game developed by O'Neill (1987). Columns correspond to the different subject pools tested and to the half of play that is being analyzed. Rows report results for each test. As each pair plays 75 rounds before switching roles, the first half of play is defined as the first 37 rounds in each role while the second half of play is defined as the last 38 rounds. Panel I shows p-values from Pearson's Chi-square test for goodness of fit of aggregate frequencies to minimax predictions. P-values for the marginal frequencies of the row and column players are shown in the first two rows, while the third row shows p-values for combinations of plays by both players. The test uses three degrees of freedom for the marginal distribution of play and fifteen for the joint distribution. Panel II shows the percentage of individuals (or pairs) that we reject at the 5% level for this same Chi-square test. For Panels III and IV, play is divided into two – diamond plays and non-diamond plays – before being analyzed. Panel III shows the percentage of individuals for whom we reject the null hypothesis that success rates are equal across strategies and equal to the equilibrium success rate. The Pearson test statistic is also used in this case, but with winning and losing probabilities for each strategy rather than with frequencies. Thus, it is a chi-square test with 3 degrees of freedom. Panel IV presents the percentage of players for whom we can reject the null hypothesis of no serial correlation in actions, based on the runs test of Gibbons and Chakraborti (1982) which has the following distribution:

$$f(r | n_B^i, n_R^i) = \begin{cases} 2 \binom{n_B^i - 1}{(r/2) - 1} \binom{n_R^i - 1}{(r/2) - 1} / \binom{n_B^i + n_R^i}{n_B^i} & \text{if } r \text{ is even} \\ \left(\binom{n_B^i - 1}{(r-1)/2} \binom{n_R^i - 1}{(r-3)/2} + \binom{n_B^i - 1}{(r-3)/2} \binom{n_R^i - 1}{(r-1)/2} \right) / \binom{n_B^i + n_R^i}{n_B^i} & \text{if } r \text{ is odd} \end{cases}$$

Where r is the number of runs, and n_B^i and n_R^i are the number of black and red choices.

The serial independence hypothesis will be rejected at the 5 percent level if there are too few or too many runs, that is if $F(r | n_B^i, n_R^i) < 0.025$ or if $F(r-1 | n_B^i, n_R^i) > 0.975$, where $F(r | n_B^i, n_R^i) = \sum_{k=1}^r f(k | n_B^i, n_R^i)$.

Appendix Table 3: Summary of Results for Subjects Playing against Computers Programmed for Optimal or Naïve Play

Source: Test: Type of Player:	Computer Programmed for Optimal Play				Computer Programmed for Naïve Play			
	2 x 2		4 x 4		2 x 2		4 x 4	
	All Players		All Players		All Players		All Players	
	1st Half	2nd Half	1st Half	2nd Half	1st Half	2nd Half	1st Half	2nd Half
# Players	21		21		13		13	
# Player-Roles	42		42		26		26	
I. Minimax Play at Aggregate Level								
Chi-square test for minimax play:								
Evader/Row Player	<0.001	0.133	0.369	0.419	0.302	0.309	<0.001	<0.001
Pursuer/Column Player	<0.001	<0.001	0.165	<0.001	<0.001	<0.001	<0.001	<0.001
II. Minimax Play at Individual Level								
Rejections at 5 percent:								
Evader/Row Player	61.90%	23.81%	33.33%	14.29%	84.62%	92.31%	38.46%	76.92%
Pursuer/Column Player	61.90%	47.62%	28.57%	9.52%	76.92%	76.92%	76.92%	76.92%
III. Equality of Success Rates Across Strategies and to the Equilibrium Rate								
Rejections at 5 percent	45.24%	35.71%	26.19%	26.19%	69.23%	73.08%	73.08%	73.08%
IV. Runs Tests								
Rejections at 5 percent	8.33%	9.52%	7.14%	10.71%	28.85%	17.31%	13.46%	17.31%
V. Mean Player Payoff Relative to Total Payoff								
Overall	0.500	0.492	0.513	0.458	0.500	0.517	0.575	0.576
Fraction of Players who beat the computer:	3/7	3/7	11/21	4/21	4/13	9/13	12/13	1

Appendix Table 3 continued

Appendix table 3 compares the first half of play to the second half of play for the computer-based experiments. The first four columns correspond to games played on the computer programmed for optimal play, while the last four columns correspond to games played on the computer programmed for naïve play. As each pair plays 75 rounds before switching roles, the first half of play is defined as the first 37 rounds in each role while the second half of play is defined as the last 38 rounds. Panel I shows p-values from Pearson's Chi-square test for goodness of fit of the human player's aggregate frequencies to minimax predictions. P-values for the marginal frequencies of the human player as evader (or row) and pursuer (or column) are shown in the first and second rows. The test uses one (three) degree(s) of freedom for the marginal distribution of play and three (fifteen) for the joint distribution for the 2x2 (4x4 game). Panel II shows the percentage of humans that we reject at the 5% level for this same Chi-square test. For Panels III and IV, play in the 4x4 game is divided into two – diamond plays and non-diamond plays – and then analyzed as in the 2x2 game. Panel III shows the percentage of individuals for whom we reject the null hypothesis that success rates are equal across strategies and equal to the equilibrium success rate. The Pearson test statistic is also used in this case, but with winning and losing probabilities for each play rather than with frequencies. Thus, it is a chi-square test with 3 degrees of freedom. Panel IV presents the percentage of players for whom we can reject the null hypothesis of no serial correlation in actions, based on the runs test of Gibbons and Chakraborti (1982) which has the following distribution:

$$f(r | n_B^i, n_R^i) = \begin{cases} 2 \binom{n_B^i - 1}{(r/2) - 1} \binom{n_R^i - 1}{(r/2) - 1} / \binom{n_B^i + n_R^i}{n_B^i} & \text{if } r \text{ is even} \\ \left(\binom{n_B^i - 1}{(r-1)/2} \binom{n_R^i - 1}{(r-3)/2} + \binom{n_B^i - 1}{(r-3)/2} \binom{n_R^i - 1}{(r-1)/2} \right) / \binom{n_B^i + n_R^i}{n_B^i} & \text{if } r \text{ is odd} \end{cases}$$

Where r is the number of runs, and n_B^i and n_R^i are the number of black and red choices.

The serial independence hypothesis will be rejected at the 5 percent level if there are too few or too many runs, that is

if $F(r | n_B^i, n_R^i) < 0.025$ or if $F(r-1 | n_B^i, n_R^i) > 0.975$, where $F(r | n_B^i, n_R^i) = \sum_{k=1}^r f(k | n_B^i, n_R^i)$.

Panel V gives the average player payoff relative to the maximum potential payoff. In equilibrium, the expected payoff is 50 percent.

Appendix Table 4: Summary of Results for Subjects Playing against Computers Programmed for Optimal or Naïve Play

Source: Test: Type of Player:	Computer Programmed for Optimal Play		Computer Programmed for Naïve Play	
	2 x 2 All Players	4 x 4 All Players	2 x 2 All Players	4 x 4 All Players
# Players	21	21	13	13
# Player-Roles	42	42	26	26
I. Minimax Play at Aggregate Level				
Chi-square test for minimax play:				
Evader/Row Player	0.037	0.594	<0.001	<0.001
Pursuer/Column Player	<0.001	<0.001	<0.001	<0.001
II. Minimax Play at Individual Level				
Rejections at 5 percent:				
Evader/Row Player	19.05%	19.05%	46.15%	76.92%
Pursuer/Column Player	57.14%	47.62%	84.62%	76.92%
III. Equality of Success Rates Across Strategies and to the Equilibrium Rate				
Rejections at 5 percent	35.71%	26.19%	80.77%	92.31%
IV. Runs Tests				
Rejections at 5 percent	10.71%	7.14%	0.00%	0.00%
Fraction of Players who beat the computer:	4/7	3/7	8/13	12/13

Appendix table 4 reports results for the computer-based experiments. The first two columns correspond to games played on the computer programmed for optimal play, while the last two columns correspond to games played on the computer programmed for naïve play. Panel I shows p-values from Pearson’s Chi-square test for goodness of fit of the computer’s aggregate frequencies to minimax predictions. P-values for the marginal frequencies of the computer as evader (or row) and pursuer (or column) are shown in the first and second rows. The test uses one (three) degree(s) of freedom for the marginal distribution of play and three (fifteen) for the joint distribution for the 2x2 (4x4 game). Panel II shows the percentage of individual computer plays that we reject at the 5% level for this same Chi-square test. For Panels III and IV, play in the 4x4 game is divided into two – diamond plays and non-diamond plays – and then analyzed as in the 2x2 game. Panel III shows the percentage of individuals for whom we reject the null hypothesis that success rates are equal across strategies and equal to the equilibrium success rate. The Pearson test statistic is also used in this case, but with winning and losing probabilities for each play rather than with frequencies. Thus, it is a chi-square test

Appendix Table 4 continued

with 3 degrees of freedom. Panel IV presents the percentage of players for whom we can reject the null hypothesis of no serial correlation in actions, based on the runs test of Gibbons and Chakraborti (1982) which has the following distribution:

$$f(r | n_B^i, n_R^i) = \begin{cases} 2 \binom{n_B^i - 1}{(r/2) - 1} \binom{n_R^i - 1}{(r/2) - 1} / \binom{n_B^i + n_R^i}{n_B^i} & \text{if } r \text{ is even} \\ \left(\binom{n_B^i - 1}{(r-1)/2} \binom{n_R^i - 1}{(r-3)/2} + \binom{n_B^i - 1}{(r-3)/2} \binom{n_R^i - 1}{(r-1)/2} \right) / \binom{n_B^i + n_R^i}{n_B^i} & \text{if } r \text{ is odd} \end{cases}$$

Where r is the number of runs, and n_B^i and n_R^i are the number of black and red choices.

The serial independence hypothesis will be rejected at the 5 percent level if there are too few or too many runs, that is if $F(r | n_B^i, n_R^i) < 0.025$ or if $F(r-1 | n_B^i, n_R^i) > 0.975$, where

$$F(r | n_B^i, n_R^i) = \sum_{k=1}^r f(k | n_B^i, n_R^i).$$

Panel V gives the average player payoff relative to the maximum potential payoff. In equilibrium, the expected payoff is 50 percent.

Appendix Table 5: Summary of Results for Subjects Playing against Computers Programmed for Optimal or Naïve Play, By Rounds

Source: Test: Type of Player:	Computer Programmed for Optimal Play				Computer Programmed for Naïve Play			
	2 x 2		4 x 4		2 x 2		4 x 4	
	All Players		All Players		All Players		All Players	
	1st Half	2nd Half	1st Half	2nd Half	1st Half	2nd Half	1st Half	2nd Half
# Players	21		21		13		13	
# Player-Roles	42		42		26		26	
I. Minimax Play at Aggregate Level								
Chi-square test for minimax play:								
Evader/Row Player	0.094	<0.001	0.254	0.624	<0.001	<0.001	<0.001	<0.001
Pursuer/Column Player	0.008	<0.001	0.117	<0.001	<0.001	<0.001	<0.001	<0.001
II. Minimax Play at Individual Level								
Rejections at 5 percent:								
Evader/Row Player	9.52%	33.33%	4.76%	33.33%	53.85%	15.38%	46.15%	38.46%
Pursuer/Column Player	9.52%	52.38%	0.00%	75.00%	76.92%	69.23%	46.15%	53.85%
III. Equality of Success Rates Across Strategies and to the Equilibrium Rate								
Rejections at 5 percent	21.43%	40.48%	16.67%	28.57%	65.38%	57.69%	69.23%	65.38%
IV. Runs Tests								
Rejections at 5 percent	2.38%	9.52%	8.33%	5.95%	0.00%	1.92%	0.00%	1.92%
Fraction of Players who beat the computer:	3/7	3/7	11/21	4/21	4/13	9/13	12/13	1

Appendix Table 5 continued

Table 4b compares the first half of play to the second half of play for the computer-based experiments. The first four columns correspond to games played on the computer programmed for optimal play, while the last four columns correspond to games played on the computer programmed for naïve play. As each pair plays 75 rounds before switching roles, the first half of play is defined as the first 37 rounds in each role while the second half of play is defined as the last 38 rounds. Panel I shows p-values from Pearson's Chi-square test for goodness of fit of the computer's aggregate frequencies to minimax predictions. P-values for the marginal frequencies of the computer as evader (or row) and pursuer (or column) are shown in the first and second rows. The test uses one (three) degree(s) of freedom for the marginal distribution of play and three (fifteen) for the joint distribution for the 2x2 (4x4 game). Panel II shows the percentage of individual computer plays that we reject at the 5% level for this same Chi-square test. For Panels III and IV, play in the 4x4 game is divided into two – diamond plays and non-diamond plays – and then analyzed as in the 2x2 game. Panel III shows the percentage of individuals for whom we reject the null hypothesis that success rates are equal across strategies and equal to the equilibrium success rate. The Pearson test statistic is also used in this case, but with winning and losing probabilities for each play rather than with frequencies. Thus, it is a chi-square test with 3 degrees of freedom. Panel IV presents the percentage of players for whom we can reject the null hypothesis of no serial correlation in actions, based on the runs test of Gibbons and Chakraborti (1982) which has the following distribution:

$$f(r | n_B^i, n_R^i) = \begin{cases} 2 \binom{n_B^i - 1}{(r/2) - 1} \binom{n_R^i - 1}{(r/2) - 1} / \binom{n_B^i + n_R^i}{n_B^i} & \text{if } r \text{ is even} \\ \left(\binom{n_B^i - 1}{(r-1)/2} \binom{n_R^i - 1}{(r-3)/2} + \binom{n_B^i - 1}{(r-3)/2} \binom{n_R^i - 1}{(r-1)/2} \right) / \binom{n_B^i + n_R^i}{n_B^i} & \text{if } r \text{ is odd} \end{cases}$$

Where r is the number of runs, and n_B^i and n_R^i are the number of black and red choices.

The serial independence hypothesis will be rejected at the 5 percent level if there are too few or too many runs, that is if $F(r | n_B^i, n_R^i) < 0.025$ or if $F(r-1 | n_B^i, n_R^i) > 0.975$, where $F(r | n_B^i, n_R^i) = \sum_{k=1}^r f(k | n_B^i, n_R^i)$.

Panel V gives the average player payoff relative to the maximum potential payoff. In equilibrium, the expected payoff is 50 percent.

Appendix Table 6: Summary of Results for Subjects Playing against Computers Programmed for Serially Correlated Play

Source:	Computer Programmed for Serially Correlated Play	
	2 x 2	4 x 4
Test:	All Players	All Players
Type of Player:	All Players	All Players
# Players	11	11
# Player-Roles	22	22
I. Minimax Play at Aggregate Level		
Chi-square test for minimax play:		
Evader/Row Player	<0.001	<0.001
Pursuer/Column Player	<0.001	0.030
II. Minimax Play at Individual Level		
Rejections at 5 percent:		
Evader/Row Player	81.82%	72.73%
Pursuer/Column Player	100.00%	54.55%
III. Equality of Success Rates Across Strategies and to the Equilibrium Rate		
Rejections at 5 percent		
Evader/Row Player	100.00%	45.45%
Pursuer/Column Player	100.00%	18.18%
IV. Runs Tests		
Rejections at 5 percent		
	25.00%	9.09%
V. Mean Player Payoff Relative to Total Payoff		
Overall	0.586	0.482
1st 25 Rounds	0.535	0.509
2nd 25 Rounds	0.593	0.493
3rd 25 Rounds	0.631	0.444
Fraction of Players who beat the computer:	10/11	3/11

Appendix Table 6 reports results for the 2x2 and 4x4 games on the computer programmed for serially correlated play. Columns correspond to the game played and rows report results for each test. The 2x2 game was mis-programmed so that instead of playing 67 percent red, 33 percent black, the computer played 33 percent red, 67 percent black. The 4x4 game was programmed with the right percentages – 40 percent on diamond, 20 percent on each of the other cards.

Appendix Table 6 continued

Panel I shows p-values from Pearson’s Chi-square test for goodness of fit of the human player’s aggregate frequencies to minimax predictions. P-values for the marginal frequencies of the human player as evader (or row) and pursuer (or column) are shown in the first and second rows. The test uses one (three) degree(s) of freedom for the marginal distribution of play and three (fifteen) for the joint distribution for the 2x2 (4x4 game). Panel II shows the percentage of humans that we reject at the 5% level for this same Chi-square test. For Panels III and IV, play in the 4x4 game is divided into two – diamond plays and non-diamond plays – and then analyzed as in the 2x2 game. Panel III shows the percentage of individuals for whom we reject the null hypothesis that success rates are equal across strategies and equal to the equilibrium success rate. The Pearson test statistic is also used in this case, but with winning and losing probabilities for each play rather than with frequencies. Thus, it is a chi-square test with 3 degrees of freedom. Panel IV presents the percentage of players for whom we can reject the null hypothesis of no serial correlation in actions, based on the runs test of Gibbons and Chakraborti (1982) which has the following distribution:

$$f(r | n_B^i, n_R^i) = \begin{cases} 2 \binom{n_B^i - 1}{(r/2) - 1} \binom{n_R^i - 1}{(r/2) - 1} / \binom{n_B^i + n_R^i}{n_B^i} & \text{if } r \text{ is even} \\ \left(\binom{n_B^i - 1}{(r-1)/2} \binom{n_R^i - 1}{(r-3)/2} + \binom{n_B^i - 1}{(r-3)/2} \binom{n_R^i - 1}{(r-1)/2} \right) / \binom{n_B^i + n_R^i}{n_B^i} & \text{if } r \text{ is odd} \end{cases}$$

Where r is the number of runs, and n_B^i and n_R^i are the number of black and red choices.

The serial independence hypothesis will be rejected at the 5 percent level if there are too few or too many runs, that is if $F(r | n_B^i, n_R^i) < 0.025$ or if $F(r - 1 | n_B^i, n_R^i) > 0.975$, where

$$F(r | n_B^i, n_R^i) = \sum_{k=1}^r f(k | n_B^i, n_R^i).$$

Panel V gives the average player payoff relative to the maximum potential payoff. In equilibrium, the expected payoff is 50 percent.

Appendix Table A1: 2x2 Game - Students

		Evader Choice		Marginal Frequencies for Pursuer
		B	R	
Pursuer Choice	B	0.198 (0.11) {0.0021}	0.268 (0.22) {0.0011}	0.400 (0.33) {0.0021}
	R	0.213 (0.22) {0.0002}	0.321 (0.44) {0.0031}	0.600 (0.67) {0.0021}
Marginal Frequencies For Evader		0.380 (0.33) {0.0014}	0.620 (0.67) {0.0014}	
N # pairs		1050 14		
Pursuer p-value		<.001		
Evader p-value		<.001		

Appendix table A1 reports the aggregate marginal and joint frequencies for the student subject pool in the 2x2 game. Numbers in parentheses indicate the minimax predicted frequencies, while numbers in brackets represent the standard deviations of the observed frequencies from the predicted frequencies. P-values from a chi-square goodness of fit test of the observed marginal frequencies to the predicted frequencies are also reported for each role.

Appendix Table A2: 2x2 Game - Students

Pair	Screen	Pursuer	Evader	Joint Frequencies				pvalue
		R	R	BB	BR	RB	RR	
1	no	0.320 **	0.413 **	0.387	0.293	0.200	0.120	0.000 **
2	no	0.453 **	0.720	0.147	0.400	0.133	0.320	0.001 **
3	no	0.573 *	0.520 **	0.227	0.200	0.253	0.320	0.007 **
4	no	0.533 **	0.533 **	0.200	0.267	0.267	0.267	0.007 **
5	no	0.373 **	0.600	0.293	0.333	0.107	0.267	0.000 **
6	no	0.640	0.627	0.107	0.253	0.267	0.373	0.602
7	no	0.520 **	0.507 **	0.200	0.280	0.293	0.227	0.001 **
8	no	0.813 **	0.560 *	0.120	0.067	0.320	0.493	0.008 **
9	no	0.413 **	0.560 *	0.293	0.293	0.147	0.267	0.000 **
10	no	0.467 **	0.427 **	0.240	0.293	0.333	0.133	0.000 **
11	no	0.573 *	0.453 **	0.200	0.227	0.347	0.227	0.000 **
12	no	0.640	0.733	0.080	0.280	0.187	0.453	0.528
13	no	0.520 **	0.653	0.133	0.347	0.213	0.307	0.032 **
14	no	0.373 **	0.840 **	0.120	0.507	0.040	0.333	0.000 **
15	no	0.600	0.627	0.213	0.187	0.160	0.440	0.032 **
16	no	0.400 **	0.587	0.267	0.333	0.147	0.253	0.000 **
17	no	0.640	0.507 **	0.187	0.173	0.307	0.333	0.027 **
18	no	0.493 **	0.707	0.133	0.373	0.160	0.333	0.010 **
19	no	0.560 *	0.453 **	0.320	0.120	0.227	0.333	0.000 **
20	no	0.520 **	0.493 **	0.213	0.267	0.293	0.227	0.001 **
21	no	0.760 *	0.907 **	0.040	0.200	0.053	0.707	0.000 **
22	no	0.560 *	0.533 **	0.227	0.213	0.240	0.320	0.008 **

Appendix table A2 reports individual-level results for the Pearson chi-square test of goodness of fit of the observed frequencies to the minimax predicted frequencies. Columns 3 and 4 show the observed frequencies for which the pursuer and evader each play the red card, as well as the corresponding rejections of the minimax hypothesis. ** and * denote rejections at the 5 and 10 percent levels respectively. The test uses one degree of freedom in this case. Columns 5 to 8 show the joint frequencies of play, and column 9 reports the corresponding p-values when the same chi-square test is used with three degrees of freedom.

Appendix Table A3: 2x2 Game - Students

Pair	Player	B		R		Pearson	p-value
		Success	Fail	Success	Fail		
1	P	0.293	0.387	0.040	0.280	67.521	0.000 **
	E	0.293	0.293	0.373	0.040	57.981	0.000 **
2	P	0.120	0.427	0.067	0.387	16.119	0.001 **
	E	0.160	0.120	0.653	0.067	10.976	0.012 **
3	P	0.160	0.267	0.107	0.467	8.751	0.033 **
	E	0.320	0.160	0.413	0.107	11.014	0.012 **
4	P	0.107	0.360	0.080	0.453	6.977	0.073 *
	E	0.360	0.107	0.453	0.080	6.977	0.073 *
5	P	0.240	0.387	0.093	0.280	42.321	0.000 **
	E	0.160	0.240	0.507	0.093	32.267	0.000 **
6	P	0.067	0.293	0.093	0.547	2.027	0.567
	E	0.307	0.067	0.533	0.093	2.259	0.521
7	P	0.133	0.347	0.040	0.480	11.901	0.008 **
	E	0.360	0.133	0.467	0.040	12.801	0.005 **
8	P	0.107	0.080	0.133	0.680	14.254	0.003 **
	E	0.333	0.107	0.427	0.133	3.994	0.262
9	P	0.187	0.400	0.080	0.333	25.877	0.000 **
	E	0.253	0.187	0.480	0.080	15.411	0.001 **
10	P	0.160	0.373	0.013	0.453	21.056	0.000 **
	E	0.413	0.160	0.413	0.013	25.144	0.000 **
11	P	0.147	0.280	0.053	0.520	10.011	0.018 **
	E	0.400	0.147	0.400	0.053	17.649	0.001 **
12	P	0.053	0.307	0.093	0.547	2.721	0.437
	E	0.213	0.053	0.640	0.093	4.701	0.195
13	P	0.093	0.387	0.080	0.440	8.314	0.040 **
	E	0.253	0.093	0.573	0.080	3.171	0.366
14	P	0.107	0.520	0.120	0.253	31.316	0.000 **
	E	0.053	0.107	0.720	0.120	19.616	0.000 **
15	P	0.107	0.293	0.133	0.467	1.911	0.591
	E	0.267	0.107	0.493	0.133	1.294	0.730
16	P	0.120	0.480	0.067	0.333	24.553	0.000 **
	E	0.293	0.120	0.520	0.067	5.833	0.120
17	P	0.133	0.227	0.080	0.560	6.463	0.091 *
	E	0.360	0.133	0.427	0.080	10.063	0.018 **
18	P	0.120	0.387	0.133	0.360	10.577	0.014 **
	E	0.173	0.120	0.573	0.133	4.817	0.186
19	P	0.173	0.267	0.160	0.400	12.094	0.007 **
	E	0.373	0.173	0.293	0.160	21.146	0.000 **
20	P	0.200	0.280	0.107	0.413	18.651	0.000 **
	E	0.307	0.200	0.387	0.107	20.091	0.000 **
21	P	0.040	0.200	0.240	0.520	6.463	0.091 *
	E	0.053	0.040	0.667	0.240	20.889	0.000 **
22	P	0.120	0.320	0.093	0.467	5.113	0.164
	E	0.347	0.120	0.440	0.093	6.759	0.080 *

Appendix table A3 reports results for the test that success rates are equal to the minimax predicted success rates and are equal across strategies.

Appendix Table A3 continued

Columns 3 – 6 report the observed success and failure rates for each strategy and each player. Columns 7 and 8 report the test statistics from the Pearson Chi-square test (with 3 degrees of freedom) of goodness of fit of the observed success and failure rates to the equilibrium rates.

Appendix Table A4: 2x2 Game - Students

Pair	Player	Runs	Choices		F(r)	F(r - 1)
			R	B		
1	P	34	24	51	0.580	0.486
	E	43	44	31	0.930	0.890
2	P	35	34	41	0.265	0.195
	E	24	21	54	0.027 *	0.015
3	P	47	43	32	0.991	0.982 **
	E	36	36	39	0.326	0.246
4	P	38	40	35	0.516	0.422
	E	48	35	40	0.992	0.984 **
5	P	28	28	47	0.030 *	0.017
	E	39	30	45	0.728	0.639
6	P	37	48	27	0.689	0.588
	E	31	28	47	0.128	0.082
7	P	40	39	36	0.685	0.597
	E	37	37	38	0.408	0.322
8	P	28	61	14	0.907	0.889
	E	39	33	42	0.641	0.550
9	P	33	31	44	0.177	0.121
	E	36	33	42	0.365	0.281
10	P	41	35	40	0.770	0.694
	E	30	43	32	0.044 *	0.026
11	P	40	43	32	0.747	0.666
	E	40	41	34	0.707	0.622
12	P	30	48	27	0.100	0.064
	E	33	20	55	0.836	0.724
13	P	56	39	36	1.000	1.000 **
	E	24	26	49	0.004 **	0.002
14	P	24	28	47	0.002 **	0.001
	E	25	12	63	0.917	0.917
15	P	37	45	30	0.548	0.449
	E	33	28	47	0.260	0.185
16	P	37	30	45	0.548	0.449
	E	25	31	44	0.002 **	0.001
17	P	45	48	27	0.995	0.989 **
	E	29	37	38	0.018 **	0.010
18	P	27	37	38	0.005 **	0.002
	E	29	22	53	0.237	0.153
19	P	40	42	33	0.725	0.641
	E	47	41	34	0.986	0.975 **
20	P	44	39	36	0.921	0.881
	E	35	38	37	0.243	0.177
21	P	27	57	18	0.393	0.257
	E	14	7	68	0.562	0.461
22	P	40	42	33	0.725	0.641
	E	39	35	40	0.607	0.516

Appendix Table A4 continued

Appendix table A4 reports results from the runs test of serial independence of Gibbons and Chakraborti (1992). A run is defined as the number of times a player switches from one strategy to another (from black to red in this case). Column 3 reports the number of runs for each player and columns 4 and 5 report the number of times each card is played. The test is based on the following distribution:

$$f(r | n_B^i, n_R^i) = \begin{cases} 2 \binom{n_B^i - 1}{(r/2) - 1} \binom{n_R^i - 1}{(r/2) - 1} / \binom{n_B^i + n_R^i}{n_B^i} & \text{if } r \text{ is even} \\ \left(\binom{n_B^i - 1}{(r-1)/2} \binom{n_R^i - 1}{(r-3)/2} + \binom{n_B^i - 1}{(r-3)/2} \binom{n_R^i - 1}{(r-1)/2} \right) / \binom{n_B^i + n_R^i}{n_B^i} & \text{if } r \text{ is odd} \end{cases}$$

Where r is the number of runs, and n_B^i and n_R^i are the number of black and red choices.

The serial independence hypothesis will be rejected at the 5 percent level if there are too few or too many runs, that is if $F(r | n_B^i, n_R^i) < 0.025$ or if $F(r-1 | n_B^i, n_R^i) > 0.975$, where

$$F(r | n_B^i, n_R^i) = \sum_{k=1}^r f(k | n_B^i, n_R^i). \text{ Columns 6 and 7 report p-values for both alternatives.}$$

Appendix Table B1: 4x4 Game - Students

		Column Player Choice				Marginal Frequencies for Row Player
		C	D	H	S	
Row Player Choice	C	0.044 (0.040) {0.0001}	0.076 (0.080) {0.0001}	0.050 (0.040) {0.0002}	0.042 (0.040) {0.0000}	0.212 (0.200) {0.0003}
	D	0.087 (0.080) {0.0001}	0.150 (0.016) {0.0002}	0.075 (0.080) {0.0003}	0.089 (0.080) {0.0002}	0.401 (0.400) {0.0000}
	H	0.044 (0.040) {0.0001}	0.071 (0.080) {0.0002}	0.038 (0.040) {0.0000}	0.051 (0.040) {0.0002}	0.203 (0.200) {0.0001}
	S	0.040 (0.040) {0.0000}	0.067 (0.080) {0.0002}	0.038 (0.040) {0.0000}	0.039 (0.040) {0.0000}	0.184 (0.200) {0.0004}
Marginal Frequencies for Column Player		0.215 (0.200) {0.0004}	0.363 (0.400) {0.0009}	0.202 (0.200) {0.0000}	0.220 (0.200) {0.0005}	
N		1800				
#pairs		24				
Row p-value		0.320				
Column p-value		0.008				

Appendix table B1 reports the aggregate marginal and joint frequencies for the student subject pool in the 4x4 game. Numbers in parentheses represent the minimax predicted frequencies, while numbers in brackets represent the standard deviations of the observed frequencies from the predicted frequencies. P-values from a Chi-square goodness of fit test of the observed marginal frequencies to the predicted frequencies are also reported for each role.

Appendix Table B2: 4x4 Game - Students

	Row Player Choices				Column Player Choices				P-values from Chi-Squared Test on Minimax Predicted Choices		
Pair	C	D	H	S	C	D	H	S	Row Player	Column Player	Both Players
1	0.227	0.507	0.133	0.133	0.133	0.560	0.187	0.120	0.125	0.030 **	0.084 *
2	0.253	0.307	0.200	0.240	0.120	0.493	0.213	0.173	0.348	0.224	0.382
3	0.320	0.387	0.080	0.213	0.293	0.253	0.147	0.307	0.012 **	0.006 **	0.001 **
4	0.187	0.453	0.147	0.213	0.200	0.400	0.200	0.200	0.630	1.000	0.814
5	0.093	0.547	0.293	0.067	0.240	0.480	0.053	0.227	0.000 **	0.017 **	0.004 **
6	0.187	0.493	0.147	0.173	0.133	0.533	0.133	0.200	0.387	0.083 *	0.344
7	0.147	0.493	0.200	0.160	0.213	0.387	0.120	0.280	0.348	0.179	0.451
8	0.227	0.493	0.147	0.133	0.213	0.387	0.213	0.187	0.201	0.972	0.906
9	0.107	0.480	0.307	0.107	0.293	0.173	0.280	0.253	0.007 **	0.001 **	0.000 **
10	0.227	0.280	0.253	0.240	0.227	0.427	0.133	0.213	0.201	0.545	0.439
11	0.227	0.347	0.293	0.133	0.293	0.187	0.293	0.227	0.125	0.002 **	0.026 **
12	0.200	0.240	0.200	0.360	0.160	0.453	0.213	0.173	0.002 **	0.690	0.053 *
13	0.107	0.440	0.320	0.133	0.360	0.107	0.133	0.400	0.014 **	0.000 **	0.000 **
14	0.267	0.453	0.107	0.173	0.133	0.333	0.320	0.213	0.125	0.047 **	0.032 **
15	0.173	0.467	0.160	0.200	0.227	0.467	0.160	0.147	0.637	0.429	0.704
16	0.173	0.400	0.293	0.133	0.147	0.520	0.160	0.173	0.158	0.201	0.488
17	0.293	0.213	0.240	0.253	0.280	0.093	0.347	0.280	0.009 **	0.000 **	0.000 **
18	0.307	0.227	0.227	0.240	0.240	0.147	0.293	0.320	0.013 **	0.000 **	0.000 **
19	0.160	0.440	0.200	0.200	0.347	0.333	0.173	0.147	0.825	0.017 **	0.382
20	0.333	0.347	0.107	0.213	0.160	0.307	0.360	0.173	0.015 **	0.007 **	0.004 **
21	0.280	0.427	0.133	0.160	0.147	0.440	0.240	0.173	0.187	0.525	0.233
22	0.280	0.333	0.160	0.227	0.200	0.347	0.173	0.280	0.251	0.362	0.589
23	0.160	0.387	0.293	0.160	0.187	0.413	0.187	0.213	0.212	0.972	0.127
24	0.147	0.453	0.240	0.160	0.213	0.480	0.107	0.200	0.423	0.209	0.545

Appendix table B2 reports individual-level results for the Pearson Chi-square test of goodness of fit of the observed frequencies to the minimax predicted frequencies. The first four columns show the observed frequencies for the row player on

Appendix Table B2 continued

each card, while the columns 5-8 show the observed frequencies for the column player on each card. The last three columns report the p-values for the row player, column player and for the joint frequencies of both players respectively. ** and * denote rejections at the 5 and 10 percent levels. The test uses three degrees of freedom for the marginal frequencies and fifteen for the joint frequencies.

Appendix Table B3: 4x4 Game - Students

Pair	Player	Mixtures		Win Rates		Pearson	p-value
		Diamond	Non-Diamond	Diamond	Non-Diamond		
1	R	0.507	0.493	0.474	0.784	11.037	0.012 **
	C	0.560	0.440	0.476	0.242	11.926	0.008 **
2	R	0.307	0.693	0.391	0.596	5.926	0.115
	C	0.493	0.507	0.378	0.553	5.926	0.115
3	R	0.387	0.613	0.690	0.587	1.028	0.795
	C	0.253	0.747	0.474	0.339	8.065	0.045 **
4	R	0.453	0.547	0.618	0.585	0.972	0.808
	C	0.400	0.600	0.433	0.378	0.231	0.972
5	R	0.547	0.453	0.561	0.647	7.315	0.063 *
	C	0.480	0.520	0.500	0.308	5.000	0.172
6	R	0.493	0.507	0.378	0.605	12.065	0.007 **
	C	0.533	0.467	0.575	0.429	12.454	0.006 **
7	R	0.493	0.507	0.622	0.474	4.944	0.176
	C	0.387	0.613	0.483	0.435	1.093	0.779
8	R	0.493	0.507	0.649	0.684	4.120	0.249
	C	0.387	0.613	0.448	0.261	4.120	0.249
9	R	0.480	0.520	0.833	0.436	15.593	0.001 **
	C	0.173	0.827	0.462	0.355	16.870	0.001 **
10	R	0.280	0.720	0.524	0.593	4.870	0.182
	C	0.427	0.573	0.313	0.512	3.444	0.328
11	R	0.347	0.653	0.885	0.449	13.565	0.004 **
	C	0.187	0.813	0.214	0.443	15.787	0.001 **
12	R	0.240	0.760	0.611	0.596	8.009	0.046 **
	C	0.453	0.547	0.206	0.561	10.972	0.012 **
13	R	0.440	0.560	0.939	0.238	39.315	0.000 **
	C	0.107	0.893	0.250	0.478	29.593	0.000 **
14	R	0.453	0.547	0.500	0.415	7.843	0.049 **
	C	0.333	0.667	0.680	0.480	9.676	0.022 **
15	R	0.467	0.533	0.600	0.675	2.222	0.528
	C	0.467	0.533	0.400	0.325	2.222	0.528
16	R	0.400	0.600	0.467	0.600	2.222	0.528
	C	0.520	0.480	0.410	0.500	5.722	0.126
17	R	0.213	0.787	1.000	0.475	21.648	0.000 **
	C	0.093	0.907	0.000	0.456	31.815	0.000 **
18	R	0.227	0.773	0.824	0.483	15.676	0.001 **
	C	0.147	0.853	0.273	0.469	22.120	0.000 **
19	R	0.440	0.560	0.697	0.571	2.056	0.561
	C	0.333	0.667	0.400	0.360	1.759	0.624
20	R	0.347	0.653	0.615	0.469	4.704	0.195
	C	0.307	0.693	0.435	0.500	5.315	0.150
21	R	0.427	0.573	0.656	0.628	0.806	0.848
	C	0.440	0.560	0.333	0.381	1.231	0.745
22	R	0.333	0.667	0.600	0.560	1.759	0.624
	C	0.347	0.653	0.385	0.449	1.444	0.695
23	R	0.387	0.613	0.655	0.761	5.481	0.140
	C	0.413	0.587	0.323	0.250	4.889	0.180
24	R	0.453	0.547	0.500	0.585	2.528	0.470
	C	0.480	0.520	0.472	0.436	3.120	0.373

Appendix Table B3 continued

Appendix table B3 reports results for the test that success rates are equal to the minimax predicted success rates and are equal across strategies. Play is broken down into two strategies – diamond and non-diamond cards – before being analyzed. Columns 3 – 6 report the observed success and failure rates for each strategy and each player. Columns 7 and 8 report the test statistics from the Pearson Chi-square test (with 3 degrees of freedom) of goodness of fit of the observed success and failure rates to the equilibrium rates.

Appendix Table B4: 4x4 Game - Students

Pair	Player	Runs	Choices		F(r)	F(r - 1)
			Diamond	Non-Diamond		
1	R	42	38	37	0.825	0.757
	C	34	42	33	0.207	0.146
2	R	25	23	52	0.023	0.011
	C	51	37	38	0.999 **	0.998 **
3	R	57	29	46	1.000 **	1.000 **
	C	36	19	56	0.989 **	0.980 **
4	R	48	34	41	0.993 **	0.986 **
	C	43	30	45	0.944	0.908
5	R	34	41	34	0.195	0.136
	C	47	36	39	0.983 **	0.970 *
6	R	60	37	38	1.000 **	1.000 **
	C	32	40	35	0.087	0.055
7	R	37	37	38	0.408	0.322
	C	34	29	46	0.303	0.226
8	R	36	37	38	0.322	0.243
	C	32	29	46	0.158	0.108
9	R	41	36	39	0.761	0.685
	C	27	13	62	1.000 **	0.948
10	R	33	21	54	0.749	0.625
	C	38	32	43	0.575	0.481
11	R	35	26	49	0.555	0.445
	C	24	14	61	0.561	0.465
12	R	31	18	57	0.855	0.731
	C	45	34	41	0.958 *	0.932
13	R	52	33	42	1.000 **	0.999 **
	C	17	8	67	1.000 **	0.660
14	R	47	34	41	0.986 **	0.975 **
	C	42	25	50	0.985 **	0.974 *
15	R	38	35	40	0.516	0.422
	C	56	35	40	1.000 **	1.000 **
16	R	38	30	45	0.639	0.548
	C	44	39	36	0.921	0.881
17	R	33	16	59	1.000 **	0.991 **
	C	15	7	68	1.000 **	0.562
18	R	33	17	58	0.991 **	0.959 *
	C	21	11	64	0.822	0.556
19	R	43	33	42	0.905	0.858
	C	37	25	50	0.800	0.707
20	R	42	26	49	0.974 *	0.957 *
	C	28	23	52	0.113	0.073
21	R	35	32	43	0.301	0.224
	C	30	33	42	0.039	0.023
22	R	28	25	50	0.063	0.039
	C	31	26	49	0.188	0.124
23	R	29	29	46	0.042	0.024
	C	46	31	44	0.986 **	0.975 **
24	R	41	34	41	0.782	0.707
	C	33	36	39	0.125	0.083

Appendix Table B4 continued

Appendix table B4 reports results from the runs test of serial independence of Gibbons and Chakraborti (1992). A run is defined as the number of times a player switches from one strategy to another (from black to red in this case). Column 3 reports the number of runs for each player and columns 4 and 5 report the number of times each card is played. The test is based on the following distribution:

$$f(r | n_B^i, n_R^i) = \begin{cases} 2 \binom{n_B^i - 1}{(r/2) - 1} \binom{n_R^i - 1}{(r/2) - 1} / \binom{n_B^i + n_R^i}{n_B^i} & \text{if } r \text{ is even} \\ \left(\binom{n_B^i - 1}{(r-1)/2} \binom{n_R^i - 1}{(r-3)/2} + \binom{n_B^i - 1}{(r-3)/2} \binom{n_R^i - 1}{(r-1)/2} \right) / \binom{n_B^i + n_R^i}{n_B^i} & \text{if } r \text{ is odd} \end{cases}$$

Where r is the number of runs, and n_B^i and n_R^i are the number of black and red choices.

The serial independence hypothesis will be rejected at the 5 percent level if there are too few or too many runs, that is if $F(r | n_B^i, n_R^i) < 0.025$ or if $F(r-1 | n_B^i, n_R^i) > 0.975$, where

$F(r | n_B^i, n_R^i) = \sum_{k=1}^r f(k | n_B^i, n_R^i)$. Columns 6 and 7 report p-values for both alternatives.

Appendix Table C1: 2x2 Game - Bridge Players

		Evader Choice		Marginal Frequencies For Pursuer
		B	R	
Pursuer Choice	B	0.148 (0.11) {0.0011}	0.252 (0.22) {0.0009}	0.466 (0.33) {0.0033}
	R	0.232 (0.22) {0.0003}	0.368 (0.44) {0.0024}	0.534 (0.67) {0.0033}
Marginal Frequencies For Evader		0.411 (0.33) {0.0019}	0.589 (0.67) {0.0019}	
N # pairs		1650 22		
Pursuer p-value		<.001		
Evader p-value		<.001		

Appendix table C1 reports the aggregate marginal and joint frequencies for the bridge players in the 2x2 game. Numbers in parentheses represent the minimax predicted frequencies, while numbers in brackets represent the standard deviations of the observed frequencies from the predicted frequencies. P-values from a chi-square goodness of fit test (with one degree of freedom) of the observed marginal frequencies to the predicted frequencies are also reported for each role.

Appendix Table C2: 2x2 Game - Bridge Players

Pair	Pursuer	Evader	Joint Frequencies				p-value
	R	R	BB	BR	RB	RR	
1	0.600	0.453 **	0.240	0.160	0.307	0.293	0.000 **
2	0.453 **	0.520 **	0.293	0.253	0.187	0.267	0.000 **
3	0.573 *	0.747	0.107	0.320	0.147	0.427	0.156
4	0.680	0.680	0.107	0.213	0.213	0.467	0.985
5	0.667	0.813 **	0.080	0.253	0.107	0.560	0.052 *
6	0.680	0.587	0.107	0.213	0.307	0.373	0.348
7	0.800 **	0.573 *	0.080	0.120	0.347	0.453	0.024 **
8	0.613	0.520 **	0.187	0.200	0.293	0.320	0.039 **
9	0.427 **	0.640	0.200	0.373	0.160	0.267	0.000 **
10	0.667	0.627	0.107	0.227	0.267	0.400	0.796
11	0.667	0.440 **	0.187	0.147	0.373	0.293	0.001 **
12	0.520 **	0.680	0.147	0.333	0.173	0.347	0.059 *
13	0.507 **	0.640	0.133	0.360	0.227	0.280	0.010 **
14	0.547 **	0.760 *	0.093	0.360	0.147	0.400	0.031 **

Appendix table C2 reports individual-level results for the Pearson chi-square test of goodness of fit of the observed frequencies to the minimax predicted frequencies. Columns 2 and 3 show the observed frequencies for which the pursuer and evader each play the red card, as well as the corresponding rejections of the minimax hypothesis. ** and * denote rejections at the 5 and 10 percent levels respectively. The test uses one degree of freedom in this case. Columns 3 to 6 show the joint frequencies of play, and column 7 shows the corresponding p-values when the same chi-square test is used with three degrees of freedom.

Appendix Table C3: 2x2 Game - Bridge Players

Pair	Player	B		R		Pearson	p-value
		Success	Fail	Success	Fail		
1	P	0.213	0.187	0.107	0.493	22.123	0.000 **
	E	0.333	0.213	0.347	0.107	26.366	0.000 **
2	P	0.227	0.320	0.053	0.400	31.226	0.000 **
	E	0.253	0.227	0.467	0.053	28.526	0.000 **
3	P	0.080	0.347	0.173	0.400	4.599	0.204
	E	0.173	0.080	0.573	0.173	2.927	0.403
4	P	0.093	0.227	0.187	0.493	1.526	0.676
	E	0.227	0.093	0.493	0.187	1.526	0.676
5	P	0.080	0.253	0.213	0.453	2.811	0.422
	E	0.107	0.080	0.600	0.213	9.883	0.020 **
6	P	0.093	0.227	0.107	0.573	1.989	0.575
	E	0.320	0.093	0.480	0.107	2.529	0.470
7	P	0.053	0.147	0.200	0.600	6.424	0.093 *
	E	0.373	0.053	0.373	0.200	8.610	0.035 **
8	P	0.120	0.267	0.120	0.493	2.644	0.450
	E	0.360	0.120	0.400	0.120	7.504	0.057 *
9	P	0.107	0.467	0.107	0.320	20.091	0.000 **
	E	0.253	0.107	0.533	0.107	1.989	0.575
10	P	0.093	0.240	0.147	0.520	0.484	0.922
	E	0.280	0.093	0.480	0.147	0.716	0.870
11	P	0.133	0.200	0.067	0.600	8.893	0.031 **
	E	0.427	0.133	0.373	0.067	18.073	0.000 **
12	P	0.093	0.387	0.120	0.400	7.504	0.057 *
	E	0.227	0.093	0.560	0.120	1.333	0.721
13	P	0.053	0.440	0.120	0.387	12.801	0.005 **
	E	0.307	0.053	0.520	0.120	1.487	0.685
14	P	0.067	0.387	0.147	0.400	6.784	0.079 *
	E	0.173	0.067	0.613	0.147	3.493	0.322

Appendix table C3 reports results for the test that success rates are equal to the minimax predicted success rates and are equal across strategies. Columns 3 – 6 report the observed success and failure rates for each strategy and each player. Columns 7 and 8 report the test statistics from the Pearson chi-square test (with 3 degrees of freedom) of goodness of fit of the observed success and failure rates to the equilibrium rates.

Appendix Table C4: 2x2 Game - Bridge Players

Pair	Player	Runs	Choices		F(r)	F(r - 1)
			R	B		
1	P	36	45	30	0.449	0.358
	E	35	41	34	0.265	0.195
2	P	36	34	41	0.348	0.265
	E	41	36	39	0.761	0.685
3	P	36	43	32	0.388	0.301
	E	22	19	56	0.019 **	0.010
4	P	27	51	24	0.053	0.029
	E	27	24	51	0.053	0.029
5	P	27	50	25	0.039 *	0.021
	E	17	14	61	0.013 **	0.004
6	P	34	51	24	0.580	0.486
	E	25	31	44	0.002 **	0.001
7	P	15	60	15	0.001 **	0.000
	E	38	32	43	0.575	0.481
8	P	38	46	29	0.678	0.590
	E	38	36	39	0.506	0.413
9	P	35	32	43	0.301	0.224
	E	34	27	48	0.390	0.303
10	P	39	50	25	0.916	0.859
	E	36	28	47	0.536	0.442
11	P	32	50	25	0.310	0.231
	E	41	42	33	0.798	0.725
12	P	39	39	36	0.597	0.506
	E	33	24	51	0.486	0.371
13	P	38	38	37	0.501	0.408
	E	39	27	48	0.842	0.767
14	P	45	41	34	0.958	0.932
	E	31	18	57	0.855	0.731

Appendix table C4 reports results from the runs test of serial independence of Gibbons and Chakraborti (1992). A run is defined as the number of times a player switches from one strategy to another (from black to red in this case). Column 3 reports the number of runs for each player and columns 4 and 5 report the number of times each card is played. The test is based on the following distribution:

$$f(r | n_B^i, n_R^i) = \begin{cases} 2 \binom{n_B^i - 1}{(r/2) - 1} \binom{n_R^i - 1}{(r/2) - 1} / \binom{n_B^i + n_R^i}{n_B^i} & \text{if } r \text{ is even} \\ \left(\binom{n_B^i - 1}{(r-1)/2} \binom{n_R^i - 1}{(r-3)/2} + \binom{n_B^i - 1}{(r-3)/2} \binom{n_R^i - 1}{(r-1)/2} \right) / \binom{n_B^i + n_R^i}{n_B^i} & \text{if } r \text{ is odd} \end{cases}$$

Where r is the number of runs, and n_B^i and n_R^i are the number of black and red choices.

The serial independence hypothesis will be rejected at the 5 percent level if there are too few or too many runs, that is if $F(r | n_B^i, n_R^i) < 0.025$ or if $F(r - 1 | n_B^i, n_R^i) > 0.975$, where

$$F(r | n_B^i, n_R^i) = \sum_{k=1}^r f(k | n_B^i, n_R^i). \text{ Columns 6 and 7 report p-values for both alternatives.}$$

Appendix Table D1: 4x4 Game - Bridge Players

	Column Player Choice				Marginal Frequencies for Row
	C	D	H	S	
C	0.045 (0.040) {0.0001}	0.058 (0.080) {0.0006}	0.039 (0.040) {0.0000}	0.044 (0.040) {0.0001}	0.186 (0.200) {0.0003}
D	0.091 (0.080) {0.0003}	0.157 (0.016) {0.0001}	0.074 (0.080) {0.0001}	0.086 (0.080) {0.0001}	0.408 (0.400) {0.0002}
H	0.046 (0.040) {0.0001}	0.083 (0.080) {0.0001}	0.037 (0.040) {0.0001}	0.045 (0.040) {0.0001}	0.212 (0.200) {0.0003}
S	0.048 (0.040) {0.0002}	0.071 (0.080) {0.0002}	0.044 (0.040) {0.0001}	0.032 (0.040) {0.0002}	0.195 (0.200) {0.0001}
Marginal Frequencies for Column Player	0.230 (0.200) {0.0007}	0.368 (0.400) {0.0008}	0.194 (0.200) {0.0001}	0.207 (0.200) {0.0002}	
N	1650				
#pairs	22				
Row p-value	0.362				
Column p-value	0.006				

Appendix table D1 reports the aggregate marginal and joint frequencies for the bridge players in the 4x4 game. Numbers in parentheses represent the minimax predicted frequencies, while numbers in brackets represent the standard deviations of the observed frequencies from the predicted frequencies. P-values from a Pearson chi-square goodness of fit test (with three degrees of freedom) of the observed marginal frequencies to the predicted frequencies are also reported for each role.

Appendix Table D2: 4x4 Game - Bridge Players

Pair	Row Player Choices				Column Player Choices				P-values from Chi-Squared Test on Minimax Predictions		
	C	D	H	S	C	D	H	S	Row Player	Column Player	Both Players
1	0.160	0.413	0.173	0.253	0.253	0.373	0.080	0.293	0.579	0.020 **	0.175
2	0.013	0.440	0.093	0.453	0.240	0.387	0.240	0.133	0.000 **	0.407	0.000 **
3	0.427	0.253	0.200	0.120	0.320	0.173	0.253	0.253	0.000 **	0.001 **	0.000 **
4	0.213	0.320	0.253	0.213	0.107	0.400	0.227	0.267	0.494	0.158	0.377
5	0.320	0.280	0.240	0.160	0.240	0.320	0.293	0.147	0.026 **	0.105	0.005 **
6	0.187	0.427	0.293	0.093	0.187	0.440	0.187	0.187	0.052 *	0.919	0.166
7	0.133	0.347	0.227	0.293	0.267	0.093	0.320	0.320	0.125	0.000 **	0.000 **
8	0.120	0.547	0.187	0.147	0.320	0.467	0.133	0.080	0.056 *	0.004 **	0.032 **
9	0.147	0.507	0.187	0.160	0.213	0.413	0.187	0.187	0.276	0.972	0.583
10	0.200	0.493	0.147	0.160	0.160	0.600	0.147	0.093	0.348	0.004 **	0.050 **
11	0.173	0.373	0.200	0.253	0.280	0.227	0.253	0.240	0.690	0.021 **	0.366
12	0.107	0.613	0.187	0.093	0.160	0.373	0.200	0.267	0.001 **	0.494	0.035 **
13	0.147	0.333	0.213	0.307	0.307	0.307	0.187	0.200	0.101	0.113	0.069 *
14	0.040	0.573	0.253	0.133	0.133	0.480	0.160	0.227	0.000 **	0.292	0.000 **
15	0.253	0.387	0.213	0.147	0.360	0.413	0.107	0.120	0.525	0.002 **	0.029 **
16	0.187	0.453	0.133	0.227	0.187	0.413	0.160	0.240	0.469	0.729	0.942
17	0.227	0.320	0.320	0.133	0.307	0.267	0.120	0.307	0.036 **	0.003 **	0.002 **
18	0.213	0.413	0.333	0.040	0.227	0.333	0.173	0.267	0.001 **	0.387	0.065 *
19	0.173	0.427	0.213	0.187	0.240	0.493	0.147	0.120	0.912	0.127	0.140
20	0.307	0.240	0.213	0.240	0.147	0.373	0.293	0.187	0.021 **	0.209	0.145
21	0.187	0.373	0.267	0.173	0.200	0.307	0.213	0.280	0.545	0.251	0.764
22	0.160	0.440	0.107	0.293	0.213	0.453	0.187	0.147	0.059 *	0.630	0.086 *

Appendix table D2 reports individual-level results for the Pearson chi-square test of goodness of fit of the observed frequencies to the minimax predicted frequencies. Columns 2-5 show the observed frequencies for the row player on each card, while the columns 6-9 show the observed frequencies for the column player on each card. The last three columns report the p-values for the row player, column player and for the joint frequencies of both players respectively. ** and * denote rejections at the 5 and 10 percent levels. The test uses three degrees of freedom for the marginal frequencies and fifteen for the joint frequencies.

Appendix Table D3: 4x4 Game - Bridge Players

Pair	Player	Mixtures		Win Rates		Pearson	p-value
		Diamond	Non-Diamond	Diamond	Non-Diamond		
1	R	0.413	0.587	0.645	0.523	1.398	0.706
	C	0.373	0.627	0.393	0.447	0.676	0.879
2	R	0.440	0.560	0.727	0.571	3.083	0.379
	C	0.387	0.613	0.310	0.391	1.009	0.799
3	R	0.253	0.747	0.789	0.500	11.426	0.010 **
	C	0.173	0.827	0.308	0.452	17.204	0.001 **
4	R	0.320	0.680	0.458	0.569	3.843	0.279
	C	0.400	0.600	0.433	0.489	1.620	0.655
5	R	0.280	0.720	0.667	0.426	12.954	0.005 **
	C	0.320	0.680	0.292	0.608	13.343	0.004 **
6	R	0.427	0.573	0.625	0.767	5.111	0.164
	C	0.440	0.560	0.364	0.238	4.981	0.173
7	R	0.347	0.653	0.923	0.367	22.722	0.000 **
	C	0.093	0.907	0.286	0.456	30.815	0.000 **
8	R	0.547	0.453	0.512	0.647	8.759	0.033 **
	C	0.467	0.533	0.571	0.300	7.870	0.049 **
9	R	0.507	0.493	0.500	0.432	9.120	0.028 **
	C	0.413	0.587	0.613	0.477	7.176	0.066 *
10	R	0.493	0.507	0.568	0.868	12.556	0.006 **
	C	0.600	0.400	0.356	0.167	17.593	0.001 **
11	R	0.373	0.627	0.821	0.489	8.065	0.045 **
	C	0.227	0.773	0.294	0.414	9.898	0.019 **
12	R	0.613	0.387	0.652	0.655	15.259	0.002 **
	C	0.373	0.627	0.571	0.213	10.593	0.014 **
13	R	0.333	0.667	0.640	0.600	1.528	0.676
	C	0.307	0.693	0.391	0.385	2.787	0.426
14	R	0.573	0.427	0.442	0.375	20.611	0.000 **
	C	0.480	0.520	0.667	0.513	16.593	0.001 **
15	R	0.387	0.613	0.655	0.696	2.204	0.531
	C	0.413	0.587	0.323	0.318	2.056	0.561
16	R	0.453	0.547	0.588	0.610	0.926	0.819
	C	0.413	0.587	0.452	0.364	0.648	0.885
17	R	0.320	0.680	0.625	0.392	12.454	0.006 **
	C	0.267	0.733	0.450	0.564	13.194	0.004 **
18	R	0.413	0.587	0.548	0.477	3.111	0.375
	C	0.333	0.667	0.560	0.460	4.444	0.217
19	R	0.427	0.573	0.594	0.698	1.861	0.602
	C	0.493	0.507	0.351	0.342	3.620	0.305
20	R	0.240	0.760	0.611	0.579	8.139	0.043 **
	C	0.373	0.627	0.250	0.511	5.176	0.159
21	R	0.373	0.627	0.750	0.596	2.676	0.444
	C	0.307	0.693	0.304	0.365	3.694	0.296
22	R	0.440	0.560	0.485	0.500	4.139	0.247
	C	0.453	0.547	0.500	0.512	4.454	0.216

Appendix Table D3 continued

Appendix table D3 reports results for the test that success rates are equal to the minimax predicted success rates and are equal across strategies. Play is broken down into two strategies – diamond and non-diamond cards – before being analyzed. Columns 3 – 6 report the observed success and failure rates for each strategy and each player. Columns 7 and 8 report the test statistics from the Pearson chi-square test (with 3 degrees of freedom) of goodness of fit of the observed success and failure rates to the equilibrium rates. ** and * denote rejections at the 5 and 10 percent level respectively.

Appendix Table D4: 4x4 Game - Bridge Players

Pair	Player	Runs	Choices		F(r)	F(r - 1)
			Diamond	Non-Diamond		
1	R	41	31	44	0.839	0.772
	C	45	28	47	0.992	0.983 **
2	R	45	33	42	0.963	0.939
	C	44	29	46	0.975	0.957 *
3	R	22	19	56	0.019 **	0.010
	C	16	13	62	0.010 **	0.005
4	R	45	24	51	1.000	0.999 **
	C	43	30	45	0.944	0.908
5	R	36	21	54	0.934	0.899
	C	28	24	51	0.084	0.053
6	R	32	32	43	0.109	0.071
	C	41	33	42	0.798	0.725
7	R	24	26	49	0.004 **	0.002
	C	15	7	68	1.000	0.562
8	R	36	41	34	0.348	0.265
	C	34	35	40	0.186	0.129
9	R	40	38	37	0.680	0.592
	C	36	31	44	0.416	0.327
10	R	45	37	38	0.949	0.919
	C	47	45	30	0.995	0.990 **
11	R	43	28	47	0.969	0.945
	C	24	17	58	0.167	0.113
12	R	53	46	29	1.000	1.000 **
	C	42	28	47	0.945	0.913
13	R	33	25	50	0.415	0.310
	C	37	23	52	0.903	0.832
14	R	32	43	32	0.109	0.071
	C	39	36	39	0.597	0.506
15	R	36	29	46	0.489	0.396
	C	29	31	44	0.030 *	0.017
16	R	41	34	41	0.782	0.707
	C	27	31	44	0.009 **	0.004
17	R	35	24	51	0.693	0.580
	C	33	20	55	0.836	0.724
18	R	44	31	44	0.957	0.930
	C	36	25	50	0.707	0.621
19	R	37	32	43	0.481	0.388
	C	37	37	38	0.408	0.322
20	R	36	18	57	0.998	0.996 **
	C	33	28	47	0.260	0.185
21	R	38	28	47	0.721	0.637
	C	33	23	52	0.568	0.445
22	R	28	33	42	0.013 **	0.007
	C	36	34	41	0.348	0.265

Appendix Table D4 continued

Appendix table D4 reports results from the runs test of serial independence of Gibbons and Chakraborti (1992). A run is defined as the number of times a player switches from one strategy to another (from diamond to non-diamond in this case). Column 3 reports the number of runs for each player and columns 4 and 5 report the number of times each card is played. The test is based on the following distribution:

$$f(r | n_B^i, n_R^i) = \begin{cases} 2 \binom{n_B^i - 1}{(r/2) - 1} \binom{n_R^i - 1}{(r/2) - 1} / \binom{n_B^i + n_R^i}{n_B^i} & \text{if } r \text{ is even} \\ \left(\binom{n_B^i - 1}{(r-1)/2} \binom{n_R^i - 1}{(r-3)/2} + \binom{n_B^i - 1}{(r-3)/2} \binom{n_R^i - 1}{(r-1)/2} \right) / \binom{n_B^i + n_R^i}{n_B^i} & \text{if } r \text{ is odd} \end{cases}$$

Where r is the number of runs, and n_B^i and n_R^i are the number of black and red choices. The serial independence hypothesis will be rejected at the 5 percent level if there are too few or too many runs, that is if $F(r | n_B^i, n_R^i) < 0.025$ or if $F(r-1 | n_B^i, n_R^i) > 0.975$, where $F(r | n_B^i, n_R^i) = \sum_{k=1}^r f(k | n_B^i, n_R^i)$. Columns 6 and 7 report p-values for both alternatives. ** and * denote rejections at the 5 and 10 percent level respectively.

Appendix Table E1: 2x2 Game - Poker Players

		Evader Choice		Marginal Frequencies for Evader
		B	R	
Pursuer Choice	B	0.201 (0.11) {0.0016}	0.271 (0.22) {0.0009}	0.472 (0.33) {0.0024}
	R	0.209 (0.22) {0.0002}	0.319 (0.44) {0.0022}	0.528 (0.67) {0.0024}
Marginal Frequencies For Pursuer		0.410 (0.33) {0.0013}	0.590 (0.67) {0.0013}	
N # pairs		3300 44		
Pursuer p-value		<.001		
Evader p-value		<.001		

Appendix table E1 reports the aggregate marginal and joint frequencies for professional poker players in the 2x2 game. Numbers in parentheses represent the minimax predicted frequencies, while numbers in brackets represent the standard deviations of the observed frequencies from the predicted frequencies. P-values from a Chi-square goodness of fit test (with one degree of freedom) of the observed marginal frequencies to the predicted frequencies are also reported for each role.

Appendix Table E2: 2x2 Game - Poker Players

pair	wc	Pursuer		Evader		Joint Frequencies				pvalue
		R	R	BB	BR	RB	RR			
1	0	0.507 **	0.573 *	0.213	0.280	0.213	0.293	0.007 **		
2	0	0.640	0.680	0.107	0.253	0.213	0.427	0.936		
3	0	0.493 **	0.480 **	0.267	0.240	0.253	0.240	0.000 **		
4	0	0.413 **	0.507 **	0.280	0.307	0.213	0.200	0.000 **		
5	0	0.533 **	0.573 *	0.280	0.187	0.147	0.387	0.000 **		
6	0	0.533 **	0.507 **	0.120	0.347	0.373	0.160	0.000 **		
7	0	0.333 **	0.573 *	0.293	0.373	0.133	0.200	0.000 **		
8	0	0.493 **	0.800 **	0.067	0.440	0.133	0.360	0.000 **		
9	0	0.467 **	0.573 *	0.213	0.320	0.213	0.253	0.001 **		
10	0	0.560 *	0.693	0.133	0.307	0.173	0.387	0.250		
11	0	0.600	0.533 **	0.213	0.187	0.253	0.347	0.024 **		
12	0	0.480 **	0.520 **	0.253	0.267	0.227	0.253	0.000 **		
13	2	0.480 **	0.440 **	0.293	0.227	0.267	0.213	0.000 **		
14	2	0.560 *	0.507 **	0.227	0.213	0.267	0.293	0.004 **		
15	0	0.493 **	0.520 **	0.253	0.253	0.227	0.267	0.000 **		
16	0	0.587	0.480 **	0.227	0.187	0.293	0.293	0.002 **		
17	0	0.507 **	0.613	0.227	0.267	0.160	0.347	0.006 **		
18	0	0.533 **	0.480 **	0.267	0.200	0.253	0.280	0.000 **		
19	1	0.613	0.560 *	0.160	0.227	0.280	0.333	0.185		
20	1	0.640	0.707	0.160	0.200	0.133	0.507	0.165		
21	0	0.413 **	0.773 *	0.147	0.440	0.080	0.333	0.000 **		
22	0	0.547 **	0.520 **	0.173	0.280	0.307	0.240	0.004 **		
23	0	0.507 **	0.520 **	0.253	0.240	0.227	0.280	0.000 **		
24	0	0.547 **	0.640	0.147	0.307	0.213	0.333	0.147		
25	0	0.427 **	0.707	0.160	0.413	0.133	0.293	0.000 **		
26	0	0.720	0.680	0.147	0.133	0.173	0.547	0.107		
27	1	0.493 **	0.667	0.227	0.280	0.107	0.387	0.002 **		
28	1	0.520 **	0.573 *	0.187	0.293	0.240	0.280	0.017 **		
29	0	0.507 **	0.520 **	0.267	0.227	0.213	0.293	0.000 **		
30	0	0.440 **	0.533 *	0.213	0.347	0.253	0.187	0.000 **		
31	0	0.667	0.680	0.107	0.227	0.213	0.453	0.996		
32	0	0.560 *	0.653	0.120	0.320	0.227	0.333	0.147		
33	0	0.440 **	0.440 **	0.280	0.280	0.280	0.160	0.000 **		
34	0	0.333 **	0.547 **	0.333	0.333	0.120	0.213	0.000 **		
35	0	0.520 **	0.667	0.200	0.280	0.133	0.387	0.021 **		
36	0	0.707	0.747	0.067	0.227	0.187	0.520	0.435		
37	1	0.480 **	0.453 **	0.267	0.253	0.280	0.200	0.000 **		
38	1	0.547 **	0.493 **	0.240	0.213	0.267	0.280	0.001 **		
39	0	0.600	0.947 **	0.027	0.373	0.027	0.573	0.000 **		
40	0	0.720	0.653	0.133	0.147	0.213	0.507	0.401		
41	0	0.533 **	0.507 **	0.227	0.240	0.267	0.267	0.002 **		
42	0	0.467 **	0.533 **	0.253	0.280	0.213	0.253	0.000 **		
43	1	0.627	0.547 **	0.187	0.187	0.267	0.360	0.105		
44	1	0.440 **	0.640	0.227	0.333	0.133	0.307	0.000 **		

Appendix Table E2 continued

Appendix table E2 reports individual-level results for the Pearson chi-square test of goodness of fit of the observed frequencies to the minimax predicted frequencies. The number of world-class players in each pair is given in Column 2. Columns 3 and 4 show the observed frequencies for which the pursuer and evader each play the red card, as well as the corresponding rejections of the minimax hypothesis. ** and * denote rejections at the 5 and 10 percent levels respectively. The test uses one degree of freedom in this case. Columns 5 to 8 show the joint frequencies of play, and column 9 shows the corresponding p-values when the same chi-square test is used with three degrees of freedom.

Appendix Table E3: 2x2 Game - Poker Players

Pair	WC	Player	B		R		Pearson	p-value
			Success	Fail	Success	Fail		
1	0	P	0.147	0.347	0.040	0.467	13.856	0.003 **
		E	0.280	0.147	0.533	0.040	11.413	0.010 **
2	0	P	0.067	0.293	0.147	0.480	0.607	0.895
		E	0.253	0.067	0.520	0.147	0.067	0.995
3	0	P	0.160	0.347	0.067	0.427	14.267	0.003 **
		E	0.360	0.160	0.413	0.067	15.373	0.002 **
4	0	P	0.213	0.373	0.067	0.347	31.033	0.000 **
		E	0.280	0.213	0.440	0.067	24.013	0.000 **
5	0	P	0.200	0.267	0.120	0.400	18.504	0.000 **
		E	0.227	0.200	0.440	0.120	17.656	0.001 **
6	0	P	0.080	0.387	0.040	0.493	10.744	0.013 **
		E	0.413	0.080	0.467	0.040	13.213	0.004 **
7	0	P	0.213	0.453	0.040	0.293	43.787	0.000 **
		E	0.213	0.213	0.533	0.040	26.199	0.000 **
8	0	P	0.040	0.467	0.080	0.413	17.571	0.001 **
		E	0.160	0.040	0.720	0.080	12.249	0.007 **
9	0	P	0.187	0.347	0.080	0.387	19.911	0.000 **
		E	0.240	0.187	0.493	0.080	15.386	0.002 **
10	0	P	0.107	0.333	0.120	0.440	3.956	0.266
		E	0.200	0.107	0.573	0.120	2.927	0.403
11	0	P	0.173	0.227	0.147	0.453	10.899	0.012 **
		E	0.293	0.173	0.387	0.147	12.827	0.005 **
12	0	P	0.200	0.320	0.120	0.360	21.159	0.000 **
		E	0.280	0.200	0.400	0.120	18.613	0.000 **
13	2	P	0.187	0.333	0.067	0.413	19.384	0.000 **
		E	0.373	0.187	0.373	0.067	23.010	0.000 **
14	2	P	0.133	0.307	0.080	0.480	6.771	0.080 *
		E	0.360	0.133	0.427	0.080	10.063	0.018 **
15	0	P	0.133	0.373	0.120	0.373	10.770	0.013 **
		E	0.347	0.133	0.400	0.120	8.199	0.042 **
16	0	P	0.160	0.253	0.133	0.453	8.211	0.042 **
		E	0.360	0.160	0.347	0.133	14.794	0.002 **
17	0	P	0.160	0.333	0.080	0.427	12.634	0.005 **
		E	0.227	0.160	0.533	0.080	10.166	0.017 **
18	0	P	0.160	0.307	0.080	0.453	11.091	0.011 **
		E	0.360	0.160	0.400	0.080	14.794	0.002 **
19	1	P	0.093	0.293	0.120	0.493	1.204	0.752
		E	0.347	0.093	0.440	0.120	3.879	0.275
20	1	P	0.067	0.293	0.107	0.533	1.294	0.730
		E	0.227	0.067	0.600	0.107	2.194	0.533
21	0	P	0.107	0.480	0.147	0.267	24.347	0.000 **
		E	0.120	0.107	0.627	0.147	8.379	0.039 **
22	0	P	0.107	0.347	0.160	0.387	5.871	0.118
		E	0.373	0.107	0.360	0.160	8.546	0.036 **
23	0	P	0.133	0.360	0.120	0.387	9.407	0.024 **
		E	0.347	0.133	0.400	0.120	8.199	0.042 **
24	0	P	0.080	0.373	0.093	0.453	5.936	0.115
		E	0.280	0.080	0.547	0.093	1.796	0.616

Appendix Table E3 continued

25	0	P	0.120	0.453	0.093	0.333	19.513	0.000 **
		E	0.173	0.120	0.613	0.093	7.093	0.069 *
26	0	P	0.133	0.147	0.187	0.533	8.006	0.046 *
		E	0.187	0.133	0.493	0.187	5.923	0.115
27	1	P	0.173	0.333	0.040	0.453	18.099	0.000 **
		E	0.160	0.173	0.627	0.040	20.439	0.000 **
28	1	P	0.160	0.320	0.080	0.440	11.786	0.008 **
		E	0.267	0.160	0.493	0.080	9.934	0.019 **
29	0	P	0.200	0.293	0.053	0.453	21.557	0.000 **
		E	0.280	0.200	0.467	0.053	21.120	0.000 **
30	0	P	0.093	0.467	0.093	0.347	18.613	0.000 **
		E	0.373	0.093	0.440	0.093	6.553	0.088 *
31	0	P	0.053	0.280	0.227	0.440	4.573	0.206
		E	0.267	0.053	0.453	0.227	4.187	0.242
32	0	P	0.027	0.413	0.107	0.453	10.629	0.014 *
		E	0.320	0.027	0.547	0.107	4.329	0.228
33	0	P	0.253	0.307	0.053	0.387	40.251	0.000 **
		E	0.307	0.253	0.387	0.053	40.251	0.000 **
34	0	P	0.227	0.440	0.027	0.307	46.989	0.000 **
		E	0.227	0.227	0.520	0.027	31.354	0.000 **
35	0	P	0.107	0.373	0.120	0.400	7.273	0.064 *
		E	0.227	0.107	0.547	0.120	1.899	0.594
36	0	P	0.040	0.253	0.133	0.573	1.731	0.630
		E	0.213	0.040	0.613	0.133	3.197	0.362
37	1	P	0.173	0.347	0.067	0.413	17.147	0.001 **
		E	0.373	0.173	0.387	0.067	19.616	0.000 **
38	1	P	0.187	0.267	0.080	0.467	15.591	0.001 **
		E	0.320	0.187	0.413	0.080	17.854	0.000 **
39	0	P	0.027	0.373	0.173	0.427	7.581	0.056 *
		E	0.027	0.027	0.773	0.173	27.639	0.000 **
40	0	P	0.093	0.187	0.213	0.507	4.071	0.254
		E	0.253	0.093	0.440	0.213	3.429	0.330
41	0	P	0.133	0.333	0.107	0.427	7.234	0.065 *
		E	0.360	0.133	0.400	0.107	9.394	0.024 **
42	0	P	0.200	0.333	0.107	0.360	22.149	0.000 **
		E	0.267	0.200	0.427	0.107	18.163	0.000 **
43	1	P	0.133	0.227	0.080	0.547	6.329	0.097 *
		E	0.307	0.133	0.467	0.080	6.946	0.074 *
44	1	P	0.080	0.480	0.107	0.333	19.963	0.000 **
		E	0.280	0.080	0.533	0.107	1.063	0.786

Appendix table E3 reports results for the test that success rates are equal to the minimax predicted success rates and are equal across strategies. The number of world-class players in each pair is given in Column 2. Columns 4 – 7 report the observed success and failure rates for each strategy and each player. Columns 8 and 9 report the test statistics from the Pearson Chi-square test (with 3 degrees of freedom) of goodness of fit of the observed success and failure rates to the equilibrium rates. ** and * denote rejections at the 5 and 10 percent levels respectively.

Appendix Table E4: 2x2 Game - Poker Players

Pair	WC	Player	Choices		Runs	F(r)	F(r - 1)
			R	B	r		
1	0	P	38	37	28	0.010 **	0.005
		E	43	32	24	0.001 **	0.000
2	0	P	48	27	30	0.100	0.064
		E	51	24	32	0.371	0.286
3	0	P	37	38	38	0.501	0.408
		E	36	39	28	0.010 **	0.005
4	0	P	31	44	47	0.993	0.986 **
		E	38	37	35	0.243	0.177
5	0	P	40	35	31	0.055	0.033
		E	43	32	24	0.001 **	0.000
6	0	P	40	35	24	0.001 **	0.000
		E	38	37	33	0.122	0.082
7	0	P	25	50	32	0.310	0.231
		E	43	32	43	0.917	0.873
8	0	P	37	38	37	0.408	0.322
		E	60	15	19	0.030 *	0.011
9	0	P	35	40	30	0.033 *	0.019
		E	43	32	39	0.666	0.575
10	0	P	42	33	36	0.365	0.281
		E	52	23	30	0.249	0.180
11	0	P	45	30	37	0.548	0.449
		E	40	35	34	0.186	0.129
12	0	P	36	39	33	0.125	0.083
		E	39	36	32	0.083	0.053
13	2	P	36	39	43	0.881	0.828
		E	33	42	33	0.146	0.099
14	2	P	42	33	33	0.146	0.099
		E	38	37	31	0.051	0.031
15	0	P	37	38	40	0.680	0.592
		E	39	36	44	0.921	0.881
16	0	P	44	31	32	0.121	0.080
		E	36	39	45	0.950	0.921
17	0	P	38	37	31	0.051	0.031
		E	46	29	24	0.002 **	0.001
18	0	P	40	35	53	1.000	1.000 **
		E	36	39	41	0.761	0.685
19	1	P	46	29	31	0.108	0.068
		E	42	33	40	0.725	0.641
20	1	P	48	27	30	0.100	0.064
		E	53	22	21	0.002 **	0.001
21	0	P	31	44	36	0.416	0.327
		E	58	17	29	0.780	0.625
22	0	P	41	34	21	0.000 **	0.000
		E	39	36	45	0.950	0.921
23	0	P	38	37	43	0.878	0.825
		E	39	36	45	0.950	0.921
24	0	P	41	34	29	0.021 **	0.011
		E	48	27	36	0.588	0.495

Appendix Table E4 continued

25	0	P	32	43	36	0.388	0.301
		E	53	22	29	0.237	0.153
26	0	P	54	21	25	0.053	0.027
		E	51	24	33	0.486	0.371
27	1	P	37	38	44	0.919	0.878
		E	50	25	29	0.105	0.063
28	1	P	39	36	39	0.597	0.506
		E	43	32	41	0.817	0.747
29	0	P	38	37	40	0.680	0.592
		E	39	36	45	0.950	0.921
30	0	P	33	42	35	0.281	0.207
		E	40	35	30	0.033 *	0.019
31	0	P	50	25	33	0.415	0.310
		E	51	24	19	0.000 **	0.000
32	0	P	42	33	38	0.550	0.456
		E	49	26	41	0.957	0.921
33	0	P	33	42	29	0.023 **	0.013
		E	33	42	30	0.039 *	0.023
34	0	P	25	50	30	0.156	0.105
		E	41	34	33	0.136	0.092
35	0	P	39	36	30	0.032 *	0.018
		E	50	25	37	0.800	0.707
36	0	P	53	22	35	0.837	0.739
		E	56	19	23	0.040 *	0.019
37	1	P	36	39	35	0.246	0.180
		E	34	41	26	0.003 **	0.001
38	1	P	41	34	42	0.845	0.782
		E	37	38	38	0.501	0.408
39	0	P	45	30	28	0.020 **	0.011
		E	71	4	6	0.018 **	0.007
40	0	P	54	21	25	0.053	0.027
		E	49	26	33	0.354	0.259
41	0	P	40	35	38	0.516	0.422
		E	38	37	42	0.825	0.757
42	0	P	35	40	40	0.694	0.607
		E	40	35	36	0.335	0.254
43	1	P	47	28	37	0.637	0.536
		E	41	34	32	0.092	0.058
44	1	P	33	42	36	0.365	0.281
		E	48	27	39	0.842	0.767

Appendix table E4 reports results from the runs test of serial independence of Gibbons and Chakraborti (1992). A run is defined as the number of times a player switches from one strategy to another (from black to red in this case). Column3 reports the number of world-class players in each pair. Column 4 reports the number of runs for each player and columns 5 and 6 report the number of times each card is played. The test is based on the following distribution:

Appendix Table E4 continued

$$f(r | n_B^i, n_R^i) = \begin{cases} 2 \binom{n_B^i - 1}{(r/2) - 1} \binom{n_R^i - 1}{(r/2) - 1} / \binom{n_B^i + n_R^i}{n_B^i} & \text{if } r \text{ is even} \\ \left(\binom{n_B^i - 1}{(r-1)/2} \binom{n_R^i - 1}{(r-3)/2} + \binom{n_B^i - 1}{(r-3)/2} \binom{n_R^i - 1}{(r-1)/2} \right) / \binom{n_B^i + n_R^i}{n_B^i} & \text{if } r \text{ is odd} \end{cases}$$

Where r is the number of runs, and n_B^i and n_R^i are the number of black and red choices.

The serial independence hypothesis will be rejected at the 5 percent level if there are too few or too many runs, that is if $F(r | n_B^i, n_R^i) < 0.025$ or if $F(r-1 | n_B^i, n_R^i) > 0.975$, where

$F(r | n_B^i, n_R^i) = \sum_{k=1}^r f(k | n_B^i, n_R^i)$. Columns 7 and 8 report p-values for both alternatives. ** and * denote rejections at the 5 and 10 percent levels respectively.

Appendix Table F1 - Professional poker players in 4x4 game

	Column Player Choice				Marginal Frequenc
	C	D	H	S	
C	0.041 (0.040) {0.0000}	0.074 (0.080) {0.0001}	0.045 (0.040) {0.0001}	0.043 (0.040) {0.0000}	0.191 (0.200) {0.0001}
D	0.067 (0.080) {0.0002}	0.158 (0.160) {0.0000}	0.077 (0.080) {0.0000}	0.089 (0.080) {0.0001}	0.395 (0.400) {0.0109}
H	0.039 (0.040) {0.0000}	0.072 (0.080) {0.0001}	0.039 (0.040) {0.0000}	0.037 (0.040) {0.0000}	0.204 (0.200) {0.0001}
S	0.041 (0.040) {0.0000}	0.087 (0.080) {0.0001}	0.041 (0.040) {0.0000}	0.048 (0.040) {0.0001}	0.210 (0.200) {0.0002}
Marginal Frequencies for Column Player	0.200 (0.200) {0.0000}	0.387 (0.400) {0.0109}	0.188 (0.200) {0.0002}	0.225 (0.200) {0.0004}	
N #pairs	3900 52				
Row p-value	0.253				
Column p-value	0.001				

Appendix table F1 reports the aggregate marginal and joint frequencies for professional poker players in the 4x4 game. Numbers in parentheses represent the minimax predicted frequencies, while numbers in brackets represent the standard deviations of the observed frequencies from the predicted frequencies. P-values from a chi-square goodness of fit test (with three degrees of freedom) of the observed marginal frequencies to the predicted frequencies are also reported for each role.

Appendix Table F2 - Professional poker players in 4x4 game

Pair	WC	Row Player Choices				Column Player Choices				P-values from Chi-Squared Test on Minimax Predicted Choices		
		C	D	H	S	C	D	H	S	Row Player	Column Player	Joint Test
		1	0	0.280	0.253	0.320	0.147	0.200	0.280	0.213	0.307	0.005 **
2	0	0.093	0.507	0.173	0.227	0.253	0.253	0.240	0.253	0.074 *	0.080 *	0.206
3	2	0.160	0.400	0.293	0.147	0.200	0.387	0.213	0.200	0.177	0.992	0.557
4	2	0.187	0.453	0.133	0.227	0.227	0.413	0.160	0.200	0.469	0.825	0.787
5	2	0.200	0.427	0.133	0.240	0.093	0.627	0.173	0.107	0.494	0.001 **	0.051 *
6	2	0.107	0.400	0.280	0.213	0.213	0.480	0.160	0.147	0.125	0.402	0.360
7	2	0.160	0.453	0.120	0.267	0.093	0.547	0.227	0.133	0.158	0.017 **	0.151
8	2	0.173	0.333	0.320	0.173	0.213	0.307	0.147	0.333	0.080 *	0.024 **	0.127
9	1	0.227	0.307	0.240	0.227	0.067	0.320	0.253	0.360	0.429	0.000 **	0.027 **
10	1	0.227	0.147	0.267	0.360	0.267	0.253	0.200	0.280	0.000 **	0.044 **	0.000 **
11	2	0.133	0.453	0.147	0.267	0.253	0.413	0.133	0.200	0.177	0.429	0.488
12	2	0.240	0.333	0.173	0.240	0.200	0.320	0.227	0.240	0.513	0.559	0.388
13	0	0.173	0.453	0.173	0.200	0.173	0.307	0.227	0.293	0.785	0.143	0.685
14	0	0.160	0.413	0.187	0.240	0.200	0.400	0.160	0.240	0.729	0.753	0.482
15	0	0.213	0.413	0.213	0.160	0.160	0.453	0.187	0.200	0.857	0.753	0.685
16	0	0.187	0.427	0.200	0.187	0.147	0.427	0.213	0.213	0.966	0.721	0.210
17	2	0.173	0.493	0.120	0.213	0.200	0.347	0.187	0.267	0.224	0.519	0.532
18	2	0.120	0.573	0.133	0.173	0.173	0.453	0.173	0.200	0.019 **	0.785	0.122
19	0	0.200	0.493	0.147	0.160	0.107	0.547	0.133	0.213	0.348	0.029 **	0.214
20	0	0.253	0.440	0.133	0.173	0.093	0.613	0.120	0.173	0.348	0.001 **	0.093 *
21	2	0.173	0.373	0.173	0.280	0.253	0.413	0.147	0.187	0.381	0.525	0.463
22	2	0.200	0.507	0.173	0.120	0.187	0.480	0.253	0.080	0.187	0.052 *	0.145
23	1	0.227	0.213	0.307	0.253	0.293	0.133	0.320	0.253	0.007 **	0.000 **	0.000 **
24	1	0.120	0.547	0.187	0.147	0.293	0.187	0.307	0.213	0.056 *	0.001 **	0.004 **
25	0	0.240	0.240	0.213	0.307	0.200	0.200	0.240	0.360	0.021 **	0.001 **	0.000 **
26	0	0.067	0.440	0.200	0.293	0.240	0.493	0.093	0.173	0.017 **	0.080 *	0.041 **
27	1	0.280	0.227	0.213	0.280	0.293	0.307	0.147	0.253	0.015 **	0.071 *	0.000 **
28	1	0.067	0.507	0.293	0.133	0.147	0.613	0.093	0.147	0.003 **	0.002 **	0.000 **
29	0	0.267	0.213	0.253	0.267	0.240	0.267	0.213	0.280	0.012 **	0.094 *	0.009 **
30	0	0.187	0.387	0.267	0.160	0.187	0.427	0.173	0.213	0.500	0.912	0.366
31	0	0.173	0.493	0.200	0.133	0.227	0.360	0.160	0.253	0.312	0.525	0.134
32	0	0.147	0.493	0.187	0.173	0.187	0.373	0.293	0.147	0.387	0.209	0.782
33	1	0.200	0.373	0.187	0.240	0.147	0.360	0.213	0.280	0.849	0.280	0.609
34	1	0.120	0.067	0.360	0.453	0.227	0.387	0.147	0.240	0.000 **	0.579	0.000 **
35	2	0.160	0.467	0.133	0.240	0.120	0.573	0.173	0.133	0.296	0.019 **	0.172
36	2	0.160	0.467	0.187	0.187	0.107	0.507	0.133	0.253	0.667	0.043 **	0.003 **
37	0	0.187	0.387	0.120	0.307	0.173	0.293	0.267	0.267	0.080 *	0.125	0.254
38	0	0.213	0.360	0.200	0.227	0.213	0.373	0.200	0.213	0.889	0.966	0.532
39	0	0.227	0.413	0.173	0.187	0.240	0.360	0.200	0.200	0.889	0.825	0.966
40	0	0.213	0.427	0.147	0.213	0.160	0.307	0.253	0.280	0.721	0.127	0.329
41	0	0.307	0.373	0.160	0.160	0.333	0.400	0.173	0.093	0.133	0.011 **	0.157
42	0	0.133	0.453	0.307	0.107	0.187	0.427	0.147	0.240	0.021 **	0.601	0.137
43	0	0.240	0.280	0.253	0.227	0.253	0.480	0.107	0.160	0.201	0.105	0.132
44	0	0.173	0.387	0.307	0.133	0.307	0.387	0.093	0.213	0.101	0.035 **	0.117
45	0	0.240	0.200	0.280	0.280	0.227	0.213	0.267	0.293	0.005 **	0.008 **	0.000 **
46	0	0.333	0.533	0.040	0.093	0.213	0.440	0.173	0.173	0.000 **	0.825	0.007 **
47	1	0.200	0.520	0.133	0.147	0.227	0.413	0.213	0.147	0.143	0.698	0.428
48	1	0.253	0.387	0.267	0.093	0.187	0.453	0.053	0.307	0.071 *	0.005 **	0.001 **
49	0	0.133	0.480	0.213	0.173	0.187	0.333	0.120	0.360	0.362	0.005 **	0.005 **
50	0	0.253	0.267	0.133	0.347	0.227	0.320	0.267	0.187	0.003 **	0.362	0.058 *
51	0	0.173	0.453	0.240	0.133	0.253	0.320	0.213	0.213	0.381	0.494	0.470
52	0	0.200	0.413	0.213	0.173	0.133	0.400	0.160	0.307	0.947	0.088 *	0.122

Appendix table F2 reports individual-level results for the Pearson chi-square test of goodness of fit of the observed frequencies to the minimax predicted frequencies. The number of world class players in each pair is given in Column 2. Columns 3-6 show the observed frequencies for the row player on each card, while the columns 7-10 show the observed frequencies for the column player on each card. The last three columns report the p-values for the row player, column player and for the joint frequencies of both players respectively. ** and * denote rejections at the 5 and 10 percent levels. The test uses three degrees of freedom for the marginal frequencies and fifteen for the joint frequencies.

Appendix Table F3 - Professional poker players in 4x4 game

Pair	WC	Player	Mixtures		Win Rates		Pearson	p-value
			Non-		Non-			
			Diamond	Diamond	Diamond	Diamond		
1	0	R	0.253	0.747	0.737	0.589	7.694	0.053 *
		C	0.280	0.720	0.238	0.426	6.287	0.098 *
2	0	R	0.507	0.493	0.737	0.486	8.944	0.030 **
		C	0.253	0.747	0.526	0.339	8.593	0.035 **
3	2	R	0.400	0.600	0.567	0.622	0.231	0.972
		C	0.387	0.613	0.448	0.370	0.509	0.917
4	2	R	0.453	0.547	0.588	0.634	1.093	0.779
		C	0.413	0.587	0.452	0.341	1.037	0.792
5	2	R	0.427	0.573	0.406	0.814	13.398	0.004 **
		C	0.627	0.373	0.404	0.286	17.009	0.001 **
6	2	R	0.400	0.600	0.533	0.578	0.648	0.885
		C	0.480	0.520	0.389	0.487	3.093	0.378
7	2	R	0.453	0.547	0.382	0.683	9.565	0.023 **
		C	0.547	0.453	0.512	0.382	9.694	0.021 **
8	2	R	0.333	0.667	0.680	0.500	4.259	0.235
		C	0.307	0.693	0.348	0.481	4.556	0.207
9	1	R	0.307	0.693	0.783	0.519	6.806	0.078 *
		C	0.320	0.680	0.208	0.490	6.898	0.075 *
10	1	R	0.147	0.853	0.636	0.531	21.870	0.000 **
		C	0.253	0.747	0.211	0.536	13.870	0.003 **
11	2	R	0.453	0.547	0.588	0.634	1.093	0.779
		C	0.413	0.587	0.452	0.341	1.037	0.792
12	2	R	0.333	0.667	0.560	0.500	3.120	0.373
		C	0.320	0.680	0.458	0.471	3.509	0.320
13	0	R	0.453	0.547	0.676	0.585	1.861	0.602
		C	0.307	0.693	0.478	0.327	4.509	0.211
14	0	R	0.413	0.587	0.516	0.455	4.787	0.188
		C	0.400	0.600	0.500	0.533	4.583	0.205
15	0	R	0.413	0.587	0.516	0.568	1.176	0.759
		C	0.453	0.547	0.441	0.463	1.787	0.618
16	0	R	0.427	0.573	0.594	0.744	3.787	0.285
		C	0.427	0.573	0.406	0.256	3.787	0.285
17	2	R	0.493	0.507	0.595	0.421	7.009	0.072 *
		C	0.347	0.653	0.577	0.449	4.361	0.225
18	2	R	0.573	0.427	0.535	0.781	13.593	0.004 **
		C	0.453	0.547	0.588	0.171	14.759	0.002 **
19	0	R	0.493	0.507	0.568	0.737	5.426	0.143
		C	0.547	0.453	0.390	0.294	7.944	0.047 **
20	0	R	0.440	0.560	0.364	0.786	14.583	0.002 **
		C	0.613	0.387	0.457	0.310	15.787	0.001 **
21	2	R	0.373	0.627	0.500	0.660	2.037	0.565
		C	0.413	0.587	0.452	0.364	0.648	0.885
22	2	R	0.507	0.493	0.447	0.595	8.231	0.041 **
		C	0.480	0.520	0.583	0.385	8.083	0.044 **
23	1	R	0.213	0.787	0.875	0.492	17.370	0.001 **
		C	0.133	0.867	0.200	0.462	24.259	0.000 **
24	1	R	0.547	0.453	0.829	0.382	24.065	0.000 **
		C	0.187	0.813	0.500	0.344	15.565	0.001 **
25	0	R	0.240	0.760	0.889	0.596	11.759	0.008 **
		C	0.200	0.800	0.133	0.383	14.815	0.002 **

Appendix Table F3 continued

26	0	R	0.440	0.560	0.606	0.667	1.231	0.745
		C	0.493	0.507	0.351	0.368	3.306	0.347
27	1	R	0.227	0.773	0.529	0.310	35.722	0.000 **
		C	0.307	0.693	0.348	0.769	37.056	0.000 **
28	1	R	0.507	0.493	0.658	0.919	17.120	0.001 **
		C	0.613	0.387	0.283	0.103	25.120	0.000 **
29	0	R	0.213	0.787	0.563	0.492	14.731	0.002 **
		C	0.267	0.733	0.350	0.545	11.620	0.009 **
30	0	R	0.387	0.613	0.483	0.674	2.731	0.435
		C	0.427	0.573	0.469	0.349	1.343	0.719
31	0	R	0.493	0.507	0.649	0.632	3.306	0.347
		C	0.360	0.640	0.481	0.292	3.676	0.299
32	0	R	0.493	0.507	0.649	0.632	3.306	0.347
		C	0.373	0.627	0.464	0.298	2.806	0.423
33	1	R	0.373	0.627	0.750	0.532	3.620	0.305
		C	0.360	0.640	0.259	0.458	3.231	0.357
34	1	R	0.067	0.933	0.200	0.543	36.759	0.000 **
		C	0.387	0.613	0.138	0.696	25.204	0.000 **
35	2	C	0.467	0.533	0.486	0.750	6.944	0.074 *
		C	0.573	0.427	0.419	0.313	10.204	0.017 **
36	2	R	0.467	0.533	0.343	0.450	15.972	0.001 **
		C	0.507	0.493	0.605	0.595	16.806	0.001 **
37	0	R	0.387	0.613	0.724	0.587	1.889	0.596
		C	0.293	0.707	0.364	0.358	4.093	0.252
38	0	C	0.360	0.640	0.667	0.646	1.398	0.706
		C	0.373	0.627	0.321	0.362	1.194	0.754
39	0	R	0.413	0.587	0.548	0.523	1.481	0.687
		C	0.360	0.640	0.519	0.438	2.222	0.528
40	0	R	0.427	0.573	0.625	0.558	0.611	0.894
		C	0.307	0.693	0.522	0.365	4.111	0.250
41	0	R	0.373	0.627	0.679	0.596	0.898	0.826
		C	0.400	0.600	0.300	0.422	1.343	0.719
42	0	R	0.453	0.547	0.471	0.561	3.815	0.282
		C	0.427	0.573	0.563	0.419	4.037	0.257
43	0	R	0.280	0.720	0.524	0.722	8.889	0.031 **
		C	0.480	0.520	0.278	0.385	4.722	0.193
44	0	R	0.387	0.613	0.724	0.587	1.889	0.596
		C	0.387	0.613	0.276	0.413	1.889	0.596
45	0	R	0.200	0.800	0.800	0.500	17.083	0.001 **
		C	0.213	0.787	0.188	0.508	16.287	0.001 **
46	0	R	0.533	0.467	0.575	0.743	8.009	0.046 **
		C	0.440	0.560	0.515	0.214	8.139	0.043 **
47	1	R	0.520	0.480	0.538	0.583	5.333	0.149
		C	0.413	0.587	0.581	0.341	5.037	0.169
48	1	R	0.387	0.613	0.655	0.587	0.444	0.931
		C	0.453	0.547	0.294	0.463	3.315	0.346
49	0	R	0.480	0.520	0.667	0.538	3.333	0.343
		C	0.333	0.667	0.480	0.360	2.315	0.510
50	0	R	0.267	0.733	0.650	0.564	6.065	0.108
		C	0.320	0.680	0.292	0.471	4.139	0.247
51	0	R	0.453	0.547	0.735	0.683	4.898	0.179
		C	0.320	0.680	0.375	0.255	7.120	0.068 *
52	0	R	0.413	0.587	0.742	0.614	2.778	0.427
		C	0.400	0.600	0.267	0.378	2.315	0.510

Appendix Table F3 continued

Appendix table F3 reports results for the test that success rates are equal to the minimax predicted success rates and are equal across strategies. The number of world-class players in each pair is given in column 2. Play is broken down into two strategies – diamond and non-diamond cards – before being analyzed. Columns 4 – 7 report the observed success and failure rates for each strategy and each player. Columns 8 and 9 report the test statistics from the Pearson chi-square test (with 3 degrees of freedom) of goodness of fit of the observed success and failure rates to the equilibrium rates. ** and * denote rejections at the 5 and 10 percent levels respectively.

Appendix Table F4 - Professional poker players in 4x4 game

Pair	WC	Player	Runs	Choices		F(r)	F(r - 1)
				Diamond	Non-Diamond		
1	0	R	29	19	56	0.519	0.374
		C	33	21	54	0.749	0.625
2	0	R	42	38	37	0.825	0.757
		C	29	19	56	0.519	0.374
3	2	R	34	30	45	0.271	0.199
		C	38	29	46	0.678	0.590
4	2	R	41	34	41	0.782	0.707
		C	36	31	44	0.416	0.327
5	2	R	30	32	43	0.044 *	0.026
		C	34	47	28	0.343	0.260
6	2	R	27	30	45	0.011 **	0.005
		C	43	36	39	0.881	0.828
7	2	R	42	34	41	0.845	0.782
		C	42	41	34	0.845	0.782
8	2	R	39	25	50	0.916	0.859
		C	41	23	52	0.994	0.983 **
9	1	R	33	23	52	0.568	0.445
		C	34	24	51	0.580	0.486
10	1	R	14	11	64	0.011 **	0.005
		C	26	19	56	0.180	0.123
11	2	R	44	34	41	0.932	0.894
		C	41	31	44	0.839	0.772
12	2	R	26	25	50	0.021 **	0.011
		C	38	24	51	0.901	0.854
13	0	R	41	34	41	0.782	0.707
		C	29	23	52	0.180	0.113
14	0	R	30	31	44	0.050 *	0.030
		C	31	30	45	0.092	0.058
15	0	R	33	31	44	0.177	0.121
		C	43	34	41	0.894	0.845
16	0	R	47	32	43	0.991	0.982 **
		C	36	32	43	0.388	0.301
17	2	R	33	37	38	0.122	0.082
		C	35	26	49	0.555	0.445
18	2	R	45	43	32	0.969	0.948
		C	32	34	41	0.092	0.058
19	0	R	37	37	38	0.408	0.322
		C	44	41	34	0.932	0.894
20	0	R	50	33	42	0.999	0.997 **
		C	33	46	29	0.226	0.158
21	2	R	45	28	47	0.992	0.983 **
		C	35	31	44	0.327	0.245
22	2	R	18	38	37	0.000 **	0.000
		C	37	36	39	0.413	0.326
23	1	R	32	16	59	0.991	0.984 **
		C	19	10	65	0.751	0.446
24	1	R	50	41	34	0.998	0.996
		C	25	14	61	0.763	0.561
25	0	R	26	18	57	0.260	0.188
		C	21	15	60	0.113	0.052

Appendix Table F4 continued

26	0	R	28	33	42	0.013 **	0.007
		C	23	37	38	0.000 **	0.000
27	1	R	29	17	58	0.780	0.625
		C	37	23	52	0.903	0.832
28	1	R	36	38	37	0.322	0.243
		C	32	46	29	0.158	0.108
29	0	R	29	16	59	0.895	0.765
		C	27	20	55	0.205	0.124
30	0	R	39	29	46	0.764	0.678
		C	32	32	43	0.109	0.071
31	0	R	44	37	38	0.919	0.878
		C	33	27	48	0.303	0.218
32	0	R	31	37	38	0.051	0.031
		C	37	28	47	0.637	0.536
33	1	R	43	28	47	0.969	0.945
		C	46	27	48	0.998	0.995 **
34	1	R	11	5	70	1.000	0.349
		C	47	29	46	0.997	0.993 **
35	2	R	36	35	40	0.335	0.254
		C	40	43	32	0.747	0.666
36	2	R	35	35	40	0.254	0.186
		C	36	38	37	0.322	0.243
37	0	R	46	29	46	0.993	0.987 **
		C	37	22	53	0.943	0.888
38	0	R	36	27	48	0.588	0.495
		C	41	28	47	0.913	0.862
39	0	R	41	31	44	0.839	0.772
		C	36	27	48	0.588	0.495
40	0	R	52	32	43	1.000	1.000 **
		C	36	23	52	0.832	0.766
41	0	R	36	28	47	0.536	0.442
		C	37	30	45	0.548	0.449
42	0	R	34	34	41	0.195	0.136
		C	35	32	43	0.301	0.224
43	0	R	36	21	54	0.934	0.899
		C	40	36	39	0.685	0.597
44	0	R	42	29	46	0.927	0.888
		C	39	29	46	0.764	0.678
45	0	R	29	15	60	0.971	0.887
		C	32	16	59	0.991	0.984 **
46	0	R	54	40	35	1.000	1.000 **
		C	41	33	42	0.798	0.725
47	1	R	29	39	36	0.018 **	0.010
		C	42	31	44	0.890	0.839
48	1	R	36	29	46	0.489	0.396
		C	30	34	41	0.036 *	0.021
49	0	R	35	36	39	0.246	0.180
		C	28	25	50	0.063	0.039
50	0	R	26	20	55	0.124	0.081
		C	34	24	51	0.580	0.486
51	0	R	38	34	41	0.530	0.437
		C	40	24	51	0.968	0.947
52	0	R	40	31	44	0.772	0.695
		C	30	30	45	0.058	0.035

Appendix Table F4 continued

Appendix table F4 reports results from the runs test of serial independence of Gibbons and Chakraborti (1992). A run is defined as the number of times a player switches from one strategy to another (from diamond to non-diamond in this case). Column 3 reports the number of world-class players in each pair. Column 4 reports the number of runs for each player and columns 5 and 6 report the number of times each card is played. The test is based on the following distribution:

$$f(r | n_B^i, n_R^i) = \begin{cases} 2 \binom{n_B^i - 1}{(r/2) - 1} \binom{n_R^i - 1}{(r/2) - 1} / \binom{n_B^i + n_R^i}{n_B^i} & \text{if } r \text{ is even} \\ \left(\binom{n_B^i - 1}{(r-1)/2} \binom{n_R^i - 1}{(r-3)/2} + \binom{n_B^i - 1}{(r-3)/2} \binom{n_R^i - 1}{(r-1)/2} \right) / \binom{n_B^i + n_R^i}{n_B^i} & \text{if } r \text{ is odd} \end{cases}$$

Where r is the number of runs, and n_B^i and n_R^i are the number of black and red choices.

The serial independence hypothesis will be rejected at the 5 percent level if there are too few or too many runs, that is if $F(r | n_B^i, n_R^i) < 0.025$ or if $F(r-1 | n_B^i, n_R^i) > 0.975$,

where $F(r | n_B^i, n_R^i) = \sum_{k=1}^r f(k | n_B^i, n_R^i)$. Columns 7 and 8 report p-values for both

alternatives. ** and * denote rejections at the 5 and 10 percent levels respectively.

Appendix Table G1: 2x2 Computer Game (Optimal)

		Computer Choice		Marginal Frequencies for Player
		B	R	
Player Choice	B	0.163 (0.111) {0.0009}	0.284 (0.222) {0.0011}	0.448 (0.333) {0.0020}
	R	0.208 (0.222) {0.0003}	0.344 (0.444) {0.0018}	0.552 (0.667) {0.0020}
Marginal Frequencies For Computer		0.371 (0.333) {0.0007}	0.629 (0.667) {0.0007}	
N		3150		
# pairs		42		
Player's p-value		0		

Appendix table G1 reports the aggregate marginal and joint frequencies for professional poker players and computers in the 2x2 computer game that is programmed for optimal play. Numbers in parentheses represent the minimax predicted frequencies, while numbers in brackets represent the standard deviations of the observed frequencies from the predicted frequencies. The p-value from a chi-square test of goodness of fit (with one degree of freedom) of the observed marginal frequencies to the predicted frequencies are also reported for the human players.

Appendix Table G2: 2x2 Computer Game (Optimal)

pair	wc	Player Role	Marginal Frequencies		Joint Frequencies				Joint P-value
			Player	Computer	BB	BR	RB	RR	
			R	R					
1	yes	pursuer	0.560 *	0.573 *	0.160	0.280	0.267	0.293	0.064 *
2	yes	evader	0.773 *	0.733	0.093	0.133	0.173	0.600	0.051 *
3	no	pursuer	0.507 **	0.693	0.213	0.280	0.093	0.413	0.003 **
4	no	evader	0.787 **	0.733	0.067	0.147	0.200	0.587	0.077 *
5	no	pursuer	0.587	0.507 **	0.173	0.240	0.320	0.267	0.010 **
6	no	evader	0.653	0.520 **	0.173	0.173	0.307	0.347	0.059 *
7	yes	pursuer	0.467 **	0.787 **	0.120	0.413	0.093	0.373	0.000 **
8	yes	evader	0.693	0.547 **	0.160	0.147	0.293	0.400	0.134
9	no	pursuer	0.587	0.720	0.133	0.280	0.147	0.440	0.335
10	no	evader	0.400 **	0.493 **	0.227	0.373	0.280	0.120	0.000 **
11	no	pursuer	0.560 *	0.613	0.160	0.280	0.227	0.333	0.185
12	no	evader	0.587	0.600	0.240	0.173	0.160	0.427	0.004 **
13	no	pursuer	0.533 **	0.720	0.120	0.347	0.160	0.373	0.059 *
14	no	evader	0.547 **	0.533 **	0.187	0.267	0.280	0.267	0.012 **
15	no	pursuer	0.640	0.680	0.120	0.240	0.200	0.440	0.954
16	no	evader	0.800 **	0.640	0.040	0.160	0.320	0.480	0.043 **
17	no	pursuer	0.533 **	0.707	0.120	0.347	0.173	0.360	0.063 *
18	no	evader	0.440 **	0.347 **	0.280	0.280	0.373	0.067	0.000 **
19	no	pursuer	0.587	0.587	0.147	0.267	0.267	0.320	0.187
20	no	evader	0.720	0.680	0.093	0.187	0.227	0.493	0.789
21	no	pursuer	0.387 **	0.760 *	0.147	0.467	0.093	0.293	0.000 **
22	no	evader	0.667	0.627	0.080	0.253	0.293	0.373	0.316
23	no	pursuer	0.467 **	0.600	0.160	0.373	0.240	0.227	0.001 **
24	no	evader	0.707	0.587	0.147	0.147	0.267	0.440	0.327
25	no	pursuer	0.627	0.640	0.120	0.253	0.240	0.387	0.789
26	no	evader	0.653	0.600	0.147	0.200	0.253	0.400	0.641
27	no	pursuer	0.373 **	0.747	0.200	0.427	0.053	0.320	0.000 **
28	no	evader	0.427 **	0.480 **	0.307	0.267	0.213	0.213	0.000 **
29	no	pursuer	0.200 **	0.867 **	0.093	0.707	0.040	0.160	0.000 **
30	no	evader	0.480 **	0.453 **	0.280	0.240	0.267	0.213	0.000 **
31	no	pursuer	0.387 **	0.747	0.160	0.453	0.093	0.293	0.000 **
32	no	evader	0.600	0.547 **	0.160	0.240	0.293	0.307	0.085 *
33	yes	pursuer	0.587	0.680	0.200	0.213	0.120	0.467	0.030 **
34	yes	evader	0.547 **	0.413 **	0.253	0.200	0.333	0.213	0.000 *
35	no	pursuer	0.653	0.640	0.133	0.213	0.227	0.427	0.936
36	no	evader	0.267 **	0.413 **	0.440	0.293	0.147	0.120	0.000 **
37	yes	pursuer	0.413 **	0.747	0.160	0.427	0.093	0.320	0.000 **
38	yes	evader	0.547 **	0.493 **	0.187	0.267	0.320	0.227	0.001 **
39	yes	pursuer	0.533 **	0.653	0.173	0.293	0.173	0.360	0.097 *
40	yes	evader	0.867 **	0.827 **	0.027	0.107	0.147	0.720	0.000 **
41	no	pursuer	0.147 **	0.853 **	0.120	0.733	0.027	0.120	0.000 **
42	no	evader	0.693	0.627	0.147	0.160	0.227	0.467	0.522

Appendix Table G2 continued

Appendix table G2 reports individual-level results for the Pearson Chi-square test of goodness of fit of the observed frequencies to the minimax predicted frequencies. In this case, the computer is programmed for optimal play. Column 2 reports whether the human player in each pair is a world-class poker player or not, while column 3 reports the player's role. Columns 4 and 5 show the observed frequencies for which the human player and the computer each play the red card, as well as the corresponding rejections of the minimax hypothesis. ** and * denote rejections at the 5 and 10 percent levels respectively. The test uses one degree of freedom in this case. Columns 5 to 8 show the joint frequencies of play, and column 9 shows the corresponding p-values when the same chi-square test is used with three degrees of freedom.

Appendix Table G3: 2x2 Computer Game (Optimal)

pair	wc	Player's Role	B		R		Pearson	p-value	
			Success	Fail	Success	Fail			
1	yes	P	0.080	0.360	0.080	0.480	5.537	0.136	
2	yes	E	0.187	0.040	0.520	0.253	8.301	0.040	**
3	no	P	0.133	0.360	0.107	0.400	9.394	0.024	**
4	no	E	0.173	0.040	0.667	0.120	6.887	0.076	*
5	no	P	0.147	0.267	0.067	0.520	8.713	0.033	**
6	no	E	0.213	0.133	0.507	0.147	4.187	0.242	
7	no	P	0.053	0.467	0.120	0.360	16.916	0.001	**
8	yes	E	0.187	0.120	0.533	0.160	3.763	0.288	
9	no	P	0.027	0.387	0.133	0.453	7.697	0.053	*
10	no	E	0.507	0.093	0.373	0.027	28.603	0.000	**
11	no	P	0.120	0.320	0.107	0.453	4.689	0.196	
12	no	E	0.280	0.133	0.507	0.080	6.051	0.109	
13	no	P	0.053	0.413	0.120	0.413	9.304	0.026	**
14	no	E	0.360	0.093	0.427	0.120	4.933	0.177	
15	no	P	0.093	0.267	0.147	0.493	0.484	0.922	
16	no	E	0.173	0.027	0.640	0.160	6.617	0.085	*
17	no	P	0.067	0.400	0.080	0.453	8.751	0.033	**
18	no	E	0.440	0.120	0.427	0.013	22.007	0.000	**
19	no	P	0.080	0.333	0.133	0.453	2.349	0.503	
20	no	E	0.227	0.053	0.560	0.160	1.063	0.786	
21	no	P	0.120	0.493	0.093	0.293	26.841	0.000	**
22	no	E	0.293	0.040	0.573	0.093	3.467	0.325	
23	no	P	0.120	0.413	0.067	0.400	14.396	0.002	**
24	no	E	0.227	0.067	0.613	0.093	3.184	0.364	
25	no	P	0.080	0.293	0.160	0.467	0.831	0.842	
26	no	E	0.240	0.107	0.560	0.093	2.953	0.399	
27	no	P	0.173	0.453	0.093	0.280	30.621	0.000	**
28	no	E	0.413	0.160	0.373	0.053	21.943	0.000	**
29	no	P	0.080	0.720	0.067	0.133	86.267	0.000	**
30	no	E	0.307	0.213	0.413	0.067	25.247	0.000	**
31	no	P	0.080	0.533	0.147	0.240	32.987	0.000	**
32	no	E	0.293	0.107	0.520	0.080	3.763	0.288	
33	yes	P	0.133	0.280	0.120	0.467	4.470	0.215	
34	yes	E	0.333	0.120	0.467	0.080	6.463	0.091	*
35	no	P	0.067	0.280	0.133	0.520	0.291	0.962	
36	no	E	0.467	0.267	0.227	0.040	68.241	0.000	**
37	yes	P	0.120	0.467	0.147	0.267	23.756	0.000	**
38	yes	E	0.360	0.093	0.493	0.053	7.954	0.047	**
39	yes	P	0.080	0.387	0.067	0.467	8.481	0.037	**
40	yes	E	0.107	0.027	0.693	0.173	13.753	0.003	**
41	no	P	0.093	0.760	0.027	0.120	103.354	0.000	**
42	no	E	0.227	0.080	0.547	0.147	0.459	0.928	

Appendix table G3 reports results for the human player only for the test that success rates are equal to the minimax predicted success rates and are equal across strategies. Column 2 reports whether or not the human player in each pair is a world-class poker player, while

Appendix Table G3 continued

column 3 shows whether the human player was row or column. Columns 4 – 7 report the observed success and failure rates for the human player on each strategy. Columns 8 and 9 report the test statistics from the Pearson chi-square test (with 3 degrees of freedom) of goodness of fit of the observed success and failure rates to the equilibrium rates. ** and * denote rejections at the 5 and 10 percent levels respectively.

Appendix Table G4: 2x2 Computer Game (Optimal)

Pair	WC	Player	Role	B		R		Pearson	p-value
				Success	Fail	Success	Fail		
1	yes	P	pursuer	0.080	0.360	0.080	0.480	5.537	0.136
		C		0.347	0.080	0.493	0.080	4.689	0.196
2	yes	P	evader	0.187	0.040	0.520	0.253	8.301	0.040 **
		C		0.040	0.227	0.253	0.480	7.299	0.063 *
3	no	P	pursuer	0.133	0.360	0.107	0.400	9.394	0.024 **
		C		0.173	0.133	0.587	0.107	7.234	0.065 *
4	no	P	evader	0.173	0.040	0.667	0.120	6.887	0.076 *
		C		0.040	0.227	0.120	0.613	3.184	0.364
5	no	P	pursuer	0.147	0.267	0.067	0.520	8.713	0.033 **
		C		0.347	0.147	0.440	0.067	11.799	0.008 **
6	no	P	evader	0.213	0.133	0.507	0.147	4.187	0.242
		C		0.133	0.347	0.147	0.373	8.816	0.032 **
7	no	P	pursuer	0.080	0.453	0.067	0.400	16.324	0.001 **
		C		0.133	0.080	0.720	0.067	13.856	0.003
8	yes	P	evader	0.187	0.120	0.533	0.160	3.763	0.288
		C		0.120	0.333	0.160	0.387	6.309	0.098 *
9	no	P	pursuer	0.027	0.387	0.133	0.453	7.697	0.053 *
		C		0.253	0.027	0.587	0.133	3.069	0.381
10	no	P	evader	0.507	0.093	0.373	0.027	28.603	0.000 **
		C		0.093	0.413	0.027	0.467	15.103	0.002 **
11	no	P	pursuer	0.120	0.320	0.107	0.453	4.689	0.196
		C		0.267	0.120	0.507	0.107	3.043	0.385
12	no	P	evader	0.280	0.133	0.507	0.080	6.051	0.109
		C		0.133	0.267	0.080	0.520	5.923	0.115
13	no	P	pursuer	0.053	0.413	0.120	0.413	9.304	0.026 **
		C		0.227	0.053	0.600	0.120	2.104	0.551
14	no	P	evader	0.360	0.093	0.427	0.120	4.933	0.177
		C		0.093	0.373	0.120	0.413	6.141	0.105
15	no	P	pursuer	0.093	0.267	0.147	0.493	0.484	0.922
		C		0.227	0.093	0.533	0.147	0.716	0.870
16	no	P	evader	0.173	0.027	0.640	0.160	6.617	0.085 *
		C		0.027	0.333	0.160	0.480	4.149	0.246
17	no	P	pursuer	0.067	0.400	0.080	0.453	8.751	0.033 **
		C		0.227	0.067	0.627	0.080	4.406	0.221
18	no	P	evader	0.440	0.120	0.427	0.013	22.007	0.000 **
		C		0.120	0.533	0.013	0.333	38.027	0.000 **
19	no	P	pursuer	0.080	0.333	0.133	0.453	2.349	0.503
		C		0.333	0.080	0.453	0.133	2.349	0.503
20	no	P	evader	0.227	0.053	0.560	0.160	1.063	0.786
		C		0.053	0.267	0.160	0.520	0.523	0.914
21	no	P	pursuer	0.120	0.493	0.093	0.293	26.841	0.000 **
		C		0.120	0.120	0.667	0.093	12.441	0.006 **
22	no	P	evader	0.293	0.040	0.573	0.093	3.467	0.325
		C		0.040	0.333	0.093	0.533	4.316	0.229
23	no	P	pursuer	0.120	0.413	0.067	0.400	14.396	0.002 **
		C		0.280	0.120	0.533	0.067	5.653	0.130
24	no	P	evader	0.227	0.067	0.613	0.093	3.184	0.364
		C		0.067	0.347	0.093	0.493	3.879	0.275
25	no	P	pursuer	0.080	0.293	0.160	0.467	0.831	0.842
		C		0.280	0.080	0.480	0.160	0.446	0.931
26	no	P	evader	0.240	0.107	0.560	0.093	2.953	0.399
		C		0.107	0.293	0.093	0.507	2.953	0.399
27	no	P	pursuer	0.173	0.453	0.093	0.280	30.621	0.000 **
		C		0.080	0.173	0.653	0.093	23.421	0.000 **
28	no	P	evader	0.413	0.160	0.373	0.053	21.943	0.000 **
		C		0.160	0.360	0.053	0.427	16.183	0.001 **

Appendix Table G4 continued

29	no	P	pursuer	0.080	0.720	0.067	0.133	86.267	0.000	**
		C		0.053	0.080	0.800	0.067	27.124	0.000	**
30	no	P	evader	0.307	0.213	0.413	0.067	25.247	0.000	**
		C		0.213	0.333	0.067	0.387	27.099	0.000	**
31	no	P	pursuer	0.080	0.533	0.147	0.240	32.987	0.000	**
		C		0.173	0.080	0.600	0.147	3.133	0.372	
32	no	P	evader	0.293	0.107	0.520	0.080	3.763	0.288	
		C		0.107	0.347	0.080	0.467	6.026	0.110	
33	yes	P	pursuer	0.133	0.280	0.120	0.467	4.470	0.215	
		C		0.187	0.133	0.560	0.120	5.730	0.126	
34	yes	P	evader	0.333	0.120	0.467	0.080	6.463	0.091	*
		C		0.120	0.467	0.080	0.333	21.891	0.000	**
35	no	P	pursuer	0.067	0.280	0.133	0.520	0.291	0.962	
		C		0.293	0.067	0.507	0.133	0.523	0.914	
36	no	P	evader	0.467	0.267	0.227	0.040	68.241	0.000	**
		C		0.267	0.320	0.040	0.373	47.593	0.000	**
37	yes	P	pursuer	0.120	0.467	0.147	0.267	23.756	0.000	**
		C		0.133	0.120	0.600	0.147	7.684	0.053	*
38	yes	P	evader	0.360	0.093	0.493	0.053	7.954	0.047	**
		C		0.093	0.413	0.053	0.440	12.686	0.005	**
39	yes	P	pursuer	0.080	0.387	0.067	0.467	8.481	0.037	**
		C		0.267	0.080	0.587	0.067	4.084	0.253	
40	yes	P	evader	0.107	0.027	0.693	0.173	13.753	0.003	**
		C		0.027	0.147	0.173	0.653	8.893	0.031	**
41	no	P	pursuer	0.093	0.760	0.027	0.120	103.354	0.000	**
		C		0.053	0.093	0.827	0.027	33.849	0.000	**
42	no	P	evader	0.227	0.080	0.547	0.147	0.459	0.928	
		C		0.080	0.293	0.147	0.480	0.587	0.899	

Appendix table G4 reports results for both the human and computer for the test that success rates are equal to the minimax predicted success rates and are equal across strategies. Column 2 reports whether or not the human player in each pair is a world-class poker player, while column 3 shows whether the human player was row or column and column 4 shows whether the reported results are for the human (P) or the computer (C). Play is broken down into two strategies – diamond and non-diamond cards – before being analyzed. Columns 4 – 7 report the observed success and failure rates for each strategy for the human player. Columns 8 and 9 report the test statistics from the Pearson chi-square test (with 3 degrees of freedom) of goodness of fit of the observed success and failure rates to the equilibrium rates. ** and * denote rejections at the 5 and 10 percent level respectively.

Appendix Table G5: 2x2 Computer Game (Optimal)

Pair	Player's Role	Choices			Runs (r)	F(r)	F(r - 1)
		WC	B	R			
1	P	1	33	42	21	0.000 **	0.000
2	E	1	17	58	4	0.000 **	0.000
3	P	0	37	38	55	1.000	1.000 **
4	E	0	16	59	33	0.991	0.991 **
5	P	0	31	44	27	0.009 **	0.004
6	E	0	26	49	28	0.048 *	0.029
7	P	1	40	35	40	0.694	0.607
8	E	1	23	52	34	0.658	0.568
9	P	0	31	44	32	0.121	0.080
10	E	0	45	30	26	0.005 **	0.003
11	P	0	33	42	35	0.281	0.207
12	E	0	31	44	39	0.695	0.605
13	P	0	35	40	34	0.186	0.129
14	E	0	34	41	31	0.058	0.036
15	P	0	27	48	43	0.980	0.961 *
16	E	0	15	60	23	0.301	0.168
17	P	0	35	40	48	0.992	0.984 **
18	E	0	42	33	24	0.001 **	0.000
19	P	0	31	44	31	0.080	0.050
20	E	0	21	54	26	0.085	0.053
21	P	0	46	29	23	0.001 **	0.000
22	E	0	25	50	31	0.231	0.156
23	P	0	40	35	41	0.770	0.694
24	E	0	22	53	24	0.017 **	0.009
25	P	0	28	47	29	0.051	0.030
26	E	0	26	49	27	0.029 *	0.015
27	P	0	47	28	41	0.913	0.862
28	E	0	43	32	40	0.747	0.666
29	P	0	60	15	31	1.000	0.983 **
30	E	0	39	36	41	0.761	0.685
31	P	0	46	29	24	0.002 **	0.001
32	E	0	30	45	47	0.995	0.990 **
33	P	1	31	44	31	0.080	0.050
34	E	1	34	41	36	0.348	0.265
35	P	0	26	49	30	0.124	0.082
36	E	0	55	20	28	0.280	0.205
37	P	1	44	31	45	0.975	0.957 *
38	E	1	34	41	53	1.000	1.000
39	P	1	35	40	47	0.984	0.972 *
40	E	1	10	65	13	0.016 **	0.004
41	P	0	64	11	17	0.163	0.063
42	E	0	23	52	24	0.011 **	0.006

Appendix table G5 reports results for the human player only from the runs test of serial independence of Gibbons and Chakraborti (1992). A run is defined as the number of

Appendix Table G5 continued

times a player switches from one strategy to another (from diamond to non-diamond in this case). Column 2 reports whether the human player was a world-class poker player or not, while column 3 reports the role of the human player in each pair. Column 4 reports the number of runs for the human player, and columns 5 and 6 report the number of times each card is played. The test is based on the following distribution:

$$f(r | n_B^i, n_R^i) = \begin{cases} 2 \binom{n_B^i - 1}{(r/2) - 1} \binom{n_R^i - 1}{(r/2) - 1} / \binom{n_B^i + n_R^i}{n_B^i} & \text{if } r \text{ is even} \\ \left(\binom{n_B^i - 1}{(r-1)/2} \binom{n_R^i - 1}{(r-3)/2} + \binom{n_B^i - 1}{(r-3)/2} \binom{n_R^i - 1}{(r-1)/2} \right) / \binom{n_B^i + n_R^i}{n_B^i} & \text{if } r \text{ is odd} \end{cases}$$

Where r is the number of runs, and n_B^i and n_R^i are the number of black and red choices.

The serial independence hypothesis will be rejected at the 5 percent level if there are too few or too many runs, that is if $F(r | n_B^i, n_R^i) < 0.025$ or if $F(r-1 | n_B^i, n_R^i) > 0.975$, where

$F(r | n_B^i, n_R^i) = \sum_{k=1}^r f(k | n_B^i, n_R^i)$. Columns 7 and 8 report p-values for both alternatives. ** and * denote rejections at the 5 and 10 percent level respectively.

Appendix Table G6: 2x2 Computer Game (Optimal)

pair	WC	Player/ Computer	Player's Role	Choices		Runs	F(r)	F(r - 1)
				R	B			
1	yes	P	pursuer	42	33	21	0.000 **	0.000
		C		43	32			
2	yes	P	evader	58	17	4	0.000 **	0.000
		C		55	20			
3	no	P	pursuer	38	37	55	1.000	1.000 **
		C		52	23			
4	no	P	evader	59	16	33	0.991	0.991 **
		C		55	20			
5	no	P	pursuer	44	31	27	0.009 **	0.004
		C		38	37			
6	no	P	evader	49	26	28	0.048 *	0.029
		C		39	36			
7	yes	P	pursuer	35	40	40	0.694	0.607
		C		59	16			
8	yes	P	evader	52	23	34	0.658	0.568
		C		41	34			
9	no	P	pursuer	44	31	32	0.121	0.080
		C		54	21			
10	no	P	evader	30	45	26	0.005 **	0.003
		C		37	38			
11	no	P	pursuer	42	33	35	0.281	0.207
		C		46	29			
12	no	P	evader	44	31	39	0.695	0.605
		C		45	30			
13	no	P	pursuer	40	35	34	0.186	0.129
		C		54	21			
14	no	P	evader	41	34	31	0.058	0.036
		C		40	35			
15	no	P	pursuer	48	27	43	0.980	0.961 *
		C		51	24			
16	no	P	evader	60	15	23	0.301	0.168
		C		48	27			
17	no	P	pursuer	40	35	48	0.992	0.984 **
		C		53	22			
18	no	P	evader	33	42	24	0.001 **	0.000
		C		26	49			
19	no	P	pursuer	44	31	31	0.080	0.050
		C		44	31			
20	no	P	evader	54	21	26	0.085	0.053
		C		51	24			
21	no	P	pursuer	29	46	23	0.001 **	0.000
		C		57	18			
22	no	P	evader	50	25	31	0.231	0.156
		C		47	28			
23	no	P	pursuer	35	40	41	0.770	0.694
		C		45	30			
24	no	P	evader	53	22	24	0.017 **	0.009
		C		44	31			
25	no	P	pursuer	47	28	29	0.051	0.030
		C		48	27			
26	no	P	evader	49	26	27	0.029 *	0.015
		C		45	30			
27	no	P	pursuer	28	47	41	0.913	0.862
		C		56	19			
28	no	P	evader	32	43	40	0.747	0.666
		C		36	39			
29	no	P	pursuer	15	60	31	1.000	0.983 **
		C		65	10			
30	no	P	evader	36	39	41	0.761	0.685
		C		34	41			
31	no	P	pursuer	29	46	24	0.002 **	0.001
		C		56	19			
32	no	P	evader	45	30	47	0.995	0.990 **
		C		41	34			

Appendix Table G6 continued

33	yes	P	pursuer	44	31	31	0.080	0.050
		C		51	24	25	0.016 **	0.008
34	yes	P	evader	41	34	36	0.348	0.265
		C		31	44	36	0.416	0.327
35	no	P	pursuer	49	26	30	0.124	0.082
		C		48	27	32	0.218	0.154
36	no	P	evader	20	55	28	0.280	0.205
		C		31	44	22	0.000 **	0.000
37	yes	P	pursuer	31	44	45	0.975	0.957 *
		C		56	19	28	0.374	0.287
38	yes	P	evader	41	34	53	1.000	1.000 **
		C		37	38	52	1.000	0.999 **
39	yes	P	pursuer	40	35	47	0.984	0.972 *
		C		49	26	41	0.957	0.921
40	yes	P	evader	65	10	13	0.016 **	0.004
		C		62	13	26	0.948	0.921
41	no	P	pursuer	11	64	17	0.163	0.063
		C		64	11	19	0.460	0.234
42	no	P	evader	52	23	24	0.011 **	0.006
		C		47	28	29	0.051	0.030

Appendix table G6 reports results for both the human and computer from the runs test of serial independence of Gibbons and Chakraborti (1992). A run is defined as the number of times a player switches from one strategy to another (from diamond to non-diamond in this case). Column 2 reports whether the human player was a world-class poker player or not, while column 3 reports the role of the human player in each pair and column 4 shows whether the reported results are for the human (P) or the computer (C). Column 5 reports the number of runs for the human player, and columns 6 and 7 report the number of times each card is played. The test is based on the following distribution:

$$f(r | n_B^i, n_R^i) = \begin{cases} 2 \binom{n_B^i - 1}{(r/2) - 1} \binom{n_R^i - 1}{(r/2) - 1} / \binom{n_B^i + n_R^i}{n_B^i} & \text{if } r \text{ is even} \\ \left(\binom{n_B^i - 1}{(r-1)/2} \binom{n_R^i - 1}{(r-3)/2} + \binom{n_B^i - 1}{(r-3)/2} \binom{n_R^i - 1}{(r-1)/2} \right) / \binom{n_B^i + n_R^i}{n_B^i} & \text{if } r \text{ is odd} \end{cases}$$

Where r is the number of runs, and n_B^i and n_R^i are the number of black and red choices.

The serial independence hypothesis will be rejected at the 5 percent level if there are too few or too many runs, that is if $F(r | n_B^i, n_R^i) < 0.025$ or if $F(r-1 | n_B^i, n_R^i) > 0.975$, where

$F(r | n_B^i, n_R^i) = \sum_{k=1}^r f(k | n_B^i, n_R^i)$. Columns 8 and 9 report p-values for both alternatives. ** and * denote rejections at the 5 and 10 percent level respectively.

Appendix Table H1: 2x2 Computer Game (Naïve)

		Computer Choice		Marginal Frequencies for Player
		B	R	
Player Choice	B	0.229 (0.111) {0.0027}	0.256 (0.222) {0.0008}	0.486 (0.333) {0.0035}
	R	0.256 (0.222) {0.0008}	0.258 (0.444) {0.0042}	0.514 (0.667) {0.0035}
Marginal Frequencies For Computer		0.485 (0.333) {0.0034}	0.515 (0.667) {0.0034}	
N # pairs		1950 26		
Player's p-value		<.001		

Appendix table H1 reports the aggregate marginal and joint frequencies for professional poker players and computers in the 2x2 computer game that is programmed for naïve play. Numbers in parentheses represent the minimax predicted frequencies, while numbers in brackets represent the standard deviations of the observed frequencies from the predicted frequencies. The p-value from a chi-square test of goodness of fit (with one degree of freedom) of the observed marginal frequencies to the predicted frequencies are also reported for the human players.

Appendix Table H2: 2x2 Computer Game (Naïve)

Pair	Player's		Marginal Frequencies		Joint Frequencies				Joint P-value
			Player	Computer					
			WC	Role	R	R	BB	BR	
1	no	P	0.360 **	0.480 **	0.333	0.307	0.187	0.173	0.000 **
2	no	E	0.680	0.413 **	0.213	0.107	0.373	0.307	0.000 **
3	no	P	0.000 **	0.600	0.400	0.600	0.000	0.000	0.000 **
4	no	E	1.000 **	0.413 **	0.000	0.000	0.587	0.413	0.000 **
5	no	P	0.453 **	0.440 **	0.320	0.227	0.240	0.213	0.000 **
6	no	E	0.467 **	0.493 **	0.293	0.240	0.213	0.253	0.000 **
7	no	P	0.107 **	0.507 **	0.440	0.453	0.053	0.053	0.000 **
8	no	E	1.000 **	0.507 **	0.000	0.000	0.493	0.507	0.000 **
9	no	P	0.640	0.627	0.093	0.267	0.280	0.360	0.360
10	no	E	0.413 **	0.493 **	0.267	0.320	0.240	0.173	0.000 **
11	no	P	0.213 **	0.573 *	0.373	0.413	0.053	0.160	0.000 **
12	no	E	1.000 **	0.427 **	0.000	0.000	0.573	0.427	0.000 **
13	no	P	0.427 **	0.613	0.213	0.360	0.173	0.253	0.000 **
14	no	E	0.707	0.480 **	0.187	0.107	0.333	0.373	0.004 **
15	no	P	0.387 **	0.533 **	0.267	0.347	0.200	0.187	0.000 **
16	no	E	0.440 **	0.480 **	0.293	0.267	0.227	0.213	0.000 **
17	no	P	0.440 **	0.520 **	0.280	0.280	0.200	0.240	0.000 **
18	no	E	0.453 **	0.560 *	0.240	0.307	0.200	0.253	0.000 **
19	no	P	0.080 **	0.573 *	0.387	0.533	0.040	0.040	0.000 **
20	no	E	1.000 **	0.507 **	0.000	0.000	0.493	0.507	0.000 **
21	no	P	0.507 *	0.560 *	0.253	0.240	0.187	0.320	0.001 **
22	no	E	0.427 **	0.507 **	0.293	0.280	0.200	0.227	0.000 **
23	yes	P	0.533 **	0.547 **	0.200	0.267	0.253	0.280	0.012 **
24	yes	E	0.453 **	0.373 **	0.333	0.213	0.293	0.160	0.000 **
25	no	P	0.560 *	0.600	0.160	0.280	0.240	0.320	0.141
26	no	E	0.627	0.560 *	0.120	0.253	0.320	0.307	0.078 *

Appendix table H2 reports individual-level results for the Pearson chi-square test of goodness of fit of the observed frequencies to the minimax predicted frequencies. In this case, the computer is programmed for naïve play. Column 2 reports whether the human player in each pair is world-class poker or not, while column 3 reports the player's role. Columns 4 and 5 show the observed frequencies for which the human player and the computer each play the red card, as well as the corresponding rejections of the minimax hypothesis. ** and * denote rejections at the 5 and 10 percent levels respectively. The test uses one degree of freedom in this case. Columns 5 to 8 show the joint frequencies of play, and column 9 shows the corresponding p-values when the same chi-square test is used with three degrees of freedom.

Appendix Table H3: 2x2 Computer Game (Naïve)

Pair	WC	Player's Role	B		R		Pearson	P-value	
			Success	Fail	Success	Fail			
1	no	pursuer	0.227	0.413	0.040	0.320	42.064	0.000	**
2	no	evader	0.160	0.160	0.533	0.147	10.359	0.016	**
3	no	pursuer	0.293	0.707	0.000	0.000	156.583	0.000	**
4	no	evader	0.000	0.000	0.787	0.213	37.551	0.000	**
5	no	pursuer	0.200	0.347	0.067	0.387	24.141	0.000	**
6	no	evader	0.387	0.147	0.373	0.093	14.601	0.002	**
7	no	pursuer	0.253	0.640	0.027	0.080	109.757	0.000	**
8	no	evader	0.000	0.000	0.787	0.213	37.551	0.000	**
9	no	pursuer	0.093	0.267	0.120	0.520	0.793	0.851	
10	no	evader	0.440	0.147	0.347	0.067	22.419	0.000	**
11	no	pursuer	0.213	0.573	0.067	0.147	71.533	0.000	**
12	no	evader	0.000	0.000	0.827	0.173	39.056	0.000	**
13	no	pursuer	0.120	0.453	0.080	0.347	19.654	0.000	**
14	no	evader	0.160	0.133	0.547	0.160	6.591	0.086	
15	no	pursuer	0.160	0.453	0.027	0.360	29.477	0.000	**
16	no	evader	0.373	0.187	0.347	0.093	22.393	0.000	**
17	no	pursuer	0.187	0.373	0.080	0.360	22.586	0.000	**
18	no	evader	0.387	0.160	0.373	0.080	17.571	0.001	**
19	no	pursuer	0.240	0.680	0.013	0.067	117.819	0.000	**
20	no	evader	0.000	0.000	0.840	0.160	40.020	0.000	**
21	no	pursuer	0.200	0.293	0.120	0.387	19.307	0.000	**
22	no	evader	0.440	0.133	0.360	0.067	20.001	0.000	**
23	yes	pursuer	0.107	0.360	0.067	0.467	7.761	0.051	*
24	yes	evader	0.307	0.240	0.427	0.027	37.217	0.000	**
25	no	pursuer	0.120	0.320	0.133	0.427	4.534	0.209	
26	no	evader	0.267	0.107	0.507	0.120	1.513	0.679	

Appendix table H3 reports results for the human player only for the test that success rates are equal to the minimax predicted success rates and are equal across strategies. Column 2 reports whether or not the human player in each pair is a world-class poker player, while column 3 shows what role he/she played. Columns 4 – 7 report the observed success and failure rates for the human player on each strategy. Columns 8 and 9 report the test statistics from the Pearson chi-square test (with 3 degrees of freedom) of goodness of fit of the observed success and failure rates to the equilibrium rates. ** and * denote rejections at the 5 and 10 percent levels respectively.

Appendix Table H4: 2x2 Computer Game (Naïve)

Pair	WC	Player/ Computer	Player's Role	Success		Fail		Pearson	P-value
				B	B	R	R		
1	no	P	pursuer	0.227	0.413	0.040	0.320	42.064	0.000 **
		C		0.293	0.227	0.440	0.040	30.724	0.000 **
2	no	P	evader	0.160	0.160	0.533	0.147	10.359	0.016 **
		C		0.160	0.427	0.147	0.267	24.759	0.000 **
3	no	P	pursuer	0.293	0.707	0.000	0.000	156.583	0.000 **
		C		0.107	0.293	0.600	0.000	67.483	0.000 **
4	no	P	evader	0.000	0.000	0.787	0.213	37.551	0.000 **
		C		0.000	0.587	0.213	0.200	53.391	0.000 **
5	no	P	pursuer	0.200	0.347	0.067	0.387	24.141	0.000 **
		C		0.360	0.200	0.373	0.067	25.401	0.000 **
6	no	P	evader	0.387	0.147	0.373	0.093	14.601	0.002 **
		C		0.147	0.360	0.093	0.400	11.824	0.008 **
7	no	P	pursuer	0.253	0.640	0.027	0.080	109.757	0.000 **
		C		0.240	0.253	0.480	0.027	40.329	0.000 **
8	no	P	evader	0.000	0.000	0.787	0.213	37.551	0.000 **
		C		0.000	0.493	0.213	0.293	30.891	0.000 **
9	no	P	pursuer	0.093	0.267	0.120	0.520	0.793	0.851
		C		0.280	0.093	0.507	0.120	0.921	0.820
10	no	P	evader	0.440	0.147	0.347	0.067	22.419	0.000 **
		C		0.147	0.360	0.067	0.427	12.853	0.005 **
11	no	P	pursuer	0.213	0.573	0.067	0.147	71.533	0.000 **
		C		0.213	0.213	0.507	0.067	23.627	0.000 **
12	no	P	evader	0.000	0.000	0.827	0.173	39.056	0.000 **
		C		0.000	0.573	0.173	0.253	44.584	0.000 **
13	no	P	pursuer	0.120	0.453	0.080	0.347	19.654	0.000 **
		C		0.267	0.120	0.533	0.080	4.534	0.209
14	no	P	evader	0.160	0.133	0.547	0.160	6.591	0.086 *
		C		0.133	0.387	0.160	0.320	14.023	0.003 **
15	no	P	pursuer	0.160	0.453	0.027	0.360	29.477	0.000 **
		C		0.307	0.160	0.507	0.027	15.617	0.001 **
16	no	P	evader	0.373	0.187	0.347	0.093	22.393	0.000 **
		C		0.187	0.333	0.093	0.387	18.459	0.000 **
17	no	P	pursuer	0.187	0.373	0.080	0.360	22.586	0.000 **
		C		0.293	0.187	0.440	0.080	16.414	0.001 **
18	no	P	evader	0.387	0.160	0.373	0.080	17.571	0.001 **
		C		0.160	0.280	0.080	0.480	10.166	0.017 **
19	no	P	pursuer	0.240	0.680	0.013	0.067	117.819	0.000 **
		C		0.187	0.240	0.560	0.013	38.850	0.000 **
20	no	P	evader	0.000	0.000	0.840	0.160	40.020	0.000 **
		C		0.000	0.493	0.160	0.347	25.749	0.000 **
21	no	P	pursuer	0.200	0.293	0.120	0.387	19.307	0.000 **
		C		0.240	0.200	0.440	0.120	17.456	0.001 **
22	no	P	evader	0.440	0.133	0.360	0.067	20.001	0.000 **
		C		0.133	0.360	0.067	0.440	10.744	0.013 **
23	yes	P	pursuer	0.107	0.360	0.067	0.467	7.761	0.051 *
		C		0.347	0.107	0.480	0.067	6.861	0.076 *

Appendix Table H4 continued

24	yes	P	evader	0.307	0.240	0.427	0.027	37.217	0.000 **
		C		0.240	0.387	0.027	0.347	44.314	0.000 **
25	no	P	pursuer	0.120	0.320	0.133	0.427	4.534	0.209
		C		0.280	0.120	0.467	0.133	2.760	0.430
26	no	P	evader	0.267	0.107	0.507	0.120	1.513	0.679
		C		0.107	0.333	0.120	0.440	3.956	0.266

Appendix table H4 reports results for both the human and computer from the test that success rates are equal to the minimax predicted success rates and are equal across strategies. Column 2 reports whether or not the human player in each pair is a world-class poker player, while column 3 shows what role he/she played and column 4 shows whether the reported results are for the human (P) or the computer (C). Play is broken down into two strategies – diamond and non-diamond cards – before being analyzed. Columns 4 – 7 report the observed success and failure rates for each strategy for the human player. Columns 8 and 9 report the test statistics from the Pearson chi-square test (with 3 degrees of freedom) of goodness of fit of the observed success and failure rates to the equilibrium rates. ** and * denote rejections at the 5 and 10 percent level respectively.

Appendix Table H5: 2x2 Computer Game (Naïve)

Pair	Player's Role	Choices			Runs	F(r)	F(r - 1)
		WC	R	B			
1	P	0	27	48	24	0.003 **	0.001
2	E	0	51	24	32	0.371	0.286
3	P	0	0	75	1	0.000 **	0.000
4	E	0	75	0	1	0.000 **	0.000
5	P	0	34	41	25	0.001 **	0.001
6	E	0	35	40	36	0.335	0.254
7	P	0	8	67	17	1.000	0.660
8	E	0	75	0	1	0.000 **	0.000
9	P	0	48	27	41	0.936	0.892
10	E	0	31	44	34	0.245	0.177
11	P	0	16	59	9	0.000 **	0.000
12	E	0	75	0	1	0.000 **	0.000
13	P	0	32	43	25	0.002 **	0.001
14	E	0	53	22	29	0.237	0.153
15	P	0	29	46	45	0.987	0.975 *
16	E	0	33	42	41	0.798	0.725
17	P	0	33	42	26	0.003 **	0.002
18	E	0	34	41	33	0.136	0.092
19	P	0	6	69	13	1.000	0.456
20	E	0	75	0	1	0.000 **	0.000
21	P	0	38	37	28	0.010 **	0.005
22	E	0	32	43	21	0.000 **	0.000
23	P	1	40	35	27	0.005 **	0.003
24	E	1	34	41	29	0.021 **	0.011
25	P	0	42	33	47	0.988	0.979 **
26	E	0	47	28	51	1.000	1.000 **

Appendix table H5 reports results for the human player only from the runs test of serial independence of Gibbons and Chakraborti (1992). A run is defined as the number of times a player switches from one strategy to another (from diamond to non-diamond in this case). Column 2 reports whether the human player was a world-class poker player or not, while column 3 reports the role of the human player in each pair. Column 4 reports the number of runs for the human player, and columns 5 and 6 report the number of times each card is played. The test is based on the following distribution:

$$f(r | n_B^i, n_R^i) = \begin{cases} 2 \binom{n_B^i - 1}{(r/2) - 1} \binom{n_R^i - 1}{(r/2) - 1} / \binom{n_B^i + n_R^i}{n_B^i} & \text{if } r \text{ is even} \\ \left(\binom{n_B^i - 1}{(r-1)/2} \binom{n_R^i - 1}{(r-3)/2} + \binom{n_B^i - 1}{(r-3)/2} \binom{n_R^i - 1}{(r-1)/2} \right) / \binom{n_B^i + n_R^i}{n_B^i} & \text{if } r \text{ is odd} \end{cases}$$

Where r is the number of runs, and n_B^i and n_R^i are the number of black and red choices.

The serial independence hypothesis will be rejected at the 5 percent level if there are too few or too many runs, that is if $F(r | n_B^i, n_R^i) < 0.025$ or if $F(r-1 | n_B^i, n_R^i) > 0.975$, where

$$F(r | n_B^i, n_R^i) = \sum_{k=1}^r f(k | n_B^i, n_R^i).$$

Columns 7 and 8 report p-values for both alternatives. ** and * denote rejections at the 5 and 10 percent level respectively.

Appendix Table H6: 2x2 Computer Game (Naïve)

Pair	Player's Role	Player/Computer	Choices			Runs	F(r)	F(r - 1)
			WC	R	B			
1	pursuer	P	0	27	48	24	0.003 **	0.001
		C		36	39	41	0.761	0.685
2	evader	P	0	51	24	32	0.371	0.286
		C		31	44	34	0.245	0.177
3	pursuer	P	0	0	75	1	0.000 **	0.000
		C		45	30	37	0.548	0.449
4	evader	P	0	75	0	1	0.000 **	0.000
		C		31	44	39	0.695	0.605
5	pursuer	P	0	34	41	25	0.001 **	0.001
		C		33	42	40	0.725	0.641
6	evader	P	0	35	40	36	0.335	0.254
		C		37	38	46	0.969	0.949
7	pursuer	P	0	8	67	17	1.000	0.660
		C		38	37	35	0.243	0.177
8	evader	P	0	75	0	1	0.000 **	0.000
		C		38	37	37	0.408	0.322
9	pursuer	P	0	48	27	41	0.936	0.892
		C		47	28	31	0.128	0.082
10	evader	P	0	31	44	34	0.245	0.177
		C		37	38	36	0.322	0.243
11	pursuer	P	0	16	59	9	0.000 **	0.000
		C		43	32	38	0.575	0.481
12	evader	P	0	75	0	1	0.000 **	0.000
		C		32	43	42	0.873	0.817
13	pursuer	P	0	32	43	25	0.002 **	0.001
		C		46	29	34	0.303	0.226
14	evader	P	0	53	22	29	0.237	0.153
		C		36	39	37	0.413	0.326
15	pursuer	P	0	29	46	45	0.987	0.975 *
		C		40	35	38	0.516	0.422
16	evader	P	0	33	42	41	0.798	0.725
		C		36	39	34	0.180	0.125
17	pursuer	P	0	33	42	26	0.003 **	0.002
		C		39	36	35	0.246	0.180
18	evader	P	0	34	41	33	0.136	0.092
		C		42	33	41	0.798	0.725
19	pursuer	P	0	6	69	13	1.000	0.456
		C		43	32	42	0.873	0.817
20	evader	P	0	75	0	1	0.000 **	0.000
		C		38	37	34	0.177	0.122
21	pursuer	P	0	38	37	28	0.010 **	0.005
		C		42	33	35	0.281	0.207
22	evader	P	0	32	43	21	0.000 **	0.000
		C		38	37	38	0.501	0.408
23	pursuer	P	1	40	35	27	0.005 **	0.003
		C		41	34	36	0.348	0.265
24	evader	P	1	34	41	29	0.021 **	0.011
		C		28	47	37	0.637	0.536
25	pursuer	P	0	42	33	47	0.988	0.979 **
		C		45	30	43	0.944	0.908
26	evader	P	0	47	28	51	1.000	1.000 **
		C		42	33	37	0.456	0.365

Appendix Table H6 continued

Appendix table H6 reports results for both the human and computer from the runs test of serial independence of Gibbons and Chakraborti (1992). A run is defined as the number of times a player switches from one strategy to another (from diamond to non-diamond in this case). Column 2 reports whether the human player was a world-class poker player or not, while column 3 reports the role of the human player in each pair and column 4 shows whether the reported results are for the human (P) or the computer (C).. Column 5 reports the number of runs for the human player, and columns 6 and 7 report the number of times each card is played. The test is based on the following distribution:

$$f(r | n_B^i, n_R^i) = \begin{cases} 2 \binom{n_B^i - 1}{(r/2) - 1} \binom{n_R^i - 1}{(r/2) - 1} / \binom{n_B^i + n_R^i}{n_B^i} & \text{if } r \text{ is even} \\ \left(\binom{n_B^i - 1}{(r-1)/2} \binom{n_R^i - 1}{(r-3)/2} + \binom{n_B^i - 1}{(r-3)/2} \binom{n_R^i - 1}{(r-1)/2} \right) / \binom{n_B^i + n_R^i}{n_B^i} & \text{if } r \text{ is odd} \end{cases}$$

Where r is the number of runs, and n_B^i and n_R^i are the number of black and red choices.

The serial independence hypothesis will be rejected at the 5 percent level if there are too few or too many runs, that is if $F(r | n_B^i, n_R^i) < 0.025$ or if $F(r-1 | n_B^i, n_R^i) > 0.975$, where $F(r | n_B^i, n_R^i) = \sum_{k=1}^r f(k | n_B^i, n_R^i)$.

Columns 8 and 9 report p-values for both alternatives. ** and * denote rejections at the 5 and 10 percent level respectively.

Appendix Table I1 - 4x4 Computer Game (Optimal)

		Computer Choice				Marginal Frequencies for Player
		C	D	H	S	
Player Choice	C	0.038 (0.040) {0.0000}	0.090 (0.080) {0.0002}	0.044 (0.040) {0.0001}	0.043 (0.040) {0.0001}	0.215 (0.200) {0.0003}
	D	0.076 (0.080) {0.0001}	0.161 (0.160) {0.0000}	0.087 (0.080) {0.0001}	0.069 (0.080) {0.0002}	0.392 (0.400) {0.0001}
	H	0.033 (0.040) {0.0001}	0.084 (0.080) {0.0001}	0.043 (0.040) {0.0001}	0.037 (0.040) {0.0001}	0.197 (0.200) {0.0000}
	S	0.043 (0.040) {0.0001}	0.079 (0.080) {0.0000}	0.038 (0.040) {0.0000}	0.036 (0.040) {0.0001}	0.196 (0.200) {0.0001}
Marginal Frequencies for Computer		0.190 (0.200) {0.0002}	0.413 (0.400) {0.0002}	0.212 (0.200) {0.0002}	0.185 (0.200) {0.0003}	
N		3150				
#pairs		42				
Player p-value		0.203				

Appendix table I1 reports the aggregate marginal and joint frequencies for professional poker players and computers in the 4x4 computer game that is programmed for optimal play. Numbers in parentheses represent the minimax predicted frequencies, while numbers in brackets represent the standard deviations of the observed frequencies from the predicted frequencies. The p-value from a Chi-square goodness of fit test (with three degrees of freedom) of the observed marginal frequencies to the predicted frequencies are also reported for the human players.

Appendix Table I2 - 4x4 Computer Game (Optimal)

		Player					Computer				P-values from Chi-Squared Test on Minimax Predicted Values		
Pair	WC	Player's Role	C	D	H	S	C	D	H	S	Player	Computer	Joint
1	yes	row	0.280	0.493	0.227	0.000	0.160	0.440	0.080	0.320	0.000 **	0.008 **	0.000 **
2	yes	column	0.160	0.440	0.227	0.173	0.107	0.360	0.240	0.293	0.698	0.059 *	0.377
3	no	row	0.133	0.293	0.253	0.320	0.333	0.293	0.240	0.133	0.016 **	0.011 **	0.001 **
4	no	column	0.147	0.493	0.173	0.187	0.147	0.400	0.267	0.187	0.387	0.423	0.782
5	no	row	0.320	0.440	0.160	0.080	0.133	0.400	0.213	0.253	0.008 **	0.423	0.203
6	no	column	0.240	0.373	0.173	0.213	0.240	0.320	0.213	0.227	0.785	0.545	0.729
7	yes	row	0.160	0.427	0.133	0.280	0.200	0.427	0.253	0.120	0.187	0.308	0.577
8	yes	column	0.280	0.373	0.187	0.160	0.293	0.413	0.147	0.147	0.362	0.143	0.507
9	no	row	0.187	0.413	0.187	0.213	0.173	0.293	0.427	0.107	0.972	0.000 **	0.001 **
10	no	column	0.373	0.253	0.187	0.187	0.267	0.440	0.080	0.213	0.001 **	0.059 *	0.007 **
11	no	row	0.227	0.387	0.267	0.120	0.107	0.453	0.120	0.320	0.224	0.009 **	0.206
12	no	column	0.307	0.360	0.187	0.147	0.293	0.373	0.213	0.120	0.127	0.118	0.030 **
13	no	row	0.173	0.440	0.227	0.160	0.133	0.347	0.253	0.267	0.698	0.177	0.304
14	no	column	0.227	0.387	0.187	0.200	0.213	0.307	0.213	0.267	0.947	0.330	0.835
15	no	row	0.187	0.360	0.253	0.200	0.227	0.387	0.320	0.067	0.698	0.006 **	0.002 **
16	no	column	0.240	0.360	0.253	0.147	0.213	0.373	0.253	0.160	0.387	0.601	0.416
17	no	row	0.187	0.320	0.227	0.267	0.213	0.373	0.227	0.187	0.362	0.912	0.225
18	no	column	0.173	0.520	0.173	0.133	0.253	0.307	0.267	0.173	0.179	0.201	0.099 *
19	no	row	0.200	0.467	0.227	0.107	0.107	0.413	0.240	0.240	0.224	0.212	0.210
20	no	column	0.253	0.227	0.213	0.307	0.213	0.547	0.120	0.120	0.012 **	0.031 **	0.010 **
21	no	row	0.147	0.587	0.173	0.093	0.160	0.533	0.067	0.240	0.007 **	0.011 **	0.003 **
22	no	column	0.280	0.320	0.187	0.213	0.293	0.400	0.107	0.200	0.292	0.088 *	0.010 **
23	no	row	0.107	0.480	0.253	0.160	0.133	0.427	0.307	0.133	0.105	0.052 *	0.065 *
24	no	column	0.213	0.240	0.280	0.267	0.173	0.493	0.120	0.213	0.030 **	0.224	0.067 *
25	no	row	0.093	0.520	0.227	0.160	0.333	0.413	0.160	0.093	0.050 **	0.009 **	0.006 **
26	no	column	0.253	0.467	0.093	0.187	0.200	0.347	0.160	0.293	0.101	0.221	0.233
27	no	row	0.213	0.267	0.187	0.333	0.133	0.387	0.240	0.240	0.017 **	0.407	0.304
28	no	column	0.320	0.240	0.200	0.240	0.160	0.480	0.107	0.253	0.013 **	0.105	0.045 **
29	no	row	0.307	0.160	0.173	0.360	0.133	0.347	0.360	0.160	0.000 **	0.006 **	0.000 **
30	no	column	0.200	0.093	0.347	0.360	0.067	0.693	0.107	0.133	0.000 **	0.000 **	0.000 **
31	no	row	0.173	0.453	0.120	0.253	0.187	0.413	0.280	0.120	0.234	0.179	0.206
32	no	column	0.067	0.627	0.160	0.147	0.133	0.307	0.333	0.227	0.000 **	0.017 **	0.003 **
33	yes	row	0.173	0.440	0.240	0.147	0.227	0.320	0.267	0.187	0.525	0.362	0.564
34	yes	column	0.200	0.400	0.160	0.240	0.253	0.387	0.107	0.253	0.753	0.143	0.583
35	no	row	0.253	0.387	0.173	0.187	0.147	0.480	0.240	0.133	0.698	0.209	0.939
36	no	column	0.360	0.133	0.267	0.240	0.093	0.600	0.187	0.120	0.000 **	0.003 **	0.000 **
37	yes	row	0.120	0.640	0.040	0.200	0.133	0.600	0.160	0.107	0.000 **	0.005 **	0.000 **
38	yes	column	0.253	0.333	0.213	0.200	0.213	0.400	0.187	0.200	0.579	0.988	0.532
39	yes	row	0.133	0.493	0.107	0.267	0.227	0.493	0.187	0.093	0.041 **	0.101	0.055 *
40	yes	column	0.240	0.373	0.267	0.120	0.187	0.413	0.280	0.120	0.187	0.179	0.206
41	no	row	0.240	0.547	0.120	0.093	0.107	0.440	0.307	0.147	0.010 **	0.031 **	0.023 **
42	no	column	0.240	0.427	0.187	0.147	0.253	0.307	0.253	0.187	0.601	0.280	0.163

Appendix Table I2 continued

Appendix table I2 reports individual-level results for the Pearson Chi-square test of goodness of fit of the observed frequencies to the minimax predicted frequencies. In this case, the computer is programmed for optimal play. Column 2 reports whether the human player in each pair is a world-class poker player or not, while column 3 reports the player's role. Columns 4-7 show the observed frequencies for the human player on each card, while columns 8-11 show observed frequencies for the computer on each card. The last three columns report the p-values for the human, the computer and for the joint frequencies of both respectively. ** and * denote rejections at the 5 and 10 percent levels. The test uses three degrees of freedom for the marginal frequencies and fifteen for the joint frequencies.

Appendix Table I3 - 4x4 Computer Game (Optimal)

Pair	WC	Player's Role	Mixtures		Win Rates		Pearson	p-value
			Diamond	Non-Diamond	Diamond	Non-Diamond		
1	yes	row	0.493	0.507	0.622	0.579	2.870	0.412
2	yes	column	0.440	0.560	0.455	0.452	1.398	0.706
3	no	row	0.293	0.707	0.727	0.472	8.926	0.030 **
4	no	column	0.493	0.507	0.459	0.447	3.694	0.296
5	no	row	0.440	0.560	0.606	0.571	0.639	0.887
6	no	column	0.373	0.627	0.357	0.489	2.056	0.561
7	yes	row	0.427	0.573	0.500	0.512	2.981	0.394
8	yes	column	0.373	0.627	0.321	0.362	1.194	0.754
9	no	row	0.413	0.587	0.742	0.500	4.537	0.209
10	no	column	0.253	0.747	0.368	0.321	8.565	0.036 **
11	no	row	0.387	0.613	0.586	0.652	0.611	0.894
12	no	column	0.360	0.640	0.444	0.417	0.759	0.859
13	no	row	0.440	0.560	0.667	0.714	3.306	0.347
14	no	column	0.387	0.613	0.310	0.522	3.898	0.273
15	no	row	0.360	0.640	0.370	0.521	7.176	0.066 *
16	no	column	0.360	0.640	0.444	0.417	0.759	0.859
17	no	row	0.320	0.680	0.542	0.706	4.972	0.174
18	no	column	0.520	0.480	0.462	0.639	12.148	0.007 **
19	no	row	0.467	0.533	0.571	0.550	1.898	0.594
20	no	column	0.227	0.773	0.471	0.241	17.426	0.001 **
21	no	row	0.587	0.413	0.386	0.516	23.787	0.000 **
22	no	column	0.320	0.680	0.333	0.294	5.056	0.168
23	no	row	0.480	0.520	0.611	0.769	6.056	0.109
24	no	column	0.240	0.760	0.278	0.333	10.009	0.018 **
25	no	row	0.520	0.480	0.615	0.611	4.565	0.207
26	no	column	0.467	0.533	0.371	0.450	1.898	0.594
27	no	row	0.267	0.733	0.550	0.527	7.176	0.066 *
28	no	column	0.240	0.760	0.611	0.386	10.065	0.018 **
29	no	row	0.160	0.840	0.750	0.540	19.787	0.000 **
30	no	column	0.093	0.907	0.714	0.191	48.731	0.000 **
31	no	row	0.453	0.547	0.647	0.683	2.315	0.510
32	no	column	0.627	0.373	0.362	0.607	19.620	0.000 **
33	yes	row	0.440	0.560	0.697	0.643	2.222	0.528
34	yes	column	0.400	0.600	0.300	0.356	1.620	0.655
35	no	row	0.387	0.613	0.483	0.630	1.843	0.606
36	no	column	0.133	0.867	0.500	0.277	28.287	0.000 **
37	yes	row	0.640	0.360	0.438	0.778	28.583	0.000 **
38	yes	column	0.333	0.667	0.360	0.500	3.843	0.279
39	yes	row	0.493	0.507	0.459	0.553	6.778	0.079 *
40	yes	column	0.373	0.627	0.357	0.426	0.556	0.907
41	no	row	0.547	0.453	0.634	0.647	7.231	0.065 *
42	no	column	0.427	0.573	0.219	0.256	8.454	0.038 **

Appendix table I3 reports results for the human player only for the test that success rates are equal to the minimax predicted success rates and are equal across strategies.

Appendix Table I3 continued

Column 2 reports whether or not the human player in each pair is a world-class poker player, while column 3 shows whether the human player was row or column. Play is broken down into two strategies – diamond and non-diamond cards – before being analyzed. Columns 4 – 7 report the observed success and failure rates for each strategy for the human player. Columns 8 and 9 report the test statistics from the Pearson chi-square test (with 3 degrees of freedom) of goodness of fit of the observed success and failure rates to the equilibrium rates. ** and * denote rejections at the 5 and 10 percent level respectively.

Appendix Table I4 - 4x4 Computer Game (Optimal)

Pair	WC	Player's Role	Player	Mixtures		Win Rates		Pearson	p-value
				Diamond	Non-Diamond	Diamond	Non-Diamond		
1	yes	row	P	0.493	0.507	0.622	0.579	2.870	0.412
			C	0.440	0.560	0.424	0.381	0.648	0.885
2	yes	column	P	0.440	0.560	0.455	0.452	1.398	0.706
			C	0.360	0.640	0.444	0.604	2.954	0.399
3	no	row	P	0.293	0.707	0.727	0.472	8.926	0.030 **
			C	0.293	0.707	0.273	0.528	8.926	0.030 **
4	no	column	P	0.493	0.507	0.459	0.447	3.694	0.296
			C	0.400	0.600	0.433	0.622	3.565	0.312
5	no	row	P	0.440	0.560	0.606	0.571	0.639	0.887
			C	0.400	0.600	0.433	0.400	0.139	0.987
6	no	column	P	0.373	0.627	0.357	0.489	2.056	0.561
			C	0.320	0.680	0.583	0.549	2.648	0.449
7	yes	row	P	0.427	0.573	0.500	0.512	2.981	0.394
			C	0.427	0.573	0.500	0.488	2.981	0.394
8	yes	column	P	0.373	0.627	0.321	0.362	1.194	0.754
			C	0.413	0.587	0.710	0.614	1.694	0.638
9	no	row	P	0.413	0.587	0.742	0.500	4.537	0.209
			C	0.293	0.707	0.364	0.415	3.704	0.295
10	no	column	P	0.253	0.747	0.368	0.321	8.565	0.036 **
			C	0.440	0.560	0.788	0.571	5.972	0.113
11	no	row	P	0.387	0.613	0.586	0.652	0.611	0.894
			C	0.453	0.547	0.353	0.390	1.259	0.739
12	no	column	P	0.360	0.640	0.444	0.417	0.759	0.859
			C	0.373	0.627	0.571	0.574	0.444	0.931
13	no	row	P	0.440	0.560	0.667	0.714	3.306	0.347
			C	0.347	0.653	0.423	0.245	6.287	0.098 *
14	no	column	P	0.387	0.613	0.310	0.522	3.898	0.273
			C	0.307	0.693	0.609	0.538	3.676	0.299
15	no	row	P	0.360	0.640	0.370	0.521	7.176	0.066 *
			C	0.387	0.613	0.586	0.500	6.065	0.108
16	no	column	P	0.360	0.640	0.444	0.417	0.759	0.859
			C	0.373	0.627	0.571	0.574	0.444	0.931
17	no	row	P	0.320	0.680	0.542	0.706	4.972	0.174
			C	0.373	0.627	0.393	0.319	1.565	0.667
18	no	column	P	0.520	0.480	0.462	0.639	12.148	0.007 **
			C	0.307	0.693	0.217	0.558	13.926	0.003 **
19	no	row	P	0.467	0.533	0.571	0.550	1.898	0.594
			C	0.413	0.587	0.484	0.409	1.009	0.799
20	no	column	P	0.227	0.773	0.471	0.241	17.426	0.001 **
			C	0.547	0.453	0.805	0.588	16.537	0.001 **
21	no	row	P	0.587	0.413	0.386	0.516	23.787	0.000 **
			C	0.533	0.467	0.675	0.429	22.454	0.000 **
22	no	column	P	0.320	0.680	0.333	0.294	5.056	0.168
			C	0.400	0.600	0.733	0.667	3.056	0.383
23	no	row	P	0.480	0.520	0.611	0.769	6.056	0.109
			C	0.427	0.573	0.438	0.209	6.648	0.084 *

Appendix Table I4 continued

24	no	column	P	0.240	0.760	0.278	0.333	10.009	0.018	**
			C	0.493	0.507	0.865	0.500	17.398	0.001	**
25	no	row	P	0.520	0.480	0.615	0.611	4.565	0.207	
			C	0.413	0.587	0.484	0.318	2.194	0.533	
26	no	column	P	0.467	0.533	0.371	0.450	1.898	0.594	
			C	0.347	0.653	0.500	0.633	2.065	0.559	
27	no	row	P	0.267	0.733	0.550	0.527	7.176	0.066	*
			C	0.387	0.613	0.310	0.565	6.343	0.096	*
28	no	column	P	0.240	0.760	0.611	0.386	10.065	0.018	**
			C	0.480	0.520	0.694	0.436	7.398	0.060	*
29	no	row	P	0.160	0.840	0.750	0.540	19.787	0.000	**
			C	0.347	0.653	0.115	0.592	16.676	0.001	**
30	no	column	P	0.093	0.907	0.714	0.191	48.731	0.000	**
			C	0.693	0.307	0.904	0.435	62.898	0.000	**
31	no	row	P	0.453	0.547	0.647	0.683	2.315	0.510	
			C	0.413	0.587	0.387	0.295	2.037	0.565	
32	no	column	P	0.627	0.373	0.362	0.607	19.620	0.000	**
			C	0.307	0.693	0.261	0.673	12.509	0.006	**
33	yes	row	P	0.440	0.560	0.697	0.643	2.222	0.528	
			C	0.320	0.680	0.417	0.294	4.722	0.193	
34	yes	column	P	0.400	0.600	0.300	0.356	1.620	0.655	
			C	0.387	0.613	0.690	0.652	1.528	0.676	
35	no	row	P	0.387	0.613	0.483	0.630	1.843	0.606	
			C	0.480	0.520	0.417	0.436	2.231	0.526	
36	no	column	P	0.133	0.867	0.500	0.277	28.287	0.000	**
			C	0.600	0.400	0.889	0.400	39.306	0.000	**
37	yes	row	P	0.640	0.360	0.438	0.778	28.583	0.000	**
			C	0.600	0.400	0.600	0.200	27.083	0.000	**
38	yes	column	P	0.333	0.667	0.360	0.500	3.843	0.279	
			C	0.400	0.600	0.700	0.444	5.787	0.122	
39	yes	row	P	0.493	0.507	0.459	0.553	6.778	0.079	*
			C	0.493	0.507	0.541	0.447	6.778	0.079	*
40	yes	column	P	0.373	0.627	0.357	0.426	0.556	0.907	
			C	0.413	0.587	0.677	0.545	1.389	0.708	
41	no	row	P	0.547	0.453	0.634	0.647	7.231	0.065	*
			C	0.440	0.560	0.455	0.286	3.083	0.379	
42	no	column	P	0.427	0.573	0.219	0.256	8.454	0.038	**
			C	0.307	0.693	0.696	0.788	12.287	0.006	**

Appendix table I4 reports results for both the human and computer for the test that success rates are equal to the minimax predicted success rates and are equal across strategies. Column 2 reports whether or not the human player in each pair is a world-class poker player, while column 3 shows whether the human player was row or column and column 4 shows whether the reported results are for the human (P) or the computer (C). Play is broken down into two strategies – diamond and non-diamond cards – before being analyzed. Columns 4 – 7 report the observed success and failure rates for each strategy for the human player. Columns 8 and 9 report the test statistics from the Pearson chi-square test (with 3 degrees of freedom) of goodness of fit of the observed success and failure rates to the equilibrium rates. ** and * denote rejections at the 5 and 10 percent levels respectively.

Appendix Table I5 - 4x4 Computer Game (Optimal)

Pair	WC	Player's Role	Choices		Runs (r)	F(r)	F(r - 1)
			Diamond	Non-Diamond			
1	yes	row	37	38	21	0.000 **	0.000
2	yes	column	33	42	30	0.039 *	0.023
3	no	row	22	53	42	0.999	0.998 **
4	no	column	37	38	53	1.000	1.000 **
5	no	row	33	42	26	0.003 **	0.002
6	no	column	28	47	29	0.051	0.030
7	yes	row	32	43	45	0.969	0.948
8	yes	column	28	47	38	0.721	0.637
9	no	row	31	44	33	0.177	0.121
10	no	column	19	56	25	0.123	0.067
11	no	row	29	46	37	0.590	0.489
12	no	column	27	48	36	0.588	0.495
13	no	row	33	42	33	0.146	0.099
14	no	column	29	46	36	0.489	0.396
15	no	row	27	48	28	0.038 *	0.022
16	no	column	27	48	27	0.022 **	0.011
17	no	row	24	51	21	0.001 **	0.000
18	no	column	39	36	27	0.005 **	0.003
19	no	row	35	40	29	0.019 **	0.011
20	no	column	17	58	21	0.033 *	0.014
21	no	row	44	31	42	0.890	0.839
22	no	column	24	51	39	0.947	0.901
23	no	row	36	39	24	0.001 **	0.000
24	no	column	18	57	29	0.648	0.490
25	no	row	39	36	38	0.506	0.413
26	no	column	35	40	42	0.835	0.770
27	no	row	20	55	18	0.000 **	0.000
28	no	column	18	57	21	0.018 **	0.007
29	no	row	12	63	25	1.000	0.917
30	no	column	7	68	15	1.000	0.562
31	no	row	34	41	40	0.707	0.622
32	no	column	47	28	37	0.637	0.536
33	yes	row	33	42	35	0.281	0.207
34	yes	column	30	45	35	0.358	0.271
35	no	row	29	46	15	0.000 **	0.000
36	no	column	10	65	16	0.151	0.097
37	yes	row	48	27	38	0.767	0.689
38	yes	column	25	50	39	0.916	0.859
39	yes	row	37	38	31	0.051	0.031
40	yes	column	28	47	39	0.803	0.721
41	no	row	41	34	42	0.845	0.782
42	no	column	32	43	50	0.999	0.998 **

Appendix table I5 reports results for the human player only from the runs test of serial independence of Gibbons and Chakraborti (1992).

Appendix Table I5 continued

A run is defined as the number of times a player switches from one strategy to another (from diamond to non-diamond in this case). Column 2 reports whether the human player was a world-class poker player or not, while column 3 reports the role of the human player in each pair. Column 4 reports the number of runs for the human player, and columns 5 and 6 report the number of times each card is played. The test is based on the following distribution:

$$f(r | n_B^i, n_R^i) = \begin{cases} 2 \binom{n_B^i - 1}{(r/2) - 1} \binom{n_R^i - 1}{(r/2) - 1} / \binom{n_B^i + n_R^i}{n_B^i} & \text{if } r \text{ is even} \\ \left(\binom{n_B^i - 1}{(r-1)/2} \binom{n_R^i - 1}{(r-3)/2} + \binom{n_B^i - 1}{(r-3)/2} \binom{n_R^i - 1}{(r-1)/2} \right) / \binom{n_B^i + n_R^i}{n_B^i} & \text{if } r \text{ is odd} \end{cases}$$

Where r is the number of runs, and n_B^i and n_R^i are the number of black and red choices.

The serial independence hypothesis will be rejected at the 5 percent level if there are too few or too many runs, that is if $F(r | n_B^i, n_R^i) < 0.025$ or if $F(r-1 | n_B^i, n_R^i) > 0.975$, where

$$F(r | n_B^i, n_R^i) = \sum_{k=1}^r f(k | n_B^i, n_R^i).$$

Columns 7 and 8 report p-values for both alternatives. ** and * denote rejections at the 5 and 10 percent level respectively.

Appendix Table I6 - 4x4 Computer Game (Optimal)

Pair	Role	Player	WC	Choices		Runs (r)	F (r)	F (r - 1)
				Diamond	Non-Diamond			
1	row	P	yes	37	38	21	0.000 **	0.000
		C		33	42	37	0.456	0.365
2	column	P	yes	33	42	30	0.039 *	0.023
		C		27	48	25	0.006 **	0.003
3	row	P	no	22	53	42	0.999	0.998 **
		C		22	53	29	0.237	0.153
4	column	P	no	37	38	53	1.000	1.000 **
		C		30	45	30	0.058	0.035
5	row	P	no	33	42	26	0.003 **	0.002
		C		30	45	42	0.908	0.863
6	column	P	no	28	47	29	0.051	0.030
		C		24	51	32	0.371	0.286
7	row	P	yes	32	43	45	0.969	0.948
		C		32	43	29	0.026 *	0.014
8	column	P	yes	28	47	38	0.721	0.637
		C		31	44	34	0.245	0.177
9	row	P	no	31	44	33	0.177	0.121
		C		22	53	32	0.530	0.436
10	column	P	no	19	56	25	0.123	0.067
		C		33	42	42	0.858	0.798
11	row	P	no	29	46	37	0.590	0.489
		C		34	41	35	0.265	0.195
12	column	P	no	27	48	36	0.588	0.495
		C		28	47	44	0.983	0.969 *
13	row	P	no	33	42	33	0.146	0.099
		C		26	49	36	0.645	0.555
14	column	P	no	29	46	36	0.489	0.396
		C		23	52	34	0.658	0.568
15	row	P	no	27	48	28	0.038 *	0.022
		C		29	46	41	0.888	0.830
16	column	P	no	27	48	27	0.022 **	0.011
		C		28	47	33	0.260	0.185
17	row	P	no	24	51	21	0.001 **	0.000
		C		28	47	31	0.128	0.082
18	column	P	no	39	36	27	0.005 **	0.003
		C		23	52	24	0.011 **	0.006
19	row	P	no	35	40	29	0.019 **	0.011
		C		31	44	25	0.002 **	0.001
20	column	P	no	17	58	21	0.033 *	0.014
		C		41	34	36	0.348	0.265
21	row	P	no	44	31	42	0.890	0.839
		C		40	35	32	0.087	0.055
22	column	P	no	24	51	39	0.947	0.901
		C		30	45	26	0.005 **	0.003
23	row	P	no	36	39	24	0.001 **	0.000
		C		32	43	37	0.481	0.388

Appendix Table I6 continued

24	column	P	no	18	57	29	0.648	0.490
		C		37	38	37	0.408	0.322
25	row	P	no	39	36	38	0.506	0.413
		C		31	44	36	0.416	0.327
26	column	P	no	35	40	42	0.835	0.770
		C		26	49	27	0.029 *	0.015
27	row	P	no	20	55	18	0.000 **	0.000
		C		29	46	40	0.830	0.764
28	column	P	no	18	57	21	0.018 **	0.007
		C		36	39	38	0.506	0.413
29	row	P	no	12	63	25	1.000	0.917
		C		26	49	30	0.124	0.082
30	column	P	no	7	68	15	1.000	0.562
		C		52	23	32	0.445	0.354
31	row	P	no	34	41	40	0.707	0.622
		C		31	44	29	0.030 *	0.017
32	column	P	no	47	28	37	0.637	0.536
		C		23	52	23	0.006 **	0.003
33	row	P	yes	33	42	35	0.281	0.207
		C		24	51	25	0.016 **	0.008
34	column	P	yes	30	45	35	0.358	0.271
		C		29	46	43	0.957	0.927
35	row	P	no	29	46	15	0.000 **	0.000
		C		36	39	46	0.970	0.950 *
36	column	P	no	10	65	16	0.151	0.097
		C		45	30	38	0.639	0.548
37	row	P	yes	48	27	38	0.767	0.689
		C		45	30	38	0.639	0.548
38	column	P	yes	25	50	39	0.916	0.859
		C		30	45	33	0.199	0.137
39	row	P	yes	37	38	31	0.051	0.031
		C		37	38	41	0.757	0.680
40	column	P	yes	28	47	39	0.803	0.721
		C		31	44	38	0.605	0.512
41	row	P	no	41	34	42	0.845	0.782
		C		33	42	34	0.207	0.146
42	column	P	no	32	43	50	0.999	0.998 **
		C		23	52	39	0.970	0.937

Appendix table I6 reports results for both the human and computer from the runs test of serial independence of Gibbons and Chakraborti (1992). A run is defined as the number of times a player switches from one strategy to another (from diamond to non-diamond in this case). Column 2 reports whether the human player was a world-class poker player or not, while column 3 reports the role of the human player in each pair and column 4 shows whether the results given are for the human (P) or the computer (C). Column 5 reports the number of runs for the human and the computer, and columns 6 and 7 report the number of times each card is played. The test is based on the following distribution:

Appendix Table I6 continued

$$f(r | n_B^i, n_R^i) = \begin{cases} 2 \binom{n_B^i - 1}{(r/2) - 1} \binom{n_R^i - 1}{(r/2) - 1} / \binom{n_B^i + n_R^i}{n_B^i} & \text{if } r \text{ is even} \\ \left(\binom{n_B^i - 1}{(r-1)/2} \binom{n_R^i - 1}{(r-3)/2} + \binom{n_B^i - 1}{(r-3)/2} \binom{n_R^i - 1}{(r-1)/2} \right) / \binom{n_B^i + n_R^i}{n_B^i} & \text{if } r \text{ is odd} \end{cases}$$

Where r is the number of runs, and n_B^i and n_R^i are the number of black and red choices.

The serial independence hypothesis will be rejected at the 5 percent level if there are too few or too many runs, that is if $F(r | n_B^i, n_R^i) < 0.025$ or if $F(r-1 | n_B^i, n_R^i) > 0.975$, where

$F(r | n_B^i, n_R^i) = \sum_{k=1}^r f(k | n_B^i, n_R^i)$. Columns 8 and 9 report p-values for both alternatives. ** and * denote rejections at the 5 and 10 percent levels respectively.

Appendix Table J1 - 4x4 Computer Game (Naïve)

		Computer Choice				Marginal Frequencies for Player
		C	D	H	S	
Player Choice	C	0.061 (0.040) {0.0005}	0.055 (0.080) {0.0006}	0.057 (0.040) {0.0004}	0.057 (0.040) {0.0004}	0.230 (0.200) {0.0007}
	D	0.104 (0.080) {0.0005}	0.097 (0.160) {0.0014}	0.103 (0.080) {0.0005}	0.111 (0.080) {0.0007}	0.415 (0.400) {0.0003}
	H	0.043 (0.040) {0.0001}	0.037 (0.080) {0.0010}	0.055 (0.040) {0.0003}	0.041 (0.040) {0.0000}	0.176 (0.200) {0.0005}
	S	0.039 (0.040) {0.0000}	0.051 (0.080) {0.0007}	0.053 (0.040) {0.0003}	0.035 (0.040) {0.0001}	0.178 (0.200) {0.0005}
Marginal Frequencies for Computer		0.247 (0.200) {0.0011}	0.240 (0.400) {0.0036}	0.269 (0.200) {0.0016}	0.244 (0.200) {0.0010}	
N		1950				
#pairs		26				
Player p-value		0.000				

Appendix table J1 reports the aggregate marginal and joint frequencies for professional poker players and computers in the 4x4 computer game that is programmed for naïve play. Numbers in parentheses represent the minimax predicted frequencies, while numbers in brackets represent the standard deviations of the observed frequencies from the predicted frequencies. The p-value from a chi-square goodness of fit test (with three degrees of freedom) of the observed marginal frequencies to the predicted frequencies are also reported for the human players.

Appendix Table J2 - 4x4 Computer Game (Naïve)

		Player				Computer				P-values from Chi-Squared Test on Minimax Predicted Values			
Pair	WC	Player's Role	C	D	H	S	C	D	H	S	Player	Computer	Joint
1	no	row	0.160	0.627	0.120	0.093	0.280	0.267	0.240	0.213	0.001 **	0.094 *	0.003 **
2	no	column	0.227	0.133	0.227	0.413	0.253	0.160	0.307	0.280	0.000 **	0.000 **	0.000 **
3	no	row	0.227	0.413	0.093	0.267	0.213	0.253	0.240	0.293	0.101	0.047 **	0.001 **
4	no	column	0.267	0.080	0.307	0.347	0.213	0.267	0.293	0.227	0.000 **	0.074 *	0.000 **
5	no	row	0.227	0.267	0.307	0.200	0.200	0.333	0.267	0.200	0.049 **	0.475	0.237
6	no	column	0.227	0.240	0.333	0.200	0.227	0.240	0.240	0.293	0.008 **	0.030 **	0.001 **
7	no	row	0.000	1.000	0.000	0.000	0.147	0.160	0.293	0.400	0.000 **	0.000 **	0.000 **
8	no	column	0.707	0.067	0.040	0.187	0.213	0.227	0.293	0.267	0.000 **	0.014 **	0.000 **
9	no	row	0.147	0.707	0.067	0.080	0.347	0.253	0.160	0.240	0.000 **	0.004 **	0.000 **
10	no	column	0.187	0.240	0.227	0.347	0.227	0.267	0.280	0.227	0.004 **	0.099 *	0.008 **
11	no	row	0.000	0.960	0.040	0.000	0.240	0.253	0.213	0.293	0.000 **	0.047 **	0.000 **
12	no	column	0.320	0.147	0.253	0.280	0.147	0.240	0.400	0.213	0.000 **	0.000 **	0.000 **
13	no	row	0.000	1.000	0.000	0.000	0.293	0.160	0.293	0.253	0.000 **	0.000 **	0.000 **
14	no	column	0.280	0.120	0.320	0.280	0.187	0.253	0.267	0.293	0.000 **	0.029 **	0.000 **
15	no	row	0.147	0.627	0.120	0.107	0.267	0.253	0.267	0.213	0.001 **	0.059 *	0.002 **
16	no	column	0.427	0.067	0.333	0.173	0.280	0.240	0.240	0.240	0.000 **	0.038 **	0.000 **
17	no	row	0.240	0.627	0.120	0.013	0.253	0.240	0.320	0.187	0.000 **	0.010 **	0.000 **
18	no	column	0.333	0.120	0.333	0.213	0.293	0.253	0.320	0.133	0.000 **	0.002 **	0.000 **
19	no	row	0.080	0.920	0.000	0.000	0.307	0.213	0.200	0.280	0.000 **	0.004 **	0.000 **
20	no	column	0.307	0.000	0.227	0.467	0.253	0.227	0.293	0.227	0.000 **	0.017 **	0.000 **
21	no	row	0.107	0.627	0.173	0.093	0.387	0.253	0.147	0.213	0.001 **	0.000 **	0.001 **
22	no	column	0.333	0.187	0.253	0.227	0.187	0.227	0.360	0.227	0.001 **	0.001 **	0.000 **
23	yes	row	0.173	0.680	0.093	0.053	0.307	0.187	0.227	0.280	0.000 **	0.001 **	0.000 **
24	yes	column	0.307	0.160	0.187	0.347	0.267	0.253	0.293	0.187	0.000 **	0.029 **	0.000 **
25	no	row	0.213	0.533	0.173	0.080	0.240	0.213	0.333	0.213	0.028 **	0.003 **	0.018 **
26	no	column	0.347	0.240	0.240	0.173	0.200	0.347	0.200	0.253	0.003 **	0.659	0.199

Appendix table J2 reports individual-level results for the Pearson Chi-square test of goodness of fit of the observed frequencies to the minimax predicted frequencies. In this case, the computer is programmed for naïve play. Column 2 reports whether the human player in each pair is a world-class poker player or not, while column 3 reports the human player's role. Columns 4-7 show the observed frequencies for the human player on each card, while columns 8-11 show observed frequencies for the computer on each card. The last three columns report the p-values for the human, the computer and for the joint frequencies of both respectively. ** and * denote rejections at the 5 and 10 percent levels. The test uses three degrees of freedom for the marginal frequencies and fifteen for the joint frequencies.

Appendix Table J3 - 4x4 Computer Game (Naïve)

Pair	WC	Player's Role	Mixtures		Win Rates		Pearson	P-value
			Diamond	Non-Diamond	Diamond	Non-Diamond		
1	no	row	47	28	0.702	0.571	19.315	0.000 **
2	no	column	10	65	0.300	0.585	35.694	0.000 **
3	no	row	31	44	0.903	0.614	12.361	0.006 **
4	no	column	6	69	0.167	0.449	33.343	0.000 **
5	no	row	20	55	0.800	0.545	8.611	0.035 **
6	no	column	18	57	0.111	0.561	19.593	0.000 **
7	no	row	75	0	0.840	0.000	157.500	0.000 **
8	no	column	5	70	0.400	0.571	48.056	0.000 **
9	no	row	53	22	0.717	0.409	36.361	0.000 **
10	no	column	18	57	0.278	0.386	8.731	0.033 **
11	no	row	72	3	0.736	0.333	111.398	0.000 **
12	no	column	11	64	0.273	0.422	20.509	0.000 **
13	no	row	75	0	0.840	0.000	157.500	0.000 **
14	no	column	9	66	0.111	0.455	26.639	0.000 **
15	no	row	47	28	0.702	0.536	19.556	0.000 **
16	no	column	5	70	0.200	0.429	35.231	0.000 **
17	no	row	47	28	0.745	0.500	23.204	0.000 **
18	no	column	9	66	0.111	0.500	29.472	0.000 **
19	no	row	69	6	0.768	0.333	103.426	0.000 **
20	no	column	0	75	0.000	0.533	59.259	0.000 **
21	no	row	47	28	0.702	0.393	22.370	0.000 **
22	no	column	14	61	0.214	0.574	25.565	0.000 **
23	yes	row	51	24	0.765	0.333	38.093	0.000 **
24	yes	column	12	63	0.333	0.540	25.259	0.000 **
25	no	row	40	35	0.800	0.543	14.815	0.002 **
26	no	column	18	57	0.444	0.439	8.537	0.036 **

Appendix table J3 reports results for the human player only for the test that success rates are equal to the minimax predicted success rates and are equal across strategies. Column 2 reports whether or not the human player in each pair is a world-class poker player, while column 3 shows whether the human player was row or column. Play is broken down into two strategies – diamond and non-diamond cards – before being analyzed. Columns 4 – 7 report the observed success and failure rates for each strategy for the human player. Columns 8 and 9 report the test statistics from the Pearson chi-square test (with 3 degrees of freedom) of goodness of fit of the observed success and failure rates to the equilibrium rates. ** and * denote rejections at the 5 and 10 percent levels respectively.

Appendix Table J4 - 4x4 Computer Game (Naïve)

Pair	WC	Player's Role	Player/Computer	Mixtures		Win Rates		Pearson	P-value
				Diamond	Non-Diamond	Diamond	Non-Diamond		
1	no	Row	P	47	28	0.702	0.571	19.315	0.000 **
			C	20	55	0.700	0.218	19.815	0.000 **
2	no	Column	P	10	65	0.300	0.585	35.694	0.000 **
			C	12	63	0.750	0.397	33.620	0.000 **
3	no	Row	P	31	44	0.903	0.614	12.361	0.006 **
			C	19	56	0.158	0.304	12.361	0.006 **
4	no	Column	P	6	69	0.167	0.449	33.343	0.000 **
			C	20	55	0.950	0.436	19.861	0.000 **
5	no	Row	P	20	55	0.800	0.545	8.611	0.035 **
			C	25	50	0.160	0.500	8.704	0.034 **
6	no	Column	P	18	57	0.111	0.561	19.593	0.000 **
			C	18	57	0.889	0.439	19.593	0.000 **
7	no	Row	P	75	0	0.840	0.000	157.500	0.000 **
			C	12	63	1.000	0.000	84.000	0.000 **
8	no	Column	P	5	70	0.400	0.571	48.056	0.000 **
			C	17	58	0.882	0.310	38.722	0.000 **
9	no	Row	P	53	22	0.717	0.409	36.361	0.000 **
			C	19	56	0.789	0.232	22.509	0.000 **
10	no	Column	P	18	57	0.278	0.386	8.731	0.033 **
			C	20	55	0.750	0.600	6.806	0.078 *
11	no	Row	P	72	3	0.736	0.333	111.398	0.000 **
			C	19	56	1.000	0.036	63.306	0.000 **
12	no	Column	P	11	64	0.273	0.422	20.509	0.000 **
			C	18	57	0.833	0.526	12.083	0.007 **
13	no	Row	P	75	0	0.840	0.000	157.500	0.000 **
			C	12	63	1.000	0.000	84.000	0.000 **
14	no	Column	P	9	66	0.111	0.455	26.639	0.000 **
			C	19	56	0.947	0.464	18.120	0.000 **
15	no	Row	P	47	28	0.702	0.536	19.556	0.000 **
			C	19	56	0.737	0.232	20.593	0.000 **
16	no	Column	P	5	70	0.200	0.429	35.231	0.000 **
			C	18	57	0.944	0.474	18.139	0.000 **
17	no	Row	P	47	28	0.745	0.500	23.204	0.000 **
			C	18	57	0.667	0.246	18.370	0.000 **
18	no	Column	P	9	66	0.111	0.500	29.472	0.000 **
			C	19	56	0.947	0.411	23.176	0.000 **
19	no	Row	P	69	6	0.768	0.333	103.426	0.000 **
			C	16	59	1.000	0.068	59.259	0.000 **
20	no	Column	P	0	75	0.000	0.533	59.259	0.000 **
			C	17	58	1.000	0.310	41.944	0.000 **
21	no	Row	P	47	28	0.702	0.393	22.370	0.000 **
			C	19	56	0.737	0.304	15.111	0.002 **
22	no	Column	P	14	61	0.214	0.574	25.565	0.000 **
			C	17	58	0.824	0.397	24.287	0.000 **
23	yes	Row	P	51	24	0.765	0.333	38.093	0.000 **
			C	14	61	0.857	0.262	26.444	0.000 **
24	yes	Column	P	12	63	0.333	0.540	25.259	0.000 **
			C	19	56	0.789	0.393	20.981	0.000 **
25	no	Row	P	40	35	0.800	0.543	14.815	0.002 **
			C	16	59	0.500	0.271	16.593	0.001 **
26	no	Column	P	18	57	0.444	0.439	8.537	0.036 **
			C	26	49	0.692	0.490	4.389	0.222

Appendix Table J4 continued

Appendix table J4 reports results for both the human and computer from the test that success rates are equal to the minimax predicted success rates and are equal across strategies. Column 2 reports whether or not the human player in each pair is a world-class poker player, while column 3 shows whether the human player was row or column and column 4 shows whether the reported results are for the human (P) or the computer (C). Play is broken down into two strategies – diamond and non-diamond cards – before being analyzed. Columns 4 – 7 report the observed success and failure rates for each strategy for the human player. Columns 8 and 9 report the test statistics from the Pearson chi-square test (with 3 degrees of freedom) of goodness of fit of the observed success and failure rates to the equilibrium rates. ** and * denote rejections at the 5 and 10 percent levels respectively.

Appendix Table J5 - 4x4 Computer Game (Naïve)

Pair	WC	Player's Role	Choices		Runs	F(r)	F(r - 1)
			Diamond	Non-Diamond			
1	no	row	47	28	30	0.082	0.051
2	no	column	10	65	21	1.000	0.817
3	no	row	31	44	34	0.245	0.177
4	no	column	6	69	11	0.353	0.090
5	no	row	20	55	31	0.640	0.499
6	no	column	18	57	23	0.067	0.032
7	no	row	75	0	1	0.000 **	0.000
8	no	column	5	70	9	0.249	0.045
9	no	row	53	22	30	0.317	0.237
10	no	column	18	57	27	0.396	0.260
11	no	row	72	3	3	0.001 **	0.000
12	no	column	11	64	15	0.036 *	0.011
13	no	row	75	0	1	0.000 **	0.000
14	no	column	9	66	19	1.000	0.745
15	no	row	47	28	31	0.128	0.082
16	no	column	5	70	11	1.000	0.349
17	no	row	47	28	30	0.082	0.051
18	no	column	9	66	19	1.000	0.745
19	no	row	69	6	13	0.456	0.456
20	no	column	0	75	1	0.000 **	0.000
21	no	row	47	28	22	0.000 **	0.000
22	no	column	14	61	19	0.062	0.025
23	yes	row	51	24	32	0.371	0.286
24	yes	column	12	63	23	0.878	0.660
25	no	row	40	35	58	1.000	1.000 **
26	no	column	18	57	35	0.996	0.978 **

Appendix table J5 reports results for the human player only from the runs test of serial independence of Gibbons and Chakraborti (1992). A run is defined as the number of times a player switches from one strategy to another (from diamond to non-diamond in this case). Column 2 reports whether the human player was a world-class poker player or not, while column 3 reports the role of the human player in each pair. Column 4 reports the number of runs for the human player, and columns 5 and 6 report the number of times each card is played. The test is based on the following distribution:

$$f(r | n_B^i, n_R^i) = \begin{cases} 2 \binom{n_B^i - 1}{(r/2) - 1} \binom{n_R^i - 1}{(r/2) - 1} / \binom{n_B^i + n_R^i}{n_B^i} & \text{if } r \text{ is even} \\ \left(\binom{n_B^i - 1}{(r-1)/2} \binom{n_R^i - 1}{(r-3)/2} + \binom{n_B^i - 1}{(r-3)/2} \binom{n_R^i - 1}{(r-1)/2} \right) / \binom{n_B^i + n_R^i}{n_B^i} & \text{if } r \text{ is odd} \end{cases}$$

Where r is the number of runs, and n_B^i and n_R^i are the number of black and red choices.

The serial independence hypothesis will be rejected at the 5 percent level if there are too few or too many runs, that is if $F(r | n_B^i, n_R^i) < 0.025$ or if $F(r-1 | n_B^i, n_R^i) > 0.975$, where

$$F(r | n_B^i, n_R^i) = \sum_{k=1}^r f(k | n_B^i, n_R^i).$$

Columns 7 and 8 report p-values for both alternatives. ** and * denote rejections at the 5 and 10 percent levels respectively.

Appendix Table J6 - 4x4 Computer Game (Naïve)

Pair	Player's Role	Player/Computer	WC	Choices		Runs	F(r)	F(r - 1)
				Diamond	Non-Diamond			
1	row	P	no	47	28	30	0.082	0.051
		C		20	55	35	0.948	0.887
2	column	P	no	10	65	21	1.000	0.817
		C		12	63	23	0.878	0.660
3	row	P	no	31	44	34	0.245	0.177
		C		19	56	25	0.123	0.067
4	column	P	no	6	69	11	0.353	0.090
		C		20	55	34	0.887	0.836
5	row	P	no	20	55	31	0.640	0.499
		C		25	50	40	0.947	0.916
6	column	P	no	18	57	23	0.067	0.032
		C		18	57	30	0.731	0.648
7	row	P	no	75	0	1	0.000 **	0.000
		C		12	63	23	0.878	0.660
8	column	P	no	5	70	9	0.249	0.045
		C		17	58	26	0.369	0.282
9	row	P	no	53	22	30	0.317	0.237
		C		19	56	25	0.123	0.067
10	column	P	no	18	57	27	0.396	0.260
		C		20	55	27	0.205	0.124
11	row	P	no	72	3	3	0.001 **	0.000
		C		19	56	31	0.751	0.612
12	column	P	no	11	64	15	0.036 *	0.011
		C		18	57	30	0.731	0.648
13	row	P	no	75	0	1	0.000 **	0.000
		C		12	63	21	0.570	0.335
14	column	P	no	9	66	19	1.000	0.745
		C		19	56	29	0.519	0.374
15	row	P	no	47	28	31	0.128	0.082
		C		19	56	30	0.612	0.519
16	column	P	no	5	70	11	1.000	0.349
		C		18	57	33	0.963	0.901
17	row	P	no	47	28	30	0.082	0.051
		C		18	57	27	0.396	0.260
18	column	P	no	9	66	19	1.000	0.745
		C		19	56	33	0.910	0.819
19	row	P	no	69	6	13	0.456	0.456
		C		16	59	27	0.687	0.508
20	column	P	no	0	75	1	0.000 **	0.000
		C		17	58	29	0.780	0.625
21	row	P	no	47	28	22	0.000 **	0.000
		C		19	56	23	0.040 *	0.019
22	column	P	no	14	61	19	0.062	0.025
		C		17	58	30	0.842	0.780
23	row	P	yes	51	24	32	0.371	0.286
		C		14	61	25	0.763	0.561

Appendix Table J6 continued

24	column	P	yes	12	63	23	0.878	0.660
		C		19	56	23	0.040 *	0.019
25	row	P	no	40	35	58	1.000	1.000 **
		C		16	59	23	0.186	0.098
26	column	P	no	18	57	35	0.996	0.978 **
		C		26	49	41	0.957	0.921

Appendix table J6 reports results from the runs test of serial independence of Gibbons and Chakraborti (1992). A run is defined as the number of times a player switches from one strategy to another (from diamond to non-diamond in this case). Column 2 reports whether the human player was a world-class poker player or not, while column 3 reports the role of the human player in each pair and column 4 shows whether the results given are for the human (P) or the computer (C). Column 5 reports the number of runs for the human and the computer, and columns 6 and 7 report the number of times each card is played. The test is based on the following distribution:

$$f(r | n_B^i, n_R^i) = \begin{cases} 2 \binom{n_B^i - 1}{(r/2) - 1} \binom{n_R^i - 1}{(r/2) - 1} / \binom{n_B^i + n_R^i}{n_B^i} & \text{if } r \text{ is even} \\ \left(\binom{n_B^i - 1}{(r-1)/2} \binom{n_R^i - 1}{(r-3)/2} + \binom{n_B^i - 1}{(r-3)/2} \binom{n_R^i - 1}{(r-1)/2} \right) / \binom{n_B^i + n_R^i}{n_B^i} & \text{if } r \text{ is odd} \end{cases}$$

Where r is the number of runs, and n_B^i and n_R^i are the number of black and red choices.

The serial independence hypothesis will be rejected at the 5 percent level if there are too few or too many runs, that is if $F(r | n_B^i, n_R^i) < 0.025$ or if $F(r-1 | n_B^i, n_R^i) > 0.975$, where

$F(r | n_B^i, n_R^i) = \sum_{k=1}^r f(k | n_B^i, n_R^i)$. Columns 8 and 9 report p-values for both alternatives. ** and * denote rejections at the 5 and 10 percent levels respectively.

Appendix Table K1: 4x4 Game - Professional Soccer Players

		Column Player Choice				Marginal Frequencies for Row Player
		C	D	H	S	
Row Player Choice	C	0.042 (0.040) {0.0000}	0.065 (0.080) {0.0003}	0.031 (0.040) {0.0002}	0.033 (0.040) {0.0001}	0.171 (0.200) {0.0006}
	D	0.106 (0.080) {0.0002}	0.177 (0.016) {0.0003}	0.070 (0.080) {0.0000}	0.074 (0.080) {0.0001}	0.427 (0.400) {0.0006}
	H	0.043 (0.040) {0.0001}	0.085 (0.080) {0.0005}	0.035 (0.040) {0.0001}	0.046 (0.040) {0.0001}	0.209 (0.200) {0.0002}
	S	0.040 (0.040) {0.0000}	0.081 (0.080) {0.0001}	0.037 (0.040) {0.0001}	0.036 (0.040) {0.0001}	0.193 (0.200) {0.0001}
Marginal Frequencies for Column Player		0.231 (0.200) {0.0006}	0.407 (0.400) {0.0001}	0.173 (0.200) {0.0006}	0.189 (0.200) {0.0002}	
N		2400				
#pairs		32				
Row p-value		0.001102				
Column p-value		5.54E-05				
Pooled p-value		0.058313				

Appendix table K1 reports the aggregate marginal and joint frequencies for the professional soccer players in the 4x4 game. Numbers in parentheses represent the minimax predicted frequencies, while numbers in brackets represent the standard deviations of the observed frequencies from the predicted frequencies. P-values from a Chi-square goodness of fit test of the observed marginal frequencies to the predicted frequencies are also reported for each role.

Appendix Table K2: 4x4 Game - Professional Soccer Players

Row Player Choices					Column Player Choices				P-values from Chi-Squared Test on Minimax Predictions		
Pair	C	D	H	S	C	D	H	S	Row Player	Column Player	Both Players
1	0.133	0.533	0.173	0.160	0.253	0.307	0.213	0.227	0.118	0.387	0.024 **
2	0.093	0.373	0.253	0.280	0.200	0.493	0.173	0.133	0.049 **	0.312	0.000 **
3	0.147	0.480	0.200	0.173	0.213	0.480	0.133	0.173	0.469	0.362	0.747
4	0.253	0.520	0.147	0.080	0.240	0.440	0.120	0.200	0.017 **	0.348	0.281
5	0.227	0.333	0.227	0.213	0.147	0.360	0.333	0.160	0.698	0.035 **	0.091 *
6	0.147	0.413	0.240	0.200	0.200	0.333	0.253	0.213	0.637	0.579	0.948
7	0.107	0.653	0.147	0.093	0.253	0.280	0.173	0.293	0.000 **	0.063 *	0.002 **
8	0.160	0.480	0.240	0.120	0.280	0.400	0.107	0.213	0.187	0.125	0.299
9	0.187	0.333	0.293	0.187	0.147	0.520	0.147	0.187	0.237	0.179	0.077 *
10	0.093	0.440	0.253	0.213	0.147	0.387	0.267	0.200	0.127	0.429	0.704
11	0.187	0.400	0.200	0.213	0.213	0.427	0.200	0.160	0.988	0.849	0.999
12	0.147	0.480	0.187	0.187	0.213	0.387	0.187	0.213	0.494	0.972	0.960
13	0.133	0.573	0.160	0.133	0.267	0.427	0.160	0.147	0.023 **	0.325	0.203
14	0.133	0.507	0.200	0.160	0.293	0.307	0.147	0.253	0.221	0.071 *	0.203
15	0.147	0.413	0.213	0.227	0.240	0.480	0.147	0.133	0.698	0.209	0.685
16	0.267	0.387	0.120	0.227	0.120	0.467	0.253	0.160	0.224	0.179	0.451
17	0.147	0.307	0.240	0.307	0.200	0.307	0.280	0.213	0.056 *	0.251	0.065 *
18	0.080	0.613	0.187	0.120	0.253	0.467	0.120	0.160	0.001 **	0.179	0.033 **
19	0.240	0.293	0.227	0.240	0.280	0.320	0.187	0.213	0.308	0.292	0.422
20	0.200	0.333	0.307	0.160	0.200	0.467	0.187	0.147	0.127	0.579	0.723
21	0.147	0.440	0.160	0.253	0.187	0.360	0.267	0.187	0.387	0.552	0.157
22	0.240	0.333	0.280	0.147	0.280	0.173	0.227	0.320	0.179	0.001 **	0.021 *
23	0.333	0.293	0.187	0.187	0.240	0.347	0.227	0.187	0.030 **	0.690	0.399
24	0.240	0.333	0.213	0.213	0.173	0.480	0.187	0.160	0.667	0.545	0.917
25	0.200	0.520	0.133	0.147	0.253	0.360	0.187	0.200	0.143	0.698	0.647
26	0.173	0.507	0.187	0.133	0.293	0.600	0.053	0.053	0.247	0.000 **	0.002 **
27	0.040	0.440	0.067	0.453	0.227	0.480	0.093	0.200	0.000 **	0.125	0.000 **
28	0.187	0.347	0.160	0.307	0.280	0.467	0.107	0.147	0.141	0.056 *	0.350
29	0.147	0.333	0.373	0.147	0.253	0.360	0.213	0.173	0.003 **	0.637	0.182
30	0.147	0.520	0.200	0.133	0.267	0.493	0.067	0.173	0.143	0.017 **	0.001 **
31	0.173	0.440	0.320	0.067	0.187	0.453	0.120	0.240	0.006 **	0.308	0.017 **
32	0.213	0.293	0.187	0.307	0.400	0.400	0.000	0.200	0.088 *	0.000 **	0.000 **

Appendix Table K2 continued

Appendix table K2 reports individual-level results for the Pearson Chi-square test of goodness of fit of the observed frequencies to the minimax predicted frequencies. The first four columns show the observed frequencies for the row player on each card, while the columns 5-8 show the observed frequencies for the column player on each card. The last three columns report the p-values for the row player, column player and for the joint frequencies of both players respectively. ** and * denote rejections at the 5 and 10 percent levels. The test uses three degrees of freedom for the marginal frequencies and fifteen for the joint frequencies.

Appendix Table K3: 4x4 Game - Professional Soccer Players

Pair	Player	Mixtures		Win Rates		Pearson	p-value
		Diamond	Non-Diamond	Diamond	Non-Diamond		
1	R	0.533	0.467	0.825	0.657	17.176	0.001 **
	C	0.307	0.693	0.304	0.231	10.565	0.014 **
2	R	0.373	0.627	0.036	0.362	46.509	0.000 **
	C	0.493	0.507	0.730	0.789	43.676	0.000 **
3	R	0.480	0.520	0.472	0.615	4.972	0.174
	C	0.480	0.520	0.528	0.385	4.972	0.174
4	R	0.520	0.480	0.590	0.722	6.315	0.097 *
	C	0.440	0.560	0.485	0.238	5.870	0.118
5	R	0.333	0.667	0.600	0.460	5.926	0.115
	C	0.360	0.640	0.370	0.563	6.222	0.101
6	R	0.413	0.587	0.677	0.500	2.648	0.449
	C	0.333	0.667	0.400	0.440	1.759	0.624
7	R	0.653	0.347	0.735	0.500	26.731	0.000 **
	C	0.280	0.720	0.619	0.241	14.287	0.003 **
8	R	0.480	0.520	0.611	0.564	2.204	0.531
	C	0.400	0.600	0.467	0.378	0.648	0.885
9	R	0.333	0.667	0.280	0.640	10.648	0.014 **
	C	0.520	0.480	0.462	0.500	6.500	0.090 *
10	R	0.440	0.560	0.636	0.619	0.759	0.859
	C	0.387	0.613	0.414	0.348	0.611	0.894
11	R	0.400	0.600	0.533	0.644	0.926	0.819
	C	0.427	0.573	0.438	0.372	0.556	0.907
12	R	0.480	0.520	0.639	0.487	4.065	0.255
	C	0.387	0.613	0.448	0.435	0.565	0.904
13	R	0.573	0.427	0.558	0.719	11.176	0.011 **
	C	0.427	0.573	0.594	0.209	11.787	0.008 **
14	R	0.507	0.493	0.658	0.459	6.731	0.081 *
	C	0.307	0.693	0.565	0.385	4.787	0.188
15	R	0.413	0.587	0.516	0.614	1.028	0.795
	C	0.480	0.520	0.417	0.436	2.231	0.526
16	R	0.387	0.613	0.448	0.609	2.759	0.430
	C	0.467	0.533	0.457	0.450	2.315	0.510
17	R	0.307	0.693	0.826	0.654	7.204	0.066 *
	C	0.307	0.693	0.174	0.346	7.204	0.066 *
18	R	0.613	0.387	0.565	0.690	15.204	0.002 **
	C	0.467	0.533	0.571	0.225	10.926	0.012 **
19	R	0.293	0.707	0.682	0.472	8.287	0.040 **
	C	0.320	0.680	0.292	0.549	8.287	0.040 **
20	R	0.333	0.667	0.480	0.640	3.009	0.390
	C	0.467	0.533	0.371	0.450	1.898	0.594
21	R	0.440	0.560	0.545	0.500	2.583	0.460
	C	0.360	0.640	0.556	0.438	3.250	0.355
22	R	0.333	0.667	0.880	0.460	12.731	0.005 **
	C	0.173	0.827	0.231	0.435	17.176	0.001 **
23	R	0.293	0.707	0.682	0.585	4.065	0.255
	C	0.347	0.653	0.269	0.449	3.028	0.387

Appendix Table K3 continued

24	R	0.333	0.667	0.520	0.700	4.259	0.235
	C	0.480	0.520	0.333	0.385	2.833	0.418
25	R	0.520	0.480	0.718	0.694	8.509	0.037 **
	C	0.360	0.640	0.407	0.229	6.731	0.081 *
26	R	0.507	0.493	0.474	0.784	11.037	0.012 **
	C	0.600	0.400	0.444	0.267	14.537	0.002 **
27	R	0.440	0.560	0.576	0.667	1.315	0.726
	C	0.480	0.520	0.389	0.359	2.259	0.520
28	R	0.347	0.653	0.538	0.714	4.148	0.246
	C	0.467	0.533	0.343	0.350	2.315	0.510
29	R	0.333	0.667	0.640	0.540	2.361	0.501
	C	0.360	0.640	0.333	0.479	2.287	0.515
30	R	0.520	0.480	0.538	0.806	10.370	0.016 **
	C	0.493	0.507	0.486	0.184	10.370	0.016 **
31	R	0.440	0.560	0.636	0.667	1.426	0.699
	C	0.453	0.547	0.353	0.341	1.778	0.620
32	R	0.293	0.707	0.500	0.585	4.287	0.232
	C	0.400	0.600	0.367	0.489	1.620	0.655

Appendix table K3 reports results for the test that success rates are equal to the minimax predicted success rates and are equal across strategies. Play is broken down into two strategies – diamond and non-diamond cards – before being analyzed. Columns 3 – 6 report the observed success and failure rates for each strategy and each player. Columns 7 and 8 report the test statistics from the Pearson Chi-square test (with 3 degrees of freedom) of goodness of fit of the observed success and failure rates to the equilibrium rates.

Appendix Table K4: 4x4 Game - Professional Soccer Players

Pair	Player	Runs	Choices		F(r)	F(r - 1)
			Diamond	Non-Diamond		
1	R	40	40	35	0.694	0.607
	C	31	23	52	0.354	0.249
2	R	48	28	47	0.999	0.998 **
	C	45	37	38	0.949	0.919
3	R	41	36	39	0.761	0.685
	C	44	36	39	0.921	0.881
4	R	41	39	36	0.761	0.685
	C	36	33	42	0.365	0.281
5	R	33	25	50	0.415	0.310
	C	41	27	48	0.936	0.892
6	R	41	31	44	0.839	0.772
	C	33	25	50	0.415	0.310
7	R	39	49	26	0.881	0.813
	C	34	21	54	0.817	0.749
8	R	40	36	39	0.685	0.597
	C	34	30	45	0.271	0.199
9	R	32	25	50	0.310	0.231
	C	44	39	36	0.921	0.881
10	R	34	33	42	0.207	0.146
	C	36	29	46	0.489	0.396
11	R	24	30	45	0.001 **	0.001
	C	38	32	43	0.575	0.481
12	R	43	36	39	0.881	0.828
	C	30	29	46	0.068	0.042
13	R	33	43	32	0.160	0.109
	C	41	32	43	0.817	0.747
14	R	48	38	37	0.990	0.982 **
	C	38	23	52	0.937	0.903
15	R	34	31	44	0.245	0.177
	C	31	36	39	0.053	0.032
16	R	28	29	46	0.024 **	0.013
	C	40	35	40	0.694	0.607
17	R	35	23	52	0.766	0.658
	C	34	23	52	0.658	0.568
18	R	37	46	29	0.590	0.489
	C	30	35	40	0.033 *	0.019
19	R	28	22	53	0.153	0.103
	C	31	24	51	0.286	0.197
20	R	36	25	50	0.707	0.621
	C	34	35	40	0.186	0.129
21	R	39	33	42	0.641	0.550
	C	33	27	48	0.303	0.218
22	R	32	25	50	0.310	0.231
	C	21	13	62	0.352	0.187
23	R	30	22	53	0.317	0.237
	C	46	26	49	0.999	0.998 **

Appendix Table K4 continued

24	R	33	25	50	0.415	0.310
	C	37	36	39	0.413	0.326
25	R	35	39	36	0.246	0.180
	C	40	27	48	0.892	0.842
26	R	42	38	37	0.825	0.757
	C	34	45	30	0.271	0.199
27	R	38	33	42	0.550	0.456
	C	44	36	39	0.921	0.881
28	R	43	26	49	0.988	0.974 *
	C	45	35	40	0.953	0.926
29	R	41	25	50	0.974	0.947
	C	32	27	48	0.218	0.154
30	R	33	39	36	0.125	0.083
	C	35	37	38	0.243	0.177
31	R	35	33	42	0.281	0.207
	C	45	34	41	0.958	0.932
32	R	35	22	53	0.837	0.739
	C	33	30	45	0.199	0.137

Appendix table K4 reports results from the runs test of serial independence of Gibbons and Chakraborti (1992). A run is defined as the number of times a player switches from one strategy to another (from black to red in this case). Column 3 reports the number of runs for each player and columns 4 and 5 report the number of times each card is played. The test is based on the following distribution:

$$f(r | n_B^i, n_R^i) = \begin{cases} 2 \binom{n_B^i - 1}{(r/2) - 1} \binom{n_R^i - 1}{(r/2) - 1} / \binom{n_B^i + n_R^i}{n_B^i} & \text{if } r \text{ is even} \\ \left(\binom{n_B^i - 1}{(r-1)/2} \binom{n_R^i - 1}{(r-3)/2} + \binom{n_B^i - 1}{(r-3)/2} \binom{n_R^i - 1}{(r-1)/2} \right) / \binom{n_B^i + n_R^i}{n_B^i} & \text{if } r \text{ is odd} \end{cases}$$

Where r is the number of runs, and n_B^i and n_R^i are the number of black and red choices. The serial independence hypothesis will be rejected at the 5 percent level if there are too few or too many runs, that is if $F(r | n_B^i, n_R^i) < 0.025$ or if $F(r-1 | n_B^i, n_R^i) > 0.975$, where $F(r | n_B^i, n_R^i) = \sum_{k=1}^r f(k | n_B^i, n_R^i)$. Columns 6 and 7 report p-values for both alternatives.