Supplementary Materials 1: Task instructions

All instructions as outlined below appeared on the screen. The experimenter read these instructions to the participant aloud. The experimenter continued to the next screen in case the participant confirmed understanding the instructions.

Instructions GMT Part I: Risk vs EV

Loss-probability version:

Screen 1

Welcome to the gambling machine game!
Before we start, we'll briefly explain the game.
Please read the instructions carefully.
This is a gambling machine:
[*picture of one gambling machine*]
If you select this gambling machine, the balls will be shuffled and one random ball will be selected.

Screen 2

Every gambling machine contains 10 balls. Some of them are green and some of them are red. On the gambling machine is a number. This is the number of points you **always** win if you select this gambling machine (next to the arrow).
[*picture of gambling machine, with an arrow next to the constant gain*]
If the gambling machine selects a **green** ball, you will **win** the number of points on the gambling machine and you will lose nothing.
But if the gambling machine selects a **red** ball, you will still **win** the number of points on the gambling machine, but you will **also lose** the number of points on the red ball.

Screen 3

[*4 pictures of a single gambling machine on screen*]
To select a gambling machine you can press the button below the machine.
This will shuffle the balls, so the position of the balls before shuffling is not important [*shuffling balls on second picture*].
Then, 1 random ball is selected from the machine [*selected green ball on third picture, emphasized by an arrow*].
For your next decision, this ball is thrown back into the machine [*ball falling back into the machine on the fourth picture*].

Screen 4

So that will look like this:
[*picture gambling machine*]
Now, a green ball is selected [*picture shows a green ball, emphasized by an arrow*].
This means you win the number of points that is indicated on the gambling machine [*also emphasized by an arrow*].
Therefore, you'll win these 4 [*this was the number of points that were gained in the example shown*] points [*indicated by four golden coins below the gambling machine*].

Screen 5

[*picture gambling machine*]

In case of a red ball it will look like this.
If a red ball appears, this means you will lose the number of points that is depicted on the red ball [*indicated by an arrow*], but you will still win the number of points on the gambling machine [*indicated by an arrow*].
So in this case, you win 4 [*example number*] points, but you also lose 10 [*example number*] points [*indicated on screen by 4 golden coins and 10 red coins*].

Screen 6

In the game we'll play, you will constantly see two gambling machines, like here below.
[*picture of two gambling machines*].
In this game you have to select the gambling machine that you think is best if you would play with it **very often**.
Every time we ask you to select which one is best: left or right.

Screen 7

Every time you have to make the best decision between the gambling machine on the left, on the right and the doesn't matter option.
Try to make the best decision every time.
Mind: in this game you will not actually see the shuffling of the balls, we just ask you to select what you think what would be the best gambling machine if you'd have to play with it very often.

Screen 8

You'll now see an example.
In all cases you'll see the gambling machines **before** the balls are shuffled. Keep in mind that the gambling machine will shuffle the balls after you make your decision. So, the position of the balls in the machine is not important.

Screen 9

What is the best gambling machine to play with very often (after the balls are shuffled): left or right?
[*picture of two gambling machines, the right one is clearly more advantageous, as all three characteristics are in favor of the left machine*]
[*participant makes selection*]
You have now finished the example.

Screen 10

Now we start with the real questions.
Carefully select the gambling machine you think is the best, so which machine you'd like to play with.

Screen 11

The computer remembers all you responses, and in the reward-game at the end of the last sessions, one of the machines that's chosen by you will be played for real.
This determines how much money you will win: **The <u>better</u> you perform now, the <u>more</u> money you will make in the end.**
Good luck!

<u>Gain-probability version:</u>

Screen 1

[*identical to above, but with gain-probability instead of loss-probability gambling machine on picture*]

Screen 2

Every gambling machine contains 10 balls. Some of them are red and some of them are green. On the gambling machine is a number. This is the number of points you **always** lose if you select this gambling machine (next to the arrow).

[*picture of gambling machine, with an arrow next to the constant loss*]

If the gambling machine selects a **red** ball, you will **lose** the number of points on the gambling machine and you will gain nothing.

But if the gambling machine selects a **green** ball, you will still **lose** the number of points on the gambling machine, but you will **also gain** the number of points on the green ball.

Screen 3

[*4 pictures of a single gambling machine on screen*]

To select a gambling machine you can press the button below the machine.

This will shuffle the balls, so the position of the balls before shuffling is not important [*shuffling balls on second picture*].

Then, 1 random ball is selected from the machine [*selected red ball on third picture, emphasized by an arrow*].

For your next decision, this ball is thrown back into the machine [*ball falling back into the machine on the fourth picture*].

Screen 4

So that will look like this:

[*picture gambling machine*]

Now, a red ball is selected [*picture shows a red ball, emphasized by an arrow*].

This means you lose the number of points that is indicated on the gambling machine [*also emphasized by an arrow*].

Therefore, you'll lose these 4 [*this was the number of points that were lost in the example shown*] points [*indicated by four red coins below the gambling machine*].

Screen 5

[*picture gambling machine*]

In case of a green ball it will look like this.

If a green ball appears, this means you will gain the number of points that is depicted on the green ball [*indicated by an arrow*], but you will still lose the number of points on the gambling machine [*indicated by an arrow*].

So in this case, you lose 4 [*example number*] points, but you also win 10 [*example number*] points [*indicated on screen by 4 red coins and 10 golden coins*].

Screen 6-11

[*identical to above, but with gain-probability instead of loss-probability gambling machines on pictures*]

Instructions GMT Part II: Strategy assessment

<u>Loss-probability version:</u>

Screen 1-5

[*identical to loss-probability GMT part I*]

Screen 6
In the game we'll play, you will constantly see two gambling machines, like here below.
[*picture of two gambling machines, including doesn't matter option*].
In this game you have to select the gambling machine that you think is best if you would play with it **very often**.
Every time we ask you to select which one is best: left, right, or doesn't matter.
Screen 7
Every time you have to make the best decision between the gambling machine on the left, on the right and the doesn't matter option.
You choose the **doesn't matter option** if you think both gambling machines are equal, so that it doesn't matter if you would shuffle the balls from the left or the right machine.
Try to make the best decision every time.
Hint: sometimes the doesn't matter option is the best option.
Mind: in this game you will not actually see the shuffling of the balls, we just ask you to select what you think what would be the best gambling machine if you'd have to play with it very often.
Screen 8
You'll now see a few examples.
In all cases you'll see the gambling machines **before** the balls are shuffled. Keep in mind that the gambling machine will shuffle the balls after you make your decision. So, the position of the balls in the machine is not important.
Screen 9
Example 1: What is the best gambling machine to play with very often (after the balls are shuffled): left, right or doesn't matter?
[*picture of two gambling machines, the left one is clearly more advantageous, as all three characteristics are in favor of the left machine*]
[*participant makes selection*]
The left machine was correct
[*if incorrect experimenter checks general understanding of the tasks and goes back to earlier screens if deemed necessary, without explaining anything that could possibly guide participants towards certain strategies*]
Screen 10
Example 2: What is the best gambling machine to play with very often (after the balls are shuffled): left, right or doesn't matter?
[*picture of two identical gambling machines*]
[*participant makes selection*]
The doesn't matter option was the correct answer here
[*if incorrect, experimenter checks understanding*]
Screen 11
Now we start with the real questions.
Carefully select the gambling machine you think is the best, so which machine you'd like to play with.
There is only one correct answer every time: left, right or doesn't matter.
Screen 12

The computer remembers all you responses, and in the reward-game at the end of the last sessions, one of the machines that's chosen by you will be played for real.
This determines how much money you will win: **The <u>better</u> you perform now, the <u>more</u> money you will make in the end.**
Good luck!

<u>Gain-probability version:</u>
Screen 1-5
[*identical to gain-probability GMT Part I*]
Screen 6-12
[*identical to loss-probability GMT Part II, but with gain-probability instead of loss-probability gambling machines on pictures*]

Instructions GMT Part III: Feedback
<u>Full feedback condition:</u>
Screen 1,2,3,4,5
[*identical to loss-probability versions part I and II*]
Screen 6
In the game we'll play, you will constantly see two gambling machines, like here below.
[*picture of two gambling machines*].
In this game you have to select the gambling machine that you think is best.
Every time we ask you to select which one is best: left or right.
Screen 7
In this game, you'll play the same gambling machines several consecutive times, and every time you'll see which ball is selected by the machine.
You have to make the **best** decision between the left and right gambling machine every time.
We'll practice twice to show you how it works.
Screen 8
[*two gambling machines are presented, participant choses one*]
[*feedback is presented: golden coins in case of a green ball; golden and red coins in case of a red ball*]
Screen 9
We'll practice another one
Screen 10
[*identical to screen 8*]
Screen 11
Now we start with the real questions.
Choose the gambling machine you think is best every time.
Screen 12
The computer remembers all you responses, and in the reward-game at the end of the last sessions, one of the machines that's chosen by you will be played for real.
This determines how much money you will win: **The <u>better</u> you perform now, the <u>more</u> money you will make in the end.**
Good luck!

Partial feedback condition

Screen 1-4

[*identical to full feedback version*]

Screen 5

In this version of the gambling machine game, the shuffling and selection of the balls is **hidden**.

The only thing you will see is the number of points that is depicted on the gambling machine, that's the number of points you'll **always win**. So you won't see which ball will be selected.

Screen 6

So you won't see the selection of a ball, but **beware**: the computer will remember which ball was selected.

This determines how much money you'll win in the reward-game at the end. So the better you'll perform, the more money you can earn!

Screen 7

In this game, you'll play the same gambling machines several consecutive times.

You have to make the **best** decision between the left and right gambling machine every time.

Remember that although you don't see which ball is selected by the gambling machine, the computer will remember your decision and this will influence your reward at the end.

We'll practice twice to show you how it works.

Screen 8

Choose the gambling machine you think is best.

[*two gambling machines are presented, participant choses one*]

[*selected gambling machine gradually fades while balls are shuffling*]

[*certain gain that is depicted on the machine is presented by showing golden coins underneath the selected machine*]

Screen 9

So you see the number that's on the gambling machine, **but what you don't know is whether the machine selected a green or a red ball**.

The computer remembers the ball that was selected, and this influences your reward at the end.

We'll practice another one.

Screen 10

[*identical to screen 8*]

Screen 11

Now we start with the real questions.

Choose the gambling machine you think is best every time.

Remember that although you don't see which ball is selected by the gambling machine, the computer will remember your decision and this will **influence your reward at the end.**

Screen 12

[*identical to full feedback version*]

Supplementary Materials 2: Item characteristics GMT

	Loss-probability items								Gain-probability items									
	FL(a)	FL(b)	CG(a)	CG(b)	AL(a)	AL(b)	EV(a)	EV(b)	FG(a)	FG(b)	CL(a)	CL(b)	AG(a)	AG(b)	EV(a)	EV(b)	Risk(a)	Risk(b)
Block I: Items used to assess risky vs safe decision making (i.e., the EV of both options is always equal)																		
1	0.5	0.1	2	2	-2	-10	1	1	0.5	0.1	-2	-2	2	10	-1	-1	2.35	3.62
2	0.1	0.5	2	2	-30	-6	-1	-1	0.1	0.5	-2	-2	30	6	1	1	9.65	4.64
3	0.5	0.1	2	2	-4	-20	0	0	0.5	0.1	-2	-2	4	20	0	0	3.46	6.63
4	0.5	0.5	4	2	-6	-2	1	1	0.5	0.5	-4	-2	6	2	-1	-1	5.79	2.35
5	0.5	0.5	2	4	-6	-10	-1	-1	0.5	0.5	-2	-4	6	10	1	1	4.64	8.09
6	0.5	0.5	4	2	-8	-4	0	0	0.5	0.5	-4	-2	8	4	0	0	6.93	3.46
7	0.1	0.5	2	6	-10	-10	1	1	0.1	0.5	-2	-6	10	10	-1	-1	3.62	9.25
8	0.5	0.1	9	1	-20	-20	-1	-1	0.5	0.1	-9	-1	20	20	1	1	16.75	6.33
9	0.1	0.5	2	10	-20	-20	0	0	0.1	0.5	-2	-10	20	20	0	0	6.63	17.32
10	0.1	0.5	5	9	-35	-15	1.5	1.5	0.1	0.5	-5	-9	35	15	-1.5	-1.5	12.06	13.87
11	0.1	0.5	5	8	-45	-15	0.5	0.5	0.1	0.5	-5	-8	45	15	-0.5	-0.5	15.08	13.28
12	0.5	0.1	7	4	-15	-45	-0.5	-0.5	0.5	0.1	-7	-4	15	45	0.5	0.5	12.70	14.77
13	0.5	0.2	7	3	-20	-30	-3	-3	0.5	0.2	-7	-3	20	30	3	3	15.64	13.48
14	0.5	0.2	5	1	-20	-30	-5	-5	0.5	0.2	-5	-1	20	30	5	5	14.58	12.69
15	0.4	0.1	7	4	-20	-50	-1	-1	0.4	0.1	-7	-4	20	50	1	1	14.44	16.28
Block II: Items used to assess optimal vs suboptimal decision making (i.e., the riskiness of both options is always equal)																		
1	0.3	0.1	5	5	-20	-35	-1	1.5	0.3	0.1	-5	-5	20	35	1	-1.5	12.01	12.06
2	0.5	0.1	8	8	-9	-25	3.5	5.5	0.5	0.1	-8	-8	9	25	-3.5	-5.5	9.92	9.96
3	0.5	0.1	20	20	-2	-29	19	17.1	0.5	0.1	-20	-20	2	29	-19	-17.1	14.88	14.86
4	0.1	0.5	1	8	-25	-5	-1.5	5.5	0.1	0.5	-1	-8	25	5	1.5	-5.5	7.84	7.83
5	0.5	0.1	9	2	-10	-35	4	-1.5	0.5	0.1	-9	-2	10	35	-4	1.5	11.09	11.16
6	0.5	0.1	8	1	-5	-25	5.5	-1.5	0.5	0.1	-8	-1	5	25	-5.5	1.5	7.83	7.84
7	0.3	0.1	7	6	-25	-45	-0.5	1.5	0.3	0.1	-7	-6	25	45	0.5	-1.5	15.37	15.38
8	0.2	0.4	2	3	-35	-25	-5	-7	0.2	0.4	-2	-3	35	25	5	7	15.13	15.15
9	0.2	0.4	10	9	-15	-10	7	5	0.2	0.4	-10	-9	15	10	-7	-5	10.29	10.30
10	0.3	0.1	2	4	-10	-15	-1	2.5	0.3	0.1	-2	-4	10	15	1	-2.5	5.77	5.73
Block III: Items used to assign decision-making strategies																		
1	0.1	0.1	4	2	-50	-10	-1	1	0.1	0.1	-4	-2	50	10	1	-1	16.28	3.62
2	0.1	0.5	4	4	-10	-2	3	3	0.1	0.5	-4	-4	10	2	-3	-3	4.23	3.67
3	0.1	0.1	2	4	-2	-2	1.8	3.8	0.1	0.1	-2	-4	2	2	-1.8	-3.8	1.22	1.84
4	0.5	0.1	4	2	-10	-10	-1	1	0.5	0.1	-4	-2	10	10	1	-1	8.09	3.62
5	0.1	0.1	4	4	-2	-10	3.8	3	0.1	0.1	-4	-4	2	10	-3.8	-3	1.84	4.23
6	0.1	0.5	4	2	-10	-2	3	1	0.1	0.5	-4	-2	10	2	-3	-1	4.23	2.35
7	0.1	0.5	2	2	-50	-2	-3	1	0.1	0.5	-2	-2	50	2	3	-1	15.68	2.35

8	0.5	0.1	2	2	-2	-2	1	1.8	0.5	0.1	-2	-2	2	2	-1	-1.8	2.35	1.22
9	0.1	0.1	2	4	-2	-10	1.8	3	0.1	0.1	-2	-4	2	10	-1.8	-3	1.22	4.23
10	0.1	0.5	2	4	-10	-2	1	3	0.1	0.5	-2	-4	10	2	-1	-3	3.62	3.67
11	0.5	0.5	2	4	-2	-10	1	-1	0.5	0.5	-2	-4	2	10	-1	1	2.35	8.09
12	0.1	0.5	2	2	-50	-10	-3	-3	0.1	0.5	-2	-2	50	10	3	3	15.68	7.04
13	0.5	0.5	2	4	-10	-10	-3	-1	0.5	0.5	-2	-4	10	10	3	1	7.04	8.09
14	0.1	0.5	2	4	-50	-50	-3	-21	0.1	0.5	-2	-4	50	50	3	21	15.68	32.33
15	0.5	0.5	2	2	-2	-10	1	-3	0.5	0.5	-2	-2	2	10	-1	3	2.35	7.04
16	0.1	0.5	4	2	-50	-10	-1	-3	0.1	0.5	-4	-2	50	10	1	3	16.28	7.04
17	0.1	0.5	4	4	-50	-2	-1	3	0.1	0.5	-4	-4	50	2	1	-3	16.28	3.67
18	0.1	0.5	4	4	-10	-10	3	-1	0.1	0.5	-4	-4	10	10	-3	1	4.23	8.09
19	0.1	0.1	4	2	-10	-2	3	1.8	0.1	0.1	-4	-2	10	2	-3	-1.8	4.23	1.22
20	0.1	0.5	2	4	-50	-10	-3	-1	0.1	0.5	-2	-4	50	10	3	1	15.68	8.09
Block IV: Items used in GMT versions with feedback																		
1	0.5	0.1	4	2	-10	-10	-1	1	-	-	-	-	-	-	-	-	8.09	3.62
2	0.5	0.5	2	4	-2	-2	1	3	-	-	-	-	-	-	-	-	2.35	3.67
3	0.5	0.1	4	2	-2	-10	3	1	-	-	-	-	-	-	-	-	3.67	3.62
4	0.5	0.5	2	4	-2	-10	1	-1	-	-	-	-	-	-	-	-	2.35	8.09

Table S1. Item characteristics of all different GMT versions. One item consisted of two options, gambling machine A and B, indicated by (a) and (b). The expected value of each option can be computed by the following formulas: EV = CG + (FL×AL) for loss-probability items and EV = CL + (FG×AG) for gain-probability items. Risk is calculated by the following formula: $\sqrt{(\text{gain probability} \times (\text{gain amount} - EV)^2 + \text{loss probability} \times (\text{loss amount} - EV)^2)}$. Note that riskiness of loss- and gain-probability items is identical. The items that were used to assign decision-making strategies were all assessed twice. The items that were used in the feedback conditions of the GMT were all administered 30 times in succession. Abbreviations: AG = Amount of Gain; AL = Amount of Loss; CG = Certain Gain; CL = Certain Loss; EV = Expected Value; FG = Frequency of Gain; FL = Frequency of Loss.

Supplementary Materials 3: Graphical Examples of all GMT versions

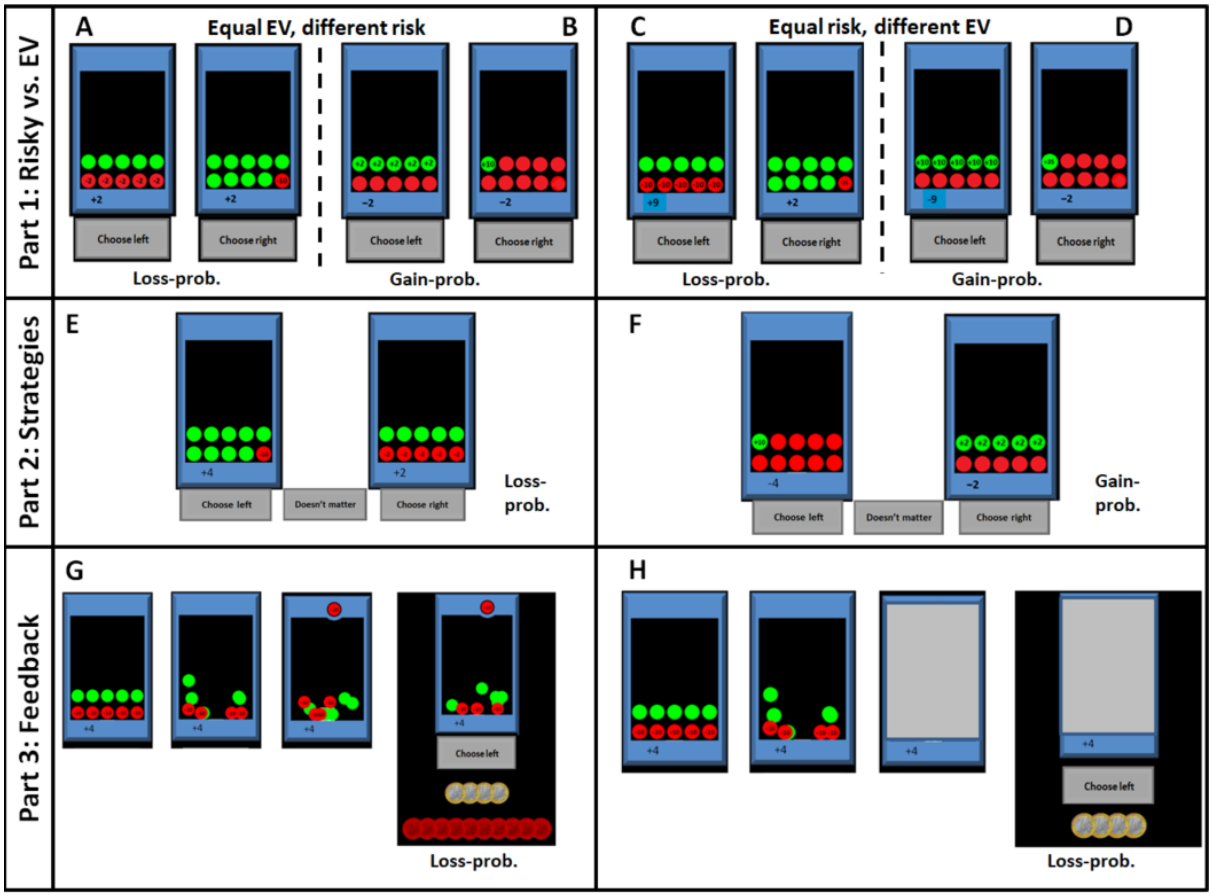

Figure S1. Gambling Machine Task (GMT) characteristics. In the GMT, participants have to choose between two gambling machines with different characteristics. Gambling machines were either oriented towards loss- or gain probability. In the loss-probability versions (panels A, C, E, G, H), the gambling machines were characterized by three different characteristics: constant gain, probability of loss and amount of loss. In the gain-probability versions of the GMT (panels B, D, F), this was opposite: constant loss, probability of gain and amount of gain. This figure contains examples of items for all different GMT versions that were used. Full item characteristics can be found in Table 1. **(A)** In this version of the GMT, both machines had equal EV (EV_{left}=2+(-2*0.5)=1, EV_{right}=2+(-10*0.1)=1) but differed in the amount of risk ($Risk_{left}$=$\sqrt{((2-1)^2+(0.5(-2-1)^2))}$=2.35, $Risk_{right}$=$\sqrt{((2-1)^2+(0.1(-10-1)^2))}$=3.62). **(B)** Similar to A, but oriented towards gain-probability instead of loss-probability. **(C)** In this version of the GMT, both machines differed in EV's (EV_{left}=9+(0.5*-10)=4, EV_{right}=2+(0.1*-35)=-1.5) but were equally risky ($Risk_{left}$=$\sqrt{(9-4)^2+0.5(-10-4)^2}$=11.09, $Risk_{right}$=$\sqrt{(2- -1.5)^2+0.1(-35- -1.5)^2}$=11.16). **(D)** Similar to C, but oriented towards gain-probability instead of loss-probability. **(E)** This version of the GMT was used to assess underlying strategies. Note that in this version, participants could also indicate that they thought both machines are equally advantageous (i.e., "doesn't matter" option). **(F)** Similar to E, but oriented towards gain-probability instead of loss-probability. **(G)** Depiction of GMT after making a decision on the full-feedback condition of the GMT. After choosing one of the two gambling machines (there is no "doesn't matter" option here), participants see that the balls are shuffled, and one of the balls is selected by the machine. Feedback is delivered by means of gold (in case of gains) and/or red (in case of losses) coins. **(H)** Depiction of the partial-feedback GMT condition. The shuffling of the balls is hidden by a screen. Participants always experience the positive feedback that is associated with their choice (in this case the certain gain is 4). However, the potential negative feedback is hidden. Participants are told that the absence of negative feedback does not necessarily indicate that their decision was correct, and that the computer remembers their answers and that this influences their final net gain (see above for specific task instructions).

Supplementary Materials 4: Strategy Assignment

Loss-probability GMT			*Gain-probability GMT*		
	ADHD (*n*=80)	TD (*n*=96)		ADHD (*n*=80)	TD (*n*=100)
Guessing	3	1	Guessing	1	2
AL	0	1	AG	0	0
FL	1	2	FG	1	3
CG	1	0	CL	0	0
AL,FL	6	2	AG,FG	2	1
FL,AL	2	3	FG,AG	2	2
AL,CG	0	0	AG,CL	0	0
CG,AL	0	0	CL,AG	0	0
FL,CG	0	0	FG,CL	0	0
CG,FL	0	0	CL,FG	0	0
AL,FL,CG	15	12	AG,FG,CL	10	8
AL,CG,FL	1	0	AG,CL,FG	0	0
FL,AL,CG	17	16	FG,AG,CL	36	38
FL,CG,AL	8	13	FG,CL,AG	4	6
CG,FL,AL	0	2	CL,FG,AG	1	0
CG,AL,FL	0	0	CL,AG,FG	0	0
Semi-integrative	20	22	Semi-integrative	20	33
Integrative	6	22	Integrative	3	7

Table S2. Number of participants per group assigned to each particular decision making strategy, according to model-based Bayesian latent-mixture analysis. Strategies range from simple (guessing) to complex (integrative). AG = Amount of Gain; AL = Amount of Loss; CG = Constant Gain; CL = Constant Loss; FG = Frequency of Gain; FL = Frequency of Loss.