CAN PSI RESEARCH SPONSOR ITSELF? SIMULATIONS AND RESULTS OF AN AUTOMATED ARV-CASINO EXPERIMENT

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Abstract

Simulations of a 32 trial ARV experiment with a roulette outcome determining the target suggest that, for viewers that perform with an effect size of around 0.35 and players using a simple betting strategy, there would be an average net result of about 10 times the starting capital. A review of ARV experiments yielding about 17 experiments for which trustworthy data could be obtained suggests that the mean scoring rate in a binary situation is around 63%. If these results could be confirmed this would falsify theories that predict that it is impossible to use psi in a consistent and robust way and moreover it could be the end of the financial problems in the field of psi research.

An automated ARV-casino system is described that reduces the administrative burden in running ARV experiments. The system has been used over the years in 120 trials with three different viewers of which at least one has performed in RV trials in the past with the required effect size. However our results suggest a lower effect size of around 56% scoring rate.

The system automatically calculates the Local Sidereal Times for the moment the viewer does his/her prediction and also for the moment that the player bets on red or black. A categorization of these times according to LST periods that have been predictive in old RV and Ganzfeld trials shows that in contrast to earlier findings on Free Response trials the period from 17:00-20:00 LST has the largest scoring percentage. None of the results are significant though.

1. Introduction

Von Lucadou (1995) was one of the first theorist who explicitly predicted that psi correlations could not be used for practical purposes, at least not in a robust way. He assumes that these correlations are non-local quantum correlations that can't be used to 'transmit a classical signal' (the no communication theorem). As soon as one would try to try to use these non-local correlations, they would disappear.

Von Lucadou joined later the weak quantum theory development (Atmanspacher et al, 2002) in which the theoretical treatment of these non local correlations can be performed in a strictly formal way. Weak quantum theory is identical to quantum theory but Planck's constant is removed in order to apply this theory to macroscopic systems.

More recently another theoretical framework, CIRTS, has been published in which all psi phenomena are supposed to be retro-causal (Bierman, 2010). it has been proposed within that framework that the repeated and robust use of psi correlations must be limited in order to prevent the creation of potential closed time loop paradoxes. In order to falsify these theories it would be relevant to develop a paradigm that explicitly shows the use of psi in a repeated and robust way.

One of the best-known successful applications of psi was the use of psi correlations to 'predict' the silver-market (Larsson, 1984; Harary & Targ, 1985). The method used was originally proposed by Stephan Schwartz (2007) and has become known as 'Associative Remote Viewing' (ARV). The remote viewer describes a 'target', a picture to be chosen in the future. The silver-market is then used as a

random number generator to select the target. If the viewer correctly describes the target, by implication (or association) the viewer "describes" the silver-market although the viewer might be totally unaware of this set up.

Nevertheless, a problem concerning the interpretation of that particular successful experiment is that, in spite of the random character of those markets, the market-behavior is partly also a consequence of rational processes. Thus, the fluctuations in the market could, in principle, also be predicted by a knowledgeable financial person without any psi. The viewer can't use any financial knowledge to improve the performance. However judges might have been aware of trends in the market and the mapping of viewer's output on the decisions to trade.

That's why, rather than predicting the future silver market, from a scientific point of view, it would be better to predict the outcome of a roulette wheel or any other lottery and we might assume that the outcomes will be fundamentally random and unpredictable.

So far, a number of conceptual replications of the original ARV experiment have been conducted. Nevertheless, a striking aspect of these is that they generally are reported without enough details. Twelve of the heighteen entries are based upon Personal Communication and it is difficult to evaluate of the results correspond to material aspects of these experiments or 'superstition'. Therefore the table summarize what we have found and has to be considered by with caution from a scientific point of view.

Name	Pub.	Year	Experimenter	N	Hits	Pass	Hit-Rate (%)	Traded	Profit in K$	Viewers
DecmbrSilver *	Harary, 1985	1982	R. Targ	9	9	0	100.0	Y	180	1
MarchSilver	PC	1983	R. Targ	9	0	0	0.0	Y (2?)	~ -20	1
School Prjct	Puthoff, 1984	1984	H. Puthoff	30	21	0	70	Y	25	7
RT/JKseries	Targ, 1995	1995	R.Targ & Katra	7	6	2	85.7	N	0	2
Tahoe Project **	PC	1988	Spottiswoode & E. Targ	5	3	0	60.0	Y	3	2
Series I	PC	1985	Spottiswoode	11	9	9	81.8	Y	3	2
Series II	PC	1985	Spottiswoode	4	0	3	0.0	Y	-5	2
Proof of Concept	PC	1977	Schwartz	2	2	0	100.0	N	0	2
Horse race	PC	1977	Schwartz	2	2	0	100.0	Y	0.02	2
S&P500 Fri	Schwartz, 2007	1982	Schwartz	37	29	5	78.3	Y	145	7
Lottery ***	PC	2000	Spottiswoode	1	1	16	100.0	N	0	16 - 18
May series	PC	2012	May	9	8	13	90.0	Y	3	4
GK (a)	Kol.… 2012	2000-2013	Kolodziejzyk	181	109	104	60.2	Y	96.6	6-30 (a)
DJIA forecast	Smith, 2010	2010	Smith, Laham, Moddel	7	7	0	100.0	Y	4	10
ProfPsychic	PC	2012	Moddel	19	13	6	68.0	Y	-1	1
Email series	PC	2010	Moddel	18	9		50.0	Y	-1	22
Basic 1 ARV	PC	2004-2011	Rosenblatt	170	104	60	61.2	Y	3.5	3
several	PC	2012	Rosenblatt	29	17	25	58.6	Y	?	3
Totals				550	349	243	63.5%		$502	

Table 1: Review of known 'scientific' ARV-experiments. N= the number of trials resulting in a forecast. Hits is the number of correct forecasts. Pass is the number of trials not resulting in a forecast. *: decisions out of 4 options ; **: decisions out of 3 options. *** Decisions out of over 256 options.

All other are binary. (a) in this experiment multiple RV's were done per decision by the *same* viewer who acted also as judge (Kolodziejzyk, 2012). PC= personal communication.

Considering the data proposed in table 1, it could be concluded that psi can be used for material gains. The over-all profit of about a half million dollars is impressive but the results not always concern net profit even if we have substracted initial investiment from the gain. Also in some cases the betting advice was given to an investor and the profits or losses (for instance in the March-silver series) are unknown to the experimenter. Moreover, some of the experimenters noted a decline within the series and there seems to be tendency that a replication from the same experimenter to be less successful.

The global finding in terms of performance is that hit-rates (when the results are converted into a binary decision, i.e. a 50% MCE) is around 70% but in terms of total number of hits divided by the total number of trials the mean hit rate is 63.5%. There seems to be a tendency that effect size is smaller with larger N, a finding that has also been observed in other psi-research. Note that the figures in the column 'Hit rate' if there is more than 1 viewer might either represent the mean hit rate of all viewers or the hit rate after consensus scoring. We have used the consensus hit rate when it was available. A typical example is the School-project conducted by Puthoff (1984) in which 7 viewers have been used. Their individual average hit rate was 62.9% but when applying consensus scoring (or majority vote), the hit rate has increased to 70%. A similar observation was proposed by May : 4 viewers produced 30 individual predictions with 20 hits (66.6%) and only 9 trials were traded with 8 good predictions (88.9%). The pass-percentage in this series was very high: 70%. So it seems that removing weak trials improve the scoring rate.

Another approach can be to use multiple trials with one viewer for the same trial. This was the method used in the GK series. With this technic, the hit rate, initially at 52,7%, increased to 60,2%. Since in this GK series the majority vote sometimes was based upon a few trials and sometimes upon more, one can easily analyze if there is a relation between the number of trials going into a single prediction and the consensus scoring rate. Indeed consensus scoring rate increases with the number trials going into the final prediction. The optimum option was to use around 30 individual scores to calculate the majority vote. For those trading events the mean score was between 71 and 78% depending on the 'a priory' confidence scores. If the difference between the confidence scores was below a criterium-value then the decision would be to pass. The pass-percentage in the GK series is only 36% that is half of the above mentioned May series. Indeed a weaker pass-criterium resulted here in a weaker scoring rate of 60.2 %, low compared to the 88.9% that was obtained in the May-series. Over-all there is a weak correlation between the hit rate and the pass rate of 0.23 (n.s.) but this is suggestive that the pass-procedures tend to increase the hit rate by reducing noise.

Note that feedback delays were in the order of days in most cases. In the March silver series, a new trial was even started before feedback on the previous trial was received. This could have contributed to the sudden decline compared with the December Silver series.

Interestingly a hit rate of about 65% is also claimed by non-scientific projects of this kind that one can find all over the internet but these data are of course less trustworthy. Also 65%-70% corresponds reasonably well with the effect sizes reported in direct Remote Viewing studies with selected viewers (May et al, 1989).

In this report the major research questions are:

1. Given the reported effect sizes in psi research and in past ARV-experiments it should be possible to earn money consistently by using psi. Is that true? This will be explored using a simulation of an ARV-casino experiment with different betting strategies and different fluctuating effect sizes allowing for periods of no psi. What is the probability of a profit? What is the mean profit?

2. What are the actual results so far from an automated ARV-casino system that was developed in the Netherlands to run hassle free ARV experiments. Does the Local Sidereal Time predict performance? We will explore the LST at the viewer when he is viewing and the local sidereal time at the location of the roulette-player when he is playing

2. Simulation of ARV-casino experiments

Figure 1 shows the parameter-setting window of the software developed to simulate ARV-casino experiments.

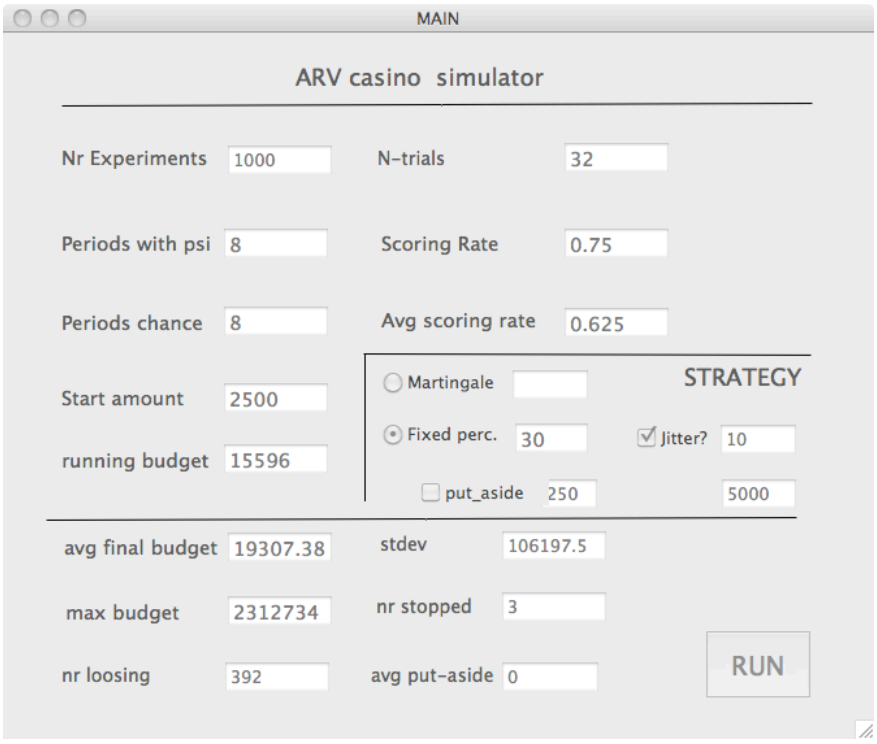


Figure 1: parameter & results window of ARV-casino simulation

One experiment consists of <Ntrials> number of trials where there are stretches <periods with psi> that the viewer scores above chance with the <scoring rate> and periods <periods chance> where the viewer scores at chance. These parameters can be set and immediately after changing a parameter the average scoring rate is calculated using Monte Carlo simulations. During the simulation, periods of psi followed by chance scoring are randomly alternated with periods of chance scoring followed by psi scoring with a probability of 0.5 for each of those sequences. If during the <Ntrials> the budget becomes smaller than 10 the remainder of the simulation is canceled and the final budget is set to 10.

There are several 'strategy' settings. The traditional *Martingale* setting is a strategy where after a loss the amount to be played is doubled. This strategy will always result in a profit given an infinite budget and when stopping after a win. However the strategy results in an average loss if one stops if the budget is below 0. A compromise is to stop if a next loss could potentially result in a debt. This extra stop criterion was implemented and resulted in a moderate profit of around 20%. In the figure 2 a typical double bumped final-budget distribution is given. The Martingale strategy is not discussed further because it results in much smaller profits than other strategies.

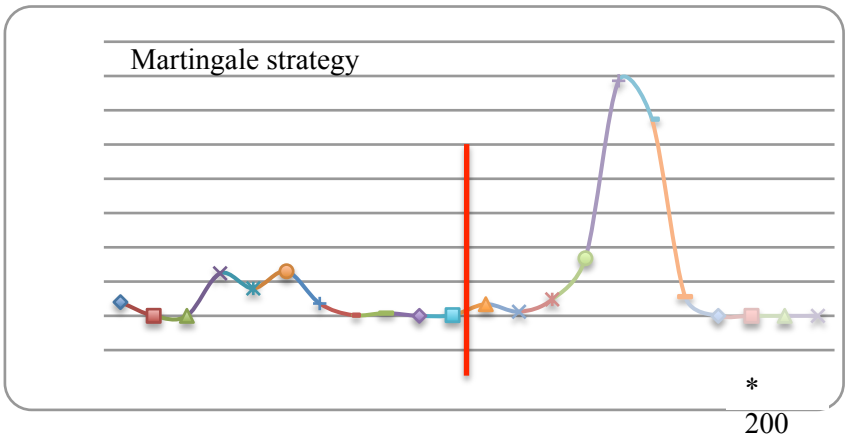


figure 2: Distribution of final outcomes of 1000 simulations of 32 trial experiments using the Martingale strategy augmented with a cautious stop-criterion. The vertical bar is starting budget. The mean scoring rate was set to 62.5%. The net profit was about 20% of the starting budget

The *fixed percentage strategy* always plays a fixed X% of the current budget. The latter strategy results in huge variance in the outcome. This can be reduced by putting aside a fixed amount each time during an experiment that the current budget exceeds a specific amount.

The outcome measures are the final budgets at the end of each experiment. The simulation consists of a large number of these experiments <Nr Experiments>. The final measure of the simulation is the average outcome of individual experiments. The output also shows the maximum final budget that was obtained over all experiments., the standard deviation of the experiment scores distribution, the number of prematurely stopped experiments and the number of experiments that ended with a negative profit.

The simulation assumes a chance scoring rate of 47.5% for European roulette's.

3. Results of the simulations

Results are given for a few typical parameters in figure 2. The application is available through Internet and researchers can therefore run their own simulations.

We present the results for a 32 trial experiment. This is a reasonable number of trials. If we assume that to arrive at 32 traded trials the total number of all traded and non traded trials has to be twice as much and an experiment can be run in slightly over a year with about one trial per week. The profit shows the final budget divided by the start budget. The strategy is the percentage of the total available budget that is played. Of course playing with a larger percentage increases the potential earnings

and losses and therefore increases the number of times the budget falls below 10 euro. In the simulations we have assumed that an experiment stops prematurely if the budget falls below 10 euro.

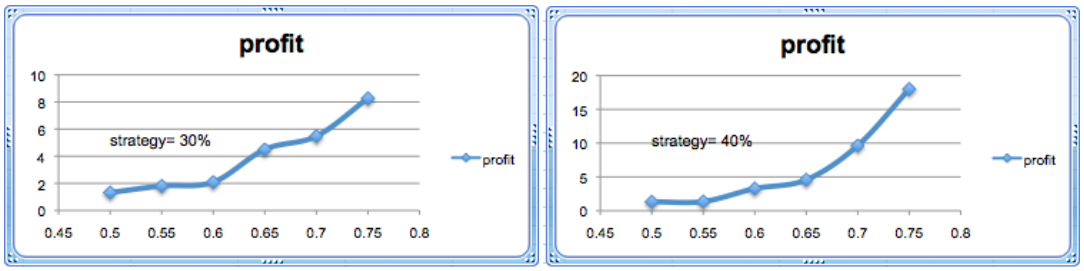


Figure 3: Profit, expressed as end-budget divided by start-budget, as a function of the psi scoring rate. Note that, since the psi scoring rate is only during 50% of the periods of 8 trials, the scoring rate when psi scoring rate is set to 60%, effectively over the whole experiment is 55%.

In case of a strategy in which 30% of the budget is used and the start-budget is 2500 euro the probability for a premature stop, if there is no psi, is about 0.4 %. The average profit is about a factor 7 (i.e. the average final budget being 7*2500). And for about 40% of the experiments the end budget is smaller than the start budget. This fits with the only real series that is large enough to perform this statistic on, the Kol-series. In that series about 38% of the traded trials get a negative result.

If one plots the distribution for a fixed betting percentage then this distribution is multi peaked. One peak corresponds to the cases in which the simulation is the result of 16 hits and 16 misses. The variation in end budget for these experiments comes from the different sequences that can result in 16 hits and 16 misses. These different sequences increase the variance but less than a group of experiment that is the result of 17 hits and 15 misses. These form another peak. In order to get a more realistic frequency distribution, the simulation allows to add some jitter to the betting percentage. An example of a resulting final budget distribution is given in fig. 4.

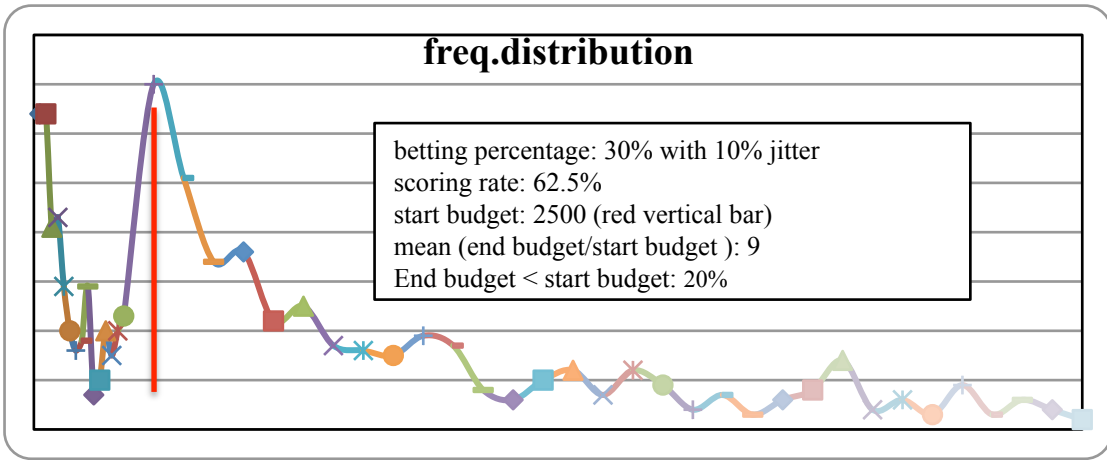


Figure 4: Typical frequency distribution of the final budget with a fixed perrcentage strategy and a 10% jiter

The more risky betting strategy (40% of the budget) yields, on the average, about 2 times more profit but a much larger fraction of premature stops. With a scoring rate of 60%, about 6% of the experiments are stopped prematurely.

Based upon remote viewing results with selected subjects, and on the review given in table 1, we esteem that an effective scoring rate of 60% (periods with 72.5% scoring rate alternated with similar periods with scoring rate of 47.5%) is a realistic guess. With a more risky betting strategy of 40% of the available budget, the simulated profit is about a factor of 10. When starting with a budget of 2500 euro the first bet will be with 1000 euro. The budget at the end of the 32 trials will be 25000 euro on the average. The premature stopping probability due to a long sequence of misses in this case is smaller than 1%. The percentage of experiments that are 'loosing', i.e. the final budget is smaller than the original budget, is about 25%. The conclusion must be that in all cases the simulation shows that this kind of experiments, with even modest effect sizes, can be used for profit if indeed the effect sizes that have been reported in ARV and RV experiments with selected subjects will be similar in the roulette setting. Also the outcomes of the simulations are in line with the outcomes of actual experiments reviewed in table 1.

4. The automated ARV-casino experiment [1]

In order to check the potential for ARV-experiments to produce psi results that could be useful (in this case to make profit), a software has been developed by *the Chair of Parapsychology* and the *Parapsychological Institute* in Utrecht. The goal was to create an environment that relieved all the administrative burden that comes with the rather complex associative remote viewing experiments. These experiments have three distinctive roles.

- The first is the *viewer*. The viewer describes a picture that will be chosen in the future by a random decision. The description can be a verbal one but also a drawing can be attached.
- The second role is the *judge*. He receives the description provided by the viewer and compares this description with two randomly chosen but orthogonal pictures. The judge decides which of the pictures fits best with the description or decides that neither of the pictures fits the description. In the latter case the trial will be closed and no betting will take place (the trial is considered to be 'a pass').
- The *player* is the third role, but this is only an instrumental role. He goes to the Casino roulette and plays at the first opportunity the color that was decided by the system upon the outcome of the judging. The amount to be played is also indicated by the system. So basically the role of the player is to 'do what the system orders you to do'. After having played the Player browses to the feedback page (see below) and enters the outcome. If it was a hit the system creates a mail with the picture that was judged as fitting best with the description by the viewer. This mail is basically the feedback to the viewer. There is also an option that the feedback has both pictures.

Since all communication is done by automatically generated mails, the experiments can run globally, the viewer can be in LA, the judge in Amsterdam and the player on the Canaries. Furthermore, there is hardly need for an experimenter. The only task remaining is setting up the experiment and starting a trial. This task is

[1] A new system is under development that allows for multiple viewers. Multiple viewer experiments bring about even more administrative hassle but that is taken care off by the computer. Also FoM scoring will be integrated.

performed by the *Manager*. Generally the manager is someone who initiated the experiment. The manager receives copies of all emails that are created by the system.

Figure 5: Manager access: screen dump of a part of the manager screen with a review of all experiments.

The manager can observe the status of all experiments. Creating a new experiment results in a screen in which the different roles are specified. Most notably the email addresses of viewer, player, judge and manager and the longitude of viewer and player.

The manager can start the trial on the manager page and this will result in an automatically generate mail to the viewer. In this mail a link is given where the player can enter a description (see fig. 6)

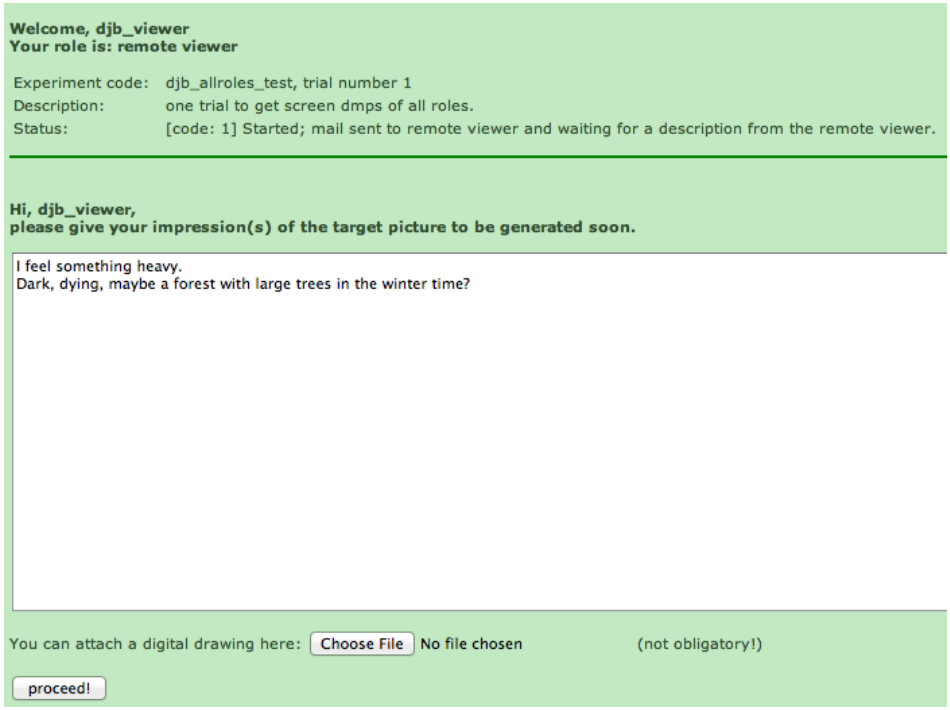
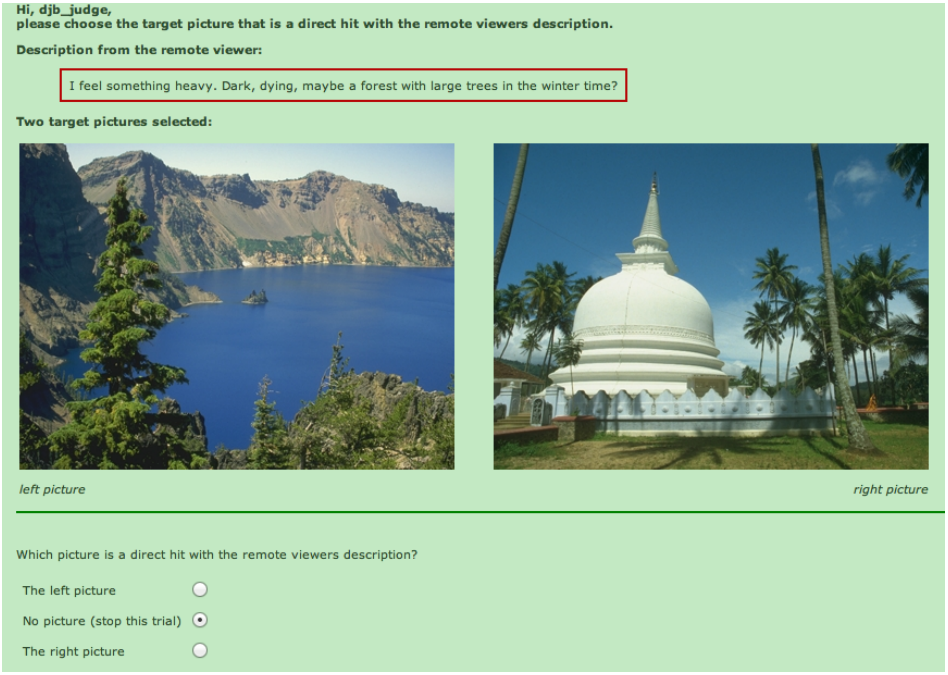


Figure 6: Screen dump of the Viewer entry page. Note that the viewer can attach a drawing.

When the viewer is ready and has submitted the description the system automatically generates a mail to the judge with a link to the judging page (see figure 7).



fFigure 7: Screen dump of judging page. One picture is randomly chosen from the pool, the other is selected as being orthogonal to the first one. The judge can choose either picture left, or picture right as the best fit to the description. The judge can also decide to pass this trial

A general experiment setting can overrule this way of judging and results in displaying just the two ID's of the pictures. All pictures in the pool have been assessed for a number of aspects already. The only thing the judge has to do is to assess now the response on these aspects and use computer based comparison resulting in a so called Figure of Merit. On the basis of the judgment the system generates a new mail for the 'player'. The mail is short: 'Play Red' or 'Play Black' followed by link to report the outcome of the roulette (see figure 8)

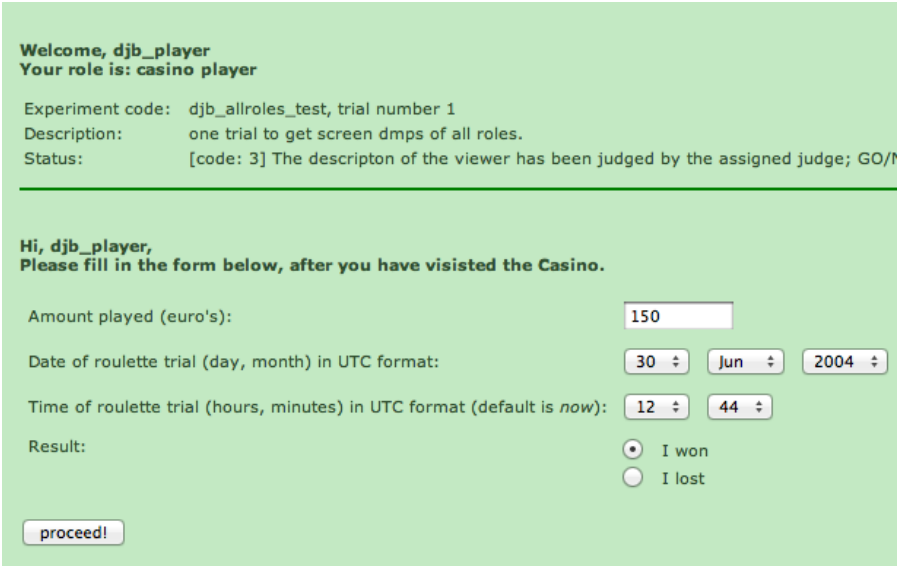


Figure 8: Screen dump of the 'player's roulette outcome registration page.

If the player won, the system mails the viewer the best fitting picture as having been the to-be-described target. (See figure 9)

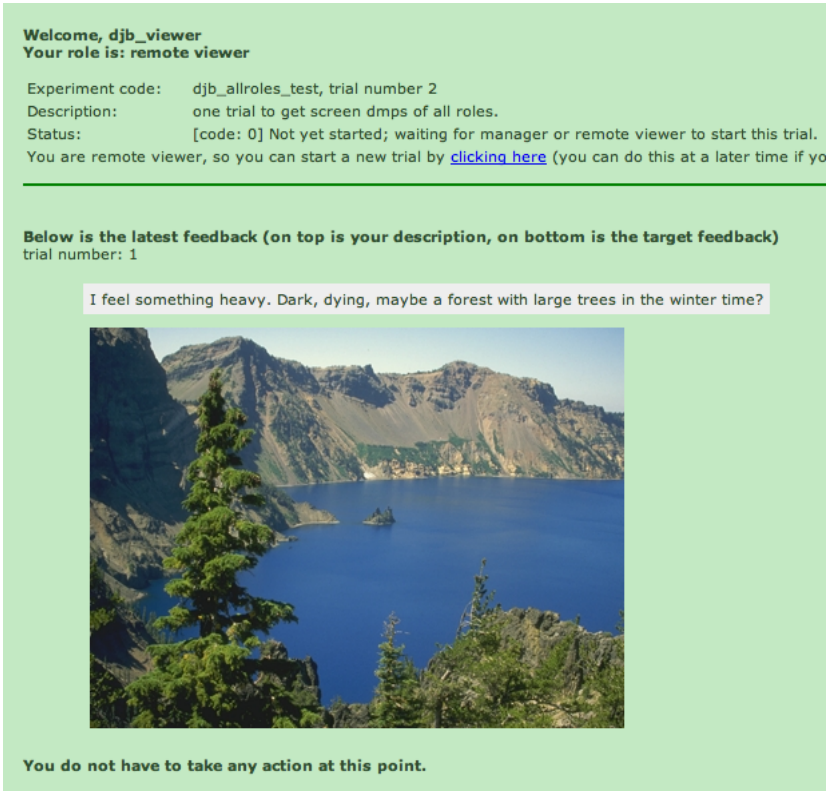


Figure 9: Screen dump of the feedback page to the viewer. Note that the viewer can also start the next trial.

5. Results of the automated ARV-Casino experiment

Description of the results is usually proposed after a predetermined number of studies in order to prevent optional stopping, one of the questionable research practices in Psychology (Jones et al, 2012). However, for a software that has been used by several independent researchers, it was envisioned that each researcher would take care of publication of their own results. This hasn't been accomplished so far and there are plans to rewrite the whole software, possibly adding a script to be used to play at a digital roulette through Internet.

Until recently digital roulettes were simulations and it was impossible to know if the digital Casino was fair. However recently some of these Casino's basically use a webcam so that one is virtually present at a real table, thus more or less assuring a fair game.

With the end of the current system in sight we decided to analyze all results so far. It should be noted that the database has a large number of pilot studies that had only one trial. The reason being that in order to get to know the software researchers set up an experiment and ran 1 or 2 trials. We did exclude those studies. Also one of the studies had more trials but was considered by the manager-experimenter as a non serious study.

We excluded this study also. This left us with 5 studies with varying number of trials. Some of these studies were aborted prematurely. For instance one study with M as subject was stopped because the viewer had to go into hospital. So it should be

realized that this review is far from ideal and the results whatever should be considered cautiously.

Overall- results

Table 2 gives the results of the 5 studies.

Series	Viewer	Judge	Period	hit	miss	passes	# viewers
ApplCasino1	T	TR	Mar-08	2	1	2	1
ApplCasino2	T	TR	mar-july 08	36	30	22	1
Casino Pilot	M	DJB	feb-apr 05	4	1	1	1
Pilot (HansG)	G	DJB	oct-nov 04	3	2	1	1
Joe Formal	M	DJB	feb-jun 08	2	3	2	1
test001	G	HG	sep-oct 04	3	2	0	1
ALL STUDIES				50	39	29	

Table 2: Review of all studies in the database of the automated ARV-casino system

The over-all scoring rate is 56.18% (exact binomial p = 0.145, one-tailed). The scoring rates of the 3 viewers do not differ significantly.

LST- results

The system logs all activities with date and time and calculates the longitude of the viewer the Local Sidereal Time at the moment the viewer submits the description of the forthcoming target. The system does the same for the LST when the player enters the result of the game. The latter LST is of course based on the longitude of the player. The LST of the player may be relevant because according to the Observational Theories the player is the first to observe the outcome of the experiment.

We calculated the results separately for three LST periods that have been shown to either promote psi (+), or to correlate with psi missing (-) or to produce chance results (0). (Spottiswoode, 1997)

One disappointment was that the largest study used a somewhat different procedure in which viewers have proposed a large number of descriptions within an hour or so. Also these trials were run around the same time and therefore all the LST were in the same period. These data are therefore left out of the LST-analyses. Of course that reduces the power considerably and strong conclusions are impossible.

Table 3 shows the results split for the 3 periods.

Location	Period	LST Start time	LST End Time	Hits	Miss
viewer	+	12.5	14.5	4	3
viewer	-	17	20	4	0
viewer	0	All other times		4	4
player	+	12.5	14.5	1	2
player	-	17	20	4	1
player	0	All other times		6	5

Table 3: Results split for LST periods.

5. Conclusion

The results of a search for serious ARV studies yielded 17 series but only a few were reported in peer-reviewed journals. The results are surprising. Most of the series led to profit, and some of them in considerable profits. This suggests that the poor reporting culture is partly due to some secrecy around this way of making profits. In the ARV studies that employed individual trials but also some combinations of efforts without exception using the combination either by using more viewers of by repeated trials for a single event by 1 person results in better performance. This reminds us of the general idea in signal theory that signal/noise ratio's become better with more measurements.

These empirical results are in line with our simulations and do indicate that, if the effect size obtained in classical RV sessions can also be obtained in the automated ARV-casino application then profit percentages of far over 500% can be made.

In our own ARV database, about 24% of all were a pass. Therefore only 89 trials were eventually used to play the roulette. The obtained results are somewhat weaker than the results in the review. The over-all results suggest that applied psi is not forbidden and theories that predict non-usability could have to be revised or abandoned. But of course more studies and replications have to be done before firm conclusions can be drawn. Besides, several researchers involved in ARV studies noted a decline in the effect size over the series. There are no exact replications in the database so it might be that upon replication the effect disappears.

Also our results suggest that the effect size that a 'viewer' obtains in a classical remote viewing session is larger than what can be obtained using an automated system. The scoring rate of viewer M is for instance lower even if only a few trials have been carried out with him. This could possibly be due to the delay in feedback that in the case of M was between one or two days. With more trials it would be possible to analyze the data as a function of feedback delay.

Furthermore, the LST results are unexpected because the period that was predicted to be the worse (from 17-20) gives the best results. However, this result doesn't reach statistical significance due to low power.

We believe that further research should use a system that incorporates computer forme of judging as used by May et al. (May, 2000). Also, the role of the player should be automated by using scripts in a digital casino. We think it is extremely important to explore the limits of usability of psi on theoretical and practical grounds. The field will could be soon accepted if it ould sponsor itself using techniques similar to the one described here or if it develops theories that explain why this is impossible.

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Acknowledgement

We thank Fred Melssen for his contributions in the development of the automated ARV-casino system. Without his efforts this system had never been created. We are thankful for the original table of published and non-published ARV experiments that we received from James Spottiswoode and that eventually resulted in table1 of this paper.

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