Using Retrocausal Practice Effects to Predict On-Line Roulette Spins

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Summary

Modern physics suggest that time may be symmetric, thus allowing for backward in time effects, also referred to as retrocausality. Likewise, there is experimental work consistent with the notion that information about a future event, unknowable through inference alone, could be obtained before the event actually occurs. Despite this body of work, there has yet to be an experimental paradigm that has convinced the scientific community at large that retrocausality can influence human behavior.

The main goal of the research agenda summarized below is to provide compelling evidence for retrocausal effects on human cognition. While it is clearly well-established that extended practice in a given domain (e.g., playing the violin) will lead to a change in performance (i.e., greater skill), the summary below describes a novel paradigm to test the strange claim that initial performance in some domain can be influenced by extended practice in the *future*. In other words, this paradigm is designed to test whether someone could be showing expertise in some domain the first time *because* that person is going to have extended practice in the future. This particular paradigm stands apart from other work on this topic through its potential to demonstrate tangible, real-world applications based on the effect (e.g., successful prediction of the spin of a roulette wheel (black vs. red) or the up/down fluctuations of the market).

The goal of the following summary is to (1) provide the rationale for this line of research, (2) describe a novel paradigm developed to test the claim that initial performance in some domain can be influenced by extended practice in the *future*, and (3) describe the current objective which is to test an applied version that can be used to predict meaningful real-world events. In the main experiment described below, the real-word event to be predicted is the outcome of an on-line roulette spin (black vs. red). Ultimately, it is hoped that the research outlined here will lead to important theoretical developments in our notions of time, causality, and their interaction with human cognition.

Background

Einstein (1951) revolutionized the concept of time with his theories of special and general relativity. Since the advent of relativity theory and discoveries within the field of quantum mechanics, some physicists no longer view the passing of time as necessarily being the same as it is experienced subjectively (Atkinson, 2000). In fact, in 2007 the American Association for the Advancement of Sciences devoted a 2-day symposium to the topic of retrocausailty, the idea that future events can influence the past. Despite support within the physics community for the possibility of retrocausality and a burgeoning interest in the phenomenon, it remains an axiom within mainstream scientific psychology that time flows in a forward direction, and that a cause must precede an effect in time. Therefore, it is no surprise that attempts to use psychology to study the behavioral ramifications of these insights from modern physics are relegated to the field of parapsychology and, as such, are generally dismissed by mainstream psychologists.

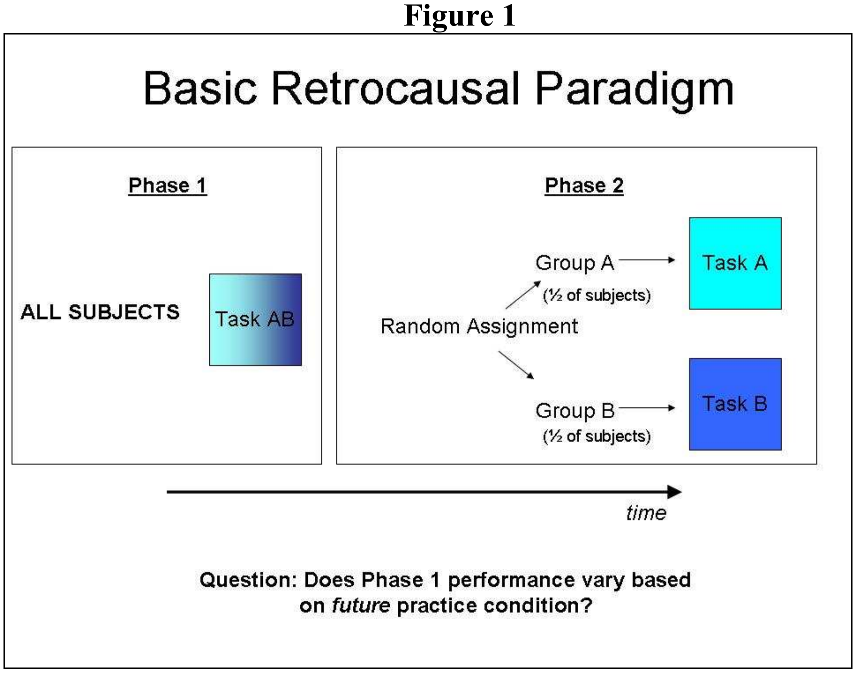
A survey of this literature, however, does reveal some experimental designs that suggest the possibility that information about some future event may influence aspects of behavior in the past. For example, it has been shown that various physiological measures of arousal are higher preceding the onset of emotionally charged versus neutral pictures that are randomly presented to subjects; this effect has been termed presentiment (Bierman & Radin, 1997, Bierman & Scholte, 2002).

More recently, Daryl Bem has done work which suggests that many 'normal' psychological phenomena can also be shown to occur retrocausally (Bem, 2011). For example, his work suggests that *future* exposure to an emotionally charged image inhibits the strong emotional reaction when it is first encountered. Also, work based on the same rationale as the present study suggests that word list recall improves with extended study *after* the test.

The Original Experiment

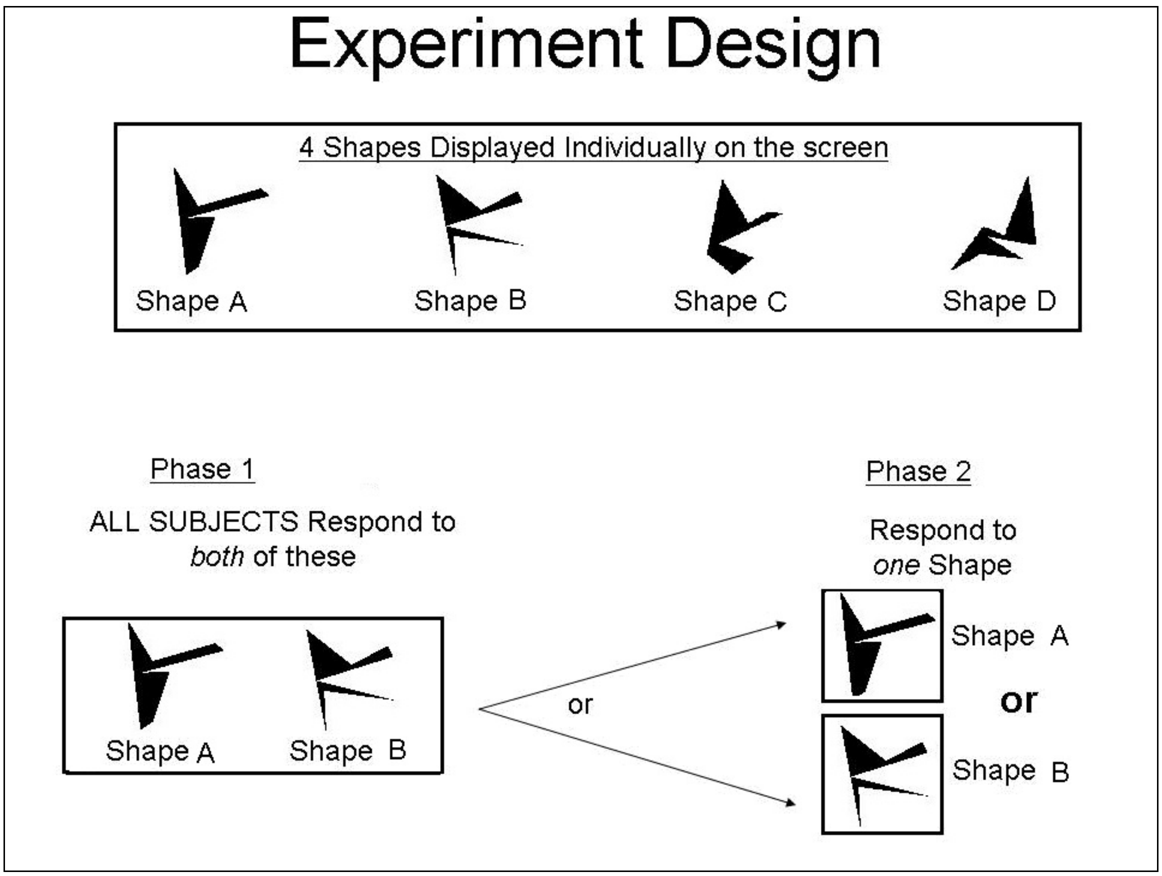
As mentioned above, the major theoretical goal of this work is to examine whether extended future practice in some domain can extend backwards in time to influence prior performance. The original experiment designed towards this aim used a novel 2-phase experiment (Franklin, 2007, 2011ab) which can be summarized as follows (See Figure 1): In phase 1 of the experiment, all subjects complete the exact same task, which is comprised of two parts (A *and* B). In phase 2, however, subjects are *randomly* divided into 2 groups with each group practicing exclusively with one of the two parts (A *or* B). Since all subjects are performing the exact same task in phase 1, we can ask the question: Is phase 1 performance influenced by future practice in phase 2?

Figure 1



In this experiment (See Figure 2) subjects see four different shapes (Shape A, B, C, and D) that randomly appear one at a time in the center of the computer screen. In phase 1, all subjects are simply told to press a button if they see Shape A or Shape B, otherwise they should not respond. Therefore, in phase 1, all subjects respond to both Shape A *and* Shape B. In phase 2, subjects are randomly divided into two groups. One group only responds to Shape A, while another group only responds to Shape B. In phase 2, therefore, subjects are getting practice with either Shape A *or* Shape B. Here we can test whether performance in phase 1, where all subjects are doing the exact same task, responding to both Shape A and B, is influenced by future practice with just one of the two shapes.

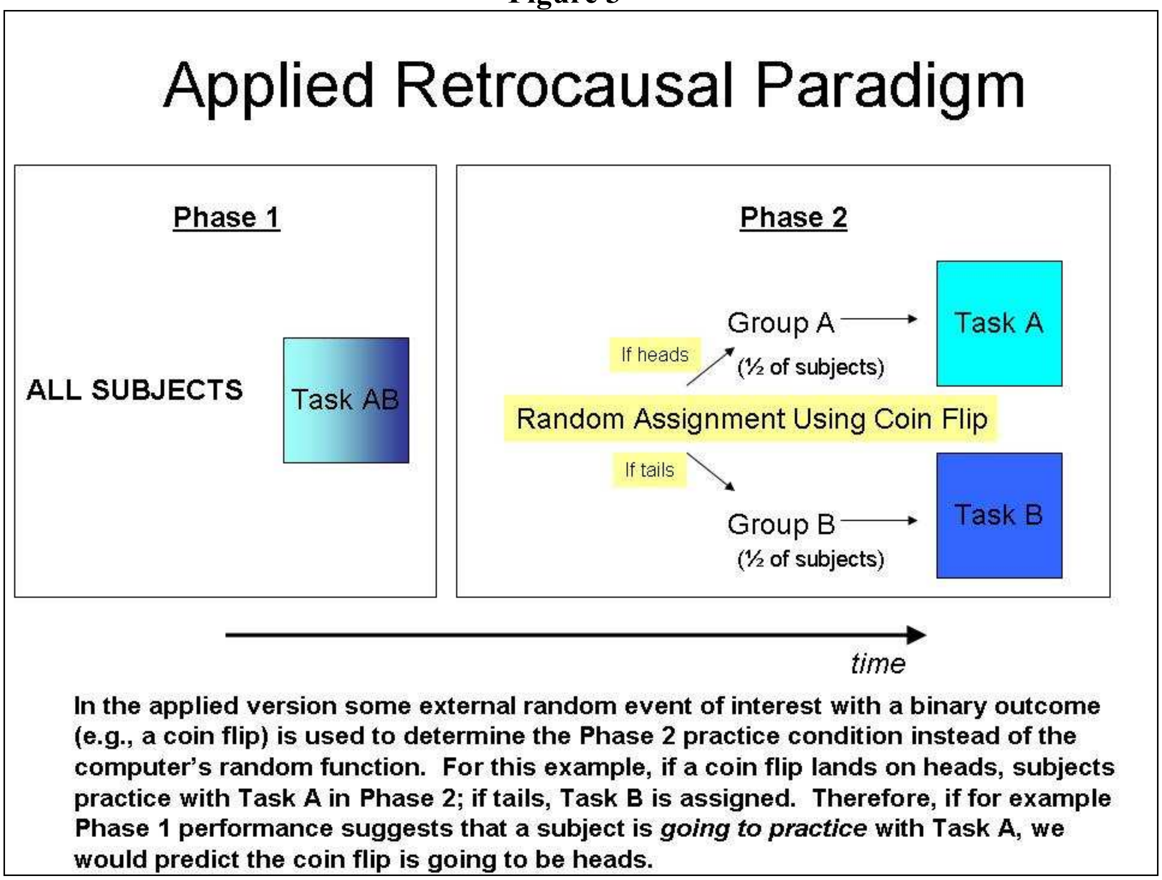
Figure 2



The data from nearly 800 subjects collected at the University of Michigan and UCSB shows that there are reliable effects found in the paradigm, where future practice with a given shape (i.e., in phase 2) significantly affects prior performance (i.e., in phase 1). Importantly, we have discovered the participants' attentional state interacts with the future practice effect (see Appendix A for a summary of the behavioral results). Since there was no way for subjects (or the experimenter) to know which shape was going to be practiced with in phase 2, the results support the hypothesis that future practice with the shape is influencing prior performance.

Ultimately, however, the most convincing demonstration of this phenomenon would be to show tangible effects applied in real-world settings. *Importantly, this particular paradigm offers a way to test for retrocausal effects in an applied manner because what these results actually show is that performance in phase 1 gives a better than chance prediction of an unknown random binary event (i.e., whether the subject will be assigned Shape A or Shape B in phase 2).* Therefore, this same logic can be used to predict other random binary events (e.g., a coin flip) at greater than chance levels (see Figure 3). In the next section, an outline is provided of the main objectives to be accomplished through this applied approach.

Figure 3



Main Objectives

The main objective of this research is to demonstrate that it is possible to use a retrocausal practice paradigm to predict meaningful real-world events. Previous work on the topic has largely attempted to demonstrate retrocausal effects through the above chance prediction of an event linked to a random number generator. Unfortunately, most people do not have a strong intuitive sense that these random number generators must necessarily be random, so it becomes easier for most mainstream scientists' to conclude that there are subtle patterns present in the stimuli rather than accepting the notion of retrocausality. In contrast, the proposed paradigm allows for the prediction of meaningful events whose very source of value stems from their fundamental unpredictability. Such events include the outcome a roulette spin (red vs. black), a hand of blackjack (win vs. loss), or the up vs. down fluctuation of the stock market. The consistent above chance prediction in any of these domains should provide compelling evidence for retrocausality because of the potential for a tangible outcome (e.g., monetary gains). In other words, if the paradigm can be shown to make accurate predictions about events that people a) consider important and b) are incapable of predicting using standard means, then the significance of the paradigm becomes self-evident. In the methods section below, specific details are provided regarding the adaptations made to the original paradigm to accomplish this goal.

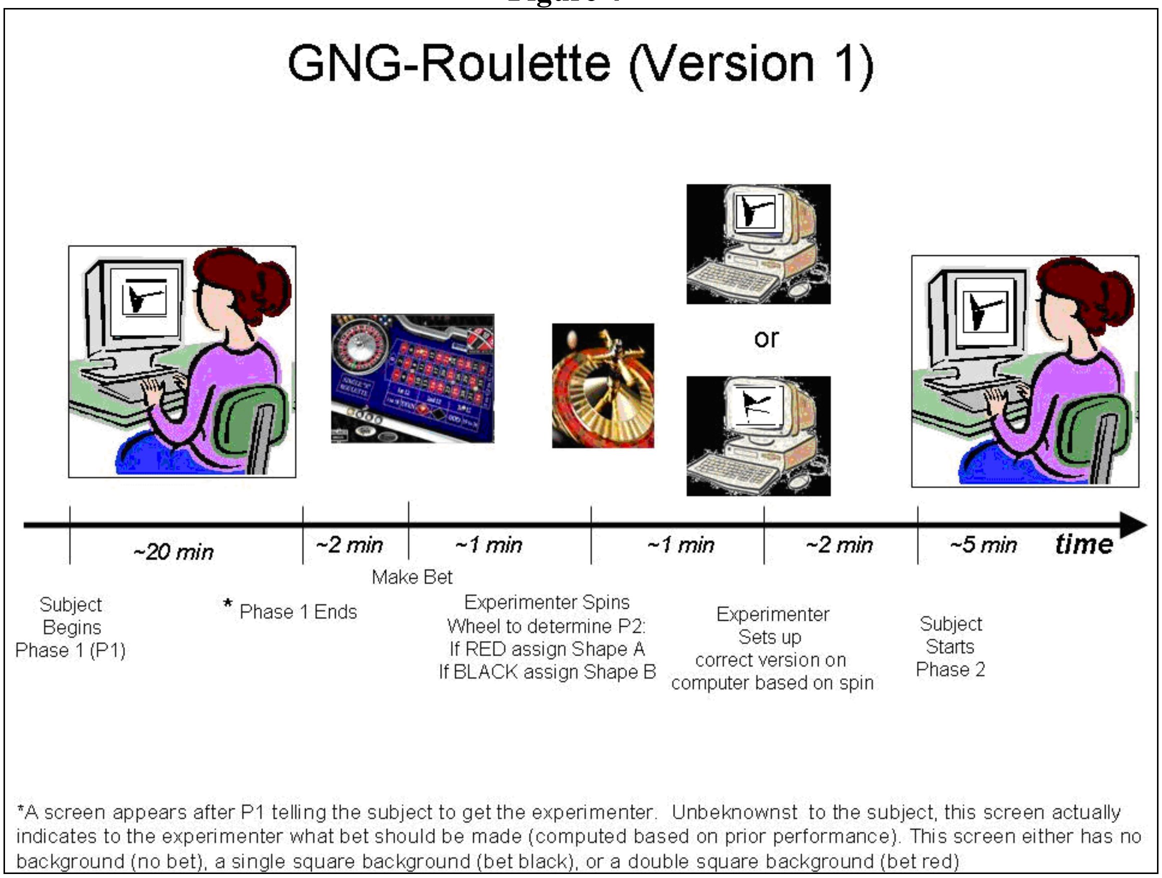
Research Methods

Applied Experimental Design – Roulette Version

In designing this applied version, each of the potential practice shapes for phase 2 (A and B) is assigned a particular outcome of the roulette spin (Shape A => RED, Shape B => BLACK). This mapping is then held constant for all subjects. After phase 1, an algorithm (created based on data collected in previous versions) uses subjects' performance in phase 1 (a combination of reaction time and accuracy) to predict which shape they are going to get in phase 2. For example, if the algorithm predicts that the subject will be assigned to practice with Shape A in phase 2, the experimenter would be told to place a bet on RED because Shape A is mapped to RED.

Two different versions of the experiment have been run that differ in (1) how the experimenter is informed of which bet to make and (2) how the second phase of the experiment is initiated. In the first version (see Figure 4), which is the easiest to implement, the betting information is covertly conveyed to the experimenter via a screen that appears after phase 1 instructing the subject to get the experimenter. This screen either has no background (no bet), a single square surrounding the text (bet black), or a double square surrounding the text (bet red). At this point, the experimenter will make the appropriate bet and then "spin the wheel", using an online roulette program on a different computer controlled by the experimenter [1]. The outcome of the spin is what determines the practice shape assigned in phase 2. So if, as in the previous example, the ball does in fact land on RED, the experimenter will set up the next phase so that the subject practices with Shape A, and the trial is scored as a hit. If, however, the ball lands on BLACK, the experimenter will assign Shape B as the practice shape, and the trial would be scored as a miss. Importantly, since phase 2 is determined by the roulette spin there is no way that the experimenter's knowledge of performance during phase 1 could contaminate the results.

Figure 4



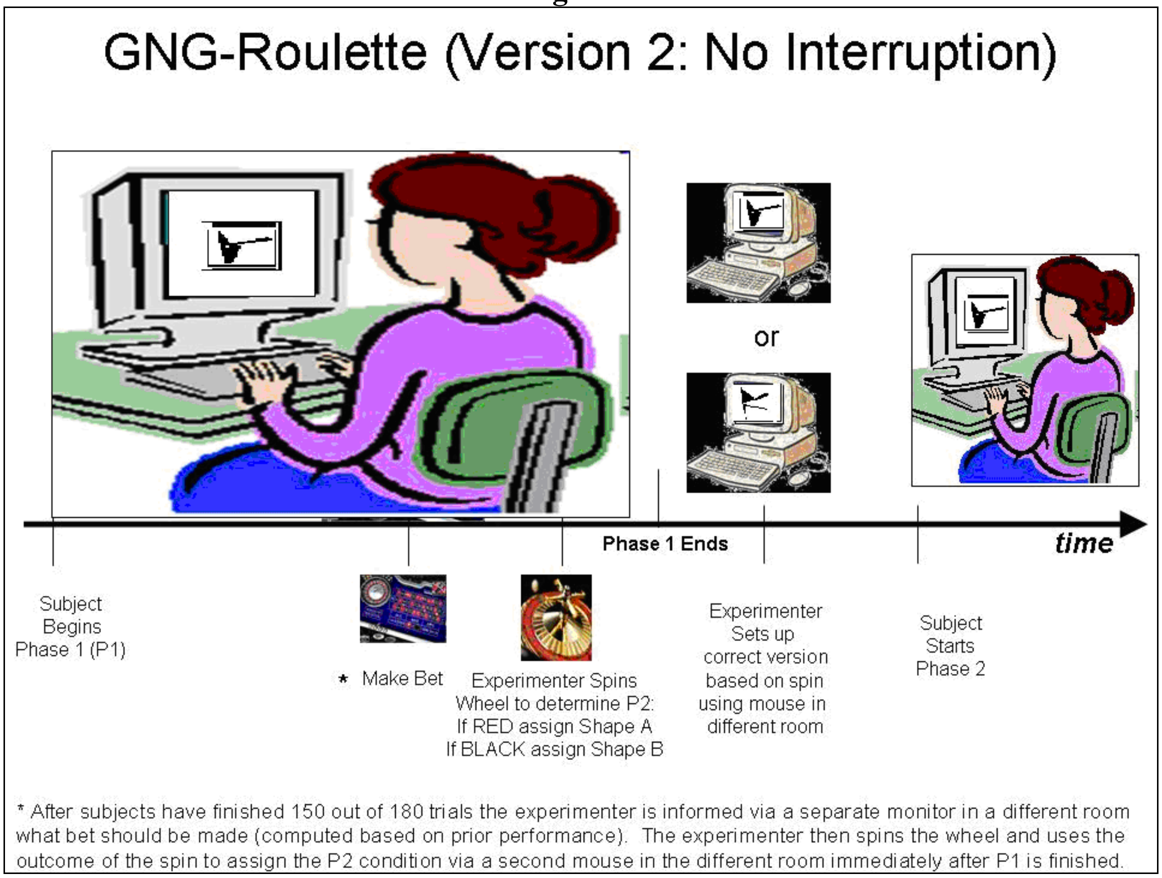
The retrocausal explanation for a hit is as follows: Because the ball landed on RED, subjects were assigned to practice with Shape A in phase 2. It is this future practice with Shape A, in phase 2, that retrocausally influences performance in phase 1. Therefore, by measuring the subject's performance in phase 1 we can predict the future practice shape (Shape A). The successful prediction of the roulette outcome is thus a consequence of the shape being mapped onto a specific roulette outcome (RED).

In the second version (see Figure 5), an additional monitor and mouse connected to the computer are placed in an adjacent testing room. In this version the betting information

[1] The roulette website (http://casino.bodog.com/free-euro-roulette.jsp) is certified by an outside accredited testing facility that runs tests to ensure that the results are fair and not predictable. Additionally, we have run our own simulations that have yielded chance results.

is conveyed to the experimenter via the second monitor, and the experimenter is able to set up the second phase of the experiment remotely (via a button press on the mouse). This version has the advantage of not interrupting the subject between the two phases, and from the perspective of the subject is exactly the same as the original experiment described previously.

Figure 5



Developing an algorithm that consistently predicts a roulette spin above-chance

In the original version, it was found that the effect of future practice interacts with the subjects' attentional state. Therefore, in order to improve the hit-rate of the prediction algorithm, a pre-task is included to help assess the extent to which a subject will be paying attention when doing the main 2-phase experiment. Specifically, this pre-test consists of a basic item-recognition task in which the subject first sees six letters on the screen, then after a short delay sees another letter, and decides whether it is part of the set. During this task various behavioral measures are collected (reaction time, accuracy, self-reports of mind-wandering) that are used to predict the amount of attention a subject will later devote to the main task.

Pilot testing with this paradigm (Versions 1 and 2) was done in order to assign values to the various parameters in an attempt to optimally predict the future practice shape[2]. Table 1 summarizes the success of the current algorithm as it is applied to all the data collected so far with subjects run on the same basic paradigm (WM task followed by the precognition task). The current algorithm, which takes into account the extra attentional measures from the WM task, yields an above chance prediction of the roulette spin when applied to a previously run 'Non-Roulette' Version (N = 135 bets[3], hit rate = 64%), Roulette Version 1 (N = 190 bets, hit rate = 57%), and Roulette Version 2a (N = 60 bets, hit rate = 60%). The most recent work has focused on the second version of the roulette experiment since it appears that interrupting the participants between the phases may weaken the effect. Importantly, new data collected thus far suggest that the algorithm is successful in predicting the outcome of the roulette spin -- when it was used in real-time with a new sample of participants the hit rate was significantly above chance (N = 194 bets, hit rate = 57.2%, 2-tailed $p < 0.05$).

Table 1

Version	N Subjects	N Bets	Hit Rate
Non-Roulette	227	135	64%
Roulette V1	295	190	57%
Roulette V2a	97	60	60%
Roulette V2b	351	194	57%

Given the complicated setup required to run the current version of the roulette experiment and the fact that this setup requires an experimenter to place a bet, 'spin' the online roulette wheel, and initiate phase 2 of the experiment (which is not ideal because it allows for the possibility that an experimenter could manipulate the condition assignment) we have sought to develop an automated on-line version of the experiment which is now accessible at www.michaelsfranklin.com.

Although initially the goal was to have the online version communicate with a 'real-money' website, a number of technical obstacles (as well as potential legal obstacles) have impeded this goal. The current on-line version uses an independent roulette program where a wheel is 'spun' and the output is used to determine the phase 2 practice condition. This version is completely analogous in design to the intended version that would have communicated with a pay website, as such, there is no reason to believe that if this current version works, that it would not also work with actual 'real-money' bets. The goal is to continue to run subjects at UCSB with new online version and recruit as many participants as possible remotely to see how well the algorithm generalizes to other subject populations; the ultimate goal being to recruit mainstream labs to conduct formal replications that could be included in a manuscript intended for a top top-tier journal[4].

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[2] More information regarding the prediction algorithm is provided in the Appendix.

[3] As can be seen from Table 1, not all participants that are run are bet on; specifically, bets are made on approximately 63% of participants run. Participants are excluded due to either poor performance on the tasks (WM task /Phase 1 of the GNG task), or because a participant's parameter values used in the algorithm fail to clearly assign that participant to one of the two future practice conditions.

[4] Appendices with more details regarding the behavioral results are available upon request.

References:

Atkinson, D. (2000). Quantum mechanics and retrocausality. In N. Dadhich and A. Kembhavi (eds.), *The universe, visions and perspectives* (35-50). Dordrecht: Kluwer Academic Publishers.

Bem, D. J. (2011, January 31). Feeling the Future: Experimental Evidence for Anomalous Retroactive Influences on Cognition and Affect. *Journal of Personality and Social Psychology*. Advance online publication. doi: 10.1037/a0021524

Bierman, D. J., & Radin, D. I. (1997). Anomalous anticipatory response on randomized future conditions. *Perceptual and Motor Skills, 84*, 689.690.

Bierman, D. J., & Scholte, H. S. (2002). *Anomalous anticipatory brain activation preceding exposure to emotional and neutral pictures.* Paper presented at The Parapsychological Association, 45th Annual Convention, Paris.

Einstein, A. (1951). *Relativity: The Special and the General Theory.* R. Lawson, New York: Crown Publishers Inc.

Franklin, M.S. (2007). Can practice effects extend backwards in time? A talk presented at the 26th Annual Society for Scientific Exploration Meeting, Michigan State University, Lansing, MI.

Franklin, M. S. & Schooler, J. W. (2011a). Using retrocausal practice effects to predict random binary events in an applied setting. A talk presented at Towards a Science of Consciousness, Stockholm, Sweden, May, 2011.

Franklin, M. S. & Schooler, J. W. (2011b). Using retrocausal practice effects to predict on-line roulette spins. A talk presented at Society for Experimental Social Psychology, Consciousness, Washington, D.C., October, 2011.