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Special random numbers: Beyond the illusion of control

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Abstract

Previous research has shown that gamblers prefer numbers they choose themselves because this choice allows them to feel more in control of the (random) outcome. We identify other conditions under which people find numbers "special" (i.e., worthy of betting more on than other numbers). By manipulating gambling task type and assigning participants a number by an endogenous system outside their own control (as is done in numerology, astrology, and other paranormal systems), we find that indeed people prefer to bet on numbers derived from particular special systems. The mechanism underlying this preference is enjoyment with the task—not control. Further, the enjoyment associated with this "specialness" is related to the prevalence of certain types of numbers (i.e., numbers based on dates and names) in the fortune-telling world and not to other factors such as individuality or even belief in the associated system. We replicate these findings using actual money and show that this prevalence-to-enjoyment link already exists in memory for dates and names and is activated and strengthened by priming the fortune-telling systems relevant to those special random numbers. Finally, we present a model of special random numbers that integrates our findings with other determinants of valuation such as regret and subjective probability. Our results expand the realm of special random numbers beyond control. Our enjoyment model has implications not only for understanding gambling, but also for understanding how reasoning under uncertainty is influenced by little-understood phenomena (such as fortune-telling systems) without affecting subjective probability or actual beliefs.

Keywords: Gambling; Uncertainty; Risk; Paranormal; Illusion of control; Randomness; Fortune-telling

In many gambling situations, the decision maker picks a number or symbol in order to potentially win money via a random system. A purely mathematical view of random gambling systems would presuppose that, given the presumed goal of maximizing the probability of winning, there is no reason to prefer one number (such as one chosen for a lottery ticket or a number on a roulette wheel) over another when the expected value stays constant over all possible choices. Research has repeatedly shown, however, that even within a random system decision makers prefer numbers they pick themselves to randomly chosen numbers—a finding termed the "illusion of control" (Langer, 1975; Langer & Roth, 1975; Wortman, 1975). This preference is reflected in actual lotteries. A significant number (approximately 30%) of state lottery players expend the extra effort to choose their own numbers rather than have the computer pick the numbers for them (MUSL, 2003).

A preference for numbers decision makers pick themselves is an indication that decision makers do not view all numbers equally within a random system. Some random numbers are more special than are others. In this set of studies, we explore this notion of "special random numbers," with a particular emphasis on a class of special numbers that has received little attention in the literature: special random numbers over which the decision maker has no control. We establish that decision makers prefer some numbers that they do

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not pick (over other numbers they do not pick) and explore the reasons for this preference, with the goal of explaining (1) the types of random numbers decision makers find special (i.e., more attractive in a gambling scenario), (2) the reasons they find them special, and (3) the cognitive/affective mechanisms that lead to this preference.

We first briefly outline previous research on the illusion of control to establish that decision makers do find some numbers more special than others, even within a random system. Second, we review previous research and discuss some theoretical insights suggesting that decision makers may also prefer some types of random numbers that they do not choose themselves (i.e., that they do not have control over). Finally, we begin to develop a general model of how and why some random numbers come to be considered special.

The illusion of control

There is ample evidence in the literature that people prefer certain numbers over others in a random system. Langer (1975), across several studies, established that participants prefer to choose their own lottery ticket instead of having one chosen for them. In one study, for example, Langer (1975) introduced choice into a lottery task by letting half the participants choose their own football card to represent their lottery ticket. The other half was randomly given a football card as a lottery ticket. When the experimenter inquired about repurchasing the card before the outcome of the lottery was announced, participants who were allowed to choose which football card represented their ticket demanded significantly more money for their ticket (over $8) compared to those participants assigned tickets ($2). This general finding, that people prefer to choose their own random number, is robust over direct and indirect measures, including willingness to bet or trade and levels of confidence in outcomes (e.g., Burger & Cooper, 1979; McKenna, 1993; Wortman, 1975). Presson and Benassi (1996) conducted a meta-analysis using 53 experiments in 29 articles to show the prevalence and consistency of the effect.

The underlying theme of this research is that feelings of control lead individuals to exaggerate their subjective probability of success, which in turn leads to their preference for numbers chosen by them. The fact that the effect is increased when the game involves skill-related cues such as choice, competition, and familiarity (Langer, 1975; Wortman, 1975) supports a control mediator, and when control has been measured (e.g., Wortman, 1975) it does indeed predict the effect. Later studies showed that these increased feelings of control are due at least in part to decision makers increasing their subjective probability estimates of success (e.g., Thompson, Armstrong, & Thomas, 1998).

But is it possible that decision makers favor some random numbers that they do not choose themselves? Could they prefer these random numbers without inflating their estimates of subjective probability? Previous research provides clues towards other special random numbers. For instance, in one study Langer (1975) found that people bet more on letters of the alphabet than on printer symbols. Similarly, Cole and Hastie (1978) found that participants preferred gambling on a common game of tic-tac-toe (which uses letters) compared to its algebraic equivalent. The tic-tac-toe game did not provide any more control than did the algebraic gamble, and participants did not feel that the subjective probability of success increased in the tic-tac-toe game versus the algebraic equivalent. These results suggest that preference for certain special numbers might be divorced from any feelings of control. Instead, preference could have been driven by the familiar system (tic-tac-toe, in this case), which is a legitimate and well-accepted game in the participants' culture. The algebraic game removes this connection to the familiar system. Prevalence in the culture (and associated variables such as enjoyment), and not an increase in control, could be responsible for the random gamble's specialness. Thus, we speculate that some random numbers might become special by association with a system prevalent in the gambler's culture. By activating these associations in memory, a prevalent system may then be more enjoyed, and ultimately preferred, over less prevalent gaming systems independent of the illusion of control.

There are anecdotal reasons to suspect that other variables besides the illusion of control can influence preferences for chance tasks. Numerous systems based on random issues, such as astrology and numerology, provide information to decision makers to guide their life, evaluate their personality, and/or make investments and other risky financial decisions. The "Kabalarians," (www.kabalarians.com) for instance, will provide an analysis of your name (in combination with your birth date) and what it means for you, including future economic decisions. These psychic and fortune-telling systems are based on systematic factors such as the current month or the letters in a person's name; however, these systems are random with respect to the issues they are asked to predict.

Little attention has been given to whether and how these special systems impact preference construction in decision making. Systematic explanations for random events have had a prominent role in human philosophy and thought for thousands of years. If these systems are used in decision making, what types of number systems may people prefer even though they have no control over them?

We propose that some systems may be preferred because they are more enjoyable and that this enjoyment is derived from associations with a game or system that is prevalent in a decision maker's society—that is, a system with which a decision maker has had experience. The positive affect stemming from positive memories of past experiences with these systems—perhaps from reading horoscopes or playing childhood numerology games—can be triggered by gambling situations that reference these systems. Thus, we propose that decision makers will prefer random numbers and that cued enjoyment with the random number system itself will mediate this process.

Overview of studies

Study 1 establishes the basic finding that there are special random numbers not associated with the illusion of control. It also tests the link between enjoyment and preference for a chance task. The special number is assigned to participants via a complex personalized system (as is done in numerology, astrology, tarot cards, and other paranormal systems). To touch base with previous research, Study 1 also includes a choice condition. We also measure enjoyment and other factors to start to establish the locus of our effects. Study 1b replicates these results using a different (perhaps preferable) response mode.

In Study 2, we explore whether prevalent systems (i.e., numerology based on names and dates) are preferred compared to less prevalent systems in a random task. Study 3 explicitly tests whether the preferred special number generating systems in Study 2 are indeed more prevalent in society, a necessary link in our theoretical argument. Together these studies help trace the possibility that prevalence (i.e., many positive associations) is associated with more enjoyment with a special number, which in turn leads to greater preference for those numbers.

Using real money in Study 4, we test more directly whether positive associations with prevalent systems underlie the enjoyment-to-preference link. By priming existing associations with a prevalent system, we are able to strengthen the enjoyment-to-preference link, providing more evidence for the proposed mechanism underlying the effect. In addition, we identify the locus of the enjoyment within the special number generation task itself. Finally, Study 4 integrates these findings with other determinants of valuation, namely subjective probability, affect, regret, expected value, and the illusion of control.

In the following set of studies we visit these issues, not to contradict the extant work—which in fact we replicate—but to add to the idea of special random numbers beyond the illusion of control. We do this to incorporate the array of factors that have been shown to impact preferences for a chance task.

Study 1

Study 1 tested preferences for a gamble in the presence of personalized random numbers of two types: those that participants have illusory control over (because they pick their own numbers) and those that participants have no control over but which we suspected would be special. We compared these two types of special random numbers to a control condition in which the random number was assigned to the participants, a condition analogous to that used in previous illusion of control studies (e.g., Langer, 1975; Thompson et al., 1998).

Participants

A total of 782 undergraduates participated from various colleges at a large southwestern university. Of these students, 260 were enrolled in introductory marketing classes (for business majors and non-majors) and received extra credit for participation. Approximately two-thirds of these participants were non-business majors. Another 522 students were recruited outside of the student union and received $5 for their participation in this study and another unrelated study lasting a total of 20 min. There were no statistical differences between the participant groups and they are combined for the analyses.

Measures and procedure

The study had a 3 (Game: Choice, No-Choice, Numerology; within-subject) × 3 (Order of Bets; between subjects) design. The order of bets was counterbalanced using a Latin square design. There was one order effect: the first bet positively affected the size of subsequent bets, as would be expected given anchoring and adjustment (Tversky & Kahneman, 1974). Order did not interact with any within-subject effects; the orders are combined for the analyses.

Participants completed paper-and-pencil questionnaires that described three hypothetical gambling scenarios on campus. The odds of success for each scenario were 1:999 with a hypothetical payout of 990:1. Participants indicated their willingness-to-pay for three gambling scenarios and could indicate any amount, including zero. The choice condition described a betting game in which students could bet on a spinning wheel. After reading the scenario, participants chose a number to play and then indicated the most they would be willing to bet on this number. For the no-choice condition, participants were told that an operator would spin a wheel and randomly assign numbers between 1 and 999. As in the choice condition, participants indicated the most they would be willing to pay for this bet, but for the no-choice condition, they did not choose the number on

which they would bet. Instead, all participants bet on the possibility that the wheel would stop on the number 185.[1]

For the numerology condition, participants calculated and were then asked to bet on their personalized "Numerology Luck Code." The numerology condition read as follows:

The numbers are based on the ancient science of numerology, which suggests that the letters in a person's name can be converted to a number, which has a particular cosmic vibration. Numerology is easy to do. To construct your Numerology Code, which is particular to you, just convert each of your initials to a number using the chart below…This code reflects your personality and should be lucky for you.

Note that these instructions provide no added cue of control or skill compared to the no-choice condition. However, the task did allow for the formation of a special random number. Specifically, the scenario related participants' names, which are often used in numerology systems (e.g., the Kabalarians), to the number on which participants could bet.

Participants indicated their feelings of confidence, enjoyment, and control on a one to seven scale for each game immediately after indicating their willingness-to-pay (WTP) but before continuing to the next scenario. The three questions asked, "How confident are you that you will win?" (Not Very Confident–Very Confident), "How much would you enjoy playing this game?" (Very Little–Very Much), and "How much control do you feel you have over the outcome of this event?" (No Control–A lot of Control).

Results

WTP measures are usually log normal, reflecting decreasing marginal utility. As in most previous research using WTP (e.g., Irwin, Slovic, Lichtenstein, & McClelland, 1993), the natural logarithm of the WTP measure was calculated to capture the log normal distribution. The natural log of .5 was assigned when the WTP value was zero.

Replicating previous research, we found that individuals were willing to pay more for different gambles, despite the equivalent expected values across games. Individuals were willing to pay significantly more for a bet in the choice condition compared to the no-choice condition [$t(776) = 5.24$, $p < .01$]. Most importantly for our purposes, individuals were willing to pay significantly more for a bet in the numerology condition compared to the no-choice condition [$t(768) = 2.74$, $p < .01$, see Table 1]. In other words, both the choice and numerology numbers were considered "special" despite participants only being able to control their special number in the choice condition.

Table 1
Study 1: WTP means and differences across conditions

Condition	Mean WTP (Geometric)	Mean within-subject difference		
		Choice	Numerology	No-choice
Choice	2.44	—	1.06*	1.14*
Numerology	2.27		—	1.07*
No-choice	2.14			—

* Difference from zero significant, $p < .01$.

In order to test whether enjoyment, confidence, and/or control affected betting, we constructed models in which differences in amount bet across conditions (i.e., the within-subject contrast variable) were predicted by differences in the three predictor variables—enjoyment, confidence, and control. Thus, this difference model told us which elements of the bet were related to the differences in preference.

In a full multivariate model with all three predictors, enjoyment and confidence significantly predicted the increase in amount bet in the choice condition over the no-choice condition [$b = .29$, $t(772) = 11.02$, $p < .001$, for enjoyment; $b = .19$, $t(772) = 6.38$, $p < .001$, for confidence; model $R^2 = .25$]; however, feelings of control did not significantly predict this increase [$t(772) = .82$, ns]. More importantly, a similar pattern emerged when comparing the numerology condition to the no-choice condition. Feelings of enjoyment and confidence significantly predicted the increase in the amount bet in the numerology condition over the no-choice condition [$b = .16$, $t(764) = 6.27$, $p < .001$, for enjoyment; $b = .23$, $t(764) = 6.96$, $p < .001$, for confidence; model $R^2 = .15$]; however, feelings of control did not predict the increase in the amount bet with enjoyment and confidence in the model [$t(764) = .36$, ns].

For our purposes, this full multivariate model is the most relevant due to the covariance between the independent variables. However, for completeness we report the simple models for each independent variable. When we regressed amount bet onto enjoyment, confidence, and control, all three simple models predicted the increase in amount bet in the choice condition compared to the no-choice condition [$b = .35$, $t(774) = 14.14$, $p < .001$, for enjoyment; $b = .29$, $t(774) = 10.64$, $p < .001$, for confidence; and $b = .23$, $t(774) = 6.77$, $p < .001$, for control] and in the numerology condition compared to the no-choice condition [$b = .22$, $t(766) = 8.83$, $p < .001$, for enjoyment; $b = .30$, $t(766) = 9.62$, $p < .001$, for confidence; and $b = .17$, $t(766) = 4.16$, $p < .001$, for control].

[1] This number was randomly chosen by the experimenter. Though all participants were assigned the number 185 in the no-choice condition, they had no way of knowing what numbers other participants were assigned. Similar results were obtained in Study 4 in which participants were told they were receiving a unique random number and were actually randomly assigned one of three different numbers.

Discussion

Study 1 suggests that at least two factors influence how individuals represent a random gambling scenario. First, how an individual derives a number for a bet influences an individual's preference for that bet. Consistent with previous research, we find individuals prefer to choose a number themselves compared to having a number given to them. In addition, individuals prefer a specialized number compared to having a number randomly given to them. This preference is not driven by feelings of control, assuming individuals have no control over their initials in the numerology condition. The analyses using enjoyment, confidence, and control underscore this notion; control did not predict preference above and beyond enjoyment and confidence.

WTP measures can be unreliable (e.g., they do not always predict preference orders as indicated by actual choices; Irwin et al., 1993; Wertenbroch & Skiera, 2002). On the one hand, hypothetical WTP values may be less trustworthy because the amount does not have to actually be paid (leading perhaps to extravagant values); on the other hand, truthful WTP values may be subject to income effects. Also, WTP measures do not apply to all contexts. For example, in a true lottery context people cannot pay more for the same ticket, but they may be more likely to play. Study 1b serves both as a replication of Study 1's counterintuitive findings and an extension to a new, and perhaps more palatable, dependent measure: participants' ratings of how likely they would be to bet.

Study 1b

Study 1b was designed to both replicate the effects of Study 1 and to test for the generalizability of the results to different valuation tasks.

Participants

Two hundred ninety-five students from various colleges at a large southwestern university participated in the study. Of these students, 183 were enrolled in introductory marketing classes and received extra credit for participation. Approximately two-thirds of these participants were non-business majors. Another 112 students were recruited outside of the student union and received $5 for their participation in this study and another unrelated study lasting a total of 20 min. Again, there were no statistical differences between these groups and they are combined for the analyses.

Measures and procedure

The study had a 3 (Game: Choice, No-Choice, Numerology; within-subject) × 3 (Order of Bets; between-subjects) design. The order of bets was counterbalanced using a Latin square design. The procedure was similar to Study 1. Participants read one of three gambling scenarios as in Study 1, but instead of indicating a WTP, participants were asked, "How likely would you be to bet?" which they rated on a seven-point scale (Not Very Likely–Very Likely). Participants then responded to the same confidence, enjoyment, and control questions as in Study 1. Participants repeated this process for the other two gambling scenarios.

Results

Consistent with Study 1, participants' ratings on the likely-to-bet scale were greater on certain gambles despite identical expected values. Participants' ratings were greater in the choice condition than the no-choice condition [$t(295) = 4.4$, $p < .001$], replicating earlier illusion of control findings. More importantly, the ratings in the numerology condition were greater than in the no-choice condition [$t(295) = 3.3$, $p < .001$], indicating that participants preferred the special random numbers.

When we regressed the likely-to-bet scale differences on our three independent measures (enjoyment, confidence, and control) in a multivariate model, we obtained similar results to Study 1. Feelings of enjoyment and confidence significantly predicted the increase in the scale ratings in the choice condition over the no-choice condition [$b = .40$, $t(291) = 7.07$, $p < .001$, for enjoyment; $b = .46$, $t(291) = 5.86$, $p < .001$, for confidence; model $R^2 = .32$]. In this full multivariate model, feelings of control did not reliably predict this increase [$t(291) = .6$, ns]. A similar pattern emerged when comparing the numerology condition to the no-choice condition. Feelings of enjoyment and confidence significantly predicted this increase in ratings [$b = .33$, $t(291) = 5.62$, $p < .001$, for enjoyment; $b = .40$, $t(291) = 5.05$, $p < .001$, for confidence; model $R^2 = .23$]. Feelings of control did not reliably predict this increase, although there was a marginal positive effect [$b = .13$, $t(291) = 1.69$, $p = .09$].

Again, for completeness we report the simple models for each independent variable. When we regressed bet scale ratings onto enjoyment, confidence, and control in three separate regressions, all three simple models predicted the increase in the ratings in the choice condition compared to the no-choice condition [$b = .52$, $t(293) = 9.31$, $p < .001$, for enjoyment; $b = .66$, $t(293) = 8.54$, $p < .001$, for confidence; and $b = .15$, $t(293) = 2.12$, $p < .04$, for control] and in the numerology condition compared to the no-choice condition [$b = .42$, $t(293) = 7.07$, $p < .001$, for enjoyment; $b = .55$, $t(293) = 7.01$, $p < .001$, for confidence; and $b = .17$, $t(293) = 2.11$, $p < .04$, for control].

Discussion

As in Study 1, the special random number was preferred over the no-choice condition, and both enjoyment

and confidence predicted this effect. These findings (1) suggest that the pattern of results in Study 1 were not appreciably influenced by the WTP measure, and (2) increase construct validity, establishing that the effects hold across multiple measures.

At this point we know that a numerology task using people's initials results in a number that is more special to them than numbers randomly assigned to that participant. We also have a sense that enjoyment and confidence are driving interest in these numbers, but we do not really know how far we can stretch this "specialness." Namely, will any numerology system result in a number of interest to participants? Or, is there something special about names?

Researching special random numbers, we noticed that some random systems are more prevalent and especially attractive to people. In particular, almost all psychic systems consistently use either a date (the current month, birthdays, etc.) or one's name. Astrological systems based on dates trace back at least to ancient Rome, as does the idea of specialness hidden in one's name. The Roman saying *nomen est omen* underscores this interest ("Your name is your destiny").

It also is possible that the individuality of one's name (it is not shared with any, or at least many, others) could lead to the increased preference. Thus, there are two clear possibilities driving the underlying "specialness" dimension(s) of the numerology task: (1) the individuality of the number or (2) the fact that the number is drawn from a random system prevalent in our culture (in this case, the participant's name). In Study 2, we manipulate these two factors—individuality and prevalence.

Study 2

This study was designed to further investigate the preference for the numerology condition by determining whether numbers associated with prevalent systems have heightened value to decision makers. We developed four numerology systems to reflect a 2×2 of Individuality (i.e., your own number or one unlikely to be shared by many) by Prevalence (i.e., system is prevalent in our culture). In addition, we included the control condition (a.k.a., no-choice condition).

In this study, we eliminated several alternative hypotheses for the results of the first two studies. We used a between-subjects design, allowing us to eliminate demand or comparison effects as alternative explanations. The between-subject design combined with the additional numerology conditions also eliminated the concern that participants were seizing on any difference they could find to differentiate the alternatives, which could have inflated differences between alternatives.

Participants

A total of 513 participants from various colleges at a large southwestern university participated in the study. Participants were approached while waiting in line to pick up their football season ticket orders. Participants were asked to answer a few opinion questions regarding gambling and personal beliefs. Nearly all those approached agreed to participate. Ages of participants ranged from 17 to 36 years and the mean was 21. Approximately 55% of participants were male.

Measures and procedure

A 2 (Individual: High vs. Low) $\times$ 2 (Prevalence: High vs. Low) + 1 Control between-subjects design was used to test the hypotheses. As in Study 1, participants responded to a paper-and-pencil questionnaire that described a hypothetical gambling scenario on campus. In four conditions participants calculated their Numerology Code "based on the ancient science of numerology." The fifth (control) condition was identical to the no-choice condition in Study 1: participants indicated how likely they would be to bet on a given number between 1 and 999, specifically the number 185.

Participants derived their Numerology Code from four different formulas that manipulated the individual nature of the Numerology Code and the prevalence of the special random systems. We noticed that all prevalent random systems (e.g., numerology, astrology, Kabalarian forecasting using one's name and birth date, etc.) are based either on one's name or on particular days and/or months. Thus, the high prevalence conditions are random systems based on these factors.

The high prevalence/high individuality condition (name) was the same as the numerology condition in Study 1; the Numerology Code was based on the participant's initials. Participants in the high prevalence/low individuality condition (date) computed their Numerology Code by taking the first three letters of the current month and converting them into a number. Participants in the low prevalence/high individuality condition (cup) computed their Numerology Code by picking three letters out of a cup and converting them into numbers in the same fashion as in the other conditions. The low prevalence/low individuality condition (university) participants computed their Numerology Code by using the initials of their university. Since the study and the gambling scenario took place on campus at a university (they were waiting in line for student tickets), participants were well aware that all individuals would have the same Numerology Code in this condition. This condition eliminated any individual aspect of the Numerology Code and did not possess any culturally prevalent cues. The date condition did have culturally prevalent cues,

but it was calculated using the current date, eliminating any individuation with the Numerology Code.

After deriving their Numerology Code, participants were asked to rate how likely they would be to bet on this number on a one to seven scale (as in Study 1b), and then to answer the same enjoyment, control, and confidence questions as in Study 1, followed by gender and age questions.

Results

We analyzed the data using four orthogonal between-subjects contrast codes: (1) the control (no-choice) condition versus the four numerology conditions, (2) high versus low prevalence, (3) high versus low individuality, and (4) the interaction of the latter two, prevalence and individuality.

The control condition was not significantly different from all four numerology conditions [$F(1,508) = .6$, ns]. The notable effect was the impact of prevalence level on participants' ratings on the likely-to-bet scale (see Fig. 1). Individuals' ratings were greater in the high prevalence systems (name and date, $M = 3.74$) compared to the low prevalence ones [university and cup, $M = 3.17$; $F(1,508) = 8.5$, $p < .01$]. There was no effect of individuality [$F(1,508) = .3$, ns] or of the individuality by prevalence interaction [$F(1,508) = .3$, ns] on ratings.

Replicating the multivariate results in Studies 1 and 1b, enjoyment and confidence significantly predicted ratings across scenarios [$b = .61$, $t(508) = 13.33$, $p < .001$, for enjoyment; $b = .49$, $t(508) = 7.2$, $p < .001$, for confidence; model $R^2 = .44$], however, control did not [$b = -.1$, $t(508) = -1.49$, $p = .14$].

We propose that enjoyment may lead to the differences in preference among numerology types, a claim that requires a mediation analysis. Regressing prevalence onto enjoyment, we found that the high prevalence conditions did lead to significantly greater feelings of enjoyment [$b = .16$, $t(510) = 1.94$, $p = .05$]. As noted previously, enjoyment significantly predicted ratings [$b = .61$, $t(508) = 13.33$, $p < .001$], and the prevalence factor significantly impacted ratings [$b = .28$, $t(511) = 2.92$, $p < .01$]. A mediation analysis (Kenny, Kasher, & Bolger, 1998) found that the effect of the prevalent conditions on these ratings ($b = .28$) decreases significantly when enjoyment is added to the model ($b = .17$). This difference was significant using a Sobel (1982) test ($z = 1.93$, $p = .05$). Neither confidence nor control showed this mediation effect, suggesting that confidence may be an outcome of the games, but it is not mediating the relationship between preference and prevalence.

Discussion

This study shows that individuals prefer numbers that are generated by systems using names and dates, systems that are especially prevalent in the fortune-telling world. Specifically, participants preferred to bet on numerology systems that were based on their own name and the current date rather than systems based on their university or letters drawn from a cup. The findings suggest that specialness of random numbers is confined to particular systems that are similar to familiar fortune-telling devices.

Consistent with our previous studies, participants' likely-to-bet ratings were associated with more enjoyment and confidence; however, control did not drive these ratings. Furthermore, only enjoyment mediated the impact that the two prevalent systems had on these ratings.

Study 2 also eliminates some alternative hypotheses. First, the between-subject design eliminates demand, comparison, or persuasion effects. Second, Study 2 disconfirms the alternative explanation of individuality as a mediator, showing that the numerology task in Study 1 was not simply tapping into an individuality heuristic by linking the participant to his/her name.

Study 2 does have one limitation. We use the term "prevalence" to describe some systems using anecdotal knowledge. But we have no direct test of prevalence for our particular stimuli. Study 3 provides this test.

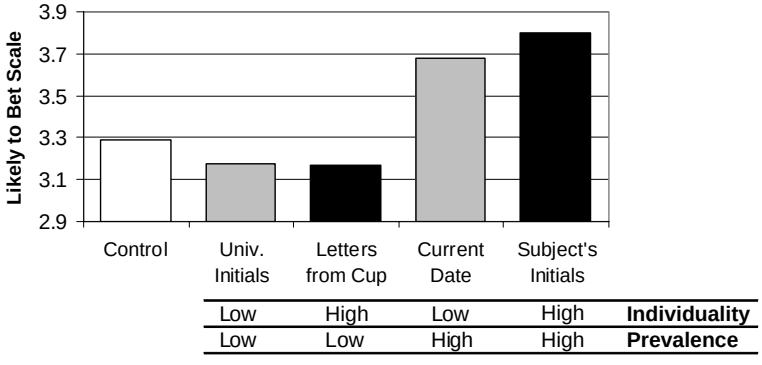

Fig. 1. Study 2: Prevalence and individuality on likely to bet scale.

Study 3

In this study, we hypothesize that people will find names and dates more representative of, or more similar to, other fortune-telling systems that they have experienced. We also test whether people believe that these systems are better at tapping into "cosmic forces" compared to the other systems to test whether true belief (and not just the activation of positive associations) is underlying our results. Similarly, we asked respondents how special and lucky they felt the systems were for them.

Participants

One hundred forty-six participants from various colleges at a large southwestern university received extra credit for participating in the study. Approximately two-thirds of the participants were non-business majors.

Measures and procedures

Participants were presented with paper-and-pencil questionnaires that described the same basic numerology betting games as in Studies 1 and 2. Participants were then presented with all four numerology systems (order was counterbalanced between-subjects and did not affect our results). Participants then rated each system on four criteria. These criteria were: (1) how well the system taps into an "individual cosmic force," (2) how similar the system is to other fortune-telling devices (i.e., how prevalent the system is), (3) how special the number is, and (4) how lucky the system is (see Appendix A for question wordings). In order to get a better sense of the numbers people generate themselves as special random numbers, the last question asked participants what three letters/numbers they would pick if they could pick any letters/numbers (those previously mentioned or any others) for their Numerology Code (see Appendix A for exact wording).

Results

As Table 2 shows, participants rated their name high on all of the scales. They rated the name and date games ($M = 4.03$) as more similar to other fortune-telling devices compared to the other two games [$M = 2.64$, $t(146) = 9.74$, $p < .001$], but, participants also rated these games higher on the other three criteria variables [$t(146) = 6.00$, $p < .001$, for tap force; $t(146) = 7.30$, $p < .001$, for specialness; $t(146) = 3.20$, $p < .001$, for lucky].

Which, if any, of the ratings tasks reflected the preference results in the previous studies? Recall that our aim for this study was to confirm that prevalence underlies the Study 2 results by showing that the prevalence ratings mirror the previous preference ratings. One hint is that the similarity ratings better predicted the prevalence variable than did the other three criteria variables [$F(1,145) = 35.20$, $p < .001$]. In a more direct test, we compared the two games with the greatest preference (names and dates) to the other two games on the four ratings scales. As Table 2 suggests, participants rated their name higher than the university initial and cup games on all of the scales (t ranged from 7 to 10.2, all $p < .001$), but the month game was rated significantly higher than the university and cup games on only one scale, the similarity (prevalence) scale [$t(146) = 7.10$, $p < .001$]. The tap and lucky questions were both not significant ($t < 2$ for both), and the special question was only moderately significant [$t(146) = 1.80$, $p < .06$]. Thus, only the similarity question followed the strong preference pattern found in Study 2. The fact that the special question reflected the pattern, but less clearly, makes sense because special probably is reflecting several dimensions, including prevalence.

Table 2
Study 3: Mean rankings by numerology task

Independent variables	Numerology task			
	Name	Date	Cup	University
Similar	4.28	3.82	3.02	2.24
Tap force	4.23	2.80	3.12	2.41
Specialness	3.95	2.65	2.51	2.34
Lucky	3.68	2.61	3.22	2.50

Recall that the open-ended question at the end of this study asked participants to indicate which three letters or numbers they would use to compute their Numerology Code (to place a hypothetical bet) and why. The results confirmed the Study 2 results. A content analysis of the responses to the open-ended "why" question showed that 90 out of 145 participants [greater than half the respondents, $t(144) = 2.98$, $p < .01$] would base their numbers/letters on either a date or a name. For example, one participant indicated that s/he would choose his/her birth month and wrote, "Birth month has always been significant in astrology throughout a multitude of cultures and centuries." Eleven out of 145 participants indicated that they would base the number on a lucky number, and seven indicated they picked their numbers randomly. The remaining 37 participants came up with responses that could not be categorized.

Discussion

Study 3 shows that the systems we labeled as "high prevalence" in Study 2 are indeed considered more prevalent by participants, who rated these systems as more similar to fortune-telling devices that they have encountered. Interestingly, beliefs in luck in a system or whether a system tapped a "cosmic" force did not translate into the increased ratings found in Study 2. This finding is important because it suggests that remembered (primed)

enjoyment is the key to our effects; the effects are not caused by an actual belief that the numbers are particularly lucky.

The findings in Study 3 help strengthen the link in our model between the preferred random systems (names and dates) and the system's prevalence in society. We propose that prevalence leads to preference by activating positive associations and greater enjoyment with the game at hand. If our proposition is correct, we also should be able to activate these associations by priming a prevalent system, which would then enhance the prevalence-to-enjoyment link.

Study 4

We designed Study 4 to more thoroughly test the prevalence-to-enjoyment link in our model. If it is indeed prevalence that drives the enjoyment-to-preference link, then we should be able to strengthen this link by priming the associations in participants who already have positive associations with a prevalent system (e.g., numerology based on dates). In Study 4, we explicitly test this process.

In Study 4, we also included tests of several competing hypotheses. First, Study 4 was administered with real money with real risks and returns for the participants to ensure that our previous results were not an artifact of hypothetical gambles. Second, using real money allowed participants simply to walk away with their money ($5 in this case) and bet nothing. This procedure eliminates the concern that in previous studies participants' preference were driven by indifference. Instead, participants had to choose whether to bet at all and were not forced to simply make a (perhaps capricious) judgment about the bets. Third, the study measured subjective probability to test whether an increase in subjective probability could more parsimoniously account for the increase in valuation across gambles. Fourth, we measured general affect. Positive affect has been shown to increase the illusion of control (Thompson et al., 1998); therefore, to ensure that the prime was not driving our results simply via positive affect, we included this measure.

In Study 4, we also investigate the role of regret. Previous research has shown that individuals' gambling behavior (e.g., exchanging lottery tickets) can be driven by concerns that an option not chosen might win and that the opportunity cost would then be framed as a loss (Bar-Hillel & Neter, 1996). Because of this shift in frame, the choice to exchange is difficult to justify by the decision maker and creates feelings of regret (Connolly & Zeelenberg, 2002). If choosing not to play one gamble is a less justified choice compared to choosing not to play another gamble, then the former could induce feelings of regret in our experimental setting. Numbers based on prevalent numerological systems may be more justifiable, and so regret might drive our results.

Studies 1–3 have also left one other question unanswered: What is the source of the increase in enjoyment associated with prevalent systems? The increase in enjoyment could be derived from three sources: (1) the playing of the game, (2) the calculation of the Numerology Code itself, or (3) the expected happiness/rejoicing from winning the game (in other words, winning with the Numerology Code might result in more happiness than would winning with an assigned number).

Participants

We recruited 74 students outside of the student union at a large southwestern university and paid them $5 for their participation in the study. The study lasted less than 20 min.

Measures and procedures

After being recruited to participate in the study, an experimenter immediately gave participants five $1 bills. Participants were then asked to answer questions regarding two games. After answering the questions, participants brought their questionnaire to another experimenter to play their bets.

The study used a 2 (Game: Numerology vs. No-Choice; within-subject) × 2 (Prime: Astrology vs. Control; between-subjects) × 2 (Order of Bets; between-subjects) design. Before reading about the two games, participants received either an astrology or control prime. The astrology prime instructed participants to locate and read their sign of the Zodiac, which corresponded to days of the year, according to their birthday. For example, the Taurus example read:

Taurus: April 21–May 21. The Taurean's characteristics are solidity, practicality, and extreme determination—no one will ever drive them, but they will loyally follow a leader they trust. They are stable, balanced, law-abiding citizens and lovers of peace, possessing all the best qualities of the bourgeoisie.

The control prime instructed participants to locate their major (or most likely major at that time) and to read about their major's color. The astrology prime consisted of general descriptions of the Zodiac taken from the self-proclaimed "largest astrology site on the Internet" (and the second highest Google ranking for "astrology" out of approximately 5.2 million hits). The control prime was based on the students' majors—a non-prevalent fortune-telling device in which participants should have no prior associations in memory,

because the authors invented all of it.[2] For example, one entry read:

Liberal Arts. The color of Liberal Arts is yellow. The color yellow is associated with the retro classics and humorousness. The color does not take itself too seriously.

Participants were then told that they could bet all, none, or some of their $5, in any combination, across two separate games. One game was similar to the numerology task in the previous studies and asked participants to calculate their Numerology Code based on their birth month (note that the astrology prime corresponded to days and not months). The other game was the no-choice condition, similar to Studies 1 and 2, in which participants were randomly assigned one of three numbers.[3] Both games allowed participants to pick a chip out of a bag containing the numbers 1 through 99. Thus, if participants chose to play both games, then they had a 1 in 99 chance to win in two separate drawings. Participants were informed that if they won they would receive $50 for every dollar they bet (expected value = −$49).

After indicating their bets, participants then answered questions about each game. There were three questions on enjoyment [enjoyment with the game, "How much would you enjoy playing Game X?" (Very Little–Very Much); enjoyment from calculating the Numerology Code, "How much did you enjoy calculating your Numerology Luck Code (being assigned a random number)?" (Very Little–Very Much); and anticipated enjoyment with winning, "Now imagine winning Game X. How happy would you feel winning this game?" (Somewhat Happy–Very Happy)], one question on regret ["Imagine you decided *not* to play Game X, how much do you think you might regret your decision?" (Very Little–Very Much)], and one question on subjective probability ["Assuming you played Game X, what is the probability of winning? _____%"]. Similar to Study 3, participants then indicated whether numerology tapped into a cosmic force. Finally, we assessed positive mood on a seven-point scale ["What is your mood right now? (Very Bad–Very Good)]. After answering these questions, participants proceeded to a third experimenter where they returned their questionnaires, actually played both games, and either paid their debts or received their winnings.

Results

Our first goal in Study 4 was to test whether a special number would be valued more than a randomly assigned number using real money. Replicating results from Studies 1–2, we found that participants bet more money on the numerology bet ($M = \$0.50$) compared to the no-choice bet [$M = \$0.31$, $t(73) = 2.45$, $p < .05$].

Our second goal in Study 4 was to understand the root of the enjoyment from the more prevalent numerology task. A multivariate analysis of the three enjoyment questions [enjoyment with (1) playing the game, (2) calculating the numerology number, and (3) winning the game] revealed moderate common variance among the three difference score measures ($\alpha = .59$), but that they do tap into different constructs. For example, the enjoyment with playing the game and calculating the number shared only 17% of their variance ($r = .41$, $p < .001$). Analyzing the within-subject difference scores with the three enjoyment questions, we found that participants enjoyed playing the numerology game [difference $M = .55$ $t(72) = 2.5$, $p < .05$] and enjoyed calculating their Numerology Code [difference $M = .64$, $t(72) = 2.57$, $p < .05$] more than being assigned a number. We did not find a statistically significant difference on expected enjoyment from winning either game [$t(72) = .76$, ns], suggesting that participants were not expecting any additional happiness/rejoicing from winning with a special number.

To test for causal relationships between enjoyment and betting behavior, we need to know whether these differences in enjoyment actually correspond to differences in amount bet. A difference in enjoyment with playing the games was associated with a significant increase in valuation of the numerology game over the no-choice game [$b = .14$, $t(71) = 3.53$, $p < .001$]. However, a difference in enjoyment from calculating the special number did not lead to a significant difference in the valuation of the numerology game [$b = .05$, $t(71) = 1.52$, $p = .13$] at traditional levels of reliability. Though these partial null results do not eliminate other forms of enjoyment as drivers of the effects, they do show that finding the game more fun to play resulted in an increased propensity to bet, suggesting that this type of enjoyment is the most important in explaining special random numbers.

Our third goal in this study was to determine the impact of other commonly measured variables (e.g., subjective probability) on bet preference. Participants indicated a higher subjective probability of success in the numerology condition compared to the no-choice condi-

[2] Individual majors included architecture; business; communication; engineering; fine arts; liberal arts; natural or life sciences; agriculture, geosciences or natural resources; nursing or social work. Colors and fortunes were created by the authors and randomly assigned to specific majors.

[3] Three random numbers (85, 12, and 49) were assigned in this study's stimuli instead of just one number to ensure that there was nothing inherently special (or "unspecial") about the number 185, the number used in Studies 1 and 2. Each participant's packet had one of these numbers assigned to it (for simplicity, we did not use all 99 numbers in the assignment process). Again, participants did not know what number other participants were assigned.

tion [difference $M = 2.02$, $t(62) = 2.13$, $p < .05$]. This difference corresponds to an increased difference in the valuation of the numerology game over the no-choice game [$b = .05$, $t(63) = 6.20$, $p < .001$]. Most importantly, the predictive abilities of subjective probability [$b = .04$, $t(62) = 2.20$, $p < .001$] and enjoyment [with playing the game; $b = .09$, $t(62) = 2.99$, $p < .01$] remained significant when they were both added to the regression model simultaneously (with difference in valuation as the dependent variable), suggesting that subjective probability and enjoyment independently impact preference. In other words, our enjoyment results are not driven by differences in subjective probability estimates.

On the other hand, feelings of regret were associated with a significant difference in the numerology versus the no-choice game [$b = .14$, $t(71) = 2.0$, $p < .05$], but this effect did not remain significant when either enjoyment and/or subjective probability were added to the regression model. Thus, feelings of regret do impact bet preference, but they seem to operate indirectly through feelings of enjoyment and through subjective probability.

Our fourth goal in this study was to test whether priming the prevalent system (i.e., dates) could induce an increase in preference for individuals who have positive associations with the dates in the numerology task. We regressed the difference in amount bet onto the prime variable and the differences in subjective probability and enjoyment (of playing the game) across the numerology and no-choice conditions.[4] To test whether astrology primed positive associations as well as negative ones and to decipher these different associations, we included the interaction between enjoyment and the prime in the model.

Enjoyment significantly predicted a positive change in preference [$b = .12$, $t(60) = 3.84$, $p < .001$]. Most importantly, the enjoyment by prime interaction significantly predicted preference for the date numerology gamble [$b = .08$, $t(60) = 2.56$, $p < .05$; model $R^2 = .53$]. The impact of enjoyment on preference increased when participants were presented with the astrology prime (slope with prime $b = .2$, slope without prime $b = .04$). In other words, as expected, when the enjoyment associated with astrology is primed, the preference for the associated date numerology game increased. When the prime did not activate positive associations (as was true for some respondents), priming this relationship resulted in less preference for the numerology game. The interaction is consistent with our model that remembered enjoyment associated with remembered fortune-telling systems (such as astrology) underlies preference for games (such as a numerology game using dates) that are associated with that system. The links work positively as long as the enjoyment is there; naturally, if the feelings about astrology are negative then the association will not increase preference.

Although the other measures—tap force, general affect, and subjective probability—all showed the expected effect on bet difference [tap force $b = .21$, $t(71) = 4.48$, $p < .001$; overall affect $b = .13$ $t(71) = 2.24$, $p < .05$; and subjective probability $b = .05$, $t(63) = 6.20$, $p < .001$], none of these variables interacted with the astrology prime. Also, adding these variables to the enjoyment model did not mediate any of the effects, confirming our expectation that these determinants operate separately from enjoyment.

Discussion

One goal of Study 4 was to test whether the effects found in previous studies were an artifact of hypothetical valuations. Study 4 replicated our previous findings using actual money. Participants still valued a special random number more than a randomly assigned number, and enjoyment with the task mediated this effect. The probability of winning and the payout decreased the expected value of the gambles (from $\$-9$ in previous studies to $\$-49$ in Study 4), but did not mitigate the general effect. Thus, it is unlikely that the previous results were induced by the particulars of the gambling context.

The results suggest that the enjoyment driving the special random number effect stems from playing the numerology game itself and not from calculating the Numerology Code or from expected enjoyment from winning with a special number. Though these three enjoyment constructs are related, enjoyment with playing the game was the only construct that was significantly related to preference differences among games. We expected this result because our theory proposes that the date numerology game is associated with enjoyment and that thinking about the date primes this enjoyment in memory. The actual calculation of the number and the amount to win are not relevant to this memory priming.

Subjective probability, general affect, and regret also impacted preferences. Whereas subjective probability and affect had independent effects on valuation in this experiment, regret seemed to operate through perceptions of probability and enjoyment. Previous research (e.g., Langer, 1975; Presson & Benassi, 1996) suggests that subjective probability is the mechanism through which the illusion of control operates. Study 4 shows that special numbers—numbers that do not contain any signals of control—were associated with an increase in enjoyment with the task beyond an increase in subjective probability. The heightened enjoyment, independent of an increase in subjective probability, then influences preference for the prevalent special number system, the numerology task.

[4] Prime variable was coded 1, −1. Enjoyment and probability difference variables were mean-deviated to properly interpret their main effects (Irwin & McClelland, 2001).

Lastly, the results suggest that enjoyment with the numerology game has been learned by participants prior to playing our experimental games. Priming systems similar to those previously learned strengthens these learned associations; we suggest that this strengthening explains why we found an even greater increase in valuation for those primed participants who have positive affect towards these systems. These results also apply to those who have negative associations towards certain systems as well. Whereas participants with greater enjoyment toward the numerology system displayed a preference for the numerology game compared to the no-choice game, individuals who did not report this enjoyment showed a strengthened dislike for the date-based numerology system after the prime.

General discussion

Numbers that people pick themselves are preferred over numbers assigned randomly by a system outside of one's control (see Presson & Benassi, 1996 for a review). An extensive research stream identifies one mediator, control, of random number "specialness." We identify other forces besides control that can also induce this specialness and lead to greater preference.

We establish that numbers generated randomly by certain systems (e.g., dates and names) are preferred to gambles of equal expected values and equal (lack of) control. More importantly, our results are consistent with a causal model in which preference is driven by positive associations in memory between some random systems and the fortune-telling systems that are prevalent in society. Note that decision makers do not necessarily believe in these systems, as beliefs do not drive preferences in our studies. Rather, the enjoyment, perhaps stemming from childhood memories, is primed by the random system, and because of this enjoyment the gamble becomes more enjoyable to play.

Where do subjective probability, affect, regret, and other mechanisms fit in our model? Clearly all decision makers will consider probability in gambling tasks. In Study 4, we show that subjective probability of success exerts its influence apart from the enjoyment mechanisms we identify. Similarly, general affect exerts its influence apart from the specific enjoyment mechanism. Unlike control, which may increase affect and induce decision makers to believe that they have a greater chance of winning, the particular type of enjoyment that we study operates outside of general affect and subjective probability estimates.

Another important component of valuation is regret. Our results suggest that regret is a function of both subjective probability and enjoyment; when these elements were added to our models, the effects of regret disappears. Important moderators of anticipated regret may be the enjoyment or belief in fate for certain special systems and these moderators may in turn impact what is perceived as justified (Connolly & Zeelenberg, 2002). On the other hand, anticipatory emotions (Loewenstein, Weber, Hsee, & Welch, 2001) may originate from other sources, such as specific associations with a special system or with gambling itself.

Our results are consistent with other findings suggesting that enjoyment and feelings of control work as separate mechanisms to impact preferences. Though previous research has not looked at the familiarity of psychic systems per se, Cole and Hastie (1978) did find that familiarity with a gambling system led to an increase in enjoyment independent of subjective probabilities of success. Our results confirm their results that enjoyment with a task can affect valuation independent of subjective probability.

Implications and limitations

Though our studies are operationalized in a gambling context, they have wider implications for other types of decision making in the presence of uncertainty and in the domain of preference construction whenever a random component is present. Specifically, if an increase in valuation occurs in a purely chance task, such as a lottery, then it is arguably likely to occur in other tasks, including mixed tasks relying on a combination of chance and skill.

Our results have implications for how reasoning under uncertainty is influenced by little-understood phenomena. To begin with, our results help us understand individuals' attraction to certain systems in which (they admit) they do not believe. Why do many people discuss horoscopes at a dinner party, or look for insight inside a fortune cookie? Our results suggest that such games are enjoyable, and further that this enjoyment impacts actual decision making containing risk. Recall that all of our gambles had negative expected values, and yet increasing enjoyment by tying the gambles to names and dates increased propensity to play.

It is possible that propensity (and associated enjoyment) underlies other types of decisions as well. For instance, very old brand names are preferred by many consumers, and enjoy a price premium. This premium holds even for commodities that (many consumers know) do not substantively differ across brands (e.g., baking soda and aspirin). Perhaps many difficult-to-justify decisions are nevertheless popular partly due to the repetition of positive associations across an individual's lifetime. If so, then our results suggest that, in general, trying to educate people away from these types of decisions will be difficult and not easily accomplished via logical arguments aimed at beliefs.

There are limitations to our studies as well. The illusion of control can be reduced by moderators such as repetition (Koehler, Gibbs, & Hogarth, 1994) and increased incentives (Dunn & Wilson, 1990). Because our work is the first that we know of to study other sorts of special random numbers, we do not yet know exactly when and how these sorts of random numbers may lose their luster. We do know that people with non-positive associations with a system value the system less, but there probably are some situations in which individuals with positive associations also balk at a familiar system. Intuition suggests that many people might be willing to bet a small amount of money or time on an interesting idea from a horoscope, for example, but most of us would not pick a job or a mate using that system alone. In fact, Dunn and Wilson (1990) find that the illusion of control vanishes in the presence of high risk and a negative frame. A similar result may hold for all special numbers as well. On the other hand, the prevalence of such systems suggests that some people may be willing to bet large amounts on these familiar systems, especially when they have positive affect towards the system and have no alternative decision strategy. In other contexts decision makers do seem to prefer non-consequentialist reasons for their decisions to not having any reasons at all (Shafir, Simonson, & Tversky, 1993).

A second limitation is the causal direction from prevalence to enjoyment. Though our results are consistent with the model we have outlined, we cannot eliminate the possibility that more enjoyable games have become prevalent because they are more enjoyable, or that both causal directions exist. How a culture goes about choosing which fortune-telling systems will be prevalent in their society is an interesting question for future research, beyond the scope of our methodology or expertise. We believe that the link between prevalence and enjoyment is established over many years, and that exposure to the games in childhood may be a necessary component of this link.

We do know that admitted believability alone does not moderate the effect on preference. The preference/believability inconsistency we find in Study 3 may be due to individuals' unwillingness to admit a belief in these systems (namely numerology and astrology), and this social desirability effect may explain why participants are still willing to change their preferences and behavior in the direction of the prevalent system. Perhaps positive affect toward the gamble is a proxy for belief in the system. More research is needed to investigate the link between beliefs in certain systems (and superstitions, including luck) and preferences. Our instinct is that there are people who truly believe in these systems and use them when playing state lotteries; however, given that we used an educated participant population, that their answers were anonymous, and that neither astrology nor numerology are viewed as particularly egregious in our society, we expect that our finding that enjoyment (not belief) underlies our result would hold up even when social desirability was controlled for more explicitly.

Specialness

The reader may wonder about the establishment of positive associations with prevalent systems that links prevalence to enjoyment and the link from enjoyment to preference. The latter link is less mysterious; mood effects (Isen, Shalker, Clark, & Karp, 1978) are the likely culprit. Previous research has shown that one way people evaluate a risk is by using their immediate affective response to it (Loewenstein et al., 2001). For example, in judging the riskiness of others' behavior, people are influenced by (risk irrelevant) affective variables such as how much they approve of the person (Irwin, Jones, & Mundo, 1996). Thus, our finding fits with this general literature by showing that finding a risky gamble enjoyable makes it more attractive. The former link, between prevalence and enjoyment, is less clear and less easy to study. We suspect that individuals are trained to find these prevalent systems enjoyable and that they have many memories (implicit or explicit, positive and/or negative) involving these systems that underlie this enjoyment. Alternatively (or in addition), the positive affect that accompanies a lifetime of mere exposure (Bornstein, 1989; Zajonc, 1968) could be playing a role.

We do note that systems or tokens could accrue specialness over time and increase valuation. For example, a university's name (as used in Studies 2 and 3) or the dog token in Monopoly could become special, but this specialness would probably take a long time (and multiple exposures) to become "special." The dog in Monopoly, for example, may gain specialness through positive associations the token evokes—perhaps from past Monopoly victories or a childhood pet. Priming positive associations with a system that has already gained "special" status in Study 4 suggests this hypothesis.

It is also possible that names and dates are inherently interesting to humans. This inherent interest has led to enjoyment and established associations in human memory. Certainly many (perhaps all) cultures have some sort of system based on dates (e.g., Western, Chinese, and Indian astrology) and/or names. The earliest records of humans (across different continents and eras) show an obsession with calendars, the movement of the stars and the sun, and the passing of time. A participant in Study 3 even cited for his/her response the significance of astrology in multitude of cultures over several centuries. Likewise, across the world people have their own name (usually shared in part with their family). Many of the world's major religions expend

substantial time and energy spelling out the name(s) of the deity(ies) of the religion. It is obviously outside our expertise to declare (or even study) that names and dates are special in a primal way to humans, but it might be worth noting that this idea is supported by our results.

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Appendix A. Study 3 questions

1. "Psychics and other spiritual experts feel that we all have an individual cosmic force or vibration. Some mechanisms tap into this force better than others. To what extent may Numerology System X tap into this force (compared to other mechanisms)?" (Not Very Much–Very Much)
2. There are many fortune-telling system in magazines, the Internet, etc. How similar [is System X] to others you have heard of? (Not Very Similar–Very Similar)
3. To what extent do you think the numbers provided by this system are special (compared with regular random numbers)? (Not Very Special–Very Special)
4. To what extent are these Numerology Systems lucky? (Not Very Lucky–Very Lucky)
5. Suppose you could use any three letters or numbers to compute your Numerology Luck Code (and bet on it). You may use the letters/numbers above or any other ones. What three letters or numbers would you pick?
   (a) Three letters you would pick: _____ _____ _____
   (b) Why did you pick these letters/numbers?

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