

The Predominance of Seven and the Apparent Spontaneity of Numerical Choices

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When asked to report the first digit that comes to mind, a predominant number (28.4%) of the respondents choose 7. Three further experiments sought to establish whether this predominance is due to an automatic activation process or to a deliberate choice. The first experiment shows that the response pattern changes markedly (with 17.3% choosing 7) when the request is for a number between 6 and 15. The second experiment shows that if 7 is mentioned by the experimenter as an example of a response, its frequency drops significantly (to 16.6%). The third experiment shows that if a number in the 20s is requested, the choice pattern remains unchanged (27 is chosen by 27.7%), but if a number in the 70s is requested, 77 is chosen only by 15.5%. All these results are consistent with the idea that subjects choose the response such that it will *appear to comply* with the request for a spontaneous response.

Seven Yale University undergraduates asked 558 people to give the first number between 0 and 9 that came to mind. Figure 1 shows the proportion of respondents choosing each digit from 0 to 9, together with similar data from several previous experiments (Heywood, 1972; Simon, 1971; Simon & Primavera, 1972). Although these data were collected under a variety of different conditions in a variety of places (Heywood obtained his data in England), they all show a striking prominence in the choice of the digit 7. Dietz (1933) reported a preference for 7 among 500 people choosing a number from 0 to 99 in yet another country, the Netherlands. In fact, the phenomenon is so reliable that it is reported as commonplace by Fodor (1947) and is used as the basis for parlor tricks (Gardner, 1973) and mindreading acts. In addition,

the number 7 has a long history of superstition behind it.¹

One psychologist (Heywood, 1972) commented that "the existence of such unmotivated preferences remains a bit of experimental debris that tidy psychological theories have yet to sweep up" (p. 358). The purpose of the present paper is to show that this stable and pandemic phenomenon of heptaphilia is far from being unmotivated.

The first experiment in this series is designed to establish a baseline to which we will compare later results.

EXPERIMENT 1

Method

Seven students² from an introductory statistics section taught by one of the authors (M. Kubovy) stopped 558 passersby on the Yale campus and said, "Please give me the first number that comes to mind between 0 and 9."

A partial report on this investigation was presented at the 45th annual meeting of the Eastern Psychological Association, Philadelphia, April 18, 1974. Alice F. Healy did much to improve the clarity of this paper with her comments on various drafts.

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¹ Even so eminent a psychologist as George A. Miller has quite candidly admitted his attraction to 7 (1956, p. 96).

² We are grateful to the following students for their diligent data collection: Lon M. Berkeley, Debbie L. Davis, Cheryl A. Lewis, Peter E. Marshall, Jonathan T. Walker, Greg J. Wiber, and Walter R. Winning.

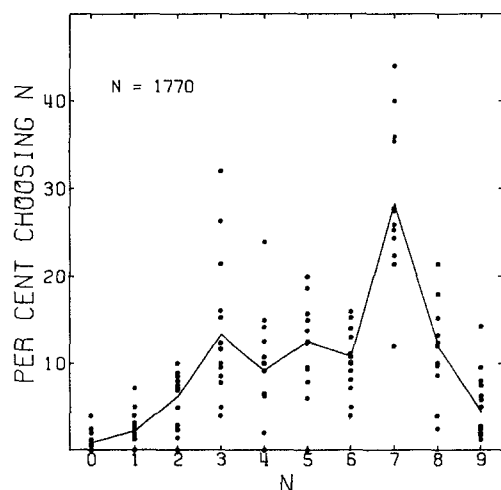


FIGURE 1. Frequency distribution for Experiment 1, with data from similar experiments.

Results

Since these results were designed to establish a baseline, they are presented with the results from previous experiments cited in the introduction and are shown in Figure 1. Thirteen clusters, ranging in size from 14 to 328, were averaged: 2 (males and females) from Simon (1971), 2 (males and females) from Simon and Primavera (1972), 1 from Heywood (1972), and 8 from Kubovy's seven students (one of whom reported separate data for males and females). In 11 of the 13 clusters, 7 was the modal choice, with an estimated percentage of 28.36%. The standard error of the percentage of 7 was calculated assuming random unequal cluster sampling (Kish, 1965, pp. 187-188); it was found to be 1.93%. The square-root design effect (the factor by which we would underestimate the standard error had we pooled our clusters and considered them as one simple random sample of the same number of elements, $n = 1,770$) was found to be 1.915.

In Experiments 2-4 we shall assume a design effect of 3.666 ($\sqrt{\text{deff}} = 1.915$). That is, we shall augment the standard errors of our estimated proportions by a factor of 1.915 in order to take into account the effects of clustering.

EXPERIMENT 2

There are two ways to conceptualize the predominance of 7 in the results of Experiment 1. On the one hand, 7 could be an automatic association activated by the request. If such were the case, the frequency of the response would be resistant to subtle suggestion and context effects. On the other hand, this choice could be the outcome of a decision process which is under conscious control. In such a case, 7 might predominate because it appears to be the most "appropriate" response to the request for a spontaneous choice. It follows that the frequency of the response would change in contexts where 7 is not a spontaneous-looking response.

The following experiment was designed to demonstrate that the frequency of 7 is context sensitive. We simply chose the set of numbers from 6 to 15 as the set of responses.

Method

The experiment was conducted on 237 undergraduates in two Yale psychology classes: 30 students in introductory statistics (not the section taught by Kubovy) and 207 students in introductory psychology.³ The students were asked to write down "the first number that comes to mind between 6 and 15."

Results and Discussion

The choice frequency distribution is shown in Figure 2. The pattern of results is strikingly different from that of Experiment 1.

There are three notable features to these data. First, 7 is not preferred over 8 and 9. Second, single digits are overwhelmingly preferred over two-digit responses. Third, numbers which have a special connotation (7, 11, 12, 13) are not chosen more often

³ Special thanks go to H. L. Roediger of Purdue University, to Jeff Carlson, Mary Weigand, and Edward Thompson of Southern Connecticut State College, to Anne Peplau of the University of California, Los Angeles, and to Robert P. Abelson, Barry P. Cook, James E. Cutting, Alice F. Healy, and Robert Rescorla at Yale University, for their collaboration in Experiments 2-4, and in studies preliminary to them.

than other responses having the same number of digits (8 and 9, 10 and 14).

Seven was chosen by 17.3% (standard error: 1.85%, assuming random unequal cluster sampling) of the subjects, 11.05% less than the baseline, which is a statistically significant difference, $z = 2.74$, $p = .0035$ (after multiplying the standard error, 1.85, by 1.915).

This context sensitivity of the numerical response does not preclude its being automatically activated. It does however reduce the plausibility of such a mechanism.

EXPERIMENT 3

If 7 is not automatically activated by the request, then perhaps it predominates because it appears to be an "appropriate" response. The present experiment reduces the apparent spontaneity of 7 by suggesting to the subjects that it is on the experimenter's mind and could be a "typical" response.

Method

The experiment was conducted on 319 undergraduates in three Yale psychology classes. The students were asked to write down "the first number that comes to mind between 0 and 9, avoiding fractions, and using only whole numbers like 7."

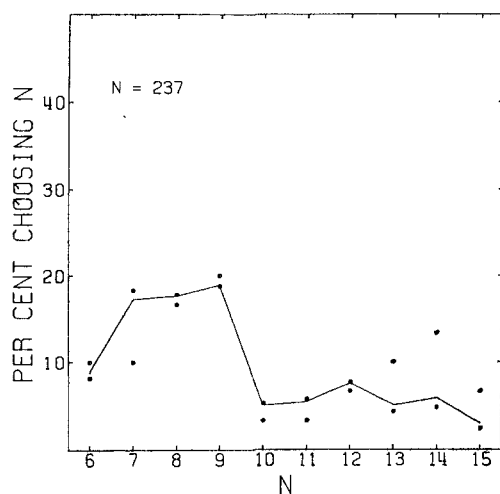


FIGURE 2. Frequency distribution for Experiment 2.

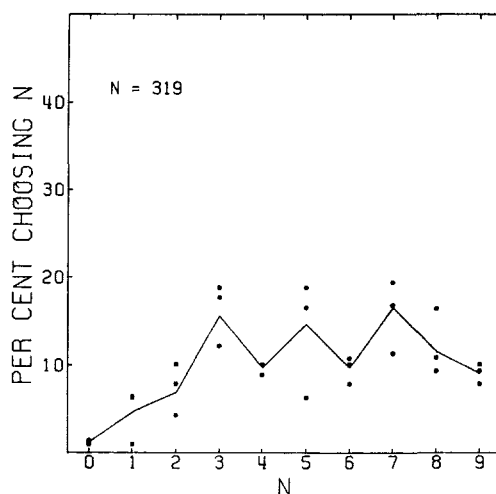


FIGURE 3. Frequency distribution for Experiment 3.

Results

The choice frequency distribution is shown in Figure 3. As expected, the frequency of 7 is dramatically reduced: It is chosen by only 16.61% (standard error: 2.18%) of the students. Thus there is an 11.75% drop in the choice of 7, which is a statistically significant difference; $z = 2.55$, $p = .0054$ (after multiplying the standard error, 2.18, by 1.915).

EXPERIMENT 4

A second method for reducing the apparent spontaneity of 7 is employed in this experiment; it is designed to make the choice of 7 appear obvious and easily explicable. Since spontaneity implies freedom from obvious causality, we expect respondents who seek to appear to comply with the request for the first response that comes to mind to shun a trite response.

Method

Two groups of subjects were studied. The first, consisting of a class of 166 undergraduates in an introductory psychology section, was asked to give a number between 20 and 29. The other, consisting of 139 students enrolled in another section of the same class, was asked to give a number between 70 and 79.

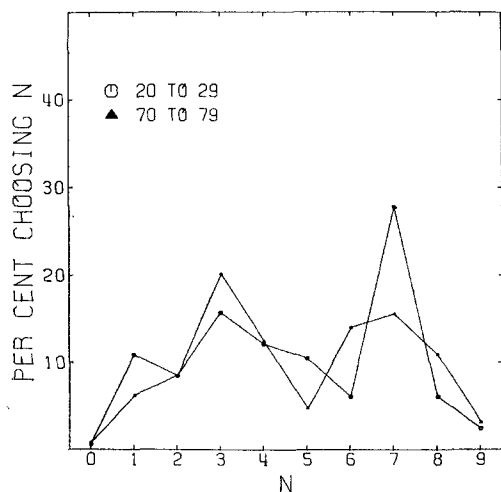


FIGURE 4. Frequency distribution for responses in the 20s and 70s for Experiment 4.

Results

The results are shown in Figure 4. Twenty-seven was selected by 27.7% (standard error: 6.65%) of the respondents who were asked to choose in the 20s, whereas 77 was selected only by 15.5% (standard error: 6.08%) of the respondents who were asked to choose in the 70s. Thus, 27 was chosen .7% less often in the 20s than 7 was chosen among the single digits; this difference is not significant with the design effect factor ($z = .10$) or without it ($z = .17$). On the other hand, 77 was chosen 12.86% less often in the 70s than 7 among the single digits, which is a statistically significant difference, $z = 2.01$, $p = .022$. The difference between the two groups (12.20%) is statistically significant if a standard comparison of proportions is performed, $z = 2.60$, $p = .0047$.

GENERAL DISCUSSION

The four experiments support the notion that the predominance of 7 is due to a choice. The data are also compatible with the idea that the choice in tasks of this sort is motivated by the desire to *appear to comply* with the request of the experi-

menter, even when there is no utilitarian reason to do so. The experimenter's request is essentially a request for a spontaneous response, and the subject is placed in a paradoxical situation—only if he does not try to comply can he comply. But then his response might not *appear* to be in compliance because of its commonness or obviousness. So, if he wishes to appear to comply, the subject must carefully select his response and thus fail to comply. We believe that this is what subjects do.

Why does 7 appear spontaneous? Perhaps 7 is unique among the numbers from 0 to 9 because it has no multiples among these numbers, and yet it is itself not a multiple of any of these numbers. The numbers fall into groups: 2, 4, 6, 8 form one group; 3, 6, 9 form another. Only 0, 1, 5, 7 remain. One can rule out 0 and 1 for being endpoints, and perhaps 5 for being a traditional midpoint. This leaves us with 7 in the unique position of being, as it were, the "oddest" digit.

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