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DISTORTIONS OF ESTIMATES OF NUMEROUSNESS
AND WAITING TIME*¹

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SUMMARY

During the gasoline shortage in 1974, 53 male and 36 female San Diego drivers waiting to purchase gasoline were asked to estimate the number of cars ahead of them in the line and the length of time they expected to wait. Unlike situations previously studied, drivers were unaware of the available amount of the commodity. Regressions of both the estimated number ahead on the actual number and the estimated waiting time on the actual time were significant ($p < .001$). In contrast to previous findings, people close to the end of lines did not underestimate the number ahead. Drivers overestimated irrespective of their position. However, considerable underestimation of the time drivers expected to wait was found throughout the lines, with the amount of underestimation proportionate to the distance from the beginning of the line.

A. INTRODUCTION

Remarkably little attention has been devoted to motivational factors affecting judgmental accuracy in real-life situations, despite the fact that at least some dimensions of judgment—numerosness being a notable example—are clearly of more than academic interest only (1, 2). The work of Mann and Taylor (1) stands almost alone in the literature. Australians at different positions in waiting lines for valued commodities estimated the number of people standing ahead of them. Those relatively close to the beginning of the line tended to *overestimate* the number ahead; however, people much farther from the beginning of the line *underestimated* the

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¹ Requests for reprints should be sent to either author at the address shown at the end of the article. Order of authorship was randomly determined.

number ahead. The authors accounted for the "critical position," beyond which underestimation was dominant in various lines of different length, in terms of a "wish-fulfillment" mechanism. Since queuers were aware of the available amount of commodity, those beyond a certain position underestimated the number ahead to justify their continued presence in the line.

A conceptual replication was needed to test the generality and culture-specificity of these results and examine the extent to which they were a function of the queuers' knowledge of the *exact* amount available of the commodity. In many situations, there is uncertainty about the amount of the desired commodity. In such cases, there should be no critical point. Instead, one might expect queuers throughout a line to underestimate the number ahead, with the degree of underestimation proportionate to the distance from the commodity.

Another important issue is whether uncertainty about the amount of commodity affects judgmental dimensions other than amount. On the assumption that waiting in lines is aversive, the wish-fulfillment tendency may be reflected in estimates of the time one will spend waiting for the commodity. In fact, because waiting time is more loosely related to the drivers' perceptual input than number of cars ahead, waiting time may well be the primary dimension on which distortion occurs. As outlined above, a critical point should not be present, and underestimation should be proportionate to the temporal distance from the commodity.²

B. METHOD

An opportunity to examine these issues arose during the gasoline shortage in 1974. Long lines formed at stations. It was impossible to predict a station's business hours and the quantity of gasoline intended for sale. *Ss* were 53 men and 36 women (17-75 years of age) who sat in their cars in one of 14 lines at 10 stations in San Diego. The lines varied in length from nine to 23 cars (a median of 15). Each driver in a line was approached by *E*, except those in the first four to five cars. *Es* were three women and two men, unaware of the hypotheses.

Having indicated a university affiliation, *E* asked *Ss* to estimate the number of cars ahead, the number of minutes they expected to wait, and the likelihood of obtaining gasoline. There were no refusals.

² The present arguments, as well as those of Mann and Taylor, can be just as comfortably cast in cognitive-dissonance terms. In the situations studied, the two theoretical positions are virtually indistinguishable.

C. RESULTS

No Ss abandoned a line prematurely. The sale ceased before 11 of 89 drivers could obtain gasoline (leaving 46 male and 32 female Ss).

1. *Numerousness*

The estimated number of cars ahead is plotted in Figure 1 as a function of the actual number. The linear regression yielded an F of 42.57, $df = 1/76$, $p < .001$ ($y = -.34 + 1.28x$), accounting for 35.1% of the variance.

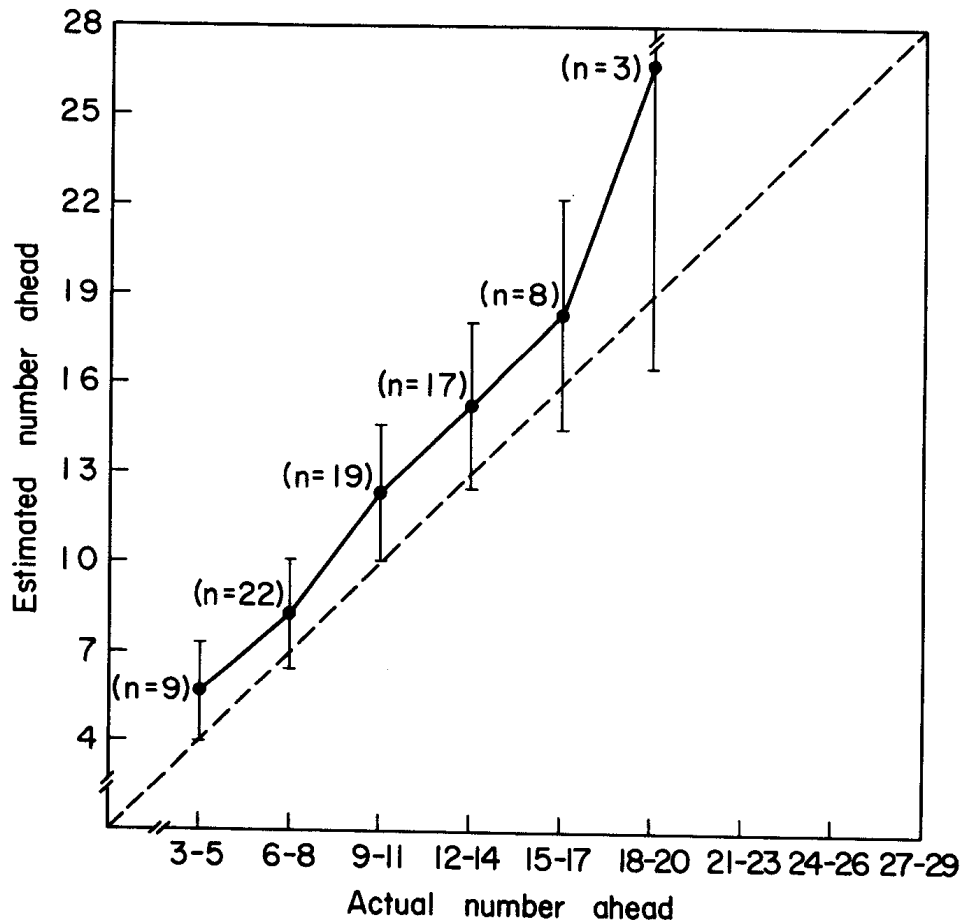


FIGURE 1

MEAN ESTIMATES OF THE NUMBER OF CARS AHEAD AS A FUNCTION OF THE ACTUAL NUMBER OF CARS AHEAD.

In comparing the above results to those of Mann and Taylor (1), note that the latter authors showed the *actual* number ahead on the ordinate.

Drivers overestimated the number ahead *irrespective* of their position in the line. While drivers farther from the commodity overestimated somewhat more than those closer to it, this trend was not significant. The Mann-Taylor findings were thus replicated, but only in part. Even when the amount of the commodity was unknown, drivers close to the beginning of a line did not underestimate the number ahead. Contrary to the Mann-Taylor results, there was no tendency for people close to the *end* of lines to underestimate, as well. Wish-fulfillment was certainly not reflected on this dimension of judgment.

2. *Waiting Time*

The estimated duration of waiting is plotted as a function of actual waiting time in Figure 2. The regression was significant ($F = 39.29$, $df = 1/76$, $p < .001$; $y = 9.80 + .32x$), accounting for 33% of the variance. Quite unlike the numerosness estimation, drivers throughout a line underestimated waiting time. While it actually took over 3.5 minutes of waiting per car ahead, *Ss* estimated one minute per actual car ahead, or slightly under 30 seconds per estimated car ahead. Also, as the actual waiting time increased, drivers were less realistic. In short, distortion occurred on a judgmental dimension less subject to verification and without a critical point being involved.

3. *Probability of Obtaining Gasoline*

None of the 89 drivers estimated their chances of obtaining gasoline as "extremely unlikely" or "quite unlikely." Since 12% of *Ss* did not obtain gasoline, this result may be interpreted as direct support for the wish-fulfillment hypothesis. Also, it may be argued that *Ss* were unaware of the available quantity of gasoline. In either case, it is clear that wish-fulfillment may be reflected on dimensions other than the number ahead.

The distribution of responses across the remaining three categories (extremely, quite, and moderately likely) was reassuring in that distortions of both numerosness and waiting time were meaningfully (and significantly) related to the degree of caution in estimating the probability of obtaining gasoline.³

³ Additional data concerning the sex, age, social status (defined by the estimated car value), and audience (defined as presence/absence of passengers) variables may be obtained directly from the authors.

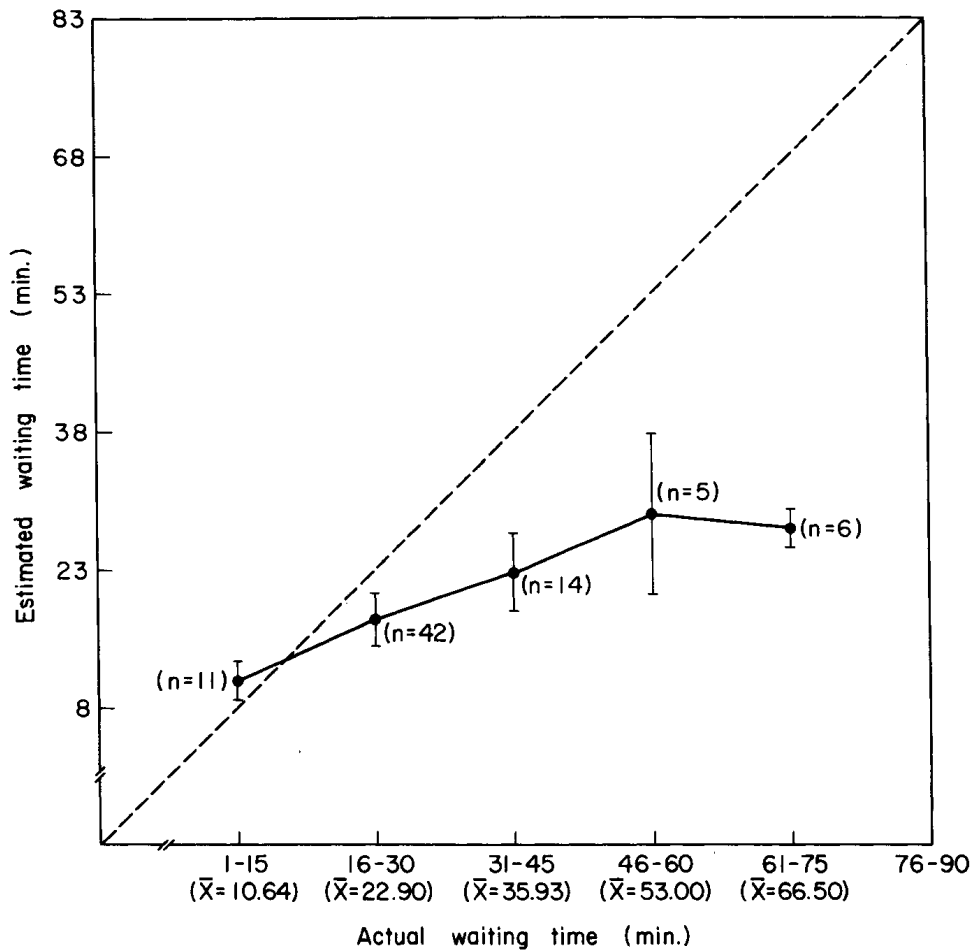


FIGURE 2

MEAN ESTIMATES OF WAITING TIME AS A FUNCTION OF THE ACTUAL WAITING TIME.
 Note that the overestimate in the one- to 15-minute actual-time category is only apparent, since the mean actual time waited in that category was 10.64 minutes.

D. DISCUSSION

One must recognize the fact that the present study differed from the Mann-Taylor research on several dimensions simultaneously (including the commodity availability, cultural context, length of queues, and the perceptual and social differences of waiting in cars *vs.* on foot). The importance of these differences is, however, considerably reduced by the fact that certain

features of the Mann-Taylor findings were replicated, as predicted, whereas others were not, also as predicted.

In short, the present research limited the generality of the Mann-Taylor results. When the amount of the desired commodity was unknown, people far from the beginning of the waiting lines did not underestimate the number of those who had priority to the commodity. Instead, without a critical point being involved, they grossly underestimated the waiting-time duration, and the more so the farther they were temporally from the commodity.

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