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How Order and Disorder Affect People's Behavior: An Explanation

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Abstract Experimental data shows that people placed in orderly rooms donate more to charity and make healthier food choices that people placed in disorderly rooms. On the other hand, people placed in disorderly rooms show more creativity. In this paper, we provide a possible explanation for these empirical phenomena.

1 Experimental Results

Experiments described in [5] have shown:

- that people placed in an orderly room donate, on average, larger amounts to charity than people placed in disorderly rooms,
- that people placed in an orderly room make much healthier food choices than people placed in disorderly rooms, and
- that people placed in disorderly rooms show more creativity in solving problems than people placed in orderly rooms.

The corresponding differences are not small:

- from an orderly room, almost twice as many people donated to charity than from a disorderly room: 82% of participants places in an orderly room donated their money whereas only 47% of the people in the disorderly room donated;
- also, those people from an organized room who decided to donate donated, on average, somewhat more than double the amount of money than the people in the disorganized rooms.

In short, the desire to donate to charity doubles – whether you measure it by the number of participants who decided to donate or by the amount each of them donated.

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The first conclusion is somewhat similar to the results of previous experiments [2, 3, 6] that showed that cleanliness of the environment (e.g., cleaning-related scents) enhances morally good behavior, including reciprocity.

That such a drastic change in people's behavior can be caused by simply being placed in a room for a few minutes or even by a clean scent is amazing. How can we explain such changes? How can we explain why the desire to donate to charity is increased by a factor of two – and not by any other factor?

2 Why Order and Cleanness Affect Human Behavior: Qualitative Explanation

General idea behind our explanation of the first two empirical phenomena. Our environments – and we ourselves – are never perfect, there are many things that we would like to improve. We would like to be in a nice clean ordered place where everything works and where it is easy to find things. We would like to be healthy. We would like to be kind to others, etc.

Achieving all these goals requires some time and some effort, and our time is limited. Some of our objectives are easier to reach, some are more difficult to reach. Naturally, we select to spend our efforts on the goals in which these efforts will bring the largest benefit.

How this general idea explains the observed human behavior. It is reasonably easy to put things in order, it is reasonably easy to clean a room – at least in comparison with such more ambitious goals such as living a healthy lifestyle or becoming more socially active.

So, not surprisingly, if a person is placed in a room that really needs ordering, or in a room that does not have a clean smell – and so, can probably be cleaned – natural person's improving-environment efforts are directed towards such easier tasks as putting the room in order or cleaning it, instead of more complex tasks such as living a healthier lifestyle of becoming more socially active.

Comment. In addition to the drastic changes caused by order vs. disorder, the paper [5] also reported a relatively another smaller-size effect: that people in the disorderly room showed greater creativity when solving problems than people in the orderly room.

This fact has an easy explanation: people in the disorderly rooms, when looking around, can see many unrelated things laying around, such as a Physics textbook. This may inspire them to relate their problems to physics (or to whatever other topic prompted by these unrelated objects) and, use ideas typically used to solve problems in physics (or in another area). This unexpected use of seemingly unrelated idea will be clearly perceived as a sign of creativity.

3 How Order and Cleanness Affect Human Behavior: Quantitative Explanation

Problem: reminder. In the previous section, we explained why order and cleanness affect human behavior. What remains to be explained is the size of this effect – i.e., the fact that both individual amounts of donations to charity and the number of participants who donate to charity double when the experiment switches from a disordered to an ordered room.

Towards an explanation. To explain the quantitative observations, let us reformulate them in the following equivalent form: the average donation to charity and the number of participants who donate to charity are both decreased by half when the experiment switches from an orderedly to a disorderly room.

Let D be the average amount donated by participants in an orderly room, and d is the overall amount donated by participants in a disorderly room. All we know – from experiment and from the explanation provided in the previous section – is that the amount d is smaller than the amount D, i.e., in mathematical terms, that d belongs to the interval $[0, D)$. What reasonable estimate for d can we produce based on this information?

Laplace Indeterminacy Principle. The situation would be simpler if we knew the probabilities of different values $d \in [0, D)$. Then, as a reasonable estimate, we could take the expected value of d; see, e.g., [4]. We do not know these probabilities, but maybe we can estimate them and thus use these estimated values to compute the corresponding expected value of d – this providing a reasonable estimate for d?

The problem of estimating probabilities in situations of uncertainty is well known, it goes back to a 19 century mathematician Pierre-Simon Laplace who first formulated, in precise terms, the following natural idea: that if we have to reason to believe that two alternatives have different probabilities, then, based on the available information, we should provide equal estimates to these probabilities. For example, if several people are suspected of the same crime, and there are no additional factors that would enable us to consider someone's guilt as more probable than others, then a natural idea is to assign equal probability to each of these suspects. This natural idea is known as *Laplace Indeterminacy Principle*; it is a particular case of a general approach – known as *Maximum Entropy* approach – according to which we should not add unnecessary certainty when there is no support for it; see, e.g., [1]. For example, in the above criminal example, we have no certainty about who is guilty, but assigning a larger probability value to one of the suspects would implicitly imply that we have reasons – with some certainty – to believe that this person is guilty.

In our case, the Laplace Indeterminacy Principle means that since we do not have any reason to assume that some values from the interval $[0, D)$ are more probable than others, a reasonable idea is to assign equal probability to all the values from this interval, i.e., to assume that the value d uniformly distributed on this interval. We can get the exact same conclusion if we apply precise formulas of the Maximum Entropy approach [1].

It turns out that this leads to the desired explanation.

Resulting explanation. We have shown that it is reasonable to assume that the value d is uniformly distributed on the interval $[0, D)$. Thus, as a reasonable estimate for d, we can take the expected value of this random variable.

In the uniform distribution on an interval $[0, D)$, the uniform distribution is described by the probability density

$$f(x) = \frac{1}{D}.$$

Thus, the desired expected value $\overline{d}$ with respect to this distribution is equal to

$$\overline{d} = \int_0^D x \cdot f(x)\,dx = \int_0^D x \cdot \frac{1}{D}\,dx = \frac{1}{D} \cdot \int_0^D x\,dx = \frac{1}{D} \cdot \left.\frac{x^2}{2}\right|_0^D = \frac{1}{D} \cdot \left(\frac{D^2}{2} - 0\right) = \frac{D}{2}.$$

Thus, we conclude that the reasonable estimate for the amount d is exactly half of the amount D – exactly as what was observed in the experiments. So, we indeed have an explanation for this numerical result as well.

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