

Human causal reasoning: “the magical number” three

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“The magical number seven, plus or minus two” has been the title of the classical paper of George Miller [1]. He reported that seven is the maximum number of classes to which a normal human adult is able to assort alternative stimuli, and also the maximum number of digits that he/she can repeat, without errors and confusion. The number may reflect a fairly limited capacity of the human mind for ranging perceptual data and for short-term memory. The present study shows that the capacity for causal reasoning may be even more restricted: three appears to be the most common number of causes humans tend to attribute to diverse phenomena.

In the study, 26 subjects from academic circles, scientists, university teachers and students, of the average age of 47.1 ± 15.8 years (range 18-70), were inquired about the causes of six specific social phenomena. Each person was independently asked to list all the causes, as many as possible, which he/she considered to be involved in a particular phenomenon. As shown in Table 1, the average number of causes of any of the items, given by any respondent, was three. (The only exception was an explanation of marriage divorcement by a woman, who enumerated 18 causes. She herself was a divorcee. This exceptional response has been canceled from the collection of data.) The responses were largely specific for each respondent, so that, taken together, all the respondents presented 17 to 27 different causes for each single phenomenon. In parallel, a Google search for the entry “ x causes of y ”, with y randomly chosen and covering psychological, social and historical items as disparate as happiness and the second world war, resulted in hits with x consistently peaking at the number three (Table 2).

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Table 1. Causes of social or political phenomena

| Phenomenon | Number of causes given by individual respondent | Total number of causes given by all 26 respondents |
|--|---|--|
| Human altruism | 2.00 ± 0.98 | 24 |
| Marriage divorcement | 3.04 ± 1.14 | 25 |
| Growth of scientific knowledge | 3.00 ± 1.02 | 22 |
| The fall of communism in Europe | 2.96 ± 1.43 | 27 |
| Disintegration of the Czechoslovak federation | 3.15 ± 1.41 | 26 |
| The rise of Mečiar to autocratic power in Slovakia (1991-1998) | 3.15 ± 1.29 | 17 |

Table 2. Number of hits in a Google search “x number of causes of y”

| Phenomenon (y) | Number of causes (x) | | | | | | | |
|----------------------|----------------------|-------|------|------|-----|-------|-----|------|
| | two | three | four | five | six | seven | ten | many |
| Happiness | 3 | 6 | 5 | 1 | 0 | 4 | 0 | 2 |
| Unhappiness | 2 | 7 | 0 | 2 | 0 | 1 | 0 | 8 |
| Love | 0 | 4 | 1 | 2 | 0 | 0 | 0 | 0 |
| Crime | 6 | 29 | 3 | 4 | 1 | 3 | 2 | 55 |
| Conflict | 17 | 42 | 19 | 16 | 8 | 7 | 2 | 70 |
| Violence | 3 | 8 | 2 | 2 | 1 | 2 | 0 | 60 |
| Terrorism | 4 | 6 | 0 | 1 | 0 | 0 | 0 | 34 |
| French revolution | 5 | 7 | 2 | 4 | 0 | 0 | 0 | 8 |
| The first world war | 3 | 6 | 1 | 1 | 2 | 1 | 1 | 3 |
| The second world war | 0 | 3 | 1 | 1 | 1 | 0 | 0 | 2 |

The number three may have persistently dominated human reasoning. Here are just a few examples. According to traditional Buddhism, human actions are rooted in “three poisons”, greed, hatred and delusion; with three antidotes: generosity, compassion and wisdom [2]. For Thucydides, the ancient Greek historian of the fifth century B.C., three hidden forces are responsible for all events: fear, power, and self interest [3]. In our time, the phenomenon of terrorism has launched out scores of attempts to identify the “root causes” of terrorism. Obviously, the identification is essential for efficient political action. While President George W. Bush, according to an American political scholar [4], recognizes terrorism monocausally as a part of bin Laden’s revolutionary strategy for imposing his harsh Islamic ideology on the world, three other prominent political actors were cited to be more discriminative. Al Gore named as “another axis of evil in the world” three causes: poverty and ignorance; disease and environmental disaster; and corruption and political oppression. Pakistani President Pervez Musharraf pointed out to three causes of terrorism: political disputes; poverty; and illiteracy. Osama bin Laden gave three causes of 9/11: U.S. troops on the Arabian peninsula; the sanctions against Iraq which allegedly caused the death of hundreds of thousands of Iraqi children; and U. S. backing of Zionist colonization (cited respectively in Refs. 5,6,7).

Causal reasoning, based on the conviction that every event of the world has its cause(s), must have been essential for human survival [8]. Its limitations to just a few causes responsible for any event may have been selected in evolution. To swiftly specify a single cause, or a few ones, rather than pondering over a web of many possible causes, was a precondition for a fast and effective action in hunting and gathering and in intercourse in small social groups of our ancestors in the savannah. Human individuals may not be appropriately equipped for judgment and action in a complicated niche created by cultural and technoscientific evolutions. This study corroborates the ordinary wisdom: pooling individual judgments may partly alleviate the deficiency.

References

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