

The Saturn-Mars Effect

How a statistical effect explains the astrological claim for the power of Mars

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ASTROLOGERS ASSUME THAT connections exist between the positions of planets at the time of birth and human personality. There are 10 celestial bodies that astrologers usually use: Mars, Mercury, Neptune, Venus, Uranus, Saturn, Jupiter, the Sun, the Moon and Pluto, further referred to as “planets”. Moreover, the sky is divided by astrologers into twelve equal sectors. The Mars Effect is a controversial claim made by Michel Gauquelin who suggested that eminent athletes are born more often when Mars is in sectors 1 and 4 at the time of their birth. The claim was based on a study that showed that 119 out of 535 eminent athletes were born in “key sectors.”¹

The validity of this claim has been challenged, most notably by Paul Kurtz and his colleagues in the early days of the modern skeptical movement, in the pages of *Skeptical Inquirer* and elsewhere.² For example a study performed on U.S. sports champions failed to replicate the Mars Effect. Many explanations were proposed for the observed data labeled as the “Mars Effect,” such as bias in Gauquelin’s dataset, different birth rates with Mars under different sectors, and social effects such as birth date forgery by parents,³ to name a few. Only the difference in birth rates seems to be excluded.

In modern genetics there is a new field called “genome-wide association studies” (GWAS),⁴ in which scientists search for associations between certain mutations and diseases. One problem encountered is that of multiple comparisons. This statistical problem arises every time we deal simultaneously with a large set of statistical inferences. In GWAS millions of mutations are studied

and even if the observed distribution of some mutation is significantly uneven between the subject and control groups, the association can turn out to be a Type-1 (false-positive) error. Within so many different relations, at



least some will turn out to be statistically significant by chance even if no real connection takes place. To account for this, multiple comparison corrections should be used.⁵

If we have n independent comparisons the significance level α for the whole experiment can be calculated as

$$\alpha = 1 - (1 - \alpha_{\text{per comparison}})^n$$

Independent studies on completely new data sets are required to confirm associations found in GWAS or other association studies.

Gauquelin’s study is an association study in which many correlations were studied and falls under these same rules. In astrology there are 10 “planets” and 12 sectors. Further-

more, there are $12 \times 11 = 132$ pairs of sectors and thus 1320 different combinations of a planet with two sectors (not completely independent with regard to the formula above). Also, within each profession there are numerous sub-samples, such as eminent athletes, best-selling authors, Nobel Prize winners, and non-basketball sport players, to name a few. In fact, there are so many relations that something similar to the Mars Effect is likely to be found even if the dataset is absolutely random. I shall call the multiple comparison problem of astrological association studies the Saturn Effect.

The Saturn Effect

To study the significance of the Mars Effect a program was created. This program assigns random sector positions to each planet at the time of the subject’s birth and that of the control. Then it chooses the strongest association. In the first test run, 106 out of 500 (21.2%) subjects were born with Saturn in sectors 1 and 10 compared to 63 out of 500 controls. The non-adjusted multiple comparisons p -value of this association (assuming binomial distribution between the subject and control groups) is 0.0006, which is a statistically significant—yet it is really a false positive result.

The strength of this Saturn Effect is comparable to the Mars Effect. This example is provided only as a demonstration of how “bad” significant associations can be.

To test if the Saturn Effect explains the Mars Effect another program was created. It was assumed in the model that all planets move independently and that the probability of each planet to position itself in each sector was equal. The strongest over-representation of births under a pair of key sectors of a planet in a sample of 535 subjects (matching Gauquelin’s sample size) was searched for in a million iterations. Also, the number of associations that were at least as significant as the association observed by Gauquelin in the whole

Drawing by Nancy Norcross-White

number of trials was calculated. An association was considered significant if at least 119 subjects were born under a planet in two key sectors ($p < 0.0005$) thus matching or exceeding the number of cases in Gauquelin's sample.

Results

Out of one million trials an effect at least as significant as the Mars Effect was observed for 672,550 combinations of a planet and two sectors. This means that we can expect to find 0.67 such associations per association study that has a sample size of 535 subjects. In 245,421 trials at least one such significant correlation was available (with $p < 0.0005$). This means that the adjusted p -value of the Mars Effect is at best 0.245 and not significant. The distribution of best associations is presented in Figure 1.

Discussion and Conclusions

With the Saturn Effect we can explore what happens if those who study astrological effects do not account for multiple comparisons of planets and pairs of sectors. These are easy to model. But we should not forget that single sectors, triplets, or even quadruplets of sectors, and not just pairs of sectors, could be of interest to astrologers. These comparisons were not modeled but could add up to increase the number of multiple comparisons. Other possible sources of multiple comparisons such as different professions and subsamples were not modeled, thus the Saturn Effect is underestimating the real error that could be introduced by multiple comparisons. For example, while criticizing the U.S. study conducted by Kurtz, Zelen, and Abell in 1979, Gauquelin proposed the exclusion of basketball players, as his previous observations revealed no Mars Effect on the basketball player subsample.⁶ This means that, in fact, there were at least some multiple comparisons on the subsample level. Finally, the model does not take into account the bias found in Gauquelin's dataset, or any other objections to the original study of Gauquelin, which could also affect the results.

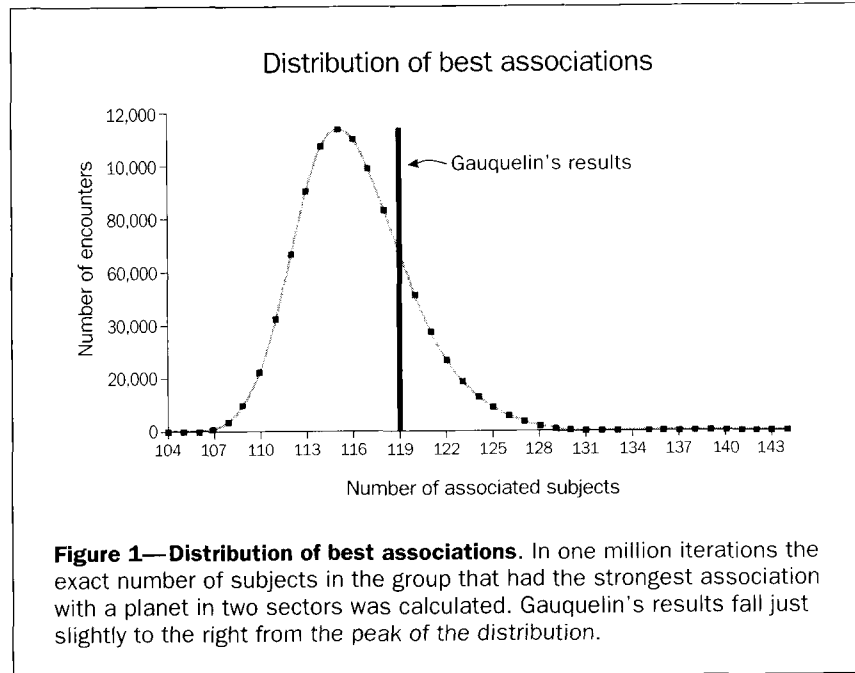


Figure 1—Distribution of best associations. In one million iterations the exact number of subjects in the group that had the strongest association with a planet in two sectors was calculated. Gauquelin's results fall just slightly to the right from the peak of the distribution.

Even without the additional corrections or assumptions mentioned above it appears that the Saturn Effect can explain the Mars Effect as a statistical anomaly and nothing more. Additional corrections could only make the insignificant Mars Effect even more so. The Saturn Effect not only explains the Mars Effect but many other claimed astrological associations as well. For example, the association between being born under a water sign and becoming a serial killer, cited in astrological literature, can be explained by the Saturn effect.

At least one more conclusion can be drawn. Studies that attempt to replicate the Mars Effect, or similar such effects, must be performed on independent samples that do not overlap with the previous dataset as it is done to confirm GWAS associations. If the Mars Effect is the result of the Saturn Effect, Gauquelin's dataset is indeed filled with athletes born under Mars in sectors 1 and 4, and any dataset containing part of Gauquelin dataset would inherit some of the initial multiple comparison error. Until better independent studies are conducted there is no place for a Mars Effect claim, and all such astrological research should take into account the Saturn Effect.

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