

The Guardian Astrology Study: A Critique and Reanalysis

Last year a massive study of sun sign and occupations was published, and some astrological effects were claimed. A reanalysis shows the results can be explained by statistical fluctuations and self-attribution.

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IN A FOUR-PART series from March 19 to March 22, 1984, the *Guardian*, the prestigious British newspaper, presented the results of a massive study of the relationship between occupation and sun sign. The analysis was conducted by Professor Alan Smithers, head of the Department of Education at Manchester University. As Smithers (1984a) tells us:

Every ten years we in Britain are all obliged to take part in the national census. This includes questions on occupation and date of birth. A computer analysis of the responses should show quite conclusively, at least for one country at one point in time, whether there is any connection.

With the help of the Koestler Foundation and the *Guardian*, it has been possible to purchase from the Office of Population Censuses and Surveys a special tabulation of information collected in the 1971 Census, the latest one for which the data we wanted are currently available.

The office was able to provide a one in ten sample of all "economically

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active persons," which includes those in employment, those who were sick at the time of the census, and those available for work but who did not have a job. Only those born in Britain and usually resident here were included. The sample was massive, comprising 1,461,874 men and 842,799 women, each assigned to one of 223 occupational groups. Occupation and date of birth has never before been studied so systematically.

Smithers's study involved an astrological analysis and a season of birth analysis. Our critique and re-analysis are concerned mostly with the former, but the latter will be included where relevant.

Smithers's Astrological Analysis and Results

Smithers's approach was simply to compare the observed sun-sign distributions with the results predicted in advance by 15 of the "most expert and well-qualified astrologers in the country" and by Charles Harvey, president of the Astrological Association. The 15 astrologers were asked to indicate which three occupations were most strongly associated with each sun-sign and which two sun-signs were most strongly associated with the 223 occupations in the study. Charles Harvey made several predictions, e.g., that nurses, trade-union officials, and salesmen would be more often born under alternate sun-signs.

Smithers gives the sun-sign occupations most frequently chosen by his 15 astrologers and for which census data was available. The result was a total of 36 occupations (see Table 1). For each occupation Smithers also gives a graph of the actual sun-sign distribution relative to the general population "so you can see for yourselves how well you think they did."

Smithers concluded that the astrologers did fairly well and that Harvey's predictions for nurses and trade-union officials were strikingly confirmed. Smithers stated: "The study does not offer dramatic support for astrology. But there are a sufficient number of odd instances to give pause. There were, for example, Charles Harvey's predictions for nurses and trade union officials, and the occasions when the panel of astrologers were correct. . . ." He then qualified this with: "Nevertheless, I remain unconvinced. Most of the hits can be explained in other ways." This statement was followed (1984d) by a discussion of these other ways—namely, seasonal factors, social habits, and belief in astrology.

Smithers's study was followed in the same newspaper by a commentary from Charles Harvey (1984). Harvey pointed out that (1) astrologers would not consider sun sign to be a dominant factor in revealing job preference, and (2) signs are traditionally related to personality and individual differences that can vary widely within a single occupation—for example, cooks may be Taurus, Cancer, or Sagittarius, depending on whether they are inclined toward haute cuisine, health food, or fast food, respectively. Nevertheless, despite these limitations and Smithers's cautious

TABLE I

Occupations Likely to Be Associated with Each Sun Sign

Sun Signs	Occupations
Aries	Athlete, dentist, car mechanic, fireman.
Taurus	Accountant, architect, farmer, baker.
Gemini	Author/journalist, commercial traveler, teacher.
Cancer	Cook, social worker
Leo	Actor/musician, manager.
Virgo	Clerk/cashier, optician, typist.
Libra	Hairdresser/beautician, tailor/dressmaker.
Scorpio	Doctor, miner, policeman.
Sagittarius	Athlete, clergyman, lawyer.
Capricorn	Civil servant, civil engineer, politician, miner.
Aquarius	Electrician, radiographer.
Pisces	Actor/musician, artist, barman/maid, fisherman.

The occupations are those most frequently chosen by Smithers's panel of 15 expert astrologers and for which census data was available. In the census data the sample size for each occupation ranges from 613 (opticians) to 233,516 (clerks and cashiers), median 5,000. When the three highest and three lowest sample sizes are excluded to avoid bias from extreme values, the range for the remaining 30 occupations is 1,177 to 28,491, average 9,712.

Source: Smithers 1984a.

assessment, Harvey was able to conclude that Smithers's study was one of an unspecified number of recent studies that promised the return of astrology as a serious science. He pointed out that astrology "does allow us to make . . . predictions for subsequent testing. The 'seasonal' explanation of Professor Smithers does not allow us to do this—a simple example of the relative sterility of such a theory despite its possible value in other respects."

In a lively response from *Guardian* readers (March 24, 27, and 31, 1984), scientists disagreed with both Harvey and Smithers, pointing out that random fluctuations and social factors were sufficient to explain the results.

We agree with this assessment. In what follows we show that non-astrological factors can explain all the results.

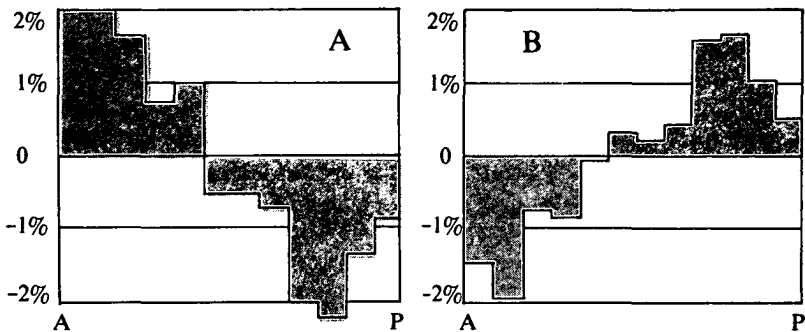
Our Re-analysis

Smithers counted the predicted sun-sign as a hit if its observed frequency was above average. He gives the results for ten occupations on which the astrologers were in good agreement (see Table 2). These results show that 8 out of 11 predictions were hits. How does this compare with the number expected by chance?

TABLE 2
Sun Sign vs. Census Data

Occupation	Social Class	Predicted Sign	Most Frequent Sign
Coal Miner	4	<i>Scorpio, Capricorn</i> (HIT)	Sagittarius
Car mechanic	3	<i>Aries</i> (HIT)	Pisces
Tailor/dressmaker	3	<i>Libra</i> (HIT)	Capricorn
Baker	3	Taurus (HIT)	Virgo
Clerk/cashier	3	Virgo (HIT)	Libra
Typist (=secretary)	3	Virgo	Cancer
Hairdresser	3	Libra	Leo
Optician	1	<i>Virgo</i> (HIT)	Gemini
Civil Engineer	1	Capricorn	Cancer
Author/journalist	2	<i>Gemini</i> (HIT)	<i>Gemini</i> (HIT)

If each sign has an equal chance of being above average, then the expected number of hits will be half the number of predictions. But, as shown in Figure 1, there are marked seasonal differences between social classes, with Virgo through Pisces being below average for the upper classes and above average for the lower classes. This means that if the occurrence of signs and classes is unbalanced—as it is in Table 2, where Virgo through Pisces and the lower classes are both overrepresented—then each sign will not have an equal chance of being above average, and the expected number of hits will not be half the number of predictions. In fact, in Table 2 the number of hits expected on seasonal grounds is 7, hence 8 hits by astrology is unremarkable. In other words, as Smithers himself



Percent difference from the average frequency for all classes combined.

FIGURE 1. Distribution of sun signs in Britain according to social class.

Data are for a 10 percent sample of the UK 1971 census.

In each graph the horizontal axis from left to right indicates the sun sign in sequence from Aries through Pisces.

A = social classes 1 (professional, e.g., doctors, scientists, clergy) and 2 (intermediate, e.g. managers, teachers, nurses). total sample 463,702 or 21 percent of the total.

B = social classes 3N (skilled nonmanual, e.g., clerks, cashiers, typists), 3M (skilled manual, e.g., carpenters, electricians, hairdressers), 4 (partly skilled, e.g., storemen, packers, hotel workers), and 5 (unskilled, e.g., laborers, office cleaners). Total sample 1,765,612 or 79 percent of the total.

Sixty-three percent of the total sample were male. There was no appreciable difference between the sun-sign distributions for males and those for females.

The difference between the two graphs is striking and is readily explained by the differences in socioeconomic factors. For example, social classes 1 and 2 would be more likely to plan spring births to avoid the winter, especially as most of the sample were born before the advent of central heating. The difference is not explained by sampling variations (see text), which for these large sample sizes are very small, namely 0.49 percent for A and 0.25 percent for B. This finding is consistent with results obtained in other studies on seasonal differences in birth rates (for a review, see Kevan 1979).

Source: Smithers 1984d.

points out (1984d), most of the predictions “depended on the seasonal patterns for their successes.”

Smithers does not apply the more rigorous test of comparing predictions with the most frequent sign. Table 2 shows that in this case the number of hits is one, which is exactly the number expected by chance.

Smithers excludes occupations for which his 15 astrologers were in less agreement. To find out what happens when no exclusions are made and other expert astrological opinions are included, we compared Smithers's census data with the sun-sign occupations given by (1) Table 1, (2) D. Parker and J. Parker (1971), which is representative of serious astrology books in the United Kingdom, and (3) C. J. Puotinen's (1980) survey of United States sources. In each case the analysis was straightforward, because neither Virgo through Pisces nor the lower social-classes were overrepresented. The results, summarized in Table 3, show that only Smithers's astrologers achieved a significant level of hits.¹ However, this is largely due to the results given in Table 2, and when these are excluded the results become nonsignificant.

TABLE 3
Astrologers' Predictions vs. Census Data

Source	No. of Predictions	Predicted sign is above average		Predicted sign is the most frequent	
		Observed	Expected	Observed	Expected
Smithers's panel	37	25	18.5	5	3.1
Parker and Parker	59	32	29.5	4	4.9
Puotinen	106	61	53.0	10	8.8

The table shows the observed number of hits and the number expected by chance. By chi-squared test with Yates's correction none of the results are significant below the $p = .15$ level except the 25 hits by Smithers's panel, for which $p = .05$.

Although generally nonsignificant, the results shown in Table 3 are nevertheless generally in the direction predicted by astrology. Does this provide some support for sun-sign astrology? The answer is no, because there is a simple, nonastrological explanation. H. J. Eysenck and D. K. B. Nias (1982) have shown that people who know the meaning of their sun-sign tend to display self-attribution—that is, they measurably shift their self-image and behavior toward the descriptions given by astrology, whereas those who are ignorant of the meaning display no measurable effect.²

Because most of the occupational correspondences tested by Smithers have been widely disseminated as part of sun-sign lore, it is reasonable to ascribe the results of Table 3 to self-attribution.³

Smithers suggests that self-attribution is unlikely to affect job choice. He acknowledges that self-attribution is a factor in personality, but states that “the serious business of getting a job though is something else” (1984a). However, few people have much help in choosing their job. Instead, their choice is influenced by their interests and abilities as assessed by themselves, their parents, and their prospective employers, which is precisely the situation that could be influenced by knowledge of sun sign.⁴ Furthermore job choice is far from being inexorably destined—even those who rise to eminence in a given profession have frequently chosen it by chance or accident. H. J. Eysenck is one example (he originally wanted to study physics); see A. Bandura (1982) for others. So, if chance or accident can play a role, why not self-attribution?

Given that self-attribution can conceivably affect job choice, the important question that Smithers fails to address is: How much self-attribution is required to explain the results? To answer this we first have to establish how much result there is to explain. We cannot ascribe all the ups and downs in Smithers's graphs to astrology because this would ignore the random variations inherent in the sampling procedure. (It is because of sampling variations that the hands dealt in a card game seldom contain equal numbers of suits.) So we measured the overall variation in nine of Smithers's graphs for sample sizes between 1,800 and 22,000 (which covers 70% of his graphs) and subtracted the theoretical sampling variation. The result was the variation to be explained by factors other than sampling variations; it averaged a little less than 2 percent.⁵

We cannot ascribe all of this variation to astrology, because other factors, such as the availability of jobs, play a part. But at least it establishes an upper bound. So we can say that Smithers's results can be explained if, at most, about 1 person in 60 is influenced by astrology in their choice of job. How does this compare with the level of self-attribution in the general population?

Some clues are provided by G. A. Dean (1983), who briefly surveyed the dozen available studies of self-attribution and sun sign, as well as various national opinion polls of belief in astrology. The indications were consistent and suggested that roughly 1 person in 3 not only believes in astrology but believes in it sufficiently to measurably shift their self-image in the corresponding direction.⁶ Therefore, to explain our result it requires about 1 in 20 of those who have shifted their self-image to have shifted their job preference as well. This does not seem improbable.

Do Smithers's Results Replicate?

Smithers's analysis rests on the comparison between astrologers' predictions

and the peaks in his graphs, but he presents no statistical analyses. In their letters to the *Guardian* the scientists ask the obvious questions. How reliable are the peaks? Do they replicate? And are they statistically significant? The point here is that unless the results replicate we cannot be sure that anything special is happening. In his reply (1984e) Smithers says: "Statistical analysis, omitted on the advice of the *Guardian*, which thought its readers would not be interested in the details, suggests that there is indeed something in the data. Also, where it has been possible to divide the sample . . . similar trends have been found in the two parts; the patterns for men and women in the same occupation can be very much alike and, where occupations are aggregated into social classes, the clear separation with time of year occurs."

Unfortunately this reply tells us little about whether the sun-sign results replicate. However, during a subsequent discussion of Smithers's study at the 4th International Astrological Research Conference in London on October 27-28, 1984, Smithers stated that he had not divided his sun-sign samples in half to see if the results replicated. This alone is enough justification to dismiss his study out of hand.⁷

Sun-Sign Alternation

Smithers makes much of Harvey's successful prediction that people in the caring professions (specifically nurses, sample size 35,039) should be born more frequently in feminine (even-numbered) signs, beginning with Taurus, and that trade-union officials (sample size 742) should be born more frequently in assertive or masculine (odd-numbered) signs, beginning with Aries. However, of the occupations listed in Table 1, nurses are the most caring and *feminine* of all (with perhaps hairdressers in second place) and trade-union officials are the most assertive and *masculine* of all (with perhaps policemen and lawyers in second place). In other words, these occupations are the ones most clearly related to sign alternation and therefore are the ones that should most clearly display the corresponding effects of self-attribution. So we cannot conclude that the results are necessarily evidence for genuine astrological effects.

There is another problem here that Smithers fails to address. A large number of occupations are involved. Could the results be due to chance? This is especially pertinent for the trade-union officials because their sample size is the second lowest of all the occupations studied; hence sampling variations probably swamped everything else and rendered the results meaningless (a point ignored by Smithers).

To find out, we counted for each occupation the number of peaks in odd-numbered signs and the number of peaks in even-numbered signs, and took whichever number was higher. We defined a peak as a sign total that had lower totals on either side regardless of whether it was above or below average; in this way we addressed alternation directly. We also

counted for each occupation the number of peaks according to element (fire, earth, air, or water) and again took the highest number.

The results are given in Table 4. They indicate that in Smithers's graphs overall there is nothing in the alternation of ups and downs that cannot be explained by chance.

TABLE 4
Distribution of Sun-Sign Peaks in Census Data

Test	No. of peaks	Frequency		Significance by chi-squared test
		Observed	Expected	
Odd or even	1	1	0.3	$\chi^2 = .44$
	2	14	12.9	$df = 3$
	3	15	15.5	$p = .9$
	4	6	7.0	
	5	2	2.0	
	6	0	0.3	
Element	1	5	6.0	$\chi^2 = .26$
	2	27	26.7	$df = 2$
	3	6	5.3	$p = .9$

Table 4 shows the results of tests applied to the 38 sun-sign distributions given by Smithers. The corresponding occupations are those given in Table 1 plus nurses and trade-union officials. The expected frequencies are those expected by chance and were determined by computer simulation using one million replications for the odd-even test and a quarter of a million replications for the element test. If a correlation with alternate signs or element exists as predicted by sun-sign astrology, the distribution of peaks should be skewed toward the higher numbers. The element results show such a skew but it is very small; the odd-even results show a slightly larger skew but in the wrong direction; overall, the results offer no support for sun-sign astrology. In both tests the difference between observed and expected frequencies is decidedly nonsignificant.

Source: Smithers 1984a; 1984b.

Some of the elements with at least two peaks (three is the maximum possible) were those that might have been predicted by astrology; for example, commercial travelers were "fire," policemen were "earth," and authors were "air." But many more were not. For example, farmers and

coal miners were “fire” not “earth,” firemen were “earth” not “fire,” fishermen were “earth” not “water,” politicians were “water” not “fire” or “air,” and car mechanics were “water” not “earth.”

Do such discrepancies and the chance results of Table 4 conflict with our explanation based on self-attribution? The answer is no, because elements are seldom part of sun-sign lore at its most popular level—at least as popularly remembered. (Do you know which element your sign is?) For example, Pisces is associated with fishermen not because it is a water sign but because it involves fish. In fact, the results strengthen the case for self-attribution and weaken it for astrology, because popular lore shows a slight bias in favor of astrology (Table 2), whereas the more subtle underlying astrological lore does not (Table 4). This is precisely the result to be expected if sun-sign astrology was nothing more than self-attribution.⁸

Conclusion

Professor Smithers has produced an interesting study that allows the most detailed look yet at the relationship between sun sign and occupation. We agree with him that there is “something in the data,” but we disagree that it reflects a genuine astrological effect. Our re-analysis of Smithers’s results shows that they can be explained by statistical fluctuations and self-attribution effects. As pointed out by Charles Harvey, the study has limitations as a test of sun-sign astrology; nevertheless we suggest that if there were underlying truths they would shine through despite these limitations. They certainly do not support sun-sign astrology.

Notes

1. Owing to space constraints we are unable to include the actual comparison. Interested readers can obtain details from Prof. I. W. Kelly, Department of Educational Psychology, University of Saskatchewan, Saskatoon, Canada, S7N 0W0.

2. The same thing applies to our perception of others. Having been told what a person is like, we often adjust our perceptions to suit, regardless of whether the information is correct. Such effects are more pervasive than commonly assumed (Cooper and Good 1983).

3. Empirical sun-sign studies of occupation seldom replicate even when the sample size is several thousands, see Dean and Mather (1977), pages 114-117. Furthermore, as Smithers points out, his expert astrologers do not use sun signs in the way implied here. Hence the astrologers will have based their opinions not on empirical studies but ultimately on what they read in astrology books. Because both popular and serious astrology books merely repeat the same traditional ideas, everyone—astrologers and lay people alike—is exposed to the same indoctrination. This provides ideal conditions for self-attribution effects and other self-fulfilling prophecies.

4. And of course by astrological business counseling. Today, in the United

States at least, choosing employees by astrology is practiced at all levels of astrological sophistication. In the San Francisco Bay area, students at the University of California at Berkeley complain that local employers use sun signs to discriminate among job applicants. "It's just too bad if you're Scorpio or Taurus—you won't get the job (Bastedo 1978). The extent to which this would apply to Smithers's census data is unknown but probably very small. Nevertheless it is obviously a factor that has to be kept in mind, especially as even small effects will manifest if the sample is large enough.

5. This variation is a standard deviation expressed as a percentage of the mean frequency per sun sign.

6. Supporting evidence is provided by G. Jahoda (1954). The Ashanti people in Ghana automatically include in their individual names the week in which they were born. From juvenile court records Jahoda found that Ashanti boys whose name meant "quiet and peaceful" were half as numerous among 416 aggressive delinquents as other boys, whereas those whose name meant "quick-tempered and aggressive" were twice as numerous. This is consistent with about half the population being affected by self-attribution to a measurable extent.

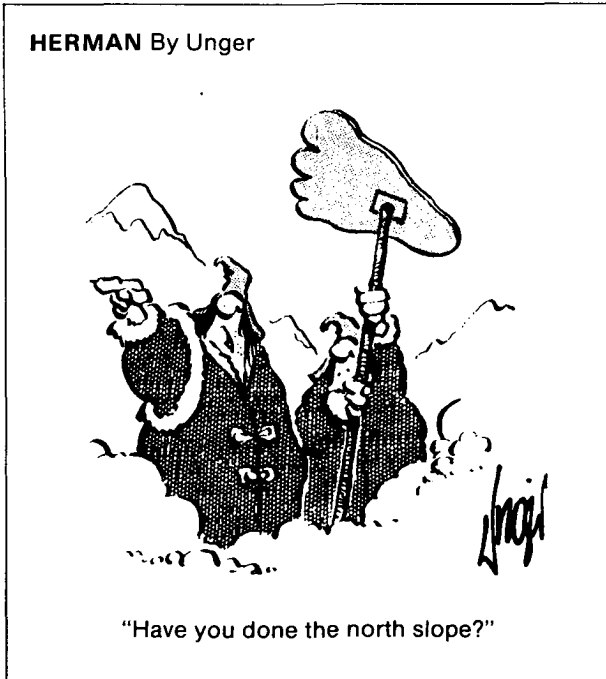
7. Smithers (1984c) gives data for only one occupation that allows the reproducibility to be checked—namely, 46,756 teachers in primary and secondary schools, 14,867 teachers of further education, and 2,304 teachers in universities. The broad trends in each case are similar and consistent with the effect of social class; for example, Aries is above average and Sagittarius is below average in all three. But there are important differences in detail; for example, Libra is well above average for the first and well below average for the others, and Cancer is the least frequent sign for the first and above average for the others. Because the sample sizes for the first two are well above average (which means that the effect of sampling variations is relatively small), the chances do not seem good for impressive replication of individual signs among the samples as a whole, which is bad news for sun-sign astrology.

8. It is worth noting that, when social class is allowed for, the odd-even sign alternation is about all that is left for self-attribution and astrology to explain. Hence alternation tests are especially crucial.

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