

**Are personality differences between twins predicted by astrology?**Svitbert Ertel^{1*} and Geoffrey Dean²¹*Institut für Psychologie, Georg-August-Universität, Gosslerstrasse 14, D-37073 Göttingen, Germany and*²*Analogic, P.O. Box 466, Subiaco 6008, Western Australia**(Received 14 October 1995)*

Summary—In Fuzeau-Braesch [*Astrologie: La Preuve par Deux* (1992a) and *Personality and Individual Differences* 13, 1135–1144 (1992b)] the parents of 238 pairs of twins matched brief astrological descriptions with their twins' personalities and achieved 68.5% hits, very significantly better than the 50% expected by chance. The author concluded that astrology may be a "new element in differentiating personality within a pair of twins." But we found reasons for doubt: her result is incompatible with previous findings, the disattenuated effect size is too high, the interval between births does not increase with increasing personality difference as required by her hypothesis, the astrological descriptions frequently differ from those prescribed by her supposedly objective rules, and the hit rate does not replicate. We then attempted to find an explanation for her results: we found evidence of artifacts in her reported data due to response set and stereotypes, and we found discrepancies between the reported data and the original data. Our re-analysis of the original data showed no significant deviation from chance. We conclude that an astrological explanation of Fuzeau-Braesch's results is unwarranted. The stereotype bias uncovered by us deserves to be added to the general list of human judgement biases. Copyright © 1996 Elsevier Science Ltd.

INTRODUCTION

Suzel Fuzeau-Braesch (1992a, b), hereafter SFB, prepared brief astrological descriptions for 238 pairs of French twins, median age 9 yr. The parents (usually mothers) of each twin pair, or sometimes non-parents, hereafter included in the term 'parents', indicated which twin best fitted each description. For example, they had to decide which one (Ann or Celine) was less sociable, and which one was more sociable. Or which one (Nicolas or Richard) was more expansive and more firm, and which one was more sensitive, receptive and affective. If no decision was possible it was called a void and counted as half a hit, which convention we have followed throughout this paper. The outcome was as follows:

<i>N</i>	Hits	Misses	Voids	H + V/2	Binomial <i>P</i>
238	153	65	20	68.5%	0.6×10^{-8}

The observed hit rate of 68.5% was very significantly higher than the 50% expected by chance. SFB attributed this to astrological influences, concluding that "the moment of birth or time difference between both births may have a role to play, in agreement with certain astrological rules, in ... the differentiation of the personalities." She even claimed that "a new scientific fact has emerged" (Fuzeau-Braesch, 1992b, pp. 1141–1142), a point echoed on the back cover of her book *Astrologie: La Preuve par Deux*, "c'est le premier test irréfutable" (Fuzeau-Braesch, 1992a). But for various reasons we were not convinced.

REASONS FOR DOUBT*Clash with previous findings*

Studies of the supposed connection between astrology and personality have consistently failed to find support commensurate with the claims, for example see Eysenck and Nias (1982), Startup (1984), Dean (1987), McGrew and McFall (1990), Müller and Ertel (1992), Dean, Mather and Kelly (1996). SFB refers only to the sun sign study by Mayo, White and Eysenck (1978), and the planet studies by Gauquelin (1960, 1988) and others, whose results "are not definitely disconfirmed" (p. 1136). But SFB used rising signs, not sun signs, and in any case the sun sign results were due to prior knowledge of astrology, for example see Pawlik and Buse (1979), Eysenck and Nias (1982), van Rooij (1994). When rising signs were tested against traits taken from biographies using samples much larger than SFB's no significant effect was found (Gauquelin, 1982). Furthermore, for people born with the same rising sign (the situation addressed by SFB's rocked-sign approach), whatever effect might exist would seem to have no chance of emerging.

The 'not definitely disconfirmed' planetary results of Gauquelin and others were obtained using eminent people and showed that half the planets and positions used by SFB were without significance. For ordinary people no planet or position was significant even with samples a hundred times larger than SFB's. Furthermore a planet stays within each Gauquelin

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sensitive zone for about 2 hr, so people born less than 2 hr apart are unlikely to show any difference in planetary effect. Yet nearly all of SFB's twins are born less than 30 min apart. In effect SFB seems to have used the smallest available telescope for locating an alleged star that others, using the largest available telescopes, have been generally unable to discover.

Improbable effect size

The parents' hit rate of 68.5% is equivalent to an effect size as Cohen's K of 0.37 (see Cicchetti, 1987), where 0 is no effect and 1 is perfect. For comparison the best Gauquelin planetary effects reach only 0.05, while the mean correlation between sun sign and personality due to prior knowledge is about 0.09 (Dean *et al.*, 1996), both values uncorrected for attenuation. When SFB's 0.37 is corrected for the range restriction in personality and in birth time, the unrestricted effect size is insensitive to the assumptions and is at least 0.95.* When further corrected for the reliability of the parents' judgements, which might not exceed 0.5,† and for the reliability of the astrological descriptions, which we show later to be about 0.4, the disattenuated effect size is $0.95/(0.5^{1/2} \times 0.4^{1/2}) = 2$, which is absurd because it exceeds unity. In other words SFB's results seem too good to be true.

Birth time interval unrelated to personality

According to SFB, personality differences between twins are related to the difference between their astrological charts. Because DZ twins differ in personality more than MZ twins, the difference between their astrological charts should tend to be larger, thus requiring larger intervals between their births. But except for non-natural births the intervals for SFB's MZ and DZ twins are in the wrong direction.‡

Mean interval	Natural births	Non-natural births	Caesarian births
For MZ twins	19.0 min SD 29.8 $N = 40$	10.1 min SD 6.1 $N = 24$	7.2 min SD 17.5 $N = 15$
For DZ twins	17.1 min SD 17.1 $N = 72$	18.8 min SD 29.4 $N = 54$	4.5 min SD 6.2 $N = 33$

Nor were the parents' hit rates related to whether the birth was natural (69%) or non-natural (69%) or Caesarian (68%), nor to whether the twins were MZ (68%) or DZ (69%) or aged under seven (70%) or over 12 (71%) or in between (65%), nor even to whether signs or planets were used (69%) or both (68%). Such a uniform independence of conditions seems unlikely if the effect were genuine.

Discrepancies in astrological descriptions

At our request SFB kindly sent us her data sheets showing the twins' birth data, zygosity, birth conditions, astrological descriptions, and whether the descriptions were a hit, miss or void. We found no appreciable differences between her computed planetary positions and ours, but we did find many discrepancies between the planets and signs selected by her rules and those obtained by working backwards from the astrological descriptions. For example her rules state "if there is no planet at the angles [i.e. near the horizon or meridian], analysis is carried out using ... zodiacal sign[s]" (p. 1137), yet signs were frequently used despite there being one or more planets at the angles. Sometimes positions expressly excluded were used, especially planets close to the lower meridian, which SFB says "are not taken into account" (p. 1137). Altogether over half of the astrological descriptions differed from those prescribed by her rules. Furthermore, when astrological interpretation became ambiguous due to conflicting indications, as when the target planet was very close to another of opposite meaning, we found no tendency for the hit rate to decrease, as logically it should.

O'Neill (1993a) attempted to replicate by computer SFB's astrological descriptions using 75% of her sample and the correspondences listed in her Appendix C. The best model achieved 53% agreement vs 9% for random matches produced by applying the descriptions to the next pair. When the same model was applied to the remaining 25% of the sample it

* The observed difference in planetary distance from the angles (SFB's first basis for chart judgement) is very small compared to the maximum unrestricted difference of 45° or 90°. Three examples: Cecile is more emotional than Anne because her Venus is 0.4° nearer the eastern horizon (this judgement was a hit). Erwan is more energetic than Renaud because his Mars is 1.0° nearer the western horizon (miss). Cedric is more sociable than Melissa because his Jupiter is 2.3° nearer the upper meridian (hit). Furthermore the median birth interval of 10 min is a mere 0.007 of the unrestricted range of one day, i.e. all 12 rising signs (SFB's second basis for chart judgement), which is itself 0.0001 of an unrestricted range of say 25 yr. When the observed effect size of 0.37 is corrected for the above range restriction and for the restriction in personality difference between twins, using the procedures of Hunter and Schmidt (1990), the unrestricted effect size is insensitive to the assumptions and is at least 0.95.

† Half the twins were aged under nine, and 80% required the rating of two or more traits together such as more mobile and more independent, which increases ambiguity when one twin is more mobile but the other is more independent. Judgement was often difficult as shown by the following examples of parents' comments: "No difference, one as energetic as the other, equally emotional" (for mixed sex twins age six). "I am very sorry but the distinction does not match reality" (MZ females age 10). "Above is badly worded—please be clear and precise" (DZ females age 12). "No difference" (the traits were more thoughtful, more sociable and more assertive vs more reactive, mixed sex age 32). These points and the findings of Stevenson, Parker, Wilkinson, Hegion and Fish (1976) suggest that the reliability of the parents' judgements might not exceed 0.5. The rule-of-thumb value for ratings generally is 0.6 (Hunter & Schmidt, 1990).

‡ A Kolmogorov-Smirnov one-sided test of the cumulative frequency distributions showed that no difference is significant below $P = 0.4$. The difference in mean birth interval required to explain the difference in personality variance between MZ and DZ twins is about one standard deviation, which would be easily detected by these sample sizes in four out of five tests at a two-sided significance level of 0.05 (Schmidt, Hunter & Urry, 1976). We therefore conclude that the results provide no support for SFB's claim. This test has the advantage of being unaffected by the various biases of human judgement discussed later.

achieved only 47% agreement, indicating a reliability as Cohen's K of 0.42 between human and computer. O'Neill's result clearly supports our own findings. We therefore disagree with SFB's claim that her method gives "objective and reliable phrases" (p. 1138).

Failure to replicate

O'Neill (1993b) also attempted to replicate SFB's study using 106 pairs of twins obtained via adverts in astrological publications, mostly in the UK. The results of his study are as follows.

<i>N</i>	Hits	Misses	Voids	H + V/2	Binomial <i>P</i>
106	48	44	14	51.9%	0.39

The hit rate of 51.9% is not significantly higher than the 50% expected by chance. However it is in the right direction, which O'Neill suggests might be due to a tendency for readers of astrological publications to volunteer data that supports astrology. By 2×2 test O'Neill's result (55 hits, 51 misses) is significantly different from SFB's result (163 hits, 75 misses), $P = 0.005$. As a precaution O'Neill had SFB rate the accuracy of his astrological descriptions for a subset of 59 non-void cases, but contrary to expectation there was no difference between hits and misses, the mean accuracy in each case being 6.9 on a scale of 0–10. This shows that his misses were not due to inaccurate interpretation. He also had SFB prepare the descriptions herself for a further subset of 33 cases, for which the result was 15 hits, 14 misses and four voids, a hit rate of 51.5%, $P = 0.50$. These findings are evidence that SFB's original results do not replicate. So how might her results be explained?

EXPLAINING FUZEAU-BRAESCH'S RESULTS

Bias due to prior knowledge

Prior knowledge of astrology explained the apparent link between sun sign and EPI scores observed by Mayo *et al.* and others. But as already noted by SFB (p. 1142) the astrological cues in her case were not sun signs but her unique mix of rising signs and planetary distance from angles. Even if some parents were familiar with astrology, it would not have been SFB's astrology unless they had learned it via personal contact. As it happens, nearly half the parents had been recruited via personal contact, the rest via a twin association, and a comparison shows that personal contact had little effect.

Source of twins	<i>N</i>	Hits	Misses	Voids	H + V/2
Personal contact	103	66	26	11	69.4%
Twin association	135	87	39	9	67.8%

The small difference is in the right direction but is far from significant (hits and misses in a 2×2 test gives $P = 0.89$). So prior knowledge of astrology does not explain SFB's results.

Bias due to response set

The parents had to write each twin's name in a box beneath the most fitting astrological description. Each description consisted of 1–4 traits, mean 1.6, or 2–7 for the pair, which parents had to rate as a whole. According to SFB (p. 1138), the description "relating to the first twin is placed on the right, that of the second on the left." This was meant as a safeguard against the parents' presumed left–right response set, or tendency to write the twins' names in birth order from left to right. But the presumed tendency to choose left–before–right might be wrong. For example, given equal left or right routes to a staircase, 75% of people choose right (Berg, 1967). Similarly, when faced with a situation demanding serious judgement, parents might deliberately avoid choosing left–before–right, as if to reassure themselves that they had made a judgement rather than a careless habitual response. Our suspicion was that the prevailing response set might have been right–before–left, contrary to the one presumed to exist, which would then have automatically generated spurious hits.

To explore the effect of cue position on response, we presented 64 German students with 12 questions in a format similar to SFB's response sheet. The results confirmed our suspicion that a response set existed, but the difference in conditions makes it unsafe to generalize to SFB's parents.* A more direct check is provided by the replication of O'Neill (1993b), who gives results for a subset of 87 cases where the trait positions were randomized. Here the parents wrote the firstborn's name on the left 39 times and on the right 48 times, giving a spurious hit rate of $48/87 = 55\%$, which difference supports our hypothesis albeit not significantly ($P = 0.20$). We conclude that response sets exist in SFB's data although we cannot be sure how important they are. Because SFB did not randomise trait positions to control for possible response sets, departures from an assumed expectancy of 50% are therefore difficult to interpret.

* Parents might also be influenced by other response sets, such as short names first, easiest-to-say names first, favourite names first, and of course males first. Some of these were actually detectable in SFB's data. Thus the firstborn had the shorter name in 58% of cases, binomial $P = 0.01$, which tendency existed for both MZ and DZ twins. For the 42 mixed-sex pairs the parents put the male first 27 times, binomial $P = 0.04$. There was some evidence of an easiest-to-say response set (for example Edouard et Georges seems easier to say than the reverse) despite uncertainties in deriving valid rules.

Bias due to stereotypes

Because SFB's chart interpretations were not always constrained by her rules, the allocation of astrological descriptions to each twin might have been affected by stereotypes. If the subsequent matching by parents was also affected by stereotypes, the result might be a spurious correlation and therefore an inflated hit rate. Sex stereotypes (here restricted of course to different-sex twins) are well known, for example males tend to be perceived as competent and rational, females as warm and expressive (Deau, 1985). Birth order stereotypes are less well known but studies of twins have found ample evidence for their effect on parents' behaviour (Takuma, 1971; Hay & O'Brien, 1984; Sandbank, 1988). In fact as parents develop a relationship with each twin, birth order may become the primary cue for stereotyped beliefs, especially for same-sex twins. Finally zygosity stereotypes are widely held, for example the belief that identical twins have a mysterious bond. Contrary to expectation, conscious attempts to ignore stereotypes can have the opposite effect (Macrae, Bodenhausen, Milne & Jetten, 1994). These various stereotypes meet our need for psychological distinctions between twins when actual distinctions are not obvious.

We began by reducing SFB's trait phrases for each twin to ratings on 10 scales, each representing the 10 meaningful clusters found to underly the 54 different trait phrases used by SFB.* We then divided SFB's twin sample into 2 male/female \times 2 first/secondborn \times 2 mono/dizygotic = 8 twin subgroups, and submitted it to discriminant analysis using CSS: STATISTICA from Statsoft, Tulsa, OK. If stereotypes based on sex or birth order or zygosity have not influenced trait selection, then no combination of traits (i.e. the 10 scale ratings and all possible products among them, a total of 55 variables) should succeed in discriminating between sex or birth order or zygosity. The results showed that successful discrimination between the eight twin subgroups was achieved for both SFB's and the parents' trait selections, but not for 10 sets of the same selections redistributed at random as a control. Randomization destroys the association between the variables and each category (sex, birth order, zygosity) but does not change the actual variables or their number, so that any artifacts arising from the latter source will be unchanged. The values of Wilk's λ (where 1 = no discriminating power, 0 = perfect) were as follows.

Trait selection	λ	<i>P</i>	λ
By SFB	0.48 (17)	<0.001	Mean of ten controls 0.90 (4.5)
By parents	0.62 (17)	<0.001	Mean of ten controls 0.90 (4.6)

() = number of variables accepted for model building.

The λ values show that the parents' trait selections were only slightly less affected by stereotypes than SFB's. Interestingly, when we analysed each case for only one or two of the three categories (sex, birth order, zygosity), λ did not drop below 0.90, showing that all three categories acted together and not separately. This suggests that twin stereotypes are perceived as wholes, not as aggregates of isolated categories. Cluster analysis of the same data showed that the structure underlying the SFB and parent stereotypes was significantly similar, which is not unexpected since the parents were obliged to deal with traits in which stereotype effects already existed. A MANOVA of the same data showed that zygosity was more significant than sex or birth order, which was consistent with the cluster analysis.† We conclude that the selection of traits by both SFB and parents was significantly affected by awareness of the twin's sex, birth order and zygosity.‡

For the parents it is easy to understand how their judgements could be biased by popular ideas about twins. But for SFB it is less easy, even though she was quite used to dealing with twins, explaining in response to our queries "I am not a twin but I have twin nieces and some friends with twins, so I first observed the problem of differentiation, as a biologist of course, and also personally, a long time ago." Here the problem is our uncertainty about what SFB knew when she prepared the astrological descriptions. She necessarily knew the twins' sex and birth order, but it is unclear whether she knew their zygosity—SFB told us she did not, but her article says she did (p. 1137). Accordingly we asked SFB to send us copies of the parents' original report forms. She kindly made available the part showing the astrological descriptions and the parents' judgements, but not the part showing whether she knew about zygosity. However, our examination of the astrological descriptions, which in general were clearly and neatly typed, revealed handwritten alterations. Nearly 20% of the forms had traits crossed out or rearranged by parents, while over 50% had traits added or amended by SFB, albeit sometimes only trivially, but evidently after the event. Altogether we found many discrepancies between the original typed traits rated by the parents and those transcribed by SFB on to her data sheets. But the twins' zygosity was necessarily known by then, if

* The 10 clusters were obtained by Q sort and were as follows: will power, sensitivity, vivacity, dominance, changeability, self-control, persistence, responsiveness, thoughtfulness, and excitability. As evidence of their reality they show a reasonable fit with the keywords listed by SFB for respectively the sun, Neptune, Mars, Jupiter, Uranus, Saturn, Saturn again, Venus, Mercury, and the moon.

† How could zygosity affect trait selection when it does not differentiate between twins? We suppose that when SFB selected the twins' traits she might have tended to contrast DZ twins in terms of, say, power traits, and MZ twins in terms of, say, sensitivity traits. The same bias would appear from the parents because they were obliged to deal with traits in which zygosity effects already existed. In this way zygosity would appear in discriminant analyses even though it cannot logically affect the hit rate within twin pairs.

‡ Interestingly, due to an astronomical artifact associated with SFB's use of rocked signs (O'Neill, 1993a), the opportunity for stereotype effects would still remain even if the selection of traits was computerised. According to SFB, if the twins' Ascendant positions are in the same sign, as they are in 87% of her cases, the twin furthest from the middle is allocated to the adjacent or 'rocked' sign. For example secondborns are Gemini if the mean Ascendant position is between mid-Taurus and mid-Gemini, and firstborns are Gemini if the mean position is between mid-Gemini and mid-Cancer. But at French latitudes the latter interval takes about 1.4 times longer to rise than the former, so among SFB's Geminis we can expect about 1.4 times more firstborns than secondborns by chance alone. And indeed this is closely matched by the observed totals of 25 and 17. SFB's trait word for Gemini is *mobile*, so the artifact here is *firstborns tend to be mobile*, which if it happens to reinforce the stereotype will inflate the hit rate. In SFB's study the mean hit rate for the cases most affected by such artifacts is 72.4% ($N = 76$), appreciably more than the mean hit rate of 66.7% for the rest ($N = 162$), although the difference by 2 \times 2 test is not significant ($P = 0.46$).

not earlier, so it was available during the transcription process, which explains why it could appear in our cluster analysis of the transcribed data.

Re-analysis of the original data

We also discovered that, contrary to her published procedure, SFB did not always put the firstborn's traits on the right, nor did she always allow for this misordering, so some reported hits are actually misses. We therefore re-analysed the original untranscribed data. First, using a computer to eliminate subjective judgements, we compared the original typed traits on each form with the corresponding birth charts to identify the twin they referred to. We then noted whether the parents' response was a hit or miss, and whether it agreed with the response reported by SFB. Altogether our results disagreed with SFB's in 42 cases, reported by her as 40 hits, one miss and one void. In a further five cases no conclusion was possible because the original form was ambiguous or the match between traits and charts was too inconsistent. In a further eight cases the prior history was unclear because the traits were handwritten, not typed. Excluding these 13 cases, reported by SFB as 12 hits and one void, the outcome of our re-analysis was as follows.

<i>N</i>	Hits	Misses	Voids	H + V/2	Binomial <i>P</i>
225	102	86	37	53.6%	0.16

Here voids include cases where parents had identified some traits as hits and others as misses, leaving the outcome undecided. Our new hit rate of 53.6% is much lower than the 68.5% reported by SFB, and is not significantly higher than the 50% expected by chance. The difference is consistent with our discovery of response set and stereotype effects in the reported data. By 2×2 test our result (120.5 hits, 104.5 misses) is significantly different from SFB's reported result (163 hits, 75 misses), $P = 0.0014$.

DISCUSSION AND CONCLUSION

The study by SFB seems to show that astrology can predict the personality difference between twins. But we found many complicating factors, namely evidence of bias due to response set and stereotypes, discrepancies between her reported astrological descriptions and those obtained by following her rules, discrepancies between her reported astrological descriptions and those recorded on the forms sent to the parents, and discrepancies between their reported order (secondborn always first) and their actual order. When we re-analysed the original data we found no significant deviation from chance, suggesting that these complications might explain SFB's results. This finding is consistent with O'Neill's (1993b) failure to replicate SFB's results, and with the general failure to find a link between astrology and the personality of ordinary people. We conclude that an astrological interpretation of SFB's results is unwarranted.

Our conclusion should not of course deter the hope that astrological research in general might still yield possible surprises. For example Gauquelin's work provides an instructive model of how such research should be done, being described by Eysenck (1990) as the single nugget "hidden in the desert of astrological research." Of course only by applying controls capable of distinguishing genuine from phantom nuggets will research in this 'desert' maintain its respectability. In the present case only phantom nuggets seem to have been found, but there was nevertheless a useful surprise, namely our uncovering of a subtle bias due to leakage of stereotype cues that spuriously inflates the agreement between experimenter and subject. This bias might now be added to the growing list of biases recognised since Rosenthal's (1976) survey of the hidden pitfalls of behavioural research.

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