A supernatural IQ? Investigating a claim to an extraordinary IQ

ANDREW M. COLMAN

A supernatural IQ? Investigating a claim to an extraordinary IQ
A report circulated by United Press International described Marilyn vos Savant as the possessor of the “the world’s highest IQ” (“An Affair of the Heart and Mind”, 1987). In the same year, The Guinness Book of Records cited her IQ as 228 (Russell, 1987, p. 16). After the publication of her own (co-authored) book, Brain Building: Exercising Yourself Smarter (vos Savant & Fleischer, 1990), this claim was widely repeated, even by a reviewer in the Skeptical Inquirer (Summer 1991, p. 415). As reported in the same issue of the Skeptical Inquirer (p. 342), Marilyn vos Savant’s weekly column in Parade magazine carries a byline noting that she is listed in the Guinness Hall of Fame for her “highest IQ”.

Paranormal claims can usually be challenged only on the basis of empirical evidence, and the history of ESP research shows how difficult and inconclusive that process tends to be because of the inherently controversial nature of the data (Colman, 1987, chap. 7). Marilyn vos Savant’s supernatural IQ, on the other hand, provides a tempting opportunity for an entirely different and more decisive line of attack. I believe that her claim to an IQ of 228 can be refuted on purely logical (or mathematical) grounds, without the necessity of any messy and potentially controversial empirical testing at all.

The Original Concept of IQ
It is necessary first to explain the concept of the intelligence quotient or IQ. As its name suggests, it originally referred to the result of dividing one number (mental age) by another (chronological age). Chronological age is simply age in the ordinary sense of the word. Mental age is a slightly less familiar but equally uncomplicated concept. It was originated by the French psychologists Alfred Binet and Theodore Simon, who constructed the first useful intelligence test in 1905. It is most easily explained with a simple example. If a 10-year-old child can solve only those problems on an intelligence test that an average 7-year-old in the standardization sample (used to establish test norms) could solve, then the child has a mental age of 7 and may be said to be mentally retarded by about three years. Another 10-year-old child who can solve as many problems as an average 12-year-old in the standardization sample may be said to have a mental age of 12 and to be well above average.

The German psychologist William Stern (1912) pointed out that mental age, on its own, does not indicate intelligence; before we can form an opinion as to the child’s intelligence, we need to compare a child’s mental age with his or her chronological age. Stern originated the idea of dividing mental age (MA) by chronological age (CA), and he called the resulting fraction the intelligence quotient. A few years later, the American psychologist Lewis Terman (1916) introduced the abbreviation IQ and suggested multiplying Stern’s fraction by 100 to convert it to a percentage, yielding the well known definition,

\[ IQ = \frac{MA}{CA} \times 100. \]

Although IQ is defined like that in most elementary textbooks of psychology, the formula is in fact obsolete in modern psychometric theory.

The Statistical Definition of IQ
The old-fashioned formula was abandoned for a number of reasons. One rather serious
problem was that it yielded absurdities when applied to the measurement of adult intelligence. After the age of about 17 or 18, most people show no further increase in intellectual ability. In other words, mental age tends to stabilize, and in later life it may even decline, but chronological age, regrettably, marches on. Average 40-year-olds perform at about the same level on IQ tests as average 20-year-olds, but according to the old formula a 40-year-old performing at the level of an average 20-year-old would have an IQ of $20/40 \times 100 = 50$, which would seem to indicate severe retardation. This is obvious nonsense, because this 40-year-old could at the same time be performing at the level of an average 40-year-old!

In 1939 the American psychologist David Wechsler introduced a new definition of IQ that has been almost universally adopted by subsequent psychometricians (Wechsler, 1939, chapter 2). Scores on any test are converted to IQs by equating the mean (average) score in the standardization sample to 100 IQ points and the standard deviation (which is a statistical index of dispersion or scatter among the scores) to 15 IQ points. Assuming that IQ scores are distributed according to the familiar bell-shaped normal distribution, for which there is a great deal of empirical evidence (Colman, 1990), this means that by definition

\[
\frac{1}{2} \text{ people score above } 100, \quad \frac{1}{64} \text{ people score above } 115, \quad \frac{1}{1,000} \text{ people score above } 130, \quad \text{and so on -- these percentages can be looked up in published tables of the normal distribution.}
\]

Marilyn vos Savant’s Unbelievable Score

Let us examine the credibility of Marilyn vos Savant’s claimed IQ by extrapolating the above calculations. In terms of the statistical definition, an IQ of 228 is 8.53 standard deviations $(8.53 \times 15)$ above the mean of 100. It is impossible to look up the area under the curve in this region because the published tables do not go anyway near 8.53 standard deviations above the mean $(Z \geq 8.53)$. There is, however, a formula (Schucany & Gray, 1968) that yields an approximation with negligible error, and according to this formula the probability corresponding to the area under the curve beyond 228 is less than $p = 10^{-17}$. This means that the probability of any specified person having an IQ of 228 or more is less than 1 in $100,000,000,000,000,000$, that is, less than one in a hundred million billion.

Taking into account the fact that there are a little over 5 billion people in the world, the probability of finding anyone at all with an IQ of 228 or more is still indistinguishable from zero. Since the probability of a single IQ falling in the range above 228 is less than $p = 10^{-17}$, and the world’s population is greater than $n = 5 \times 10^9$, the probability that anyone in the world has an IQ $\geq 228$ is less than

\[
1 - (1 - p)^n \approx 5 \times 10^{-8},
\]

which means that the odds against the event occurring are greater than 20 million to 1. The prudent punter would not wish to bet on there being anyone with such a high IQ.

Conclusions

There are only two logical possibilities arising from these calculations. Either Marilyn vos Savant really does have an IQ of 228, in which case a genuine miracle has occurred, or alternatively her IQ is spurious. Common sense bids one to prefer the latter interpretation. This in turn leads to the following paradox. If Marilyn vos Savant were really as supernaturally intelligent as she claims to be, then she would surely have done the calculation in her head (without the need for an approximation formula, perhaps), and on seeing the result she would immediately have disavowed her bogus IQ, realizing that no one could be as paranormally intelligent as that. To quote from Marilyn vos Savant’s own book, “your intellectual ability can be described as your ability to distinguish, to a finer and finer degree, sense from nonsense” (vos Savant & Fleischer, 1990, p. 243).
References
Wechsler, D. 1939. The measurement of adult intelligence. Baltimore, MD: Williams & Wilkins.

Andrew M. Colman is a reader in the Department of Psychology, University of Leicester, LE1 7RH, England.