Sex ratio of births conceived during wartime

Dear Sir,

A recent article has reported a decline in the sex ratio at birth of babies born after a 10-day war in Slovenia in 1991 (Zorn et al., 2002). Their results (fewer males than females) are in accordance with those observed after the Iran–Iraq war (1980–1988) (Ansari-Lari and Saadat, 2002) and after the Kobe earthquake (Fukuda et al., 1998). The authors suggested that a decrease in sperm motility (affecting more the proportion of fast Y-bearing sperm) observed in patients studied during the war period may be involved in the observed change in the secondary sex ratio. The same explanation was suggested for the Kobe earthquake (Fukuda et al., 1996). James (2003) recently called our attention to another mechanism that could be involved, i.e. hormone levels in both parents around the time of conception (James, 1996): ‘high parental levels of testosterone and estrogen around the time of conception are associated with the subsequent births of boys and high levels of gonadotropins and progesterone with girls’.

These biases in the sex ratio observed in Slovenia, Iran and Kobe are in disagreement with what was reported after both World War I and II, as James (2003) pointed out. After these two major wars, a small rise in the sex ratio at birth (favouring males) was observed in countries involved in the conflict (Trivers, 1985).

I would like to contribute to the discussion with an alternative, complementary explanation expressed from a different point of view.

Sperm motility or hormone levels, as well many other explanations proposed in the literature, are ‘proximate’ causes: physiological changes that would act to produce biases in the sex ratios. But from what is called an ‘ultimate’ point of view, changes in the sex ratio can be seen as an adaptive equilibrium after a decimation of males after a war (Bisioli, 2002).

After a war, males are a valuable reproductive resource because they are scarce. There is an adaptive advantage for females to produce males: these offspring would have more possibilities to successfully reproduce in an environment deprived of males. The Paraguayan war at the end of the 19th century, for example, destroyed most of the male population and was followed by an spontaneous increase in male births (Sureau, 1999). This bias towards males will last until the less represented sex return to the 1:1 balance point, when the benefits for having a boy or a girl are the same.

This explanation was first raised by Fisher (1930) and Maynard Smith (1980). Fisher (1930) had postulated that natural selection would penalize any deviation from the 1:1 ratio, that is, if females and males ‘cost’ the same (to be conceived, raised, fed, etc.), females and males are produced in same numbers. Maynard Smith (1980) challenged Fisher’s assumption. He argued that, under certain circumstances, females will produce more males because these male offspring will have better opportunities to leave more descendants in the next generations.
I agree with Dr James that the decline in sex ratio observed in Iran can be due to the effect of an environmental disruptor, the mustard gas. I would like to propose that in the case of the Kobe earthquake and the Slovenian war, the cause of the difference from the World Wars could be found in the difference in the length and size of the conflicts. Although all biases in the sex ratio have been seen 1–2 years after the ending of the conflicts, World Wars I and II lasted 5–7 years, while the Kobe earthquake and Slovenian War only a few days. I believe it is plausible to think that the proximate mechanisms involved in the sex ratio changes need time (and perhaps a threshold of stress intensity) to come into effect. The Kobe and Slovenian biases have some other unknown causes that, with our present knowledge, do not fit with Maynard Smith’s predictions.

The differences observed between the long and the short wars can be illustrating the specificity of situations in which the effects predicted by Fisher or Maynard Smith should be acting (Keller et al., 2001). As Zorn et al. (2003) expressed: ‘More rational research approaches are a prerequisite for a better understanding of the complex problem of wars and sex ratio changes’. I hope that the alternative ‘ultimate’ mechanism that I have proposed could be seen as another approach to a better understanding of this complex problem.

References

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