

Reply to Joel and Tarrasch: On the relationship between testosterone, gender, financial risk aversion, and career choices

With regard to our recent paper on testosterone, financial risk aversion, and career choices in a large population of MBA students (1), there is nothing wrong in our data analyses, in our results, or in the conclusions we draw from them. Joel and Tarrasch (2) urge caution in drawing conclusions from correlational findings. We agree, and that is why, in the first sentence of the Discussion section of our paper, we stated that the results of our study *suggest* (rather than *demonstrate*) that testosterone has both organizational and activational effects on financial risk aversion and career choices. Joel and Tarrasch also maintain that the effects we report are not strong. We agree, and never claimed that they are. Given the nature of the question we addressed and the difficulty of conducting experimental hormonal manipulations in a human study with a large sample size such as ours, correlational data analyses are appropriate and can provide useful information. Moreover, given that inter-individual variation in financial risk aversion and career choices is probably the result of multiple biological, social, and cultural factors, it would be surprising if the effects of testosterone were strong. Joel and Tarrasch argue that the correlation between testosterone and risk aversion or career choices may be the result of other variables that are independently correlated with both hormone concentrations and risk aversion or career choices. We acknowledged this possibility in our paper and examined some of these other variables. We are aware that be-

havior and environment can affect testosterone. We measured salivary testosterone concentrations before and after the subjects took the financial risk aversion test. We found that although the stress of taking the test reduced testosterone, especially in males, there was a significant positive correlation between the testosterone concentrations measured before and after the test, suggesting that individual differences in hormone concentrations were stable over time and regardless of the test. Variation in financial risk aversion and career choices was predicted by the average of the pretest and posttest testosterone concentrations, which likely reflects stable individual differences in testosterone and not the change in testosterone associated with the test. Joel and Tarrasch caution that it is wrong to assume that biological differences, such as between- or within-gender differences in testosterone concentrations, necessarily reflect innate factors. We agree, and in our paper we made no statements whatsoever regarding the origins of such differences. Stable individual differences in hormone concentrations are probably the result of multiple factors, including genetic predispositions, prenatal environmental influences, early postnatal experience, and current environment.

Paola Sapienza^a, Luigi Zingales^b and Dario Maestriperi^{c,1}

^a*Kellogg School of Management, Northwestern University, Evanston, IL 60208;* ^b*University of Chicago Booth School of Business, Chicago, IL 60637;* ^c*Department of Comparative Human Development, University of Chicago, Chicago, IL 60637*

1. Sapienza P, Zingales L, Maestriperi D (2009) Gender differences in financial risk aversion and career choices are affected by testosterone. *Proc Natl Acad Sci USA* 106: 15268–15273.
2. Joel D, Tarrasch R (2010) The risk of a wrong conclusion—On testosterone and gender differences in risk aversion and career choices. *Proc Natl Acad Sci USA* 107:E19.

Author contributions: P.S., L.Z., and D.M. wrote the paper.

The authors declare no conflict of interest.

¹To whom correspondence should be addressed. E-mail: dario@uchicago.edu.