



LETTERS

edited by Jennifer Sills

Counting India's Wild Tigers Reliably

THE INDIAN GOVERNMENT REPORTED A 16% increase in tiger numbers over the past 4 years (News of the Week, Around the World item “Tiger numbers up? Maybe,” 1 April, p. 18). This implies an average increase of 49% in local tiger densities, despite the reported range contraction of 22%. Yet these assertions cannot be verified because details of tiger photo-captures at sampled locations, as well as of spatial extrapolations from these data, are incomplete (1–3).

Reported tiger numbers were based on calibrations of tiger sign encounter rates against estimated local tiger densities (2), but the recently released values of correlation coefficients were much higher than have been reported previously (4, 5). Moreover, the extrapolation of tiger numbers to wider regions is reportedly based on standard methods of sampling and estimation (1), but it is not clear from reports (1–3) whether the survey protocols used actually match these standard practices (6, 7).

A recent global analysis (8) showed that 70% of wild tigers survive in 42 “source populations” that occupy a mere 6% of remaining habitat. Although such source populations may suffer annual losses of more than 20%, studies of tiger population dynamics show that high recruitment rates compensate for these losses when there is adequate prey and protection (9, 10). Therefore, future efforts to reverse tiger declines must focus on reliably monitoring tiger numbers, as well as survival and recruitment rates, in these threatened source populations. There is a scientific consensus that monitoring should be conducted annually—within 30 to 45 days to avoid population fluctuations—and cover an area of more than 500 km², at intensities of more than 500 trap-nights per 100 km² (11).

The monitoring protocol for India's national animal requires a major overhaul if it is to generate transparent, reliable measures of tiger conservation successes (or failures) in the future. **K. ULLAS KARANTH,^{1,2*} ARJUN M. GOPALASWAMY,^{1,3} N. SAMBA KUMAR,^{1,4} MOHAN DELAMPADY,⁵ JAMES D. NICHOLS,⁶ JOHN SEIDENSTICKER,⁷ BARRY R. NOON,⁸ STUART L. PIMM⁹**

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References

1. Y. V. Jhala, R. Gopal, Q. Qureshi, “Status of the tigers, co-predators, and prey in India” (National Tiger Conservation Authority, Government of India, New Delhi, and Wildlife Institute of India, Dehradun, 2008).
2. Y. V. Jhala, Q. Qureshi, R. Gopal, *J. Appl. Ecol.* **48**, 14 (2011).
3. Ministry of Environment and Forests, “India tiger estimate 2010” (Government of India, National Tiger Conservation Authority and Wildlife Institute of India, 2011).

4. J. E. Hines *et al.*, *Ecol. Appl.* **20**, 1456 (2010).
5. K. U. Karanth *et al.*, *J. Appl. Ecol.*, 10.1111/j.1365-2664.2011.02002.x (2011).
6. K. H. Pollock *et al.*, *Environmetrics* **13**, 105 (2002).
7. D. I. MacKenzie *et al.*, *Occupancy Estimation and Modeling: Inferring Patterns and Dynamics of Species Occurrence* (Elsevier, San Diego, CA, 2006).
8. J. Walston *et al.*, *PLoS Biol.* **8**, e1000485 (2010).
9. K. U. Karanth, J. D. Nichols, N. S. Kumar, W. A. Link, J. E. Hines, *Proc. Nat. Acad. Sci. U.S.A.* **101**, 4854 (2004).
10. K. U. Karanth, J. D. Nichols, N. S. Kumar, J. E. Hines, *Ecology* **87**, 2925 (2006).
11. A. F. O'Connell *et al.*, *Camera Traps in Animal Ecology: Methods and Analyses* (Springer, Tokyo, 2011).

Practical Implications of Test Anxiety Tools

IN THEIR REPORT “WRITING ABOUT TESTING worries boosts exam performance in the classroom” (Reports, 14 January, p. 211), G. Ramirez and S. L. Beilock showed that letting students write about their worries for 10 minutes before an exam substantially diminishes the link between test anxiety and test performance. Their second study replicates and extends our previous work, in which we showed that letting students write down attributes of successful problem-solvers for 10 minutes diminishes the relationship between cognitive test anxiety and test performance (1).

We differ regarding the theoretical interpretation of the relationship and the resulting practical implications. Although Ramirez and Beilock's intervention is not identical to ours, the fundamental mechanisms are similar. Ramirez and Beilock argue that the effect is mediated by a state of worry during the test situation, but they did not test this proposition. In one of our investigations, we tested this idea and found no support. Instead, we found cognitive test anxiety to affect situational task engagement: Students who have high cognitive test anxiety do not engage in the task because they underestimate their probability for success and consequently do not fully engage in solving the problems at hand. This idea

is in line with engagement-disengagement theories (2). An implication of applying engagement-disengagement theories is that the performance of students with low cognitive test anxiety should suffer from priming/writing interventions.

We found empirical support for this idea (1). Our studies were larger and consequently had more statistical power for detecting an effect than the study by Ramirez and Beilock. In addition, Ramirez and Beilock's Fig. 3 provides some descriptive indication that the interaction effect in the study partly resulted from students with low test anxiety performing worse in the expressive writing group.

We therefore recommend that priming/writing interventions should only be used after screening recipients for cognitive test anxiety. Students with low test anxiety should not be the recipients of interventions of this type because there is theoretical and empirical evidence that their performance will suffer.

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References

1. J. W. B. Lang, J. Lang, *Psychol. Sci.* **21**, 811 (2010).
2. C. S. Carver, M. F. Scheier, *On the Self-Regulation of Behavior* (Cambridge Univ. Press, New York, 1998).

Response

CONTRARY TO LANG AND LANG'S ASSERTION that the performance of students lower in test anxiety was harmed by expressive writing, students with lower test anxiety performed just as well on their final exams in the writing and control conditions (Experiments 3 and 4 in our Report).

Lang and Lang showed that having students imagine a person successful at solving scientific problems and write about the qualities of this person (i.e., priming competence) improved test performance of those higher in test anxiety, but harmed test performance of those lower in test anxiety (1).

Although both our expressive writing and Lang and Lang's competence exercise are designed to enhance test performance, they are very different interventions. In expressive writing, students write about their feelings regarding the upcoming test. In the competence exercise, students write about the qualities of a successful test taker. In their study, task engagement explains the impact of the competence intervention on the

test performance of students lower and higher in test anxiety. In contrast, we show that the extent to which one writes about negative thoughts and worries accounts for the benefits of expressive writing (our Experiment 2).

Given the different mechanisms, it is not surprising that the two interventions affect students with lower test anxiety differently. Whereas Lang and Lang's exercise primes competence and thus leads to less engagement for these students, our writing exercise need not relate to competence or engagement in this way. In support of this idea, in Experiment 1, we had some students expressively write before taking a low-pressure math test. If expressive writing primes competence, which in turn alters task engagement, then writing should hurt students' performance in a low-pressure situation. This is because students should approach a low-pressure test with high self-perceived competence (especially after succeeding on a similar pretest). Thus, priming competence further should lead to less effort and worse performance. However, we found that writing had no impact on low-pressure test performance.

We suggest that writing allows students to express their negative thoughts and worries, which reduces the tendency to ruminate during the test. This expression is not necessary for those in a low-pressure situation or for students with lower test anxiety; thus, their performance is neither enhanced nor harmed by expressive writing.

Lang and Lang do correctly point out that we do not provide direct evidence that expressive writing alleviated negative thoughts and worries during test performance. However, our intervention was guided by previous research showing that performance drops in high-pressure situations are accounted for by negative thoughts and worries (2) and that writing about worries alleviates the tendency to ruminate (3). If worries lead to poor



test performance and writing helps alleviate these worries, then giving students the opportunity to express themselves should enhance test performance—especially for those highest in test anxiety. This is exactly what we found.

Our evidence supports the counterintuitive idea that writing about worries benefits the performance of the most test-anxious students without compromising the performance of students lower in test anxiety. Thus, we see no need to screen people for test anxiety before they engage in expressive writing.

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References

1. J. W. B. Lang, J. Lang, *Psychol. Sci.* **21**, 811 (2010).
2. M. S. DeCaro, K. E. Rotar, M. S. Kendra, S. L. Beilock, *Q. J. Exp. Psychol.* **63**, 8 (2010).
3. K. Klein, A. Boals, *J. Exp. Psychol. Gen.* **130**, 3 (2001).

CORRECTIONS AND CLARIFICATIONS

Reports: "pH-Dependent gating in a FocA formate channel" by W. Lü *et al.* (15 April, p. 352). In addition to his affiliation with the Lehrstuhl für Biochemie, Oliver Einsle is affiliated with the Center for Biological Signaling Studies (BIOSS), Albert-Ludwigs-Universität Freiburg, Hebelstrasse 25, 79104 Freiburg, Germany. The affiliation has been added in the HTML version online.

Cover Caption: (8 April, p. 139). The caption stated that a magnet was levitating above a superconducting ceramic yttrium barium copper oxide disc, when in fact the disc was levitating above the magnet.

Books *et al.*: "The immortalist" by M. Shermer (1 April, p. 40). The title of the review is "The immortalist," not "The immoralist." Also, in the last sentence of the fourth paragraph, "absolutely" should be "absolute." The HTML version online has been corrected.

News & Analysis: "Japan's research facilities down but not out" by D. Normile (25 March, p. 1509). The name of physicist Youhei Morita, KEK's press officer, was misspelled.

Letters to the Editor

Letters (~300 words) discuss material published in *Science* in the past 3 months or matters of general interest. Letters are not acknowledged upon receipt. Whether published in full or in part, Letters are subject to editing for clarity and space. Letters submitted, published, or posted elsewhere, in print or online, will be disqualified. To submit a Letter, go to www.submit2science.org.