

LETTERS

edited by Jennifer Sills

Editorial Expression of Concern

IN THE 4 JUNE 2010 ISSUE, *SCIENCE* PUBLISHED THE REPORT “SPHK1 REGULATES PROINFLAMMATORY responses associated with endotoxin and polymicrobial sepsis” by P. Puneet *et al.* (1). After the receipt of an anonymous e-mail on 22 March 2011, *Science* learned that authorities at the authors’ principal institutions at the time of publication (University of Glasgow and National University of Singapore) and the University of Liverpool (corresponding author A.J.M.’s more recent affiliation) were investigating allegations of figure manipulation in the *Science* Report and in a paper published in *Nature Immunology* [*Nature Immunology* **12**, 344 (2011)] also by P. Puneet *et al.* The *Nature Immunology* paper was subsequently retracted after an investigation by the University of Liverpool, but we have been informed that the investigation into the *Science* Report has not yet reached a conclusion, despite indications that it was near completion.

On 14 January 2011, *Science* published a Correction to two of the figures in the Puneet *et al.* Report, after correspondence with A.J.M. In light of the continuing investigation, we can no longer be confident in the reliability of the corrected record. Pending the results of the investigations, *Science* is publishing this Editorial Expression of Concern to alert our readers to the fact that serious questions have been raised about the validity of findings in the Puneet *et al.* paper.

BRUCE ALBERTS

Editor-in-Chief

Reference

1. P. Puneet, C. T. Yap, L. Wong, L. Yulin, D. R. Koh, S. Mochhala, J. Pfeilschifter, A. Huwiler, A. J. Melendez, *Science* **328**, 1290 (2010).

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Martial Arts Research:
Prudent Skepticism

A. DIAMOND AND K. LEE’S REVIEW “Interventions shown to aid executive function development in children 4 to 12 years old” (special section on Investing Early in Education, 19 August, p. 959) leaves the impression that martial arts training as usually delivered enhances executive functions. This is far from established. Martial arts training is a heterogeneous independent variable with average effects that may be negligible or even negative.

Diamond and Lee cite two studies in support of martial arts. In the Trulson study (which was based on 34 students and 1 instructor),

the only outcome measures are the self-report personality inventories completed by the “delinquent” students (1). Trulson concluded that the meditation, contemplation of goals, and other noncombat components of martial arts are helpful, but pure competitive fight training is harmful. The Lake and Hoyt study (207 students and 1 instructor) found the most positive effects on a measure of behavior during completion of an obstacle course (2). With teacher ratings, however, insignificant effects were reported for four out of five variables, including self-control.

Longitudinal studies observing the results of many instructors lead to skepticism about the effects of martial arts training. Endresen and Olweus (3), using a longitudinal design, reported that “participation in power sports

[including martial arts] actually leads to an increase or enhancement of antisocial involvement in the form of elevated levels of violent as well as non-violent antisocial behavior outside sports.” We analyzed data from a large, nationally representative sample (4). The outcome variable was teacher-rated behavior, including self-control and attention. In each of our two main outcome analyses, we found that martial arts had no effect on behavior.

In a world beset by violence, there is irony and pathos in hoping that our children will be improved by teaching punching, kicking, and tripping. Unless the evidence for benefit is robust, it is prudent to be skeptical.

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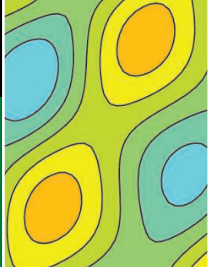
*To whom correspondence should be addressed. E-mail: joestrayhorn@gmail.com

References

1. M. E. Trulson, *Hum. Relat.* **39**, 1131 (1986).
2. K. D. Lakes, W. T. Hoyt, *Appl. Dev. Psychol.* **25**, 283 (2004).
3. I. M. Endresen, D. Olweus, *J. Child Psychol. Psych.* **46**, 468 (2005).
4. J. M. Strayhorn, J. C. Strayhorn, *J. Child Adolesc. Psychiatr. Ment. Health* **3**, 32 (2009).

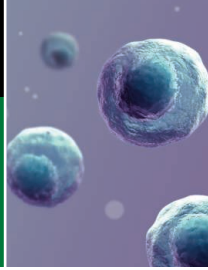
Martial Arts Research:
Weak Evidence

THE REVIEW “INTERVENTIONS SHOWN TO aid executive function development in children 4 to 12 years old” by A. Diamond and K. Lee (special section on Investing Early in Education, 19 August, p. 959) cited work that close examination shows to be weak. Some of the studies (1, 2) were randomized, but they failed to meet other criteria such as blinding of teachers and parents to pupils’ treatment groups. Studies involving martial arts and physical exercise were particularly weak on isolation of variables. One study on mar-



Signs of ocean eddies

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tial arts training for children (1) compared a treatment group who wore special uniforms, meditated, bowed to their instructor, and were reminded of self-awareness and self-control, to a control group who continued with their ordinary physical education

activities; these authors concluded that when some improvement on some scales occurred for the treatment group, the change was caused by the self-awareness and self-control messages, rather than by other ways the two groups differed. Another study (2) compared children who did "sport stacking," a bimanual

physical task, with a control group that did not experience any exciting new activity, and concluded that improvement on one of two reading measures was caused by the stacking task.

A relevant volume dealing with treatments for developmental disabilities (3) stressed the weakness of evidence for special education interventions and described some such conditions as "fad magnets." Unfortunately, early educational interventions seem to be similarly weak in evidence. The stakes are high and the resources scarce in both cases. **JEAN MERCER**

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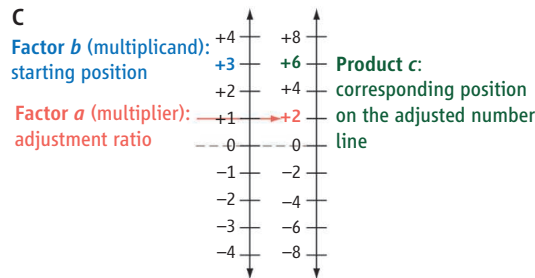
References

- 1. K. D. Lakes, W. T. Hoyt, Appl. Dev. Psychol. 25, 283 (2004).
2. T. A. Uhrich, R. L. Swalm, Percept. Mot. Skills 104, 1935 (2007).
3. J. W. Jacobson, R. M. Foxx, J. A. Mulick, Controversial Therapies for Developmental Disabilities (Erlbaum, Mahwah, NJ), 2005.

CORRECTIONS AND CLARIFICATIONS

Review: "Interventions shown to aid executive function development in children 4 to 12 years old" by A. Diamond and K. Lee (special section on Investing Early in Education, 19 August, p. 959). The journal cited in reference 28 should have been Appl. Dev. Psychol.

Education Forum: "Mathematics teachers' subtle, complex disciplinary knowledge" by B. Davis (24 June, p. 1506). The number line on the right in part C of the figure was mis-numbered. The correct panel is shown here.



TECHNICAL COMMENT ABSTRACTS

Comment on "How Cats Lap: Water Uptake by Felis catus"

Michael Nauenberg

Reis et al. (Reports, 26 November 2010, p. 1231) reported on the mechanism by which cats lap and gave a theoretical and experimental analysis of their observations. Their explanation for the cat's lapping frequency, however, is based on an incorrect application of the principles of fluid dynamics. The revised analysis given here agrees with their observations and predicts a similar lapping frequency for cats and dogs.

Full text at www.sciencemag.org/cgi/content/full/334/6054/311-b

Response to Comment on "How Cats Lap: Water Uptake by Felis catus"

Roman Stocker, Jeffrey M. Aristoff, Sunghwan Jung, Pedro M. Reis

We return to the physics of cat lapping to show that our proposed scaling analysis predicts the functional dependencies revealed by the experimental data more accurately than a recently proposed alternative description by Nauenberg. Experimental verification of functional dependencies, rather than single numerical values, represents the appropriate test for any scaling argument.

Full text at www.sciencemag.org/cgi/content/full/334/6054/311-c

Response

WE AGREE WITH STRAYHORN AND STRAYHORN that modern and traditional versions of martial arts differ. We tried to emphasize that modern American martial arts (which emphasize "punching and kicking" and competition) have been found to make unproductive behaviors worse, whereas evidence indicates that traditional martial arts [which emphasize self-control, self-defense, patience, waiting for the other person to make an error, concentration, respect, and humility (I)] improve executive functions.

We agree with Mercer about weaknesses in many studies thus far published on executive function interventions. We reviewed only peer-reviewed studies and provided detailed information about them (see tables S1 to S3 in the supporting online material) to give readers an opportunity to judge the evidence for themselves. We disagree with Mercer about the martial arts study being particularly weak. First studies are designed to determine whether there is an overall difference. Follow-up studies can then try to dissect which aspect(s) of a program had the most effect. That said, the martial arts study by Lakes and Hoyt (1) is to be commended. It used random assignment, pre- and post-testing, an intervention implemented during regular school hours (making it feasible to reach many children), an active control group that also engaged in physical activity, and incrementally increasing levels of difficulty in the martial arts condition, and it provided evidence that executive-function improvements generalized to multiple contexts. Unlike many studies that have targeted disadvantaged children and/or those behind on executive function, children in this study were socioeconomically advantaged, making the findings especially impressive.

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Reference

- 1. K. D. Lakes, W. T. Hoyt, Appl. Dev. Psychol. 25, 283 (2004).

Letters to the Editor

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