

[What, why, and which experiments?],  
[Moving beyond simple experiments], [Making it happen],  
[Zero variable cost data and MusicLab], [3 Rs]

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- 1) Introduction
- 2) Observing behavior
- 3) Asking questions
- 4) Running experiments
- 5) Mass collaboration
- 6) Ethics
- 7) The future



<http://www.kittenwar.com/kittens/69827/>

*The Principles of Humane Experimental Technique*  
by Russell and Burch (1959)

- ▶ Replace
- ▶ Refine
- ▶ Reduce

# Experimental evidence of massive-scale emotional contagion through social networks

Adam D. I. Kramer<sup>a,1</sup>, Jamie E. Guillory<sup>b,2</sup>, and Jeffrey T. Hancock<sup>b,c</sup>

<sup>a</sup>Core Data Science Team, Facebook, Inc., Menlo Park, CA 94025; and Departments of <sup>b</sup>Communication and <sup>c</sup>Information Science, Cornell University, Ithaca, NY 14853

<http://dx.doi.org/10.1073/pnas.1320040111>

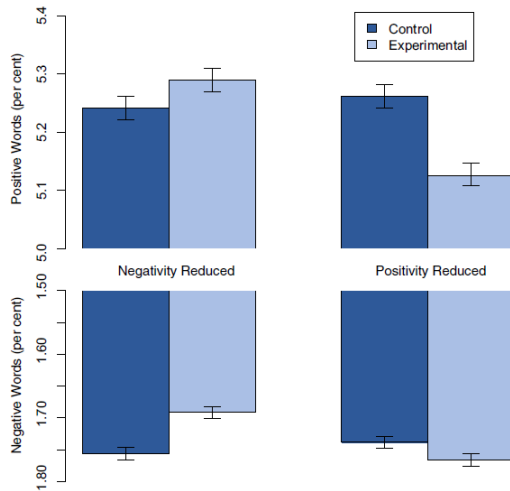


Fig. 1. Mean number of positive (*Upper*) and negative (*Lower*) emotion words (percent) generated people, by condition. Bars represent standard errors.

## Editorial Expression of Concern and Correction

### PSYCHOLOGICAL AND COGNITIVE SCIENCES

PNAS is publishing an Editorial Expression of Concern regarding the following article: “Experimental evidence of massive-scale emotional contagion through social networks,” by Adam D. I. Kramer, Jamie E. Guillory, and Jeffrey T. Hancock, which appeared in issue 24, June 17, 2014, of *Proc Natl Acad Sci USA* (111:8788–8790; first published June 2, 2014; 10.1073/pnas.1320040111). This paper represents an important and emerging area of social science research that needs to be approached with sensitivity and with vigilance regarding personal privacy issues.

**Replace** experiments with less invasive methods



**Replace** experiments with less invasive methods

# Detecting Emotional Contagion in Massive Social Networks

**Lorenzo Coviello<sup>1</sup>, Yunkyu Sohn<sup>2</sup>, Adam D. I. Kramer<sup>3</sup>, Cameron Marlow<sup>3</sup>, Massimo Franceschetti<sup>1</sup>, Nicholas A. Christakis<sup>4,5</sup>, James H. Fowler<sup>2,6\*</sup>**

<https://doi.org/10.1371/journal.pone.0090315>

**Refine** treatments to make them less harmful

**Refine** treatments to make them less harmful

Rather than blocking posts, they could have boosted posts

**Reduce** the number of participants

**Reduce** the number of participants

- ▶ Difference-in-difference estimator rather than a difference-of-means estimator.

## **Reduce** the number of participants

- ▶ Difference-in-difference estimator rather than a difference-of-means estimator.
- ▶ Would have cut the required sample size, perhaps by half (based on Deng et al. (2013) & Xie and Aurisset (2016)).

We should care about reducing the number of participants even in minimal risk experiments

We should care about reducing the number of participants even in minimal risk experiments

1. uncertainty about whether the experiment will cause harm
2. participation was not voluntary



AND, A SHORT DISTANCE  
AWAY...

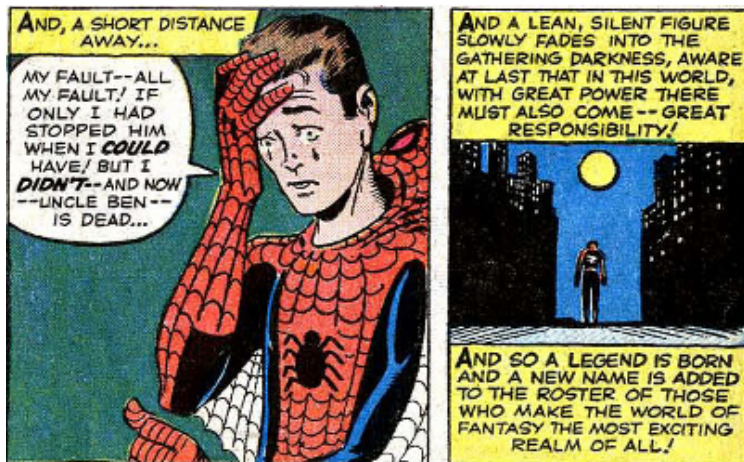
MY FAULT--ALL  
MY FAULT! IF  
ONLY I HAD  
STOPPED HIM  
WHEN I **COULD**  
HAVE! BUT I  
**DIDN'T**--AND NOW  
--UNCLE BEN--  
IS DEAD...



AND A LEAN, SILENT FIGURE  
SLOWLY FADES INTO THE  
GATHERING DARKNESS, AWARE  
AT LAST THAT IN THIS WORLD,  
WITH GREAT POWER THERE  
MUST ALSO COME-- GREAT  
RESPONSIBILITY!



AND SO A LEGEND IS BORN  
AND A NEW NAME IS ADDED  
TO THE ROSTER OF THOSE  
WHO MAKE THE WORLD OF  
FANTASY THE MOST EXCITING  
REALM OF ALL!



With great power there must also come  
great responsibility

The 3 Rs shows that humane methods can be an opportunity:

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- ▶ potentially more efficient than standard methods

The 3 Rs shows that **humane methods** can be an opportunity:

- ▶ potentially more efficient than standard methods
- ▶ stimulates interesting research (e.g., differential privacy)

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