Improving the Language Specificity of Stress in Psychological and Population Health Science

A long-standing and large struggle for the field of stress science has been the inconsistent use of the term "stress." Researchers have used the word to mean many things—from biomarkers captured in blood and saliva to traumatic childhood experiences to giving a speech in front of research assistants. This loose use of the term has meant that our ability to build a cumulative science has been considerably slowed (1), with some even suggesting we stop using the word in scientific research (2). This suggestion is not new, as in the 1980 presidential address for the American Psychosomatic Society, Dr. Robert Ader, describes the use of stress as harmful to science in that it "may actually impede conceptual and empirical advances by its implicit assumption of an equivalence of stimuli" (3). Other scientists contend, however, that the term itself is still useful; the meaning of measurement of it just needs to be clarified (4).

The lack of precise language has also meant that stress science has been communicated incorrectly to the public through media portrayal of the research findings. For example, an article published in *The Lancet* (5) led to the following media headline in the *Daily Mail*: "Cheer up! Being miserable won't kill you after all: Stress and unhappiness have NO direct impact on mortality, study finds" (6). Given the decades of human and animal research demonstrating that chronic stress is detrimental to life expectancy, this is an incorrect representation of the science, with potential harmful effects for the public. This article, using data from the UK Million Women Study, used a single item: "How often do you feel stressed?"

The wording of the item did not include a time frame, so it is unclear whether the respondent was answering how often they felt stressed today, this month, or across their entire lifetime. The assumption made in the item is also that "feeling stressed" is a universal emotional experience because there are no other descriptive words to provide detail or context for the state, although emotion researchers do not consider stress a specific or universal emotion. The item also fails to capture a) whether the individual was exposed to a stressor (objectively stressful event), b) assessment of the person's response to the stressor, and c) what resources they have had to cope with the stress. These are important omissions given the decades of research linking stress exposure and stress responses to health trajectories, and the numerous moderators of those relationships. The response scale for the item further limited the utility of this single item because there were only four options —most of the time, usually, sometimes, or rarely/never—limiting variability in the scale.

Thus far, research does not support that a single item can capture all exposures and responses that fall under the broad category of stress. However, this is an empirical question that should be thoroughly explored given that researchers have identified one-item measures of other psychosocial factors that are meaningful predictors of negative health outcomes such as subjective social standing (7).

Finally, an important point to highlight about the study by Liu et al. (5) is that the stress item was indeed associated with an increased risk of mortality before the authors covaried out the key

health behavior pathways, such as smoking, exercise, and sleep duration, which are known life-style mechanisms linking stress to worse health. These results were then distorted by the media to indicate that stress was not associated with mortality risk.

In the September 2021 issue of *Psychosomatic Medicine*, Whittaker and colleagues (8) provide a review of the state of the research on acute stress reactivity, including a detailed overview of the various ways reactivity can be conceptualized and calculated, and remaining questions for the field. This article represents a positive contribution to the field of stress science in particular because of the great precision with which they specify the type of stress they mean to talk about. With this article as an exemplar, we as the leadership team of the Stress Measurement Network wrote this letter to alert readers to the general problem in the field of stress science and present a possible solution to how we can solve the "stress problem."

Based on nearly a dozen workshops and meetings of psychologists and other behavioral scientists who are experts in the science of psychosocial stress from 2012 to 2021, we developed specific language to describe, with granularity, the various dimensions and constructs commonly captured by researchers measuring psychological stress in humans. These dimensions are outlined in a "Stress Typology" that is published as an appendix in Epel et al. (9), with consensus from Network members. The basic dimensions are outlined in Table 1; we recommend that specific attributes of stress be described in methods sections of future articles.

TABLE 1. Specific Attributes of Stress Measurement That Authors Should Select From When Describing Their Measurement Approach in Methods Sections

Time Construct	Descriptive Terms
Timescale	Acute stressor
	Daily event/hassle
	Life events
	Chronic stressor
Life period	In utero
	Childhood
	Adulthood
	Lifespan/cumulative
Assessment window	Measurement time frame (e.g., daily rating, retrospective)
	Proximity of assessment to exposure
Stressor attributes	Duration
	Severity
	Controllability
	Life domain
	Target of stressor
	Potential of stressor to elicit potentially harmfully emotional responses
Stress responses	Global subjective stress
	Subjective stress within a life domain
	Subjective and behavioral responses (e.g., emotional responses, appraisals)
Cultural contexts	Information pertaining to how specific survey items may be understood differently depending on geography, nationality, religion, or other cultural contexts.

Numerous studies demonstrate links between **exposure to** chronic**ally** stress**ful life contexts** and indices of poor health, including risk factors for cardiovascular disease and poorer immune function. Nevertheless, the exact mechanisms of how **chronic** stress**ors** gets "under the skin" remain elusive. We investigated the hypothesis that **chronic** stress **exposure** impacts health by modulating the rate of cellular aging. Here we provide evidence that psychological stress— both ~~perceived stress~~ high **levels of self-reported general subjective stress** and **the number of years living with an objective stressor (i.e. caregiving for a child with an autism spectrum disorder)** ~~chronicity of stress~~ is significantly associated with higher oxidative stress, lower telomerase activity, and shorter telomere length, which are known determinants of cell senescence and longevity, in peripheral blood mononuclear cells from healthy premenopausal women. Women with the highest levels of perceived stress have telomeres shorter on average by the equivalent of at least one decade of additional aging compared to ~~low stress~~ women **who reported low levels of global subjective stress**. These findings have implications for understanding how, at the cellular level, **subjective** stress and **chronic stressor exposure** may promote earlier onset of age-related diseases.

FIGURE 1. Edited abstract. The figure presents an example of how to edit an abstract to increase language specificity. This abstract was previously published, and we are using it with permission (11). Our suggested improvements are presented in bold font. Copyright (2004) National Academy of Sciences, U.S.A.

In the example provided at the beginning of this letter, a more appropriate label for the construct that single item is measuring would be along the lines of "single-item of current perceived stress." The word "current" in the description is the most important given that the item is not capturing lifetime exposure to stressors, but instead a current moment assessment, which, in singular form, is a measure that is unlikely to be significantly associated with critical health outcomes like premature mortality. This, indeed, is what Liu et al. (5) found. In addition, it should be reported that the validity of this single item is not known; the most commonly used and well-validated measure of current perceived stress is 10 items (10), and that was not reported on in this study.

As members of the Stress Measurement Network, we are imploring health scientists to increase their attention to methodology for measuring stress in humans and the language used to describe their methods. An example of how an old article abstract (from co-author E.S.E.) could be improved in terms of language specificity based on our recommendations is presented in Figure 1. More specific details on how to improve stress measurement and descriptions of measures can be found in books and articles by our group and others (4,9,12,13), and at https://www.stressmeasurement.org/. We suggest that editors and reviewers play an active role by encouraging authors to use more precise language and by pointing authors to this resource as a place to begin. The Stress Measurement Network welcomes feedback from the community of experts to aid in refining stress measurement to thoughtfully move the field forward.

ALEXANDRA D. CROSSWELL, PhD
ELISSA S. EPEL, PhD
WENDY BERRY MENDES, PhD
ARIC A. PRATHER, PhD
Department of Psychiatry and Behavioral Sciences
University of California, San Francisco
San Francisco, California
Alexandra.Crosswell@ucsf.edu

REFERENCES

1. Romero LM, Platts SH, Schoech SJ, Wada H, Crespi E, Martin LB, Buck CL. Understanding stress in the healthy animal-potential paths for progress. Stress 2015;18:491–7.
2. Kagan J. An overly permissive extension. Perspect Psychol Sci 2016;11:442–50.
3. Ader R. Psychosomatic and psychoimmunologic research. Psychosom Med 1980;42:307–21.
4. Cohen S. Measuring Stress: A Guide for Health and Social Scientists. New York, NY: Oxford University Press; 1997.
5. Liu B, Floud S, Pirie K, Green J, Peto R, Beral V. Does happiness itself directly affect mortality? The prospective UK million women study. Lancet 2016;387:874–81.
6. Spencer B. Cheer up! Being miserable won't kill you after all: stress and unhappiness have NO direct impact on mortality, study finds. *Daily Mail*. December 2015.
7. Singh-Manoux A, Marmot MG, Adler NE. Does subjective social status predict health and change in health status better than objective status? Psychosom Med 2005;67:855–61.
8. Whittaker AC, Ginty A, Hughes BM, Steptoe A, Lovallo WR. Cardiovascular stress reactivity and health: recent questions and future directions. Psychosom Med 2021;83:756–66.
9. Epel ES, Crosswell AD, Mayer SE, Prather AA, Slavich GM, Puterman E, Mendes WB. More than a feeling: a unified view of stress measurement for population science. Front Neuroendocrinol 2018;49:146–69.
10. Cohen S, Kamarck T, Mermelstein R. A global measure of perceived stress. J Health Soc Behav 1983;24:385–96.
11. Epel ES, Blackburn EH, Lin J, Dhabhar FS, Adler NE, Morrow JD, Cawthon RM. Accelerated telomere shortening in response to life stress. Proc Natl Acad Sci 2004;101:17312–5.
12. Crosswell AD, Lockwood KG. Best practices for stress measurement: how to measure psychological stress in health research. Health Psychol Open 2020;7:205510292093307.
13. Slavich GM. Stressnology: the primitive (and problematic) study of life stress exposure and pressing need for better measurement. Brain Behav Immun 2019;75:3–5.