

Response to Letter to Editor

Response to Ukraintseva et al. Letter: Resilience Versus Robustness in Aging

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We appreciate the thoughtful letter from Ukraintseva et al., which stimulated much interest and further discussion within our group. We agree with the letter's suggestion that, as the construct of "physical resilience" develops, it will be helpful to separate out the "ability to resist" deviation from the "ability to recover" after a deviation from baseline. In fact, we have incorporated that distinction in some of our subsequent work on resilience (1). Throughout our internal discussions on this issue, we have been mindful of the difficult balance between clearly defining terms, which is necessary for meaningful discourse, and avoiding the potential pitfall of overemphasizing semantic differences, which runs the risk of hindering scientific progress in an emerging field. Interestingly, at a Workshop on Physical Resilience hosted by the National Institute on Aging (NIA) last summer, the desire to limit focus on semantics was one reason that the organizers recommended including both *resistance to* and *recovery from* stressors in the definition of physical resilience. However, our early experience with the peer review process as well as Ukraintseva et al.'s letter suggest that many may find it more intuitive to distinguish resistance from what is more commonly understood as resilience, that is, the ability to recover or "bounce back" after a stressor.

While acknowledging that we may be jumping down the proverbial rabbit hole of preoccupation with semantics, we note that the letter from Ukraintseva et al. seems to apply "robustness" to two different scenarios. First, the authors equate robustness to "the ability to resist the deviation from baseline" in response to a stressor. To our mind, this definition is in line with our theoretical framework, in which we have conceptualized robustness, or resistance to deviation in the face of stressors, as "the opposite of frailty." In other words, a robust individual would have a relatively low risk for measurable functional decline or bad outcomes. We imagine that robustness, in this sense, is a reflection of underlying physiological reserve.

However, in a second scenario, Ukraintseva et al. apply the term "robustness" when referring to a low risk of developing particular

diseases (eg, cancer, diabetes, and hypertension). We believe that this application of "robustness" gets tricky. For one thing, there are factors other than one's physiological state that may contribute to lower risk of some major diseases in oldest old: survivorship effects, luck, and the presence of protective factors. But perhaps the more important consideration is that reduced risk of one condition in old age often signals elevated risk of other conditions. For example, because of physiologic dysregulation, an older adult who is less likely to exhibit hypertension or hyperglycemia may be at higher risk of hypotension and hypoglycemia (the other extremes of the physiological spectrum). Lower risk of certain conditions in old age often reflects age- and pathology-related declines in reserve across multiple organ systems, manifesting as a reduced ability to maintain homeostasis and respond to acute stressors. For this reason, it could be problematic to label the same person "robust" to a certain condition but "not robust" in his/her response to acute physiological stressors.

Nonetheless, Ukraintseva et al. highlight excellent and clinically relevant points and stimulate important thought about how the evolving constructs of "resilience" and "robustness" may relate to risk in the context of specific diseases. We propose that it may be helpful to make a distinction between *low risk of developing a disease* and *low risk of manifesting symptoms or functional decline* when afflicted with a certain level of disease or pathology. Our conceptual framework of resilience seems more relevant to the latter. For example, we may observe two individuals with congestive heart failure who have the same cardiac ejection fraction. One individual struggles to cross his living room (not robust), whereas the other can walk a mile without shortness of breath and golfs every week (robust to the same stressor). The notion of "cognitive resilience" has long been used to describe individuals with neurodegenerative brain changes (eg, heavy amyloid burden or microvascular disease evident on brain magnetic resonance imaging) who are cognitively intact. Just as Ukraintseva et al. suggest, it may be instructive to consider

whether this type of resilience is due to robustness/resistance (ie, the ability to maintain cognitive performance despite damage in the brain) or recovery (ie, the ability to overcome lost cognitive abilities through compensatory behaviors or processes).

We welcome additional discourse on this topic, recognizing that debates regarding the semantics of physical resilience and its aspects

not only are inevitable but serve to generate new lines of inquiry and testable hypotheses.

References

1. Duan-Porter W, Cohen HJ, Demark-Wahnefried W, et al. Physical resilience of older cancer survivors: An emerging concept. *J Geriatr Oncol*. In press.