

## Toward a balanced view of stress-adapted cognition

“Deficit models dominate much of the psychological literature”

-- APA Task Force on Socioeconomic Status, 2007, p. 25

Pepper and Nettle argue that exposure to uncontrollable disability and death leads people to value immediate rewards over longer-term goals. Whereas deficit models view this response as pathological, Pepper and Nettle consider it ‘contextually appropriate’—i.e., understandable given the context of socioeconomic hardship in which people are operating. Their perspective is consistent with results from mathematical modeling in biology and cognitive science. Such modeling shows that when “the future’s uncertain, and the end is always near” (The Doors, 1970), individuals may benefit from seizing smaller-immediate rewards at the expense of investing in larger-later rewards (Ellis et al., 2012; Fawcett et al., 2012; McGuire & Kable, 2013; Sims et al., 2013).

Despite a focus on appropriate responses to external context, Pepper and Nettle fully acknowledge that harsh conditions can lead to deficits (e.g., due to neglect or poor nutrition), and so do we (Ellis et al., 2017; Frankenhuis & de Weerth, 2013). However, deficit models are not the whole story. Contextually appropriate responses may also include the development of *enhanced skills and abilities* that are ecologically relevant in harsh-unpredictable environments. Here, we focus on such skills and abilities, which have only recently become a target of investigation, so we know little about them. Initial findings, however, are promising (for review, see Ellis et al., 2017; Frankenhuis & de Weerth, 2013). We focus specifically on skills and abilities needed to make the most of a world that is difficult to predict and control (Frankenhuis et al., 2016; Mittal et al., 2015). What protean skills and abilities might we expect in such a continually changing world?

The short answer is: it depends. What aspects of the environment are unpredictable and uncontrollable—the home, school, neighborhood, country, or all of these—and to what extent? Is there some social support that can be relied on? Barring such nuances for now, let’s consider the poorest and most chaotic inner-city areas, in which there is generally little scope for predicting and controlling outcomes in multiple life domains, including health, work, and love.

We distinguish between ‘specialization’ and ‘sensitization’ effects (Ellis et al., 2017). Specialization occurs when repeated developmental exposures to a stressor improves attention, perception, learning, memory, and problem-solving relevant to this stressor across a variety of contexts (Frankenhuis & de Weerth, 2013). Sensitization, in contrast, occurs when skills and abilities manifest only in currently stressful contexts, which match the contexts in which the stressor has normally been encountered (e.g., Dang et al., 2016; Mittal et al., 2015).

When opportunities are sparse and fleeting, people should be extra attentive to them (Nederhof et al., 2014). Although we are not aware of studies directly testing this assumption, two recent studies do suggest that stress-adapted people develop enhanced abilities for flexibly switching between tasks or mental sets. Consistent with specialization, Vandenbroucke et al. (2016) found enhanced response-shifting in Belgian children from low-SES backgrounds (but see Obradovic, 2010). Consistent with sensitization, Mittal et al. (2015) observed enhanced attention-shifting in US adults from unpredictable backgrounds when they were experimentally put into a mindset of economic uncertainty. In this mindset, people exposed to high childhood unpredictability also displayed enhanced aspects of working memory central to tracking novel environmental information (Young et al., 2016).

When encountering short-term rewards, people from harsh environments might show enhanced abilities for procuring them. Consistent with specialization, Suor et al. (2017) report enhanced reward-oriented problem-solving (e.g., gaining access to an attractive toy encased in a transparent box) in four-year-old US children with bold temperaments from low-SES backgrounds. These same children, however, displayed reduced performance in an abstract visual problem-solving task similar to the kinds of tests administered in schools. Thus, bolder children from low-SES backgrounds might develop enhanced reward-oriented problem-solving for gaining access to immediate rewards, which may trade off against abstract problem-solving skills.

So far, we have discussed: (a) shifting between tasks and mental sets, (b) tracking of novel environmental information, and (c) persistence in procuring immediate rewards. What about learning new contingencies? Consistent with sensitization, Dang et al. (2016) report that when experimentally put in a mindset of high financial demand, lower-SES Chinese students showed enhanced procedural learning (i.e., acquiring novel stimulus–response associations) compared with their higher-SES counterparts. Other work shows that in such a mindset, community samples from the US and India showed reduced performance on cognitive functions that rely heavily on working memory (Mani et al., 2013). An interesting and open question for future research is which components of working memory can become enhanced and which ones impaired by specific adversity exposures.

Traditional deficit models consider individuals from harsh backgrounds to be at risk for impaired development, and the intervention goal is to reduce or repair the damage. Following Ellis et al. (2012), Pepper and Nettle critique this approach by arguing that present-oriented behaviors are “contextually appropriate response to structural and ecological factors, rather than pathology or a failure of willpower.” Ellis et al. (2017) take this critique one step further by arguing that deficit-based intervention approaches fail to leverage the unique strengths and abilities that develop in response to high-stress environments. Uncovering a high-resolution map of these “hidden talents” would enable the design of classroom environments, instructional strategies, and job training to work with, instead of against, the capacities of stress-adapted people (see Ellis et al., 2017, for detailed illustrations), enabling a wider range of individuals to achieve their full potential.

In conclusion, we have proposed to extend Pepper and Nettle’s model by arguing for a well-rounded perspective on stress-adapted cognition, which includes deficits, contextually appropriate responses, and strengths (i.e., enhanced skills and abilities). Our perspective has scientific merit for its completeness and societal value for its ability to inform a class-conscious psychological science that attends to social-structural inequalities (see Geronimus, 2013). It underscores the unique skills and abilities that develop in high-adversity contexts, and which can be leveraged in policy and practice to better fit the needs and potentials of stress-adapted people.

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#### **References**

American Psychological Association, Task Force on Socioeconomic Status. (2007). *Report of the APA Task Force on Socioeconomic Status*. Washington, DC: American Psychological Association.

Dang, J., Xiao, S., Zhang, T., Liu, Y., Jiang, B., & Mao, L. (2016). When the poor excel: Poverty facilitates procedural learning. *Scandinavian Journal of Psychology*, *57*, 288–291.

Ellis, B.J., Bianchi, J., Griskevicius, V., & Frankenhuis, W.E. (2017; in press). Beyond risk and protective factors: An adaptation-based approach to resilience. *Perspectives on Psychological Science*.

Ellis, B. J., Del Giudice, M., Dishion, T. J., Figueredo, A. J., Gray, P., Griskevicius, V., ... & Wilson, D. S. (2012). The evolutionary basis of risky adolescent behavior: Implications for science, policy, and practice. *Developmental Psychology*, *48*, 598-623.

Frankenhuis W. E., Panchanathan, K., & Nettle, D. (2016). Cognition in harsh and unpredictable environments. *Current Opinion in Psychology*, *7*, 76-80.

Frankenhuis, & de Weerth, C. (2013). Does early-life exposure to stress shape or impair cognition? *Current Directions in Psychological Science*, *22*, 407-412.

Geronimus, A. T. (2013). Deep integration: Letting the epigenome out of the bottle without losing sight of the structural origins of population health. *American Journal of Public Health*, *103*, S56-S63.

Mani, A., Mullainathan, S., Shafir, E., & Zhao, J. (2013). Poverty impedes cognitive function. *Science*, *341*, 976-980.

McGuire, J. T., & Kable, J. W. (2013). Rational temporal predictions can underlie apparent failures to delay gratification. *Psychological Review*, *120*, 395– 410.

Mittal, C., Griskevicius, V., Simpson, J. A., Sung, S., & Young, E. S. (2015). Cognitive adaptations to stressful environments: When childhood adversity enhances adult executive function. *Journal of Personality and Social Psychology*, *109*, 604-621.

Nederhof, E., Ormel, J., & Oldehinkel, A. J. (2014). Mismatch or cumulative stress: The pathway to depression is conditional on attention style. *Psychological Science*, *25*, 684 – 692.

Obradovic, J. (2010). Effortful control and adaptive functioning of homeless children: Variable- and person-focused analyses. *Journal of Applied Developmental Psychology*, *31*, 109–117.

Sims, C. R., Neth, H., Jacobs, R. A., & Gray, W. D. (2013). Melioration as rational choice: Sequential decision making in uncertain environments. *Psychological Review*, *120*, 139-154.

Suor, J.H., Sturge-Apple, M.L., Davies, P.T., & Cicchetti, D. (2017; in press). A life history approach to delineating how harsh environments and hawk temperament traits differentially shape children's problem-solving skills. *Journal of Child Psychology and Psychiatry*.

Vandenbroucke, L., Verschueren, K., Ceulemans, E., De Smedt, B., De Roover, K., & Baeyens, D. (2016). Family demographic profiles and their relationship with the quality of executive functioning subcomponents in kindergarten. *British Journal of Developmental Psychology*, *34*, 226-244.

Young, E. S., Griskevicius, V., Simpson, J. A., Waters, T. E. A., & Mittal, C. (2016). *Can an unpredictable childhood environment enhance working memory? Testing the specialization and sensitization hypotheses*. Manuscript submitted for publication.