

children have the capacity to learn the self-regulation skills necessary to meet increasing demands and expectations as they get older, skills may develop earlier in environments with stronger foundations of support. And, conversely, children living in adversity may need additional supports or intervention to build needed skills within the context of stress.

Stress

Stress is believed to impact underlying neurobiological processes of self-regulation as well as cognitive, emotional, and behavioral aspects of self-regulation. There are different theories about how it may do this, including the concepts of “depletion” (Muraven & Baumeister, 2000) and “psychological scarcity” (Mullainathan, 2013). It is generally accepted within the child development field that stress and self-regulation have a curvilinear relationship (like an inverted U). For example, while some stress may increase arousal, focus, and goal-orientation in a way that enhances self-regulation, too much stress may impair it.

Acute and Chronic Stress. It is also important to distinguish between acute and chronic stress. **Acute stress** involves the body’s stress system activating for a short period of time in response to a temporary stimulus. Although such stress can have lasting biological or behavioral effects if it is severe enough, the human stress response system is generally well-equipped to manage acute stress. In contrast, **chronic stress**—in which the body’s stress system is activated very frequently or for a prolonged period of time or in response to persistent stimuli—may have detrimental effects on the brain and behavior. When a child experiences strong, frequent, and/or prolonged adversity that overwhelms his/her skills or support, the result can create a **toxic stress** response (Shonkoff et al., 2012). Stressors that may induce toxic stress responses include physical or emotional abuse, chronic neglect, caregiver substance abuse or mental illness, exposure to violence, and/or the accumulated burdens of family economic hardship (i.e., poverty). The word **trauma** describes an event or experience where an individual’s life or physical well-being (or that of someone important to them) is threatened. Trauma can be either acute (such as a natural disaster or robbery) or chronic (such as child maltreatment). In this regard, it can be considered a stressor, which may create toxic stress in those situations where the child or youth’s abilities to cope are overwhelmed. In addition, the aftermath of an acute trauma (for example, sustained homelessness or disruption of social networks after a natural disaster) can itself constitute a chronic stressor; in that way, even acute trauma can have chronic effects if consequences are long-lasting. Chronic stress exposure over-stimulates the body’s stress system, which eventually leads to sustained high concentrations of stress hormones even without any immediately accompanying threat, a situation that is presumed to have an adverse effect on the development of self-regulation in childhood and adolescence.

Description of Literature Review

In order to address important questions about the relationship between stress and self-regulation, recent literature published between 2009 and 2013 was reviewed. Because scientific literature is cumulative and important insights prior to 2009 are likely to have been built into more recent research, we consider our findings to comprehensively reflect current knowledge. Our search also included laboratory animal studies to assist in identifying mechanisms linking stress to self-regulation outcomes through experimental manipulations. A total of 394 studies were identified with relevant application of search terms.

The majority of studies identified were conducted on humans, with methodologies ranging from self-report correlational studies, to laboratory experiments with volunteers, to analysis of neurocognitive correlates of self-regulation and physiological measures of brain activity relating to self-regulation. Self-regulation was

measured not only with behavioral correlates like the control of attention, but also using physiological measures of relevant brain activity like neural function in the prefrontal cortex. The largest number of studies focused on parenting or family context factors. Although studies spanned ages from birth to adulthood, many more included children and adults than adolescents. This review did not include intervention studies, which are addressed separately in Report 3 of this series ([A Comprehensive Review of Self-Regulation Interventions from Birth through Young Adulthood.](#))

Key Findings

- **Experiments in laboratory animals establish the biologically toxic effects of stress on indicators of self-regulation.** In rodents, experimental administration of cumulative acute and chronic stressors induces measurable change in brain anatomy, physiology, and biochemistry relevant to self-regulation. These stressors also change cognitive, emotional, and behavioral processes that can be mapped onto self-regulation as defined in humans. Results are consistent with a smaller body of stress manipulation studies in humans, although those studies are limited by the volunteer nature of the participating samples and to examination of acute stressors rather than chronic stressors which may have much more toxic effects on self-regulation.
- **Strong associations between stress and self-regulation exist across a range of human development studies using a variety of self-report and observational methods.** Children who have experienced harsh parenting, maltreatment, and environment adversity such as poverty and food insecurity do more poorly on indicators of self-regulation across cognitive, emotional, and behavioral domains; differences can also be seen in the physiology of their stress response and their brain function. Severe childhood stress appears to have lasting effects, with self-regulation-related difficulties seen into adulthood.
- **There is a well-established link between parenting and development of self-regulation in childhood.** Parental warmth, responsiveness, and sensitivity predict self-regulation development and may buffer the effects of other stressors in the family and environment. Parenting may impact self-regulation through ecological factors and parent characteristics like depression as well as specific parenting behaviors. These results are based on correlational designs that cannot show that certain parenting behaviors cause specific self-regulation effects.
- **Stress responsivity may be influenced by a variety of individual and environmental characteristics in addition to parenting.** One important finding seen across laboratory animal and human studies is that previous exposure to stress may sensitize children to have more difficulties self-regulating when faced with acute stress later. Other individual differences that protect or increase vulnerability to stress including genes and other biological factors are relatively unexplored at this time, although there is indication that males may be more vulnerable to some impacts of stress. Some data also suggest that negative effects of stress experiences may be reversible.
- **It is likely that parenting and family factors, the environment, and individual biological characteristics interact in complex ways to influence how stress impacts self-regulation.** More research is needed on the causes and extent of variation in stress responsiveness across individuals, whether particular developmental periods are more or less sensitive to stress, and what environmental protective factors (beyond parenting) may buffer the impact of stress on children and youth. There is also evidence that

previous exposure to stressors may sensitize or “prime” a child to have more difficulties self-regulating when faced with acute stress later.

Conclusion

Although there are limitations to the data upon which this review is based (e.g., many studies are correlational rather than experimental and include volunteer participants rather than representative samples), there are some important implications from the findings described above.

- Self-regulation interventions should attend to chronic stressors in the environment that can add up to produce toxic effects (e.g., poverty and other adverse childhood experiences), as well as individually-focused interventions. In other words, both universal and targeted interventions are needed.
- Providing the most vulnerable children and families with supports to cope with chronic stressors earlier may help prevent problems with self-regulation later. At the same time, there is reason to believe that self-regulation can improve with positive changes in the environment, providing support for later interventions that help individuals cope with acute and ongoing stressors.
- Additional inter-disciplinary research is needed examining gene x environment interactions and identifying biological and non-biological predictors of vulnerability to toxic stress. Understanding variation in vulnerability is critical to inform where and how intervention resources can be deployed to maximum effect.

References

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