Mindful
Continuing Education

Self-Regulation and Adolescence

Seven Key Principles of Self–Regulation and Self Regulation in Context

This brief provides a framework for understanding self-regulation and its development in an ecological-biological development context. It is derived from a [larger report](#) on work conducted by the Duke Center for Child and Family Policy for the Administration for Children and Families.

Many different terms have been used to describe one's ability to manage emotions and impulses. Figure 1 illustrates self-regulation as an umbrella term that encompasses many constructs that may be used to describe similar skills and processes.

SEVEN KEY PRINCIPLES OF SELF-REGULATION

1. Self-regulation serves as the foundation for lifelong functioning across a wide range of domains, from mental health and emotional wellbeing to academic achievement, physical health, and socioeconomic success. It has also proven responsive to intervention, making it a powerful target for change.

2. Self-regulation is defined from an applied perspective as the act of managing cognition and emotion to enable goal-directed actions such as organizing behavior, controlling impulses, and solving problems constructively.

3. Self-regulation enactment is influenced by a combination of individual and external factors including biology, skills, motivation, caregiver support, and environmental context. These factors interact with one another to support self-regulation and create opportunities for intervention.

Self-Regulation

Willpower
Executive Functioning
Flexibility
Effortful Control

Emotional Regulation
Self-Control
Self-Management

4. Self-regulation can be strengthened and taught like literacy, with focused attention, support, and practice opportunities provided across contexts. Skills that are not developed early on can be acquired later, with multiple opportunities for intervention.

5. Development of self-regulation is dependent on "co-regulation" provided by parents or other caregiving adults through warm and responsive interactions in which support, coaching, and modeling are provided to facilitate a child's ability to understand, express, and modulate thoughts, feelings, and behavior.

6. Self-regulation can be disrupted by prolonged or pronounced stress and adversity including poverty and trauma experiences. Although manageable stress may build coping skills, stress that overwhelms children's skills or support can create toxic effects that negatively impact development and produce long-term changes in neurobiology.

7. **Self-regulation develops over an extended period from birth through young adulthood** (and beyond). There are two clear developmental periods where self-regulation skills increase dramatically due to underlying neurobiological changes– early childhood and adolescence – suggesting particular opportunities for intervention.

UNDERSTANDING SELF-REGULATION IN CONTEXT

Figure 2 presents a comprehensive model of self-regulation enactment which graphically shows the range of factors that influence whether and how well a child or youth may self-regulate in any given situation.

The most internal factor influencing a child's capacity for self-regulation is comprised of the child's *biology, genetics, and temperament*, which contribute to individual differences in self-regulation.

Figure 2

The next major influence depicted is the *self-regulation skills* that the child or youth has developed over time, which have often served as a target for interventions. Next is an individual's *motivation* to self-regulate, which can be derived from either external sources (i.e., rewards and consequences) or internal goals and values (i.e. intrinsic motivation).
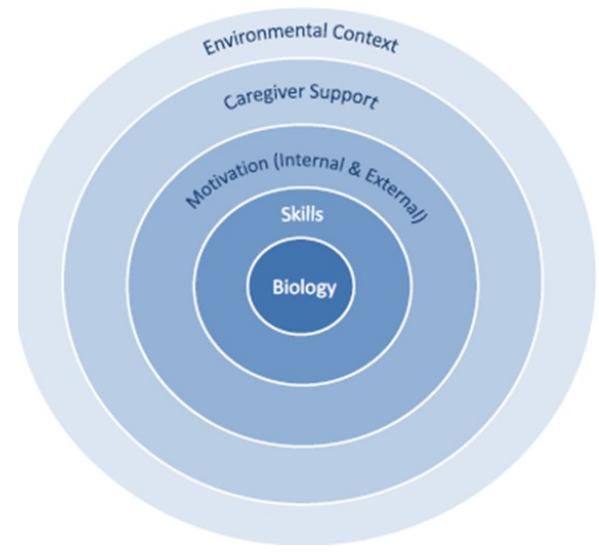
Caregiver support (provided by parents, teachers, or mentors) is the next layer in our model, which serves to strengthen children's self-regulation skills and also buffer them from adverse experiences in the larger environment.

The *environmental context* including the demands or stressors placed on children as well as the external resources available also have a significant influence on their ability to self-regulate.

It should be noted that, although the concentric circles in Figure 2 begin with those factors that are most internal and extend outward to those that are most external, each of these factors may interact with and influence the others. For example, environment may influence a child's biology by shaping brain circuitry, and biology or temperament may influence how a caregiver interacts with a child.

SUMMARY

Self-regulation can be defined from an applied perspective as the act of managing one's thoughts and feelings to engage in goal-directed actions such as organizing behavior, controlling impulses, and solving problems constructively. The act of self-regulating is dependent on several different factors that interact with each other, those that are individual to the child or youth as well as those that are external or environmental, including biology, skills, motivation, caregiver support, and environmental context.

How Do Acute and Chronic Stress Impact the Development of Self-Regulation?

Stress has been linked to long term physical health and numerous indicators of wellbeing and there is increasing evidence that stress experienced in childhood and adolescence may lead to physiological changes in the brain and to disruptions in development. However, much of the data suggesting these connections are based on associations rather than on causal evidence from experiments. There are also many unanswered questions related to the relationship between stress and self-regulation, particularly with regard to the im-pact of social adversity during sensitive devel-opmental periods, the variability in stress responsiveness across individuals, and the possibility for reversing negative effects. As part of a series of reports on self-regulation and toxic stress, the Administration for Children and Families asked a team at the Duke Center for Child and Family Policy to conduct a broad, cross -disciplinary examination of the literature. Following a summary of the key concepts of self-regulation and toxic stress, this brief provides highlights from that report, Self-Regulation and Toxic Stress Report 2: A Re-view of Ecological, Biological, and Developmental Studies of Self-Regulation and Stress
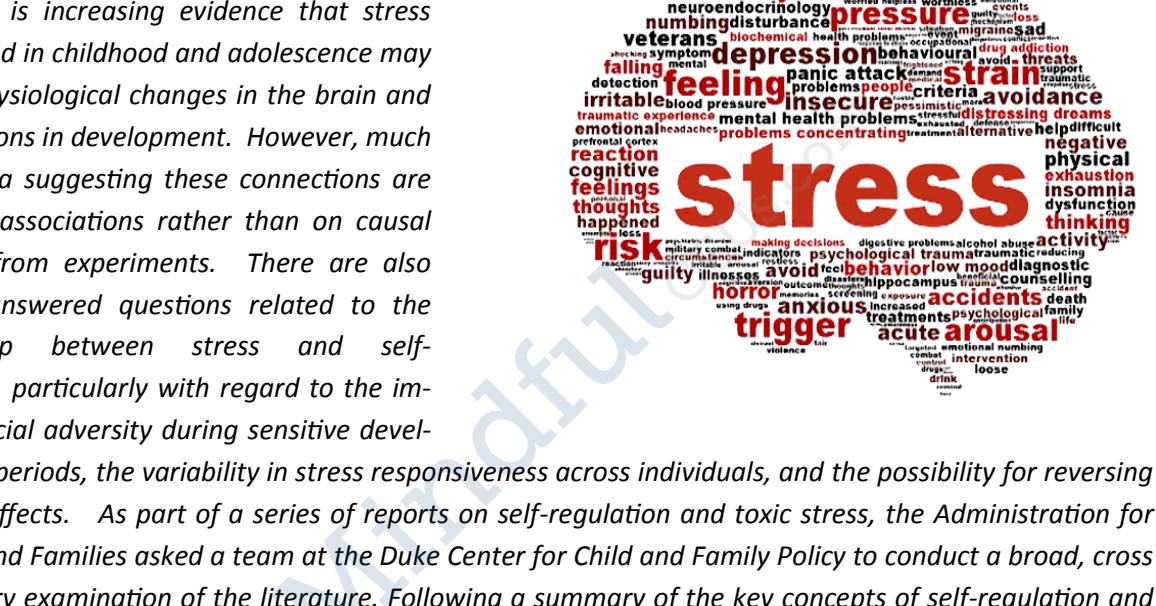
Self Regulation and its Development

As defined in Report 1 , **self-regulation is the act of managing cognition and emotion to enable goal-directed actions such as organizing behavior, controlling impulses, and solving problems constructively.** According to this applied theoretical model, self-regulation includes three overlapping domains – cognitive, emotional, and behavioral –with cognitive and emotional regulation serving as the foundation for behav-ioral regulation. It is based in brain structures and functions that process emotion or sensations (the "hotter" aspects of reasoning and behavior), and those that play an executive role managing processes in-volved in planning ("cooler" aspects). Learning to integrate these processes to achieve goals and direct behavior in relation to others is a long-term developmental task beginning at birth and extending through young adulthood. Such development is dependent on ongoing and specific environmental and contextual supports as well as factors that are individual to a child or youth. Over time, self-regulation skills are learned through instruction, support, and reinforcement or scaffolding, ideally within the context of a warm and responsive relationship with a caregiver – a process called "co-regulation". Thus, although all
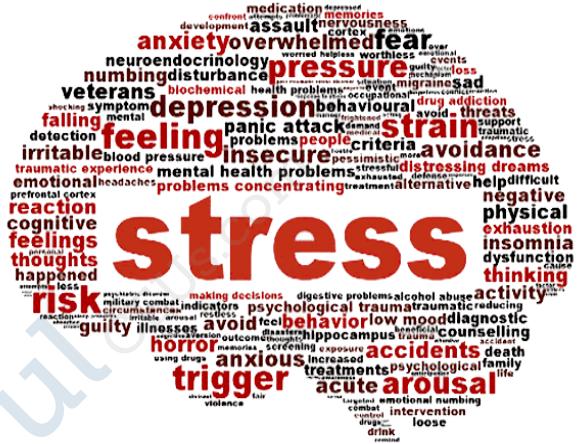
children have the capacity to learn the self-regulation skills necessary to meet increasing demands and expectations as they get older, skills may develop earlier in environments with stronger foundations of support. And, conversely, children living in adversity may need additional supports or intervention 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.

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References

Mullainathan, S., *Scarcity : why having too little means so much*, ed. E. Shafir. 2013, New York: Times Books, Henry Holt and Company

Muraven, M. and R.F. Baumeister, *Self-regulation and depletion of limited resources: Does selfcontrol resemble a muscle?* . Psychological Bulletin, 2000. **126**: p. 247-259.

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Promoting Self-Regulation in Adolescents and Young Adults: A Practice Brief

This brief reviews the importance of self-regulation for adolescents and young adults and provides guidelines for supporting self-regulation development for 14 to 25-year-olds. It is written by Desiree W. Murray and Katie Rosanbalm based on work conducted by a team at the Duke Center for Child and Family Policy for the Administration for Children and Families (ACF), and specifically addresses prevention programs and targeted interventions which could be implemented within ACF programs.

● Self-Regulation: What is it and why is it important?

Self-regulation has become recognized for its foundational role in promoting wellbeing across the lifespan, including physical, emotional, social and economic health and educational achievement. Self-regulation can be defined as **the act of managing thoughts and feelings to enable goal-directed actions**, including a variety of actions necessary for success in school, relationships, and the workplace. Supporting self-regulation development in youth is an investment in society, as stronger self-regulation predicts higher income, better financial planning, fewer risk behaviors like substance use and violence, and decreased health costs. Although many programs for older adolescents and young adults target skills *related* to self-regulation including "soft skills", life skills, and resilience-building, utilizing a specific self-regulation framework may have benefits for 14 to 25-year-olds. Although evidence for specific self-regulation interventions for this age group are merely emerging, programs can support self-regulation with the promising practices and theoretical guidelines provided in this brief.

● Why focus on self-regulation in older adolescents and young adults?

Some people believe that self-regulation has to be taught in childhood, but actually it is not too late to make a difference in the adolescent and young adult years. Research has now shown that there are major changes in brain architecture that occur during adolescence, making interventions at this age important and timely. In particular during early and mid- adolescence (i.e., 11-15 years), brain systems that seek rewards and process emotions are more developed than cognitive control systems responsible for good decision-making and future planning. This means

> **Self-Regulation Skills Developing During Adolescence**
>
> - Persisting on complex, long-term projects (e.g., applying to college)
> - Problem-solving to achieve goals (e.g., managing work and staying in school)
> - Delaying gratification to achieve goals (e.g., saving money to buy a car)
> - Self-monitoring and self-rewarding progress on goals
> - Guiding behavior based on future goals and concern for others
> - Making decisions with broad perspective and compassion for self and others
> - Managing frustration and distress effectively
> - Seeking help when stress is unmanageable or the situation is dangerous

that self-regulation is developmentally "out of balance" at this age. It also means that tremendous growth in self-regulation skills continues throughout young adulthood, which can be strengthened with instruction and support. Given that poor decisions during adolescence can have long-term negative consequences, self-regulation supports during this developmental period are critical. This is especially important for youth with a history of adverse childhood experiences; for this group, interventions during adolescence and young adulthood may reduce their risk and facilitate resilience.

• How does self-regulation develop?

Self-regulation develops and is learned through interaction with caregivers and the broader environment over an extended period from birth through young adulthood (and beyond). Cognitive, emotional, and behavioral self-regulation skills can be taught much like literacy, with structure, support, and coaching over time. Even for youth with self-regulation challenges or delays, effective interventions can strengthen and improve skills; there are ongoing opportunities for intervention across development. However, there are a number of other factors (shown in the box titled "Factors Contributing to Self-Regulation Enactment") that influence whether a youth will self-regulate in any given situation. Importantly, *although self-regulation is an internal capacity, its development and use depend on predictable, responsive and supportive environments and relationships.* For more information on self-regulation development, visit: http://www.acf.hhs.gov/programs/opre/resource/self-regulation-and-toxic-stress-foundations-for-understanding-self-regulation-from-an-applied-developmental-perspective.

Factors Contributing to Self-Regulation Enactment

Environmental Context
supports
Caregiver Support
Motivation (Internal & External)
Skills
Biology
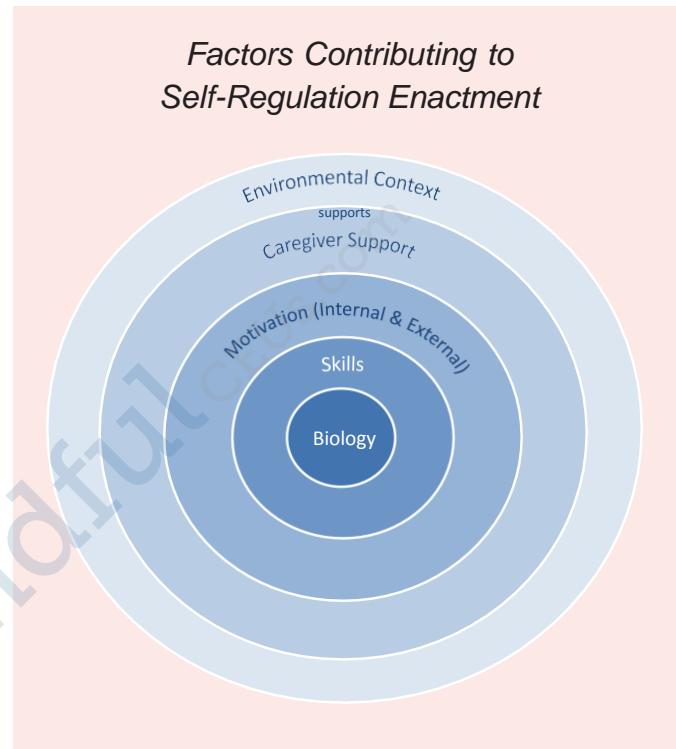
• Do older adolescents and young adults really need caregivers to help them develop self-regulation?

Contrary to many media messages that suggest teenagers are already independent and don't need adults, caregivers are critical to healthy development throughout adolescence and into young adulthood. Caregivers and mentors are particularly important in the development of self-regulation. As noted in the box on p. 1 titled "Self-Regulation Skills Developing During Adolescence", there are many critical self-regulation skills under development during this period that involve increased complexity in thinking, managing frustration and stress, and integrating thoughts and emotions in a way that supports goal achievement as well as compassion towards self and others. To help youth gain the full range of skills needed for adulthood, caregivers (including parents and teachers) as well as mentors can:

- **Teach self-regulation skills** through modeling, providing opportunities to practice skills, monitoring and reinforcing adolescents' progress on skill development and goals, and coaching them on how, why, and when to use their skills in increasingly complex situations (e.g., conflicts between work and school demands, living independently).

- **Provide a warm, responsive relationship** where youth feel safe to learn and make mistakes as they increasingly navigate bigger decisions and more challenging situations on their own (e.g., making decisions regarding risk behaviors in the context of peer pressure, raising a child with or without a partner). Caregiving relationships and mentoring can also serve to motivate youth to learn, practice, and implement self-regulation skills.

- **Structure the environment** to make self-regulation manageable, providing a buffer against environmental stressors. This involves limiting opportunities for risk-taking behaviors, providing positive discipline and natural consequences for poor decisions, and reducing the emotional intensity of conflict situations (e.g., giving time and space to calm down as needed).

> **The three points above describe the supportive process between adults and youth that we call *"co-regulation".*** Co-regulation provides assistance and support for optimal self-regulation through warm and responsive interactions. Support, coaching, and modeling are provided to facilitate a youth's ability to understand, express, and modulate their thoughts, feelings, and behavior.

• Why do some youth need more support with self-regulation than others?

Greater levels of support are needed for youth who have self-regulation difficulties due to individual characteristics or adverse childhood experiences. Individual differences may be due to temperament or genetic factors that influence how youth respond and react to stress. Adverse experiences may include physical or emotional abuse, caregiver substance abuse or mental illness, exposure to violence, and the accumulated burdens of poverty. In addition, youth living in chronic adversity are less likely to have caregivers who themselves have the resources for their own self-regulation and for co-regulation. Such youth are also likely to lack resources and positive climates in their schools, neighborhoods, and communities to support self-regulation development.

Youth with individual or environmental risk factors may have delays in self-regulation development that cause difficulties maintaining positive relationships with others and contribute to disruptive and risky behaviors. They may over-react in stressful situations and have trouble using effective coping strategies. Moreover, their expectations for the future may be limited, which may reduce their motivation and long-term goal-setting. Thus, youth who experience adversity are vulnerable to a range of negative, lifelong health and mental health difficulties without intervention. Fortunately, evidence suggests that *interventions focused on skill instruction, caregiver support, and environmental context can reverse these effects and improve long-term outcomes.*

What's the big deal about stress? Isn't it good for us?

Stress is one of the biggest challenges that youth face in peer relationships, at school, home, and work. Although manageable stress may build coping skills, ongoing high intensity stress that overwhelms existing skills and support can create toxic effects that negatively impact development and produce long-term changes in brain architecture. In fact, *the development of self-regulation can be disrupted by prolonged or pronounced stress and adversity including poverty and trauma experiences*. Ongoing, overwhelming experiences of stress can physically change the wiring of the brain to rely more heavily on emotional reactions than on reflection, reasoning, and decision-making. These changes make youth more sensitive and reactive to later experiences of stress, which may be adaptive in some situations but is generally associated with negative outcomes. For more information on the relationship between stress and self-regulation, visit: http://www.acf.hhs.gov/programs/opre/ resource/self-regulation-and-toxic-stress-a-review-of-ecological-biological-and-developmental- studies- of-self-regulation-and-stress.

What is the impact of self-regulation interventions during adolescence?

The small but growing body of research on preventive self-regulation interventions for older adolescents and young adults is described in an OPRE report titled "A Comprehensive Review of Self-Regulation Interventions from Birth through Young Adulthood". Findings reviewing 299 interventions across ages show that **positive and meaningful changes can result from several different intervention approaches** including conflict resolution, anger coping, stress management, resiliency training, and a variety of mind-body and mindfulness interventions. More specifically, results from 60 studies of intervention with high schoolers and young adults show:

- Strong and consistent improvement in cognitive regulation
- Small but significant improvements in health, mental health, and delinquency
- Substantial benefits from mindfulness programs in particular, across both cognitive and emotional regulation, as well as for stress and mental health

> Self-regulation skills may be included in "soft skills" or life skills training as part of mentoring, youth employment or leadership programs, but these tend to be very broad in focus, without the intentional and targeted skill-building recommended.

However, existing programs lack the comprehensive approach recommended in this brief. Perhaps because of this, outcome effects vary greatly across the different interventions reviewed, with many finding no clear benefits. Existing interventions would be strengthened by the following:

- *A more intentional and targeted focus on self-regulation*, where cognitive and emotional regulation skills and their integration are systematically taught with ongoing coaching, reinforcement, and support. Many current programs are very broad and diffuse, which may weaken the impact on specific self-regulation skills.
- *A greater focus on emotional regulation (i.e., managing distress and strong, negative emotions and fostering empathy and compassion for self and others).* This is particularly important given the nature of development and social relationships in adolescence.

- *Inclusion of parents, teachers, or mentors who can serve as self-regulation coaches.* Self-regulation coaching for adolescents will likely require training, as this goes beyond simply serving as a role model.

Although not the focus of the current work, it should be noted that there is also considerable evidence of the benefit of clinical interventions focused on self-regulation for youth who may require a higher level of intervention.

For more information on the effects of preventive self-regulation interventions that have been studied for high schoolers and young adults (as well as other ages), visit:
https://www.acf.hhs.gov/opre/resource/self-regulation-and-toxic-stress-report-3

● How can programs support self-regulation development in older adolescents and young adults?

As described above, types of interventions that appear promising for self-regulation development in 14 to 25-year-olds who may not yet warrant mental health treatment include: conflict resolution, anger coping, stress management, resiliency training, and a variety of mind-body and mindfulness programs. Note that not all programs have proven effective and not all have been used with at-risk youth or youth living in adversity. Given these limitations, specific interventions should be selected carefully. Skills curricula for existing programs can be reviewed to determine if they address the specific self-regulation skills described above (e.g., persisting, problem-solving, delaying gratification, goal setting and monitoring, decision-making, managing negative emotions and stress, and help-seeking). In addition, co-regulation supports from caregivers are a critical supplement to skills training.

Mind-body interventions referenced here include yoga, meditation, and martial arts. Mindfulness is an increasingly mainstream technique of intentionally focusing attention on one's emotions and thoughts in the present moment, and accepting these thoughts and feelings without judgment.

General guidelines for implementing preventive self-regulation programs based on the review of theoretical and empirical literature described above are as follows:

1. Provide interventions at varying levels and intensity depending on the youth's context and needs.
   a. Use universal approaches for building the self-regulation of all youth and to promote a positive climate in schools and other settings. In schools, skills curricula may be provided as part of health education classes and can be supported by positive behavior systems and counseling programs.
   b. When possible, decrease environmental stressors for youth living in adverse environments, as they are vulnerable to self-regulation challenges. Caregivers are an important buffer for youth against the negative impact of stress.
   c. At-risk youth would benefit from more intensive skills support that could be provided through mentoring, leadership, or youth employment programs as part of "soft skill" or non-core job skills training.

d. Provide co-regulation supports from a trained self-regulation "coach" for youth showing self-regulation difficulties. Coaching would involve clear self-regulation goals and intentional instruction and skill support. This could be a mentor or job coach from any number of community agencies.

2. Given the gap between adolescents' emotional and cognitive control systems in the brain for middle and high school age youth, it is important to target emotion regulation skills. Teaching emotion regulation skills such as accepting or managing negative feelings can help adolescents better balance their emotions. When thoughts and emotions work together, it supports youth in making more effective decisions, solving problems, and achieving goals.

3. Include parents, teachers, or mentors in any self-regulation intervention. Provide these caregivers and other supportive adults with assistance in building their own self-regulation skills in addition to coaching them on strategies to strengthen relationships and provide co-regulation for the youth.

For more information on how self-regulation interventions could be applied in programs supported by ACF, visit: https://www.acf.hhs.gov/opre/resource/self-regulation-and-toxic-stress-implications-for-programs-and-practice

What's the bottom line about older adolescents, young adults, and self-regulation?

Adolescence and young adulthood are times of both risk and opportunity with regard to self-regulation. Changes in the brain prime youth for substantial gains in self-regulation skills and capacity, while societal expectations of responsibility and consequences increase. Self-regulation interventions can help to prepare youth for employment and self-sufficiency, paving a path towards successful adulthood. Current research suggests that such outcomes can be supported with intentional focus on teaching and supporting specific cognitive, emotional, and behavioral self-regulation skills in combination with caregiver or mentor support and structure in the context of a warm relationship. Successful investments in youth benefit society as a whole by strengthening the workforce, increasing economic stability, and reducing costs for social services and the justice system.

Communicating Scientific Findings About Adolescence and Self-Regulation: Challenges and Opportunities

Introduction

Across the fields of prevention science, developmental science and intervention research, there is growing attention to the role of *self-regulation* in promoting health and well-being across the lifespan. Even Cookie Monster, the beloved paragon of poor self-restraint, is learning the fine art of delayed gratification in new seasons of Sesame Street. But while the majority of scientific and public attention has been focused on self-regulation during *early childhood*, scientists and other experts are also increasingly attuned to the role of self-regulation during *adolescence*.

The science of adolescent self-regulation does not speak for itself, however.[1] In order to make complex scientific concepts accessible to non-experts, strategies must be developed that *translate* these concepts in understandable — but still scientifically accurate — ways. This translation task requires comparing the **untranslated science story** (that is, the content that experts wish to communicate about a given scientific topic) to the **public story** (the

Even as the majority of scientific and public attention has been focused on self-regulation during *early childhood*, scientists and other experts are increasingly attuned to the role of self-regulation during *adolescence*.

Science translation requires comparing the **untranslated science story** (the content that experts wish to communicate about a given scientific topic) to the **public story** (the existing assumptions, beliefs and patterns of understanding that members of the public use to process information about that topic).

existing assumptions, beliefs and patterns of understanding that members of the public use to process information about that topic). When it comes to adolescence, the public story is fraught with negative perceptions and portrayals that serve to depress public support for interventions designed to improve developmental outcomes among this age group. Communicating effectively about these topics, therefore, requires attending to these existing patterns of understanding, and employing science translation tools and strategies that craft a **new narrative** of adolescence, self-regulation and intervention.

This brief reviews and synthesizes over 12 years of research conducted by the FrameWorks Institute in order to present the challenges — and potential solutions — surrounding scientific communication about self-regulation during adolescence, with a particular focus on the role of interventions in strengthening self-regulation capacities. The challenges associated with communicating about these topics are substantial. In order to navigate unproductive patterns of public understanding that are likely to get in the way of science messages, we recommend that communicators:

- **Use values** at the top of their communications to orient people to why these issues matter.

- **Explain why self-regulation is important and how it develops**, using tools like the Explanatory Metaphor of *Brain Architecture*.

- **Emphasize the role of environment and context** when talking about the factors that predict the acquisition and enactment of self-regulation.

- **Provide causal explanations** that show how early adversity can disrupt the development of self-regulation.

- **Cast interventions and programs as narratives** that focus on contexts, systems and populations.

- **Avoid "myth/fact" constructions**, as they will only serve to reinforce existing understandings.

- **Avoid reinforcing negative perceptions of adolescents.**

Each of these recommendations is explained in greater detail in the final section of the brief.

The brief is organized into three sections. First, we lay out the main themes of the **untranslated science story** of self-regulation, adolescence and intervention. This section represents the principles and understandings that experts would like to be able to communicate about these topics. In the second section, we describe the dominant patterns of thinking that make up the **public story** of self-regulation, adolescence and intervention. These patterns represent key obstacles that experts are likely to face when communicating about these topics to non-expert audiences. We conclude with a set of reframing

recommendations that constitute a **new narrative** to more effectively communicate scientific understandings of these topics.

The Untranslated Science Story of Self-Regulation, Adolescence and Intervention

Methods

To distill the untranslated science story of adolescence, self-regulation and intervention, FrameWorks researchers drew upon three sources of data. The primary data source consisted of one report describing a foundational theoretical model[2] and two reports summarizing comprehensive literature reviews — one on the relationship between self-regulation and toxic stress[3] and one evaluating existing self-regulation interventions.[4] This work was produced for the Administration for Children and Families (ACF) by researchers at the Center for Child and Family Policy at Duke University. In addition, FrameWorks researchers conducted one-on-one, one-hour phone interviews with four experts on these topics. These interviews were conducted in October and November of 2014 and, with participants' permission, were recorded for analysis.[5] FrameWorks researchers employed a basic grounded theory approach to analyze these two sources of data. Common themes were pulled from the review papers and interviews and were categorized, resulting in a refined set of themes that represent an initial summary of expert perspectives on self-regulation and adolescence.

Data were also gathered during an expert feedback session, conducted via webinar in November 2014. During this session, authors of the literature review papers and ACF staff were invited to provide additional input and feedback on an initial draft of the untranslated expert story. They were asked, in particular, to identify concepts that were missing, not of central importance, or inaccurately articulated in the draft of the untranslated story that was reviewed at this time.

This multi-method process yielded the untranslated science story of self-regulation and adolescence presented below.

Findings

The untranslated science story of self-regulation and adolescence is organized around four foundational questions:

1. What is self-regulation and why is it important?
2. How does self-regulation develop?
3. What disrupts the development of self-regulation?
4. What are the implications of this science for policies, programs and interventions?

1. What is self-regulation and why is it important?

Self-regulation refers to the *act* of managing one's thoughts and feelings to engage in goal-directed behaviors.[2] It includes *emotional, cognitive* and *behavioral* components. During early childhood, self-regulation includes the ability to initiate self-soothing behaviors, delay gratification, or inhibit responses for relatively short periods. During adolescence, self-regulation develops to include things like the ability to manage and plan time in an increasingly independent way, use increasingly complex cognitive strategies to manage internal distress, and solve problems and make decisions while in emotionally-arousing situations.

As described in Murray et al. (2015), self-regulation is influenced by multiple factors, both internal and external.[2] These include individuals' *biology, genetics* and *temperament*; their self-regulation *skills*; their *motivation* to self-regulate; the availability of *caregiver support* that strengthens self-regulation skills and buffers against adverse experiences that interfere with self-regulation; and *environmental context*, including both the presence of stressors that might interfere with self-regulation and the availability of other resources that can support self-regulation. Critical to this ecological perspective is the understanding that skills alone are *necessary*, but not *sufficient*, for the enactment of self-regulation.

Self-regulation is important because it has *robust* and *pervasive* effects on long-term functioning. It is a foundational component of health and well-being across the lifespan: Strong self-regulation skills predict success across a variety of domains, including school, work, socioeconomic status, health and relationships.

Self-regulation is important because it has *robust* and *pervasive* effects on long-term functioning.

2. How does self-regulation develop?

Self-regulation develops *over time* — beginning at birth and extending through young adulthood — through contingent and dynamic interactions between individuals, their biology and their environment.

Self-regulation skills build upon each other, such that more complex self-regulation skills in adolescence and early adulthood depend upon the successful development of more basic self-regulation skills during toddlerhood and early childhood.

Even though self-regulation is an internal capacity, its development and enactment depends on predictable, responsive, and supportive environments and relationships — or, as one expert put it, "well-regulated environments." Self-regulation skills build upon each other, such that more complex self-regulation skills in adolescence and early adulthood depend in large part upon the successful development of more basic self-regulation skills during toddlerhood and early childhood.

Self-regulation capacities involve *the interaction of two different systems in the brain*: those that process emotion and reward, and those that manage, plan and control behavior. These two systems develop according to two different trajectories. During early and mid-

adolescence, reward-seeking and emotion-processing systems are more developed than cognitive control systems. As a result, self-regulation is "out of balance" — meaning that adolescents may not yet have developed the self-regulatory capacities (e.g., impulse control, the ability to adopt a future-oriented perspective when making decisions) necessary to manage the emotional arousal and reward-seeking that they experience.

Self-regulation develops *in the context of social relationships*. Co-regulation — or the interactional process by which a caregiver facilitates a child's capacity to enact self-regulation by supporting, coaching and modeling self-regulation skills, and by buffering the effects of stress in the environment[2] — is particularly important to the healthy development of self-regulation. While the image of a parent soothing an infant or helping to calm a toddler in the midst of a tantrum might be the most obvious example of co-regulation, external support to engage in self-regulation is necessary well into adolescence (and even young adulthood).

Self-regulation capacities involve *the interaction of two different systems in the brain*: those that process emotion and reward, and those that manage, plan and control behavior.

3. What disrupts the development of self-regulation?

Chronic stressors such as maltreatment, poverty and food insecurity can derail the development of self-regulation capacities. In the absence of supportive caregiving relationships in early childhood to buffer their effects, these stressors can induce changes in brain circuitry that have lasting impacts on self-regulation capacities well into adulthood. In particular, experiences that elicit a toxic stress response (defined as a stress response that occurs when children experience strong, frequent, and/or prolonged adversity that overwhelms their skills[6]) can alter the ways in which individuals respond to stress in the future, and have been associated with impaired ability to control impulses and delay gratification. It is important to note, however, that the association between stress and self-regulation development is not uniform or deterministic; rather, individuals vary in their responses to adverse experiences as a result of complex interactions among genes, environment and biology.[3]

4. What are the implications of this science for policies, programs and interventions?

Because self-regulation is "environmentally-informed" — that is, because it develops via interaction between individuals and their environments — it is *malleable*. As a result, there is great potential for

Opportunities to *practice* and *apply* self-regulation skills are a key element of effective self-regulation interventions.

interventions to improve outcomes by strengthening self-regulation.[4] This potential exists even among children who have experienced toxic stress. Opportunities to *practice* and *apply* self-regulation skills are a key element of effective self-regulation interventions. These interventions must provide developmentally appropriate and supported opportunities for children to grapple with situations that demand self-regulation, thereby strengthening these capacities and skills.

Adolescence is an important opportunity for intervention because of the unique neurobiological changes that characterize this developmental period. While more research is needed to understand how to effectively intervene to improve self-regulation during adolescence, it is clear that the need for co-regulation and external support continues well into young adulthood. Interventions that target co-regulation strategies during adolescence (for example, by encouraging parents to monitor adolescents' achievement of goals and provide problem-solving support as needed) are therefore particularly promising.[4]

These themes are summarized in the figure below.

<u>Untranslated</u> Science Story of Self-Regulation, Adolescence, and Intervention

What is self-regulation and why is it important?

- *An act, not a trait:* Self-regulation refers to the act of managing one's thoughts and feelings to engage in goal-directed behaviors.

- *Multi-dimensional:* It includes cognitive, emotional and behavioral components.

- *Foundational:* It is a core component of health and well-being across the lifespan.

- *Determined by multiple factors:* Self-regulation is influenced by internal factors (individual skills, capacities, motivation and biology) and external factors (caregiver support, environmental context).

What disrupts its development?

- *Toxic stress:* While manageable stress may enhance coping abilities, the body's response to chronic stress such as maltreatment and poverty can derail the development of self-regulation skills and produce long-lasting changes in brain circuitry. However, there is individual variability in responses to chronic stress.

- *The absence of co-regulation:* Caregiving that doesn't buffer sources of stress in the environment, and thereby provide external support for children's own self-regulation skills, can disrupt the development of self-regulation.

How does self-regulation develop?

- *Over time:* Self-regulation skills develop and build upon each other from birth well into young adulthood.

- *Through person-environment interactions:* These skills develop through dynamic interactions between an individual, their biology and their environment.

- *Through caregiving relationships:* Co-regulation, or the process by which caregivers facilitate a child's capacity to self-regulate, is key to development.

- *Via two different brain systems:* Self-regulation involves two brain systems (emotion- and reward-processing, and cognitive control systems) that are at different stages of development during adolescence.

What are implications for interventions?

- *Interventions can improve outcomes:* The fact that self-regulation skills are *malleable* means effective interventions can *strengthen* and *improve* them — even among children and adolescents who have experienced toxic stress.

- *Practice is key:* Interventions must provide opportunities to practice *applying* and *using* self-regulation skills in supportive environments.

- *Adolescence is an opportunity for intervention:* The neurobiological changes that characterize this period make it an important opportunity for intervention; more research is needed to inform development of these interventions.

- *Relationships are critical:* External support for self-regulation remains important even during adolescence and young adulthood.

The Public Story of Self-Regulation, Adolescence and Intervention

Methods

In the following section, we identify the key patterns of thinking that present challenges to communicating the science of self-regulation and adolescence, and the implications of this science for programs, policies and interventions.

For the past several decades, FrameWorks has conducted qualitative and quantitative research with over 140,000 Americans to examine how members of the public think about a wide range of complex social and scientific issues.[7] A primary goal of this research is to identify the cultural models[8] — deeply shared, but implicit, patterns of understanding — that members of the public use to make sense of these issues.

To distill the public story of self-regulation, adolescence and intervention, FrameWorks researchers reviewed the Institute's portfolio of research on early childhood development, youth and adolescence, executive function, plasticity and developmental change, race and ethnicity, criminal justice, and education.[9] The resulting analysis details the cultural models that members of the public are likely to use to understand science messages about self-regulation, adolescence and interventions.

Like members of the general public, human service providers are also non-experts in the science of self-regulation and adolescence, and are therefore likely to think about these issues in many of the same ways that the public does. The challenges and recommendations that follow are therefore applicable to both members of the public and members of the human services sector.

Findings

The patterns of thinking described below represent the *dominant ways of understanding* that many members of the public and human service providers are likely to use, and fall back on, to make sense of science messages about these topics. They constitute *unproductive understandings* that, if activated, are likely to make it difficult for non-experts to consider science messages about self-regulation, adolescence and interventions.

Self-regulation is all about the self. One of the most dominant and pervasive cultural models that FrameWorks has identified across a wide variety of topics — ranging from criminal justice, to education and learning, to child mental health — is the cultural model of *individualism*. This model assumes that each individual is responsible for his or her circumstances and achievements in life. Whether or not a person succeeds in life, according to this model, is primarily a matter of whether they have enough willpower and determination. This model represents the core challenge to communicating about self-regulation. In the absence of strategic redirections, members of the public and human service providers are likely to interpret science messages about self-regulation through their dominant understandings of

individualism. When these understandings are active, they obscure key parts of the expert story regarding the role of context and environment in the development and enactment of self-regulation.

Development "just happens." Many members of the public assume that much of what constitutes "normal" and "good" development happens of its own accord, following "natural" trajectories of physical growth and maturation. When applied to the topics of self-regulation and interventions, the activation of this way of thinking is problematic in two ways. First, the assumption that development "just happens" runs directly counter to the expert understanding that the successful acquisition and enactment of self-regulation skills requires *ongoing* and *specific* environmental and contextual supports — as well as developmentally-appropriate opportunities to practice these skills. Second, when development is assumed to happen automatically, interventions designed to *promote* the development of self-regulation skills are particularly hard to appreciate. After all, why intervene in something that happens on its own?

Development is a "black box." While people are at ease using the term "develop" to describe the gradual acquisition of skills and capacities through natural growth and maturation, this language masks an underlying fuzziness about *how* development works and *what* actually develops. In short, the process and mechanisms of development remain largely "black-boxed" and poorly understood. This pattern of thinking limits the public's ability to evaluate and support effective programs and policies to promote positive developmental outcomes. When people do not understand how something works, they are ill-equipped to support solutions that address a process to improve its outcomes. FrameWorks has observed "black box" thinking across a variety of developmental domains, ranging from resilience to child mental health. It is virtually certain that members of the public will be similarly unsure about the processes by which self-regulation develops, and that this lack of understanding will impede support for science-based interventions and programs.

The effects of early experiences are fixed. Many Americans understand early childhood to be a period of dramatic and rapid change. This understanding is grounded in the assumption that young children are relatively "empty." Each new experience constitutes a dramatic change precisely because there is so little that precedes it — and the effects of early experiences are therefore permanent and indelible. While this understanding of the importance of early experiences is, on the surface, aligned with expert perspectives, it will likely also obscure science messages about how the development of self-regulation extends beyond early childhood into adolescence and early adulthood. The assumption that effects of early experiences are "set in stone" is also poorly aligned with expert understandings that self-regulation is *malleable*, even if early development is suboptimal.

In the absence of strategic redirections, many people are likely to interpret science messages about self-regulation through their dominant understandings of individualism. When these understandings are active, they obscure key parts of the expert story regarding the role of context and environment in the development and enactment of self-regulation.

Adolescence is about surviving, not thriving. Many members of the public view teenagers as a qualitatively different set of people, with divergent values and behaviors that fall short, in fundamental ways, of the standards and values to which earlier generations adhered. Many perceive teenagers' negative behaviors as so intractable that efforts designed to support adolescent development are judged as destined to fail and, therefore, largely wasted. Instead, the teenage years are viewed as something that must be "gotten through"

> Many people view the teenage years as something that must be "gotten through" — a regrettable, though inevitable, detour on the way to adulthood.

— a regrettable, though inevitable, detour on the way to adulthood. This way of thinking makes it difficult for people to appreciate that adolescence constitutes a unique developmental stage in its own right, that adolescent brains are still being built, and that, in fact, sensitivity to environments and experiences is particularly heightened during this period. As a result, these ways of perceiving this life stage depress support for interventions designed to leverage the important neurobiological changes that take place during adolescence.

Interventions are about programs for "those people" — and those people's problems are not my concern. As described above (*Development "just happens"*), FrameWorks' prior research on public understanding of developmental outcomes has found that many assume that positive and healthy development "just happens." From this perspective, poor development is an exception that occurs primarily within stereotyped groups of people — such as racial and ethnic minorities and the poor — who are seen to lack the drive, willpower and "values" that are viewed as necessary to "do well." Moreover, poor developmental outcomes among "those groups" (and among African-Americans in particular) are implicitly viewed as detached from the shared concerns and aspirations of the broader society. When this assumption of "separate fates" is operative, it is easy for members of the majority public to compartmentalize the concerns of families and children of color as being "over there," and not of collective importance.

Damage done is damage done. Many assume that once development is derailed, it cannot be put back on track. This assumption is an extension of the prevalent understanding that the effects of early experiences are fixed, in that it assumes that the poor developmental outcomes are also unchangeable. According to this pattern of thinking, interventions that attempt to address negative developmental trajectories are futile. Such thinking is likely to obscure messages about how appropriately timed and targeted interventions can effectively shift negative trajectories and improve self-regulation outcomes.

Summary of Communications Challenges

The patterns in thinking and understanding that constitute the public story described above present clear challenges to communicating scientific messages about adolescence, self-regulation and interventions. The common focus on individualism, and the assumption that development "just happens," make it difficult to appreciate the role of contextual supports in the development and enactment of self-regulation, and the potential of interventions to improve outcomes. In addition, "black-box" thinking about how development happens, and the belief that interventions are only for a select group of "other" people, will make it difficult

for the public to understand how effective interventions and programs work, and why they should be supported. Finally, assumptions that the effects of early experiences cannot be changed, and that adolescence is inevitably a time of negative, "alien" behavior, are likely to obstruct expert messages about how adolescence is a unique stage during which important social, emotional and cognitive abilities continue to develop.

Table 1 summarizes these communications challenges.

Table 1: Challenges to communicating about self-regulation, adolescence and intervention

Unproductive Pattern of Thinking	Challenge for Communicating about Self-Regulation, Adolescence and Intervention
No. 1: *Self-regulation is all about the self*	Obscures the critical role of context and environment in the development and enactment of self-regulation
No. 2: *Development "just happens"*	Complicates understanding of (1) the importance of specific environmental and contextual supports for the development and enactment of self-regulation, and (2) the potential of interventions designed to promote the development of self-regulation to improve outcomes
No. 3: *Development is a "black box"*	Limits the ability to evaluate and support effective programs designed to promote the positive development of self-regulation
No. 4: *Effects of early experiences are fixed*	Obscures science messages about how the development of self-regulation extends (and is malleable) beyond early childhood and well into adolescence and early adulthood
No. 5: *Adolescence is about surviving, not thriving.*	Reduces support for interventions that are based on the understanding that adolescence constitutes a unique developmental stage characterized by heightened sensitivity to environments and experiences

No. 6: *Interventions are for "other" people, and other people are not my concern*	Depresses support for interventions designed to address the developmental consequences of early adversity
No. 7: *Damage done is damage done*	Obscures messages about how appropriately timed and targeted interventions can effectively shift negative trajectories and improve self-regulation outcomes

Building a New Narrative of Self-Regulation, Adolescence and Intervention

The following recommendations, synthesized from the full body of FrameWorks' research on related topics, are designed to address the challenges enumerated above. We note, however, that while these recommendations and tools have proven effective in a variety of closely related domains where framing challenges similar to those detailed above have been identified, they have not been tested specifically in relation to self-regulation and adolescence.

DO use values to establish broad, shared beliefs that orient attitudes and behaviors. Values are reframing tools that help people understand what is at stake on any given issue, and why the issue matters. FrameWorks recommends that individuals communicating about programs designed to support children and families first prime their messages with values that orient audiences toward understanding why it is important to promote healthy development for *all* children. In short, these values redirect people away from the default understanding that "other people's children are not my concern" (Challenge No. 6).

Across a range of areas, the values of *Collective Prosperity* and *Ingenuity/Innovation* have been empirically shown to shift attitudes about children's development. These values address the public's tendency to assign sole responsibility for children's outcomes to parents, the child or nature, and remind people that effective interventions to improve developmental outcomes are both possible and desirable. Below are examples of these values.

> *Collective Prosperity:* When we devote societal resources to children at the very earliest stages of life, we foster the development of our economy. Supporting the skills and capacities that begin developing in early childhood becomes the basis of a prosperous and sustainable society.

> *Ingenuity/Innovation:* When we invent and replicate high-quality programs for young children, we can solve problems in early childhood development, and show significant long-term improvements for children.

DO explain why self-regulation is important. Communicators should develop and provide multiple concrete examples that show *how* and *why* self-regulation contributes to positive outcomes across the life course. In so doing, however, communicators should take care not to focus exclusively on benefits that accrue to individuals, as such examples run the risk of reinforcing dominant thinking that self-regulation is "all about the self" (Challenge No. 1), and that the consequences of adverse developmental outcomes matter only to individual children and families, and not to society as a whole (Challenge No. 6). Instead, communicators should develop examples that highlight benefits to community and society. For example, rather than asserting that self-regulation is important because it helps *individuals* succeed in the workplace and obtain better employment, communicators should emphasize that, when we support the healthy development of all children and adolescents, we enable everyone to fully realize their capacity to contribute to society.

DO emphasize environment and context. The public's emphasis on individualism easily blocks science messages about the extent to which context and environment matter to the development and enactment of self-regulation (Challenges No. 1 and No. 2). Communicators should therefore *continually emphasize* the role of context and environment in talking about the factors that predict the acquisition and enactment of self-regulation.

DO fill in the "black box" of development by explaining *how* self-regulation develops. Over the past decade, the FrameWorks Institute has been engaged in work with the Center on the Developing Child at Harvard University to fill in the public's "black box" of development.[1] This collaboration has resulted in the development of several *Explanatory Metaphors* — research-driven, empirically tested analogies that capture and distill a concept through reference to existing patterns of assumption and understanding — on topics ranging from executive function to resilience.[10] We recommend that experts communicating about the development of self-regulation employ these tools in order to *make visible* the processes of development, and highlight the mechanisms by which effective interventions can shift developmental pathways and improve self-regulation outcomes (Challenge No. 2).

One Explanatory Metaphor in particular — the metaphor of *Brain Architecture* — shows great promise in communicating the scientific understanding that, when it comes to brain development, "early matters … and so does later." We highlight this metaphor below because we suspect that it may prove particularly useful in communicating both the importance of the *early* development of self-regulation and the fact that these skills and capacities *continue to develop* — and to benefit from environmental and contextual supports — well into adolescence and early adulthood. In so doing, this metaphor may help to counteract the perception that *only* early experiences matter, that the effects of these experiences are fixed (Challenge No. 4), and that negative developmental trajectories cannot be shifted (Challenge No. 7).

> *Much like the construction of a house, the human brain is built through a complex process that requires taking the right steps in the right order to ensure the soundness of the finished structure. This brain-building process begins before birth and continues into adulthood: The foundation is laid in the earliest years, and then the brain's framing, wiring and plumbing progress over a longer period of time. People's experiences during adolescence — a time of*

rapid brain development — play a critical role in this process.

DO offer causal explanations that explain *how* adverse experiences affect/impede the development of self-regulation. In addition to explaining processes of development in general, and self-regulation in particular, communicators should provide causal explanations that show *how* early adversity can disrupt the development of self-regulation.[3] In developing these examples, communicators should also clearly show the outcomes of this disruption (that is, the *results* of poorly developed self-regulation skills). These types of examples serve to further "fill in" the public's limited understanding of developmental processes (Challenge No. 3), and to counteract the assumption that "good" development is the natural default (Challenge No. 2).

DO narrativize interventions and programs by telling thematic stories. In order to "stick" in public thinking, interventions about self-regulation must be cast as narratives. This involves leveraging the fundamental quality of an intervention as a "change in state." At the most basic level, an intervention story requires a beginning, middle and end that together answer the questions the public is likely to ask: Why does this intervention matter? What changes? How does it work? What's the goal and how do I know if it's been met? Who's responsible? If communicators do not strategically answer these questions, they will be filled in with understandings that are frequently counterproductive in relation to communications goals.

It is also vital to note that, while stories are of central importance to communicating more effectively about interventions designed to improve developmental outcomes, not all stories are equally effective in translating the expert perspective laid out above. It is important that communicators tell *thematic* stories — narratives that focus on contexts, systems and populations — rather than *episodic* stories that use isolated examples of the trials and tribulations of individual children and families. Episodic stories are likely to reinforce default understanding that the predictors and outcomes of self-regulation are located solely at the level of the individual (Challenge No. 1).

DON'T "feed" negative models of adolescence. Communicators should take care not to activate and reinforce dominant unproductive models of adolescence (Challenge No. 5). For instance, avoid using examples that focus on antisocial or negative adolescent behaviors, or portray adolescents today as qualitatively different from earlier generations. Once active in people's minds, these understandings are extremely difficult to dispel and can easily derail science messages about the importance of developing and strengthening self-regulation during adolescence.

DON'T fall into the myth-fact trap. Communicators are often tempted to tackle misunderstandings directly by presenting information in myth/fact constructions — that is, by first acknowledging and restating the incorrect understanding, and then offering the correct understanding (e.g., "Some people think that self-regulation is only important during early childhood — but science tells us that self-regulation continues to develop well into adolescence and early adulthood"). However, restating myths only serves to reinforce them. Communicators should instead focus on clearly stating and *explaining* the affirmative case ("Self-regulation develops from infancy all the way into adolescence and early adulthood. Here's how that works …").

Table 2 summarizes these recommendations.

Table 2: Recommendations for Communicating the Science Story of Self-Regulation, Adolescence and Intervention

Use values at the top of communications to orient people to why these issues matter.
Explain why and how self-regulation contributes to positive outcomes across the life course.
Emphasize the role of environment and context when talking about the factors that predict the acquisition and enactment of self-regulation.
Fill in the "black box" of development by explaining *how* self-regulation develops.
Provide causal explanations that show how early adversity can disrupt the development of self-regulation.
Cast interventions and programs as narratives that focus on contexts, systems and populations.
Avoid reinforcing negative perceptions of adolescents, as they can derail science messages about the importance of continuing to strengthen self-regulation during adolescence.
Avoid "myth/fact" constructions, as they will only serve to reinforce existing understandings.

Conclusion

A number of unproductive patterns of thinking complicate efforts to communicate the science of self-regulation and adolescence, and the application of this science to intervention design. In order to realize the potential of this body of knowledge to improve developmental outcomes at the population level, communicators must take seriously these existing patterns of understanding, and employ translational tools designed to facilitate science communication about these topics.

APPENDIX A

**MOVING FROM EXTERNAL CONTROL TO
SELF-REGULATION: TIPS FOR PARENTS**

Source: U.S. Department of Health and Human Services, Office of Adolescent Health
https://www.hhs.gov/ash/oah/resources-and-publications/info/parents/other-conversations/positive-values/index.html

Positive Values

One of the most important things teenagers do is to form the values they will live by. For parents, this process can be both rewarding and scary. On the one hand, we see young people expressing their honesty, compassion, and other positive values that we would hope to pass on to them. On the other hand, they often also do things that don't reflect our values—or even that contradict our deeply held values. Other influences in their lives—peers, media, other adults—can influence them to adopt values and perspectives that we may not share. We may feel like it's out of our hands.

But it's not. Even though it's critical that young people develop their own personal values, parents continue to shape and influence their children's values throughout the teenage years and into adulthood. The goal and challenge for parents is to help teens "make their own" the kinds of values that help them make positive choices throughout their lives. Moving from *external control* (such as doing what your parent says you should do) to *self-regulation* (doing what you believe in doing) is a central task of growing up, particularly during the teenage years.

How You Make a Difference

- **Nurture a warm relationship.** Teens tend to be more willing to accept and make parental values their own when they feel close to their parents. And close families usually have many shared interests and values that reinforce each other. Thus, keeping a strong relationship lies at the foundation of nurturing positive values in your teen.
- **Show and tell what matters.** A key to your influence on teens' values is that they understand what really matters to you. The best way to make sure teens understand what really matters to you is to both show and tell—help them see the values in action in your own life, then talk about why you do what you do. Getting their attention, being clear, and regularly reinforcing the values all help teens understand the values you hope for them—increasing the likelihood that they will make those values their own.
- **Promote open communication.** Teens are more likely to take on their parents' values when they have open, frequent, and honest communication with each other—when teens feel comfortable talking with their parents about tough issues and about things that matter to them. Open communication increases the odds that teens will listen to and embrace their parents' values. In addition, parents gain a greater understanding of how their teens think and what's important to them. That makes it easier to connect the parents' values with the teens' own emerging values.

- **Pay attention to their world and interests.** When you show interest in the things that matter to adolescents, you show them that you care about their choices and activities. That attentiveness, in turn, motivates your teen to pay attention to and accept your values and expectations.
- **Give your teen choices and appropriate independence.** Believing that they have power in their own lives and can influence others can help adolescents develop their own values. If parents don't give choices or don't see their teens as unique individuals, young people may end up pushing away in order to develop their own sense of who they are.
- **Provide information, guidelines, and structures.** In addition to giving teens opportunities to make their own choices, it is just as important to set clear and fair expectations and consequences then follow through with the consequences when needed.
- **Learn from your teen.** Your relationship with your teen is a two-way street. You learn from each other. Through their experiences, they may develop values and beliefs that enrich your life and help you see the world and other people in new ways. Be open to what they have to teach you. In the process, they will be open to what you have to teach them.
- **Make sure your values are in sync with the other parent (when applicable).** Shared values between parents increase the likelihood that their teens will accept their value priorities. If values are not shared, teens may feel conflicting loyalties in picking which values to adopt as their own.
- **Cultivate skills to put values into practice.** In order to develop values, teens need skills to help them be confident in standing up for what they believe and to take actions based on their values. Building assertiveness and the ability to resist peer pressure, the ability to understand what it feels like to be in somebody else's shoes, and the skills of caring and compassion all help to reinforce positive values.
- **Provide experiences that reinforce positive values and commitments.** If caring for others is important, give young people opportunities to care for others. If being honest is important, give them opportunities to be honest. If being generous is important, give them opportunities to share. If being responsible is important, give them responsibilities where others are depending on them. When you do, be sure to talk about or reflect on the experience, so they become more articulate about why they do what they do.
- **View mistakes as teachable moments.** Teens are going to make mistakes sometimes and not live up to your values or their own values. Sometimes these mistakes are fairly trivial; sometimes they have big consequences. In each case, remember to keep your relationship with your teen as a priority, and find ways for both of you to learn from your mistakes. Think together through appropriate consequences as well as other ways to deal with the issue in the future. That may take time, but it can pay off in the long run.
- **Recognize the limits.** Even though you can and do influence your teens' values, you don't control them. For better or worse, many factors also influence the values teens develop. That can include media, friends, teachers, coaches, and celebrities. It can also include world events that "print" values and priorities into young people's consciousness. So your children won't necessarily see the values you share as being as important as you see them. Indeed, they may choose to reject some values that are really important to you. That doesn't mean you have failed; it means they are becoming their own persons.

Endnotes

[1] Shonkoff, J., & Bales, S.N. (2011). Science does not speak for itself: Translating child development research for the public and its policymakers. *Child Development, 82,* 17-32.

[2] Murray, D.W., Rosanbalm, K., Christopoulos, C., & Hamoudi, A. (2015). *Self-regulation and toxic stress: Foundations for understanding self-regulation from an applied developmental perspective.* OPRE Report #2015-21. Washington, DC: Office of Planning, Research and Evaluation, Administration for Children and Families, U.S. Department of Health and Human Services.

[3] Hamoudi, A., Murray, D.W., Sorensen, L., & Fontaine, A. (2015). *Self-regulation and toxic stress: A review of ecological, biological, and developmental studies of self-regulation and stress.* OPRE Report #2015-30. Washington, DC: Office of Planning, Research and Evaluation, Administration for Children and Families, U.S. Department of Health and Human Services.

[4] Murray, Desiree W., Rosanbalm, Katie, and Christopoulos, Christina (2015). *Self-regulation and toxic stress: A comprehensive review of self-regulation interventions.* OPRE Report # XXX (Forthcoming), Washington, DC: Office of Planning, Research and Evaluation, Administration for Children and Families, U.S. Department of Health and Human Services.

[5] Expert interviews consisted of a series of probing questions designed to capture expert understadings about how self-regulation develops, what facilitates and disrupts its development, and the role of interventions in improving self-regulation skills. Interviews focused, in particular, on self-regulation and effective self-regulation interventions during *adolescence.* In each interview, the interviewer went through a series of prompts and hypothetical scenarios designed to challenge expert informants to explain their research, experience and perspectives; break down complicated relationships; and simplify concepts and findings from the field. Interviews were semi-structured in the sense that, in addition to preset questions, interviewers repeatedly asked for elaboration and clarification, and encouraged experts to expand upon those concepts that they identified as particularly important.

[6] Shonkoff, J. P., Boyce, W. T., & McEwen, B. S. (2009). Neuroscience, molecular biology, and the childhood roots of health disparities: Building a new framework for health promotion and disease prevention. *JAMA, 301,* 2252-9.

[7] See, for example: Kendall-Taylor, N. (2012). Conflicting models of mind: Mapping the gaps between expert and public understandings of child mental health. *Science Communication, 34,* 695-726.

[8] Quinn, N. (2005). *Finding cultural in talk: A collection of methods.* New York, NY: Palgrave Macmillan.

[9] For additional information on these bodies of research, see www.frameworksinstitute.org.

[10] For information on these metaphors and their application, please see: http://www.frameworksinstitute.org/early-childhood-development.html.