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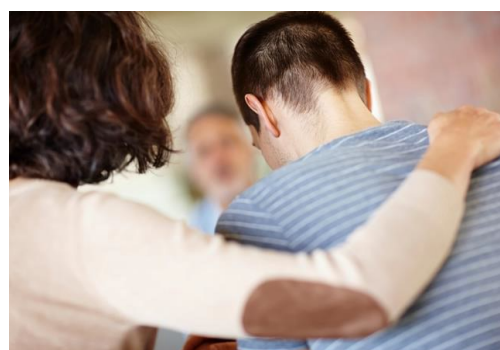
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Communicating Scientific Findings About Adolescence and Self-Regulation: Challenges and Opportunities

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

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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

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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.

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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).

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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.

Endnotes

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[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.