Current Gaps and Future Directions for Self-Regulation Intervention Research

In the process of developing a series of reports and briefs based in existing theory and research on toxic stress, self-regulation, and self-regulation interventions, a number of gaps in the existing knowledge base were identified. Research shows the value of interventions to strengthen self-regulation, yet there are many unanswered questions. This brief addresses key gaps in interventions and intervention research examined in a recent literature review. In addition, the brief highlights work needed in intervention design and development to enhance programs intended to strengthen self-regulation, particularly those that serve vulnerable children and youth. We expect that this brief will be of greatest interest to prevention scientists, funders, and policy-makers.

Introduction

Self-Regulation is the act of managing thoughts and feelings to enable goal-directed actions such as organizing behavior, controlling impulses, and solving problems constructively

Based on a comprehensive review of self-regulation intervention studies published in the 25 years between 1989 and 2013, it appears that positive and meaningful improvements in both core self-regulation domains and functional outcomes can occur across development with a variety of approaches and different types of programs. Interventions developed using this framework hold potential for addressing broad well-being goals for children and youth, particularly those who experience the most adversity, such as living in poverty.

However, existing interventions identified in this recent literature review are lacking in some important areas, which suggests that impact could be increased. There are also many gaps in the literature about what works best for whom and for which outcomes. Important questions are unanswered about the timing and critical components of interventions. The quality of future self-regulation research could be enhanced in several ways. This brief attempts to address these gaps and inform future work.

The research gaps and future directions suggested in this brief are based on two descriptive research reports. *Report 1: Foundations for Understanding Self-Regulation from an Applied Developmental Perspective* (http://www.acf.hhs.gov/opre/resource/self-regulation-and-toxic-stress-foundations-for-understanding-self-regulation-from-an-applied-developmental-perspective) provides a cross-disciplinary theoretical model of self-regulation development. This works applies recent advances in developmental neuroscience within an ecological framework that highlights the importance of context for development. Several critical questions for refining and improving self-regulation theory were identified in the Foundations report, including:

- What types of intervention approaches produce the strongest effects on self-regulation outcomes?

- Are interventions provided during sensitive developmental periods (e.g., early childhood, early adolescence) more effective than interventions at other times?
- Do interventions targeting one self-regulation domain generalize to other domains including functional outcomes?
- Can interventions compensate for and/or protect children from potential negative effects of adverse environments?

Report 3: A Comprehensive Review of Self-Regulation Interventions from Birth through Young Adulthood (http://www.acf.hhs.gov/opre/resource/self-regulation-and-toxic-stress-report-3) describes a review of 299 self-regulation interventions across development from birth through young adulthood that either targeted self-regulation with an evidence-supported theoretical mechanism or directly measured cognitive or emotional self-regulation as an intervention outcome. The two theoretical mechanisms of self-regulation development considered were 1) direct skills instruction in cognitive, emotional, or behavioral self-regulation and 2) enhancement of caregiver "co-regulation", defined as a warm, responsive relationship in which a caregiver positively structures the environment and provides support, coaching, and modeling for self-regulation skills.

Overall, the self-regulation intervention literature examined has many strengths, including the use of randomized controlled trials in two-thirds of the studies, considerable racial and ethnic diversity of samples, representation of many populations experiencing adversity, and primary implementation in schools and community settings. Findings demonstrate that self-regulation interventions from several different approaches result in positive and meaningful changes across a wide range of measures, including core self-regulation and functional outcomes such as learning, mental health, and social competence. This is based on intervention effect sizes from studies with comparison groups.

This brief will first describe gaps in the self-regulation interventions that were studied. Then, limitations of self-regulation intervention research are described. The brief concludes with suggestions for future self-regulation intervention design and development work.

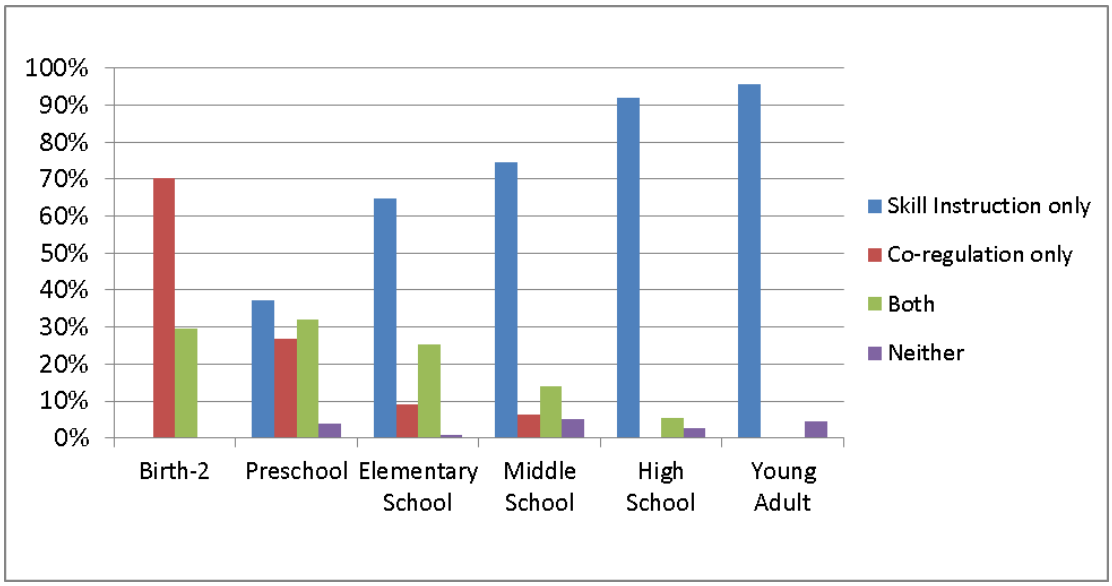
Gaps in Existing Self-Regulation Interventions

Based upon theory and a comprehensive literature review, a number of gaps were identified in the self-regulation interventions examined. Some of these apply to the literature as a whole while others are specific to particular developmental age groups or pertain to implementation challenges. One gap that applies across all developmental age groups is the lack of interventions that specifically target the role of caregivers. Our applied model of self-regulation in context (http://www.acf.hhs.gov/opre/resource/self-regulation-and-toxic-stress-foundations-for-understanding-self-regulation-from-an-applied-developmental-perspective) highlighted the role of caregivers in self-regulation development, so this is a critical limitation to consider in addition to others which are related to the influence of context in self-regulation development, including peer support and school environments. There are also other intervention components and approaches that could be considered to potentially enhance intervention outcomes.

Lack of co-regulation intervention approaches for caregivers across all developmental groups. Co-regulation, including the strategy of "coaching" self-regulation, is considered critical for maximizing self-regulation development at all ages. Yet, relatively few interventions in the literature examined focus on enhancing parent or teacher skills to support co-regulation after preschool, (*https://www.acf.hhs.gov/opre/research/project/toxic-stress-and-self-regulation-reports*). The relative absence of this approach in middle and high school is notable given the importance of parent monitoring and support for adolescent well-being. Although this may reflect general challenges of

engaging parents of older youth, there is clear need for continued self-regulation structures and supports for adolescents who experience increased emotionality and reward seeking without strongly developed cognitive controls. In addition, the lack of teacher training in co-regulation, even at preschool and elementary ages, is surprising given that many school-based interventions involve curricula delivered by teachers or other school staff. Yet most of these interventions do not teach educators to support and coach children in using these skills. In addition, a co-regulation approach was utilized in fewer than half of the studies including children and youth who were identified as being at-risk, a population for whom caregiving support would seem to be clearly needed. The substantial drop-off in caregiver co-regulation approaches with age can be seen in the figure below.

Percent of Studies Targeting Co-Regulation Relative to other Approaches, by Developmental Group



Relatively few interventions combine skills instruction and co-regulation approaches. Based on the theoretical model described in Report 1, such a combination approach would be expected to maximize the impact of interventions, yet only a third (for preschoolers) or fewer (for all other age groups) of the programs in our review incorporated this. It is also possible that one approach or another is more impactful at different ages, a question that should be evaluated empirically.

Few interventions focus on increasing caregiver self-regulation. Stress and challenges in the lives of caregivers such as parents, teachers, and mentors can adversely affect their own self-regulation capacity. This may reflect lack of support from the broader socio-cultural and economic environment, suggesting consideration of interventions focused on context vs. individuals. Nonetheless, focusing on caregivers' own self-regulation may also enhance their abilities to provide co-regulation supports and teach self-regulation effectively to children. Indeed, self-regulation interventions for children may be less effective if the caring adults in their lives are not modeling, encouraging, and scaffolding these same things, regardless of the reasons for this.

Interventions for older youth lack attention to the role of peers and partners. We were unable to identify any interventions in our review that described systematically involving peers in promoting self-regulation for youth. Given the powerful influence of peers during adolescence, leveraging this in a positive way has strong theoretical potential. In addition, engaging partners in intimate relationships for

older youth to provide co-regulation support to each other seems very relevant. There are certainly interventions that target peer relationships, but these have not been well-connected to self-regulation theory to date.

Limitations of adolescent self-regulation interventions. The interventions for adolescents examined in our review are more diffuse and briefer than those for younger children, and do not appear well-aligned with current developmental neuroscience. In addition, there is limited focus on addressing emotion regulation in interventions for adolescents, which appears to mirror a gap in more basic research on emotion regulation for this age group. These limitations may help explain why intervention effects appear more variable and have lower average impact at older ages than younger ages in many areas.

Limitations of young adult interventions. Compared to other developmental groups, relatively few self-regulation interventions were identified for this age group, and those that have been evaluated have several limitations. In particular, most have been conducted in laboratory settings with undergraduate volunteers using narrowly focused interventions, including many that are computer-administered. This is likely why there has been almost no research on relevant functional outcomes related to employment or healthy relationships. Similarly, very few self-regulation interventions in our review included young adult populations outside of the college context, who may be in greatest need of such interventions. Thus, although several significant positive intervention effects are seen in young adult studies, the representativeness and meaningfulness of these outcomes are limited.

Scalability of interventions. Many interventions may be challenging to implement across settings on a large scale in the real-world given costs and other infrastructure supports required. These include costs of training, length of programs, qualifications of practitioners to deliver programs with fidelity, and ongoing supervision/coaching needs. For example:

- The majority of interventions for infants and toddlers were provided by clinicians or specially trained staff and provided during home-visits.
- Although many effective self-regulation interventions exist for preschool, close to half of these are lengthy in duration (e.g., more than 30 sessions), requiring considerable resources.
- The majority of programs for all ages except young adults included some level of implementation support to achieve results reported (e.g., program developers actually delivered the program or provided a high level of supervision or coaching).

Limitations of Self-Regulation Intervention Research

Some important limitations were identified in the self-regulation interventions reviewed that may impact interpretation of this research. Four key limitations are related to variability in interventions and outcomes, sample representativeness, study quality, and measurement.

Variability in Interventions and Outcomes

Considerable variability exists in effect sizes across studies as well as in the percentage of findings that are positive for different outcomes for different developmental groups. Average effect sizes may not be meaningful given that some studies show medium to large effects while others fail to show any significant outcomes. Interventions are also difficult to compare across developmental groups given significant differences in approaches used, types of measures, and outcome domains examined. In order to better understand this variability and advance research on self-regulation intervention mechanisms across development, the field would benefit from empirical studies that compare key intervention components using a comparable set of outcome domains and measurements.

Sample Representativeness

In order for self-regulation intervention research to be useful for programs and practices, findings must be applicable to the populations of children and youth with which individuals and organizations work. Unfortunately, there are several areas of representativeness which are very limited. In particular:

- Relatively few self-regulation interventions have been studied for infants and toddlers, high school youth, and young adults, decreasing confidence in the generalizability of the findings for these developmental groups.
- Although individuals from culturally diverse backgrounds, particularly Black and Hispanic children and youth, were included in many intervention studies, there was less representativeness in some developmental groups. In particular, there were relatively few minorities in studies for elementary students, middle schoolers and young adults. American Indian and Alaska Natives are also significantly under-represented.
- Intervention studies on children and youth living in adversity beyond early childhood are limited, particularly for youth who live in out-of-home placements. Given the level of services utilized by these adolescents, better understanding of effective self-regulation interventions would be very valuable, along with assessment of relevant outcomes such as effects on stress and long-term educational and economic indicators of success.

Study Quality

As is true in most areas of research, self-regulation intervention studies vary with regard to methodological quality including adequacy of sample size, the equivalence of comparison groups, the nature and integrity of randomization procedures, reliability and validity of outcome measures, extent of attrition, and statistical reporting. Using an index of methodological quality based on guidelines developed by the Coalition for Evidence-Based Policy that incorporates these factors, we found that studies with lower quality report the most positive findings. A significant factor that increases confidence of results is the presence of a comparison group, which the large majority of studies examined did include. Thus, for the purposes of our review, we only calculated effect sizes for randomized controlled trials (RCTs) or studies with quasi-experimental designs.

Measurement

There are many challenges to accurately and validly measuring core self-regulation and co-regulation processes, which may impact interpretation of results of individual intervention studies as well as the ability to synthesize findings across studies. In addition, there are important outcome areas which have not been evaluated for some developmental age groups. Finally, accurate interpretation is dependent on knowing whether an intervention was implemented as intended. More specific issues related to these broader concerns with measurement in self-regulation intervention studies include the following:

- In early childhood, a number of laboratory-based and caregiver report measures exist, but these use a wide range of terms to refer to overlapping cognitive and emotional regulation processes (e.g., executive functioning, effortful control, delay of gratification), which complicates conclusions that can be drawn across studies. Moreover, measures are typically not standardized with norms to facilitate interpretation and may have limited evidence of validity with regard to predicting functioning.
- Across all developmental age groups, there are few measures of co-regulation that comprehensively assess warm responsive interactions, self-regulation coaching, and other structural and environmental supports that caregivers provide to strengthen self-regulation

development in children and youth. Indeed, existing measures in this area focus on rather narrow aspects of co-regulation (e.g., attachment in early childhood, classroom climate). To move self-regulation intervention research forward, it would be valuable to have developmentally appropriate measures of these processes as a broadly defined construct.

- For older youth, many fewer measures have been well-developed and validated, which may be related to less well-specified theoretical constructs of self-regulation beyond early childhood. There is also an over-reliance on self-report measures in older adolescents and young adults. Without more objective assessments or reports from parents, teachers, and other caregivers, results may not reflect meaningful change in youths' daily functioning.
- Self-regulation intervention studies rarely measure caregivers' own self-regulation abilities, which are theoretically related to their abilities to provide co-regulation, and may impact outcomes for children and youth.
- Self-regulation intervention studies for young adults have included few measures related to motivation/initiative, employment, and healthy relationships, all of which are important outcomes for this age. Adolescent studies have also infrequently measured the types of stress-related outcomes that are very relevant to youth populations that live in adversity.
- Considerably fewer than half the studies reported fidelity data, and this was lowest in the youngest and oldest developmental groups. Without knowing whether interventions were implemented as intended, interventions may appear less effective than they truly are.

Suggestions for Future Self-Regulation Intervention Design and Development Work

The present analysis of gaps and limitations suggests several directions and opportunities for future research and development. This may enhance the quality of self-regulation intervention research and advance knowledge that may improve intervention outcomes.

Incorporate strong measurement

To be confident in the results of self-regulation intervention research, outcome measures must adequately assess self-regulation skills, meaningful functional outcomes, and caregiver co-regulation supports across development. In addition, information should be provided regarding the extent to which measures of implementation demonstrate that interventions were actually delivered the way they were intended (with fidelity). Specific recommendations for strong measurement include:

- Use or develop reliable and objective assessments of self-regulation processes for children and youth, based on clearly defined theoretical constructs
- Use or develop reliable and objective assessments of self-regulation for caregivers and staff, as this may be relevant to their abilities to provide co-regulation
- Assess outcomes across a broad range of functioning including stress, motivation, relationships, academics, and job performance (for adolescents and young adults)
- Assess outcomes from a variety of perspectives, such as self-report, parent report, teacher report, observer report, or real-world functioning (e.g., grades in school, job retention)
- Consistently measure implementation and include measurement of fidelity of intervention delivery, ideally with observational methods

Develop and evaluate intervention strategies that are supported by self-regulation theory but have not yet been tested

Although there are many programs that positively impact self-regulation, there are several areas where gaps exist for specific age groups, settings, and approaches. Future intervention development work can be informed by similar approaches that have worked along with well-articulated self-regulation theory. The following areas would benefit from future intervention development work:

- Co-regulation trainings for caregivers other than parents, e.g., teachers, out-of-home care providers, mentors
- Peer co-regulation strategies across age groups, particularly adolescence, in addition to strategies for partners in intimate relationships for older youth and young adults
- Self-regulation coaching strategies and training
- Strategies to support caregivers' own self-regulation capacity such as mindfulness, and for professionals, reflective supervision
- Specific to adolescents:
    - strategies to effectively engage parents in co-regulation activities
    - focused and intentional interventions that target emotion regulation
- Interventions implemented during afterschool programs and work settings
- Interventions for older youth living in adversity including out-of-home placements
- Interventions that enhance school or work climate to support self-regulation

Evaluate effectiveness of different intervention approaches

In addition to evaluating specific intervention strategies, it is also important to think about broader approaches to intervention across development and systems. Such approaches require large-scale coordinated evaluation efforts, but have potential to inform policy in such a way as to create positive population-level changes. Evaluation of the following approaches is recommended:

- Comparison of long-term functional outcomes and well-being for interventions provided at different ages, e.g., early childhood vs. latency vs. adolescence
- Different lengths of interventions needed to achieve targeted developmental goals.
- Added value of "booster" interventions in adolescence following comprehensive early childhood self-regulation interventions
- Incremental value of combining direct skills instruction with co-regulation interventions
- Incremental value of "layered" interventions (e.g., using targeted approaches in addition to universal approaches like Positive Behavior Intervention Support or community-wide parenting programs)
- Intervention delivery by different types of school staff (i.e., teachers vs. counselors vs. co-located mental health staff).

Implement interventions systematically across development

It is encouraging that a wide range of intervention approaches have been developed for different developmental groups, with evidence of positive impact. However, the large majority of interventions are comprised of relatively brief and targeted self-regulation skills for specific age groups. Although this is understandable given that increasingly complex skills should be addressed for older age groups as new self-regulation demands are encountered, the lack of models for providing skill support and instruction across age groups creates challenges to large-scale impact. Strategies implemented by funders and policymakers to align and coordinate intervention systems across development are therefore needed. For example, community partnerships among human services agencies, out-of-school programs and

public school systems could adopt an approach to promoting self-regulation similar to that taken with promoting literacy, providing systematic skills instruction while simultaneously building supports for co-regulation at each developmental phase, across contexts, from early childhood through young adulthood.

Conclusions

Self-regulation interventions promote well-being across development through a variety of approaches and different types of programs. However, in order for interventions to achieve their potential for enhancing the effects of human service programs and practices, a number of gaps need to be addressed. This includes gaps in the kinds of interventions developed and gaps in what is known about how interventions work, for whom, and for what outcomes. There are also several unanswered questions such as what the critical components of different interventions may be, when the best time to intervene is, and whether layering or combining interventions has added value. Existing interventions are lacking in a few important areas, including the use of co-regulation strategies and interventions for adolescents and young adults. The quality of future self-regulation research could be improved by focusing on sample representativeness for the most vulnerable populations, developing and testing specific strategies informed by theory, and considering broader intervention approaches across settings and development. Finally, considerable work is needed to develop and validate relevant self-regulation measures that will strengthen confidence in interpreting results. It is hoped that the present brief will help to inform such work.

For more specific practice-oriented suggestions, please refer to Report 4 in the series on Self-Regulation and Toxic Stress: https://www.acf.hhs.gov/opre/resource/self-regulation-and-toxic-stress-implications-for-programs-and-practice

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