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The Speech-Language Pathologist's Role in Supporting the Development of Self-Regulation: A Review and Tutorial

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The Speech-Language Pathologist's Role in Supporting the Development of Self-Regulation: A Review and Tutorial

Self-regulation is widely recognized as a critical component of children's development and a strong predictor of both academic and social success (Blair & Diamond, 2008; Blair & Razza, 2007; Vohs & Ciarocco, 2004). At least half, but upwards of 80%, of children with speech, language, and communication disorders also face co-occurring challenges in self-regulation (Cantwell & Baker, 1991; Hyter, Rogers-Adkinson, Self, Simmons, & Jantz, 2001). This places speech-language pathologists (SLPs) in a prime position to play a meaningful role in supporting children's growth of self-regulation (Fujiki, Spackman, Brinton, & Hall, 2004; Singer & Bashir, 1999). Working on self-regulation can support children to mobilize the strategies they learn during intervention for use in real life, and can help them to more effectively engage and participate in everyday interactions with their family, schools, and larger community (Butler, Schnellert & Perry, 2017). This aligns with the goal of addressing all aspects of functioning that is endorsed by both SLP's scope of practice documents (ASHA, 2016; SAC, 2016; Speech Pathology Australia, 2015) and the World Health Organization's International Classification of Functioning, Disability and Health (WHO, 2001). We propose that the consideration of self-regulation in the assessment and intervention of young children will strengthen clinical efforts, and will ultimately translate into a broader view of the SLP's role in child development.

This article provides an overview of self-regulation and examines the roles that executive functioning, metacognition, and co-regulation play in supporting its growth. It explores the effects that stress can have on children's ability to self-regulate and provides information that SLPs can use to recognize signs that stress may be negatively impacting children's regulation. Additionally, a clinical framework is shared to illustrate how SLPs can scaffold the growth of self-regulation. Within this framework are two sets of strategies. The first set of strategies

focuses on *co*-regulation and is intended to help clinicians mitigate the dysregulating effects of stress on children. The second set of strategies focuses on helping clinicians to scaffold children's development of essential skills needed to *self*-regulate. Many of the co-regulatory and scaffolding strategies shared within this article may be routinely used by SLPs to engage and motivate children to reach therapy goals. Our goal is to demonstrate how these strategies can also be used intentionally to (a) mitigate the negative impact of stressors that may prevent children with self-regulatory challenges from benefiting from therapeutic efforts and (b) develop children's skills to self-regulate.

An Overview of Self-Regulation and How it Develops

Before we describe how SLPs can integrate addressing self-regulation into communication intervention, it is important to have a comprehensive understanding of what self-regulation is, how it develops, and what factors might impact its development. This material informed our clinical framework and can be used to help clinicians make flexible in-the-moment decisions about how to best support children, and articulate clinical decisions to colleagues and parents.

Self-Regulation Defined

Self-regulation involves the dynamic interaction of biological and cognitive systems, all working towards attaining a state of homeostasis (i.e., relative state of equilibrium; Diamond 2013; Eisenberg, Hofer & Vaughan, 2007; Liew, 2012). It explains how people learn to recognize, monitor, and manage their internal states (e.g., stress, energy, emotions) in order to attain and maintain optimal levels of biological, emotional, and cognitive arousal (Diamond, 2013; Eisenberg, Hofer &Vaughan, 2007; Liew, 2012; Shanker, 2013, 2016). This sets the foundation for children to (a) attend to and learn from their environment and social interactions, (b) work toward achieving goals, and (c) learn to act in ways that reflect social responsibility (Perry, Hutchinson, Yee, & Määttä, 2018; Vallotton & Ayoub, 2011). The focus of self-

regulation is on recognizing when disturbances to homeostasis occur, understanding how to manage energy in response to these disturbances, and taking action to restore balance, rather than controlling or suppressing emotions or behaviors through willpower (Shanker 2013, 2016). Targets of children's self-regulation can include regulating behavior, emotions, cognitions, social interactions, and, eventually, motivation for and engagement in learning, as is demonstrated in self-regulated learning (Perry et al., 2018). Examples of self-regulation include a child recognizing that he needs a break to replenish energy after engaging in a cognitively challenging reading task; a child noticing and moving away from distractions in his environment with the goal of focusing his attention to his work; or a child recognizing that her tense jaw might be impacting her speech fluency, and therefore engaging in relaxation techniques to reduce tension.

How Does Self-Regulation Develop?

Co-regulation as the foundation for self-regulation. *Self*-regulation may be misconstrued as a capacity that develops independently, while in fact, it is through experience with *co*-regulation that children's more autonomous and independent abilities for self-regulation are developed (Calkins & Hill, 2007; Harrist & Waugh, 2002). In *co-regulation*, we consider the symbiotic nature of an interaction rather than the child's regulation in isolation. Co-regulation describes how people regulate each other's behavior, through a mutual exchange of information between partners (Fogel, 1993; Garvey & Fogel, 2007). This involves continuous reading of a partner's affect cues (e.g., facial expression, body positioning, tone of voice, etc.), and adjusting our own actions and intentions in response to the partner (Fogel, 1993; Garvey & Fogel, 2007). Co-regulating children is not the same as exerting control over or managing their behavior. Co-regulation instead aims to provide children with the support and scaffolding they need to achieve a state of homeostasis and more easily attend to, engage with, and learn from their environment.

The biological importance of starting with co-regulation. The fact that young children

rely so heavily on caregivers to co-regulate them can be attributed to the gradual development of the pre-frontal cortex (PFC). The PFC is understood to be the hub of executive functions, metacognition, and, subsequently, *self*-regulation (Evans & Fuller-Rowell, 2013; Fox, 1994; Lupien, McEwen, Gunnar, & Heim, 2009). One's ability to *self*-regulate depends, in part, on development of executive functioning and metacognitive skills (Blair, 2002). Executive functions are a set of cognitive processes that include working memory, inhibitory control, and focusing attention in the service of cognitive or mental flexibility. Metacognitive skills are the knowledge of one's own cognitive processes and include such skills as analyzing and reflecting (Diamond, 2016; Kaplan, Silver, Lavaque-Manty & Meizlish, 2013). These skills support children to manage and monitor their internal states. They also enable children to reflect upon what strategies helped them restore balance, focus, or scaffold learning; which ones did not work; and why. Activation of the PFC occurs early in life but it is not fully developed until adolescence and early adulthood (Bell & Fox, 1992; Klingberg, Vaidya, Gabrieli, Moseley, & Hedehus, 1999; Nagy, Westerberg, & Klingberg, 2004). From birth, infants are launched into a world of new experiences with few resources to cope with the abundance of sensory information (Ellis, Essex, & Boyce 2005). Infants may regulate their engagement in their environment by turning their head away from the direction of a loud noise, however, they would not have the abilities to carefully plan to physically move away from the loud noise, or ask the person to 'quiet down'. Infants and young children rely on their caregivers to help attain a state of calm, guide them in refocusing their attention toward environmental stimuli conducive for learning, and scaffold their development of the executive functioning and metacognitive skills so integral to autonomous self-regulation (Glaser, 2002).

Transitioning to socially-shared regulation. During interactions with young children, adults primarily take the lead role, co-regulating children and supporting them to achieve

homeostasis (Van der Kolk, 2005). As children gain experience being engaged in reciprocal co-regulated interactions and develop intentional communication, the role of co-regulator can grow to become more of a shared act (Perry et al., 2018). This is often referred to as socially-shared regulation (Hadwin & Oshige, 2011). Socially-shared regulation can occur during adult-child interactions, but often occurs during interactions between children (Perry et al., 2018). During socially-shared regulation, the parties involved collaborate and pool their executive functioning and metacognitive resources with the aim of working toward collaborative goals (e.g., co-constructing understanding, collecting ideas, problem solving; Hadwin & Oshige, 2011). We may see socially shared regulation of learning happen as children collectively decide on work for a school project (e.g. topic, objectives, and individual roles and responsibilities; Hutchinson, 2013). We could also see socially shared regulation of behavior when a child recognizes a physiological sign he is struggling to maintain regulation (e.g., butterflies in tummy), tells an adult, and then problem solves with the adult to help determine why he's experiencing this feeling and how to recover. These interactions not only support children to develop self-regulation but also provides them with opportunities to develop social responsibility by attending to the feelings, perspectives, and goals of their peers (Hutchinson, 2013).

Although children may gradually take on a larger role in the co-regulatory process as they grow older and develop more sophisticated language and cognitive capacities, adults typically continue to take a leading role in the regulatory process for quite a while (Diamond & Aspinwall, 2003; Harrist & Waugh, 2002). Even after a person has demonstrated the ability to self-regulate, the need for co-regulation continues across the lifespan, particularly in times of crisis or when faced with an exceptional accumulation of stress.

An Overview of Stress and How it Impacts Self-Regulation

What is Stress?

The term *stress* is often associated with feeling agitated, or having too many things to do, but from a biological perspective what constitutes *being stressed* is much broader. Stress is the effect of any action or reaction that threatens homeostasis, causing excess energy to be expended (Cannon, 1929). In some forms, stress can be helpful. It can act as a motivator (e.g., having a deadline could encourage you to finish your work), and people are generally able to recover from short bursts of stress (Arnsten, 2009). However, when people do not replenish the energy spent while coping with stressful experiences and stressful experiences are chronic, it can have a detrimental impact on health, cognitive functioning, and behavior (Arnsten, 2009; Liston et al., 2009). Exposure to chronic stressors can even lead to behavior consistent with an executive functioning disorder, when it may not be the case (Diamond, 2013).
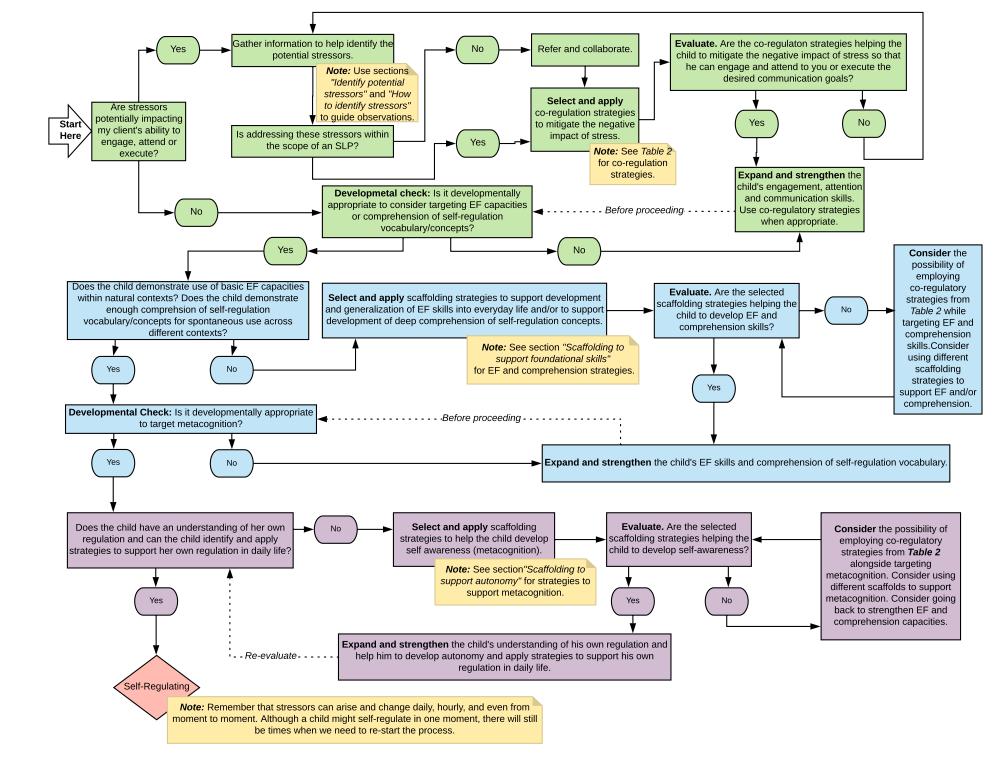
Stress can emerge irrespective of whether an experience is positive or negative. An intense tickling game might yield laughter, but without allowing time for recovery between the tickles, children can quickly move from laughter to tears. An exciting day at a birthday party, although enjoyable, can also lead to energy depletion resulting in possible meltdowns. These seemingly positive experiences could impact a child's regulation to a similar extent as getting in an argument with peers, feeling pressure to perform, or trying to tackle too many projects at once. Furthermore, *stressors* can arise from a variety of causes (e.g., biological factors, emotions, cognitive load, navigating social contexts) and our responses to stressors are highly individualized: what constitutes a stressor for one person might not be a stressor for another (Blair, 2010; Schneiderman, Ironson, & Siegel, 2005).

How does Stress Impact Systems Integral to Self-Regulating?

During periods of stress, the amygdala activates stress pathways in the hypothalamus and brainstem, which rapidly release high levels of noradrenaline and dopamine. In moderation, release of these neurotransmitters is helpful, enabling people to say alert and attend to their

environment. However, in an overabundance, they act on the PFC, impairing executive functions and metacognition, thus restricting or even prohibiting self-regulation (Arnsten, 2009; Luethi et al., 2009). A high impact stressful event or an accumulation of smaller stressful encounters can trigger this reaction (Lupien et al., 2009). Additionally, frequent exposure to high levels of stress (positive or negative) can increase children's physiological reactivity, leading them to become more reactive to even small stressors (Ellis, Essex, & Boyce, 2005; Essex et al., 2002). Too little stress (e.g., not being challenged, feeling bored) can also influence working memory and impair PFC function, thus emphasizing the need for clinicians to find the just right challenge for the children with whom they work (Arnsten, 2009; Liston et al., 2009; Luethi et al., 2009).

The SLP's Role in Supporting Growth of Self-Regulation: A Clinical Framework

Young children's brains are particularly susceptible to stress (e.g., maternal separation, harsh discipline), likely due to the extensive and important neurological changes that occur early in life (Lupien et al., 2009). Given young children's sensitivity to stress and the potential negative impact on cognitive functions essential for self-regulating, it is important for SLPs to identify stressors that might be impairing a child's ability to attend, engage, or execute tasks. Identifying if and when a child may be experiencing stress can dictate whether SLPs should (a) use co-regulatory strategies to help the child recover from stress and restore equilibrium before moving forward with assessment or intervention goals, (b) provide scaffolding to give the child opportunities to develop capacities important for self-regulating, or (c) challenge the child to more independently practice skills such as problem solving, reflective thinking, self-monitoring, or planning, all skills important for self-regulation. Figure 1 provides a flow chart of our framework, and demonstrates how identifying stressors could impact the clinical decision making process. This framework is intended to guide SLPs in how to approach assessment and intervention, and help children to function at their optimal potential.

IDENTIFYING & CO-REGULATING TO REDUCE STRES

Start Here

Are stressors potentially impacting my client's ability to engage, attend or execute?

Yes →

Gather information to help identify the potential stressors.

Note: Use sections *"Identify potential stressors"* and *"How to identify stressors"* to guide observations.

Is addressing these stressors within the scope of an SLP?

No → Refer and collaborate.

Yes →

Select and apply co-regulation strategies to mitigate the negative impact of stress.

Note: See *Table 2* for co-regulation strategies.

Evaluate. Are the co-regulaton strategies helping the child to mitigate the negative impact of stress so that he can engage and attend to you or execute the desired communication goals?

Yes

No

Expand and strengthen the child's engagement, attention and communication skills. Use co-regulatory strategies when appropriate.

No →

Developmetal check: Is it developmentally appropriate to consider targeting EF capacities or comprehension of self-regulation vocabulary/concepts?

- - - *Before proceeding* - - -

Yes

No

SCAFFOLDING TO SUPPORT FOUNDATIONAL SKILLS

Does the child demonstrate use of basic EF capacities within natural contexts? Does the child demonstrate enough comprehension of self-regulation vocabulary/concepts for spontaneous use across different contexts?

Select and apply scaffolding strategies to support development and generalization of EF skills into everyday life and/or to support development of deep comprehension of self-regulation concepts.

Note: See section *"Scaffolding to support foundational skills"* for EF and comprehension strategies.

Evaluate. Are the selected scaffolding strategies helping the child to develop EF and comprehension skills?

No →

Consider the possibility of employing co-regulatory strategies from *Table 2* while targeting EF and comprehension skills. Consider using different scaffolding strategies to support EF and/or comprehension.

Yes

No

Yes

Developmental Check: Is it developmentally appropriate to target metacognition?

- - - *Before proceeding* - - -

Yes

No

Expand and strengthen the child's EF skills and comprehension of self-regulation vocabulary.

SCAFFOLDING TO SUPPORT AUTONOMY

Does the child have an understanding of her own regulation and can the child identify and apply strategies to support her own regulation in daily life?

No →

Select and apply scaffolding strategies to help the child develop self awareness (metacognition).

Note: See section *"Scaffolding to support autonomy"* for strategies to support metacognition.

Evaluate. Are the selected scaffolding strategies helping the child to develop self-awareness?

Yes

No

Consider the possibility of employing co-regulatory strategies from *Table 2* alongside targeting metacognition. Consider using different scaffolds to support metacognition. Consider going back to strengthen EF and comprehension capacities.

Yes

SELF-REGULATING

Self-Regulating

Expand and strengthen the child's understanding of his own regulation and help him to develop autonomy and apply strategies to support his own regulation in daily life.

- - - *Re-evaluate* - - -

Note: Remember that stressors can arise and change daily, hourly, and even from moment to moment. Although a child might self-regulate in one moment, there will still be times when we need to re-start the process.

[Insert Figure 1 about here]

Could Stressors be Impacting my Client's Ability to Engage, Attend, or Execute?

The process begins with watching for possible indications that a child is being negatively impacted by stressors. Difficulty modulating strong emotions (e.g., sadness, anger, excitement) or navigating social interactions, challenges attending to salient information in the environment, social withdrawal, physical tension, accelerated heart rate, anxiousness, heightened impulsivity, and struggling with organizing the environment or thoughts are all indicators that might signal too much stress (Arnston, 2009; Liston et al., 2009; Lupien et al., 2009). We acknowledge that it is normal for children to exhibit some of these signs some of the time. However, when observed frequently, or when a child demonstrates a cluster of these signs, stressors must be carefully considered. It is important to note that stressors may not be, or may not solely be, the source of the warning signs previously listed. Nonetheless, given what we now know about stressors and their negative impact on cognition and self-regulation, the consideration of stressors during assessment and intervention is recommended.

There will be times when we do not have reason to believe that stressors are impacting our client's ability to engage, attend, or execute in the moment. However, before moving to the next step in our clinical framework, consideration of the child's developmental level should occur. If it is not developmentally appropriate to move forward, SLPs may instead focus on supporting the child to expand and strengthen foundational skills (e.g., attention, communication).

Potential Stressors

If there is a possibility that stressors are impacting a client's ability to engage, attend, or execute communication goals, the next step in the process is to identify the potential stressors. Vohs and Baumeister's model (2011) provides a framework SLPs can use for identifying the range of potential stressors that could negatively impact children. Biological, cognitive, social,

and emotion domains are used to organize identification of stressors, with recognition that many stressful experiences likely have downstream effects on more than one domain.

      Biological stressors. These stressors are affected by physiological systems. Common physical states such as hunger, fatigue, sickness, and decreased physical fitness are examples of biological stressors. The energy depletion caused by these stressors can impinge on executive functioning skills important for self-regulation (Barnes, 2012; Carson, Konewko, Wold, Mariani, Goli, Bergloff, & Crosby, 2006; Chaddock, Pontifex, Hillman, & Kramer, 2011; Hillman, Erickson, & Kramer, 2008; Lupien et al., 2009). Overwhelming sensory stimuli such as too much noise can also evoke negative physiological responses and lead to distractedness and difficulty inhibiting socially inappropriate responses even in people who do not have underlying sensory processing challenges, with the extent of stress or distractedness being highly individualized, dependent on how the noise is interpreted in the individual's central nervous system (Arnsten, 1998; Rylander, 2004).

      The stressors resulting from motor, sensory motor, and sensory processing challenges can also be classified as biological (Shanker, 2016). Children with motor challenges are likely to exert more energy performing everyday tasks such as handwriting, doing up buttons, or climbing stairs. Similarly, children with sensory processing challenges may expend a great amount of energy organizing information from their daily sensory experiences. It is therefore plausible that children with these challenges have fewer resources left over for language learning, executive functioning, or metacognitive tasks required for self-regulation (Prizant & Meyer, 1993).

      Emotion stressors. These stressors result from energy depletion from strong emotional responses such as fear, sadness, anger, and even excitement. Emotional neglect is an extreme example of an emotion stressor and has been correlated with impaired linguistic development in children (Allen & Wasserman, 1985; Moreno-Manso et al., 2010). Even seemingly small

emotional distractions, such as being presented with pictures of emotional scenes or watching an emotionally upsetting movie, can reduce activation of the PFC (Dolcos & McCarthy, 2006; Qin, Hermans, van Marle, Luo, & Fernández, 2009).

Cognitive stressors. Cognitive stress is activated during activities that require mental processes such as memory, attention, comprehension, reasoning, problem solving, and self-awareness, which are components of executive functioning and metacognitive capacities (Shanker, 2016). While seeming to be in opposition to the development of self-regulation, cognitive stress is necessary for learning and the growth of self-regulation. However, there needs to be a balance. Cognitive stress could be triggered by quick presentation of novel words or information to recall. This can negatively impact how children with developmental language disorder recall the information (Weismer & Hesketh, 1993; Montgomery, 2005). Speed of presentation can impact how typically developing children are able to perform on tasks where they are asked to identify proper versus improper grammatical use (Hayiou-Thomas, Bishop, & Plunkett, 2004). Dividing and re-directing attention are also examples of cognitively stressing tasks that impair functioning of the social pragmatic system (specifically social response inhibition) and on test taking (which requires PFC activation; Schmeichel et al., 2003; von Hippel & Gonsalkorale, 2005). Mathematic tasks are thought to be particularly taxing on executive functioning capacities (Blair & Razza, 2007; Swanson & Beebe-Frankenberger, 2004).

Social stressors. Social stresses are associated with reading social cues and/or navigating interpersonal interactions and social contexts; downstream effects on other domains (e.g., emotion) may be particularly evident. Public speaking is a social task that can be stressful for some and perhaps more stressful for children with speech or language challenges. Engaging in the task can impair cognitive flexibility and working memory (Alexander, Hillier, Smith, Tivarus, & Beversdorf, 2007; Luethi et al., 2009). Being socially excluded can also evoke a

stress response that negatively impacts executive functions including reasoning, decision

making, persistence on difficult tasks, and selective attention (Baumeister, DeWall, Ciarocco, &

Twenge, 2005; Cacioppo & Patrick, 2008; Twenge, Catanese, & Baumeister, 2002). This is a

particularly important consideration because children with language impairments are commonly

faced with peer rejection and high levels of social withdrawal (Fujiki, Brinton & Todd, 1996;

Gertner, Rice & Hadley, 1994). Table 1 provides a quick reference outlining potential sources of

stress SLPs can watch for.

[Insert Table 1 about here]

How to Identify Potential Stressors

Currently, we are not aware of any formal assessments specifically designed for SLPs to

use to definitively identify the range of children's stressors. However, valuable information can

be gathered from a dual approach of collaborating and questioning, and direct observations.

Collaborating and questioning. Information about potential stressors can be obtained

from parents and professionals such as occupational therapists, physical therapists, educators,

and mental health providers. Tools commonly used by occupational therapists, such as the

Sensory Profile (Dunn, 2014), or the Sensory Experiences Questionnaire (Ausderau et al., 2014),

could provide insight into biological stressors related to sensory processing challenges. Teacher

reports could provide valuable information about a child's response to stressors within a school

context. The initial client intake can also be used to gather information about stressors using the

four domains of stress outlined above as a framework for guiding questioning. Additionally, self-

reports may be feasible if the child is able to verbally express emotions, motivations, and dislikes

(Zimmerman & Martinez-Pons, 1988). Although helpful, the information collected through

collaborating and questioning is limited as it only provides information about "to what extent the

Table 1.
Below are examples of stressors within each domain that could negatively impact systems related to self-regulation or communication (e.g., attention, engagement, social interactions, executive functioning, metacognition, or language).

Biological Stressors	
• Hunger • Fatigue • Sickness • Decreased level of physical fitness • Sensory processing challenges	• Loud noises • Motor or sensory motor challenges (e.g., apraxia, cerebral palsy, developmental co-ordination disorder, fine motor challenges)

Emotion Stressors

Examples of situations that could evoke the emotion are listed below the named emotion.

Fear	*Anger*
• Changes in routine, divorce, perfectionism, nightmares, overhearing news stories	• An argument, recess being canceled due to rain, getting disciplined
Excitement	*Sadness*
• Pre-holiday build-up, birthday parties	• A friend moving away, a sick family member, a lost toy, getting hurt

Cognitive Stressors	
• Dividing attention (e.g., while writing a story, a child must think about characters and plot while also attending to grammatical rules) • Re-directing attention (e.g., transitioning or shifting focus from one activity to another or shifting topics of thought) • Memory tasks (e.g., following directions, retelling events)	• Mathematic tasks • Tasks that are not matched to a child's developmental level • Processing and understanding information presented quickly • Learning a new language • Language comprehension or formulation challenges (e.g., DLD) • Reading challenges (e.g., trouble decoding or comprehending, dyslexia)

Social Stressors	
• Being socially excluded • Public speaking tasks • Theory of mind and understanding others' perspectives • Understanding cultural differences	• Novel or confusing social situations (e.g., navigating how to join a play interaction with a new group of peers, understanding why someone is crying of happiness and how to respond)

child typically, or on average, displays certain behaviors within a general domain" (Cleary & Callan, 2018, p. 339).

 Direct observation. Observations of children within natural contexts have proven powerful in understanding how opportunities for young children's self-regulated learning unfold during everyday activities and exchanges (Hutchinson, 2013; Perry, 1998; Perry et al., 2018). They can also be used to capture the child's encounters with and responses to stressors as they change from moment to moment, helping us to understand how *this child* responds to stressors in situ or "during a particular activity in *that specific context* at *this moment* in time" (Cleary & Callan, 2018, p. 339). Some stressors may be easily observable (e.g., a child rubbing her eyes because she is overtired, a child reacting with extreme excitement to a sudden loud noise). However, other stressors may be less obvious, either because the stressor happened outside of the interaction (e.g., a child missed breakfast or a child was bullied at school earlier in the day) or because the stressor is not something that might typically evoke a stress response (e.g., a subtle change in routine such as taking a different route to therapy due to construction). Given the individualized and situated nature of stressors, continual consideration should be employed.

Co-regulating to Mitigate the Negative Impact of Stress

 After noticing that a child is potentially being impacted by stressors, and identifying what the potential stressors are, SLPs can use co-regulation strategies to reduce the negative effects of stress on cognitive functioning. Depending on the nature of the stressors, referrals or consultations may be necessary to determine the best way to co-regulate the child (e.g., sleep disorders, neglect or abuse). However, many strategies to reduce stressors fall within a SLP's scope of practice (ASHA, 2016; SAC, 2016; Speech Pathology Australia, 2015). Use of co-regulating strategies aimed at mitigating the negative impact of stress should be considered prior to working on cognitively taxing speech and language goals or working toward developing

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specific executive functions or metacognitive skills involved in self-regulating.

Aligned with the theory of differential susceptibility to environmental influences (Belsky, 2005), children vary in how they respond to strategies, thus treatment should be individualized according to how each child responds to the different strategies rather than to their diagnosis. Multiple strategies can be used simultaneously and selection of strategies should be tailored to each client's situation and particular needs based on the stressors that most impact each child's ability to engage, attend, or execute goals. Below we illustrate co-regulation strategies that focus on mitigating the negative effects of stress.

Modify the environment (Blair, 2010). A child's environment can play an important role in her feelings of being regulated, safe, and secure (Howes, Cicchetti, Toth, & Rogosch, 2000). One way SLPs can support children is through making modifications to the environment to minimize or remove stimulation that could be evoking a child's stress response (e.g., loud noises, visual clutter, strong smells; Blair, 2010). For example, conducting therapy sessions in a small space (e.g., tent) or room with few visuals on the walls, reducing the number of toys available in a space, using a sheet to cover shelves that house toys, placing toys that are not in use in a closed cabinet, or setting up a *sensory break tent* in a busy classroom could be done to help visually organize the environment for children, and orient their attention to the desired target. Supports may also be added to an environment with the aim of reducing a child's stress resulting from physical challenges (e.g., seating that provides adequate postural support, providing access to an augmentative communication device).

Modulate exposure of stimulation that might be triggering a stress response. If information is too intense or presented faster than a child's ability to process the information, it is plausible that she may become overwhelmed by the abundance of information and as a coping strategy disconnect or give up on the task to avoid becoming overwhelmed. Similarly, if

information is presented too slowly, a child might disengage due to lack of stimulation.

Modulating the volume of our own voices (e.g., speaking, singing) or the speed with which we

present visual stimulation may support children who are overstimulated. For example, rather than

moving in quickly to a child's visual field to give him a high five or to show him a new toy, the

SLP could move in slowly, and use anticipatory sound effects to *tell* him that she is coming,

allowing him to anticipate and get ready to process the information and engage. We could also

support the child to slow down his own movements on swings, scooters, etc., thus allowing him

more time to process the moving visual information, and connect with the SLP. Use of this

strategy may be particularly helpful if a child has sensory or motor-sensory processing

challenges in addition to a communication disorder.

    Add elements of predictability. Familiar routines can reduce stress through fostering a

child's sense of security (Prizant & Mezer 1993), therefore allowing for greater energy

expenditure on exploration, play, and communication. SLPs may use familiar song tunes or

anticipatory sound effects to help a child form patterns and anticipate a sequence of events

within the interaction. Visuals such as picture schedules could also be used to minimize

emotional distress, support comprehension, and help with organization and planning (Audet &

Hummel, 1990; Prizant & Meyer, 1993). Comprehension of temporal concepts can also help

establish predictability (Hummel & Prizant, 1993; Prizant & Meyer, 1993), and therefore may be

a valuable treatment goal.

    Although predictability is important for development of regulation and communication, if

the contexts we present to children are always too predictable, we can run the risk of the child

defaulting to autopilot mode, where little active thinking is involved and the child could

potentially get bored (Shanker, 2016). Contexts that are either too predictable or too chaotic can

be problematic for supporting the goals of developing a child's communication, language, or

self-regulation capacities. Novelty can and should be incorporated into interactions with children in order to support flexibility and adaptability to new contexts. For a child who relies on predictability, the novel element can be presented within a predictable sequence. We suggest that similar to the musical term *variations on a theme*, one element of the activity remains constant, but we then change another aspect. For example, we can use the tune of a favorite song (the constant), but change another element such as the volume, pace, or words, or by adding an instrument. Although this strategy could be used with a variety of children, it might be particularly useful when working with autistic children. Recent research on children with ASD has suggested that insistence on sameness may not be an optimal strategy for self-regulation and may even create and maintain anxiety by reinforcing intolerance of uncertainty (Factor, Condy, Farley, & Scarpa, 2016).

Be warm and responsive. High levels of social support (e.g., caregiver responsiveness and sensitivity, organized and enriched environments, strong attachment relationships) are associated with the release and reception of neurotransmitters that support children to recover from stress, develop executive functions, and engage in self-regulation (Dickerson & Kemeny, 2004; Wyman et al., 1999). An act as simple as responding with warmth and a soothing voice can help children develop resilience recovering from stressors (Bath, 2008). They learn to anticipate the soothing responses of their caregivers and then understand that help will come and emotions can be calmed (van der Kolk, 2005). Providing these social supports to assist children's communication development is fundamental to the SLP's role. However, the impact that these strategies can potentially have on reducing stressors and thus support the child to attain a regulated state may not be as familiar to clinicians. The positive effects that social supports can have on reducing stress have primarily been seen in children who exhibit self-regulation challenges and high externalizing behaviors (i.e., disobedient, aggressive, angry) and vulnerable

children (e.g., at high economic and psychosocial risk; Blair, 2002; Denham et al., 2000). The extent to which social supports may moderate effects of stress on development in children with communication disorders remains unclear, but given the connection between self-regulation challenges and communication disorders, it is plausible that effects would be similar.

Read and acknowledge the child's intent. Children whose cues are read accurately and responded to, tend to have better emotional-regulation and social communication, have more self-control, and maintain persistence in problem solving tasks then children who tend to engage in less synchronous interactions (Carpenter et al., 1998; Pianta, Sroufe, & Egeland, 1989; Tamis-LeMonda, Bornstein, & Baumwell, 2001). This underscores the importance of watching for and responding to all forms of a child's communication attempts (e.g., movements, facial expressions, shifting eye gaze, sounds, word approximations, and words).

Validate children's feelings and their right to experience and express a range of emotions. It is through experiencing a variety of emotions in real life and during play that children learn how to communicate about and recover from the stress evoked by strong emotions. SLPs can support children to use socially acceptable ways of communicating emotions, rather than distracting them from or invalidating their feelings (Hummel & Prizant, 1993). We can also validate a child's feelings though empathizing and acknowledging that we understand what the child is communicating. This does not mean that we are agreeing with how he is communicating the emotion, but it can potentially help the child to not become increasingly frustrated (thus evoking a stress response), thinking that he is not communicating his message effectively. Additionally, SLPs can join in with children's selected themes in pretend play, even themes that may be viewed as uncomfortable (e.g., power, control, sadness, anger, etc.).

Reduce the cognitive load. If a task is too difficult, it could deplete a child's energy sources. Simple alterations to our interactions such as slowing down presentation of auditory

information or reducing the amount of information presented can reduce the cognitive load and support comprehension for both children with language impairments (Weismer & Hesketh, 1993; Montgomery, 2005) and children with typical language who have engaged in a cognitively stressful activity (Hayiou-Thomas, Bishop & Plunkett, 2004). Similarly, it has been suggested that a person's working memory load may be supported by presenting information using dual-modalities (e.g., visual and auditory information; Yaghoub Mousavi, S., Low, R., Sweller, J., 1995). This may be particularly helpful when novel or complex concepts are introduced (e.g., self-regulation concepts, sequencing, comparison, categorization) and when attempting to work on tasks requiring executive functioning or metacognition (e.g., resolving conflicts, solving problems, reflecting on effective vs ineffective strategies; Hummel & Prizant, 1993). Diversifying how we share information with children by accompanying verbal language with use of gestures, affective facial expressions, and sound effects - which add meaning to interaction without adding to auditory overload - may also be effective in reducing cognitive stressors.

Although our examples have focused on reducing cognitive stress, it is important to note that if a task is too easy, the child is not provided with the opportunity to practice and develop skills (Butler et al., 2016). This is in line with Vygotsky's zone of proximal development (1986). Through careful consideration of the child's developmental level, and use of co-regulatory strategies, SLPs can both support children to reduce cognitive stressors negatively impacting the child, while continuing to stretch their thinking, social problem solving, and language learning.

Follow the child's lead (Greenspan, Wieder & Simons, 1998; Pepper & Weitzman, 2004). When children are provided with opportunities to pursue goals (even cognitively challenging goals) that they find meaningful, they tend to devote more time to their tasks and show greater concentration, thereby improving attention, processing information more deeply, and showing greater levels of persistence (Deci & Ryan, 2002). This is one of the fundamental components of

forming a secure attachment relationship, and strong attachment relationships may serve as the

basis for the ability to use social interactions and relationships to buffer stress (Gunnar, 2001).

Acknowledge that our ability to self-regulate helps us be an effective co-regulator

(Leerkes et al., 2016). Can we recognize, monitor, and manage our own internal states? Are we

regulated ourselves? Given the transactional nature of regulation, it is important to consider what

might trigger our own stress response so we can better manage how we respond to children's

dysregulation (Bath, 2008). If a child is frustrated and lashing out, it is very natural for the adult

to feel frustrated as well. This is known as emotion contagion, that is, "the tendency to mimic the

verbal, physiological and/or behavioral aspects of another person's emotional

experience/expression, and thus to experience or express the same emotions oneself" (Hsee et al.,

1990, p. 328). However, responding to the child's frustration with frustration ourselves does little

to co-regulate and develop the child's capacity to self-regulate her emotional

response. Responding in a calm manner, counterbalancing the intense emotions, can support the

child to gradually return to a state of homeostasis. This is consistent with Ed Tronick's (1989)

mutual regulation model. See Table 2 for suggestions of when to apply use of the strategies.

[Insert Table 2 about here]

Scaffolding to Support Foundational Skills

Once the negative effects of stressors have been mitigated through co-regulating

interactions and the child's developmental level has been considered, the SLP's role can shift to

using scaffolding to help children develop the skills that lay the foundation for the growth of

more independent self-regulation. The question of which co-regulatory scaffolding strategies

clinicians should use with their clients lies in the answers to the questions outlined within the

second section of our flow chart. We can begin by asking: *Is the child demonstrating the ability*

to use executive functioning skills in a variety of contexts during everyday interactions such as

Table 2. Suggestions for when to consider applying different co-regulatory strategies to reduce the negative impact of stressors.

Examples of Co-regulatory Strategies to Support Biological Stressors

Modify the environment
- To reduce overwhelming sensory input
- To add physical supports

Modulate sensory input
- Vary the tone, pitch, and volume of your voice
- Slow down

Add elements of predictability
- Use predictable routines or contexts to engage the child in sensory experiences
- Support comprehension of temporal concepts
- Use visuals
- Think about *variations on a theme* when incorporating novelty

Examples of Co-regulatory Strategies to Support Emotion Stressors

Be warm and responsive
- Read acknowledge and respond to all forms of a child's communication attempts (e.g., movements, facial expressions, shifting eye gaze, sounds, word approximations, and words)
- Respond with warmth and a soothing voice

Validate the legitimacy of children's feelings and their right to experience and express a range of emotions
- Encourage socially acceptable ways of communicating emotions, rather than using distractions or invalidations
- Join in with children's selected themes in pretend play (e.g., power, control, sadness, anger, etc.)
- Acknowledge and/or empathize with the child to express that you understand what the child is communicating.

Add elements of predictability
- Use predictable routines or contexts to support learning.
- Support comprehension of temporal concepts.
- Use visuals.
- Think about *variations on a theme* when incorporating novelty.

Acknowledge that our own ability to self-regulate is an important factor in being an effective co-regulator
- Recognize, monitor, and manage our own internal states. Are we regulated ourselves?

- Counterbalance.

Examples of Co-regulatory Strategies to Support Cognitive Stressors

Reduce cognitive load
- Find the *just right challenge*
- Slow down presentation of information
- Reduce the amount of information
- Diversify how you communicate (e.g., using multiple communicative means when interacting)
- Use visuals to support comprehension of information presented auditorily

Follow the child's lead

Examples of Co-regulatory Strategies to Support Social Stressors

Modify the environment
- To promote social engagement (e.g., sitting in circles rather than rows to promote inclusion with peers)

Add elements of predictability
- Set the stage by helping a child understand what to expect from an upcoming group activity or novel social context

Follow the child's lead
- Use the child's interests as a context for motivating or enhancing interaction with peers

remembering and following a short set of directions, focusing his attention on a play partner or on a task, asking for help, planning what to do during free time, and problem solving with peers or an adult? If the child has underdeveloped skills in these areas, the SLP can elect to enhance development of executive functioning skills across a range of contexts and use the strategies (presented later) that support implementation of these goals.

Another question SLPs can ask is: *Does the child have comprehensive understanding of the vocabulary and concepts used in the process of self-regulating (e.g., calm, stress, mental state vocabulary, specific goal related vocabulary, etc.)?* An indication of deep comprehension might be that the child is able to use such vocabulary multi-dimensionally, that is, in a variety of contexts and in reference to others and self (Henriksen, 1999). If the child lacks this comprehensive understanding, it is likely she will have difficulty understanding her own regulation, and the process of how to best regulate her emotions, behaviors, and learning. Therefore, the SLP's goals could focus on broadening the understanding of concepts used in the process of self-regulating. It is important to note that the questions above do not follow a linear progression, and therefore goals focused on growing executive functioning and goals focused on promoting comprehension of self-regulation vocabulary can be targeted simultaneously.

Once the clinician is able to answer *yes* to the aforementioned questions and the child's developmental level has been considered, SLPs can ask: *Does the child demonstrate understanding of his own regulation?* and *Does the child understand the process of how to support regulation of his own emotions, behavior, and learning?* Positive indications might include the child identifying what it means for him to feel calm; recognizing the signs that he is becoming dysregulated; and using metacognitive skills such as reflecting to consider what strategies are available to support regulation, how they can be applied, and whether (or not) they were effective. If the child cannot do these independently, strategies geared toward scaffolding,

modelling, or cognitive/metacognitive cuing of these skills are suggested.

Clinicians should pay ongoing attention to the fact that stressors could arise at any point when using this framework. The co-regulation strategies outlined in Table 2 that focus on reducing stress and helping the child to attain a state of balance may be re-visited when the child's homeostasis is compromised. These can be used alongside any of the strategies designed to develop autonomy as a means of helping children maintain an optimal state of arousal.

Scaffolding to support development of executive functioning capacities within dynamic interactions. The strategies presented in this section provide children with opportunities to practice the building blocks of self-regulation in natural and dynamic contexts that mirror everyday interactions. Therefore, they can be used in both dyadic and group settings. Within our suggestions below, we are not proposing that one specific program or strategy be used to support the growth of self-regulation. As such, they do not target communication or executive functioning in isolation. Explicit strategies designed to directly target executive functioning may be effective in supporting underlying capacities for self-regulation, but are not the focus of this paper (see Diamond and Lee, 2011, for a review).

Engaging children in problem solving. SLPs can engage children in actively collaborating in the process of solving problems as they naturally arise, rather than during set problem solving activities (e.g., a snack box will not open, a sock gets stuck inside a boot as a child takes his foot out, children have to negotiate who is going to play with the bike first). Engaging in this work throughout the day provides opportunity to vary the content and kind of executive function practiced (e.g., social problem solving, physical problem solving, negotiating, resolving conflicts). Natural interactions also enable work on the integration of skills (considering competing resources) and work supporting the generalization of skills.

Presenting children with problems may seem counterintuitive to minimizing their stress, however, practicing solving problems in supportive contexts has been correlated with later development of self-regulation, as it can actually serve to minimize potential emotional distress that is felt when such problems arise in the future (Audet & Hummel, 1990; Boekaerts & Corno, 2005; Perry & VandeKamp, 2000). Below are suggestions SLPs could use to create environments that promote opportunities for problems to arise within sessions:

a. *Using communication temptations.* Setting up the environment in a way that tempts children to initiate communication (Prizant & Weatherby, 1987) is likely familiar to SLPs as a strategy frequently used in developmental social pragmatic interventions (e.g., DIR/Floortime, Hanen, SCERTS). When using this strategy, clinicians may set up an environment and intentionally neglect to provide an item integral to the activity (e.g., setting up a paint station with no brushes), or place a preferred item in sight but out of reach for the child. Use of communicative temptations not only promotes initiation of communication but can also be used with children who are already communicating to support executive functions underlying the process of self-regulation (e.g., planning, organizing). When using this strategy, SLPs should be sure to closely monitor the situation to ensure that the problem the children encounter is not *too* difficult, which could cause frustration, excess stress, and cascading negative effects on communication or cognition, sabotaging the ultimate goal.

b. *Stacking the environment with open ended toys.* Environments stacked with open ended activities or toys encourage exploratory and pretend play. Both of these types of play promote problem solving, negotiating, learning about how things work, and regulation of social exchanges (Hummel & Prizant, 1993). Researchers have positively connected the use of open ended activities with engagement in self-regulation, executive functioning, and metacognitive tasks. Krafft and Berk (1998) found preschool aged children use more private

speech (as a means to self-regulate their behavior) during open ended activities, particularly during fantasy play, rather than during close ended tasks that had pre-determined goals. Additionally, classrooms that embraced open ended literacy activities (e.g., dynamically changing goals and tasks, student initiation, varied instruction methods) rather than close ended activities (e.g., word lists, flash-cards, word searches, recreating books) found that children were more likely to engage in activities that naturally support development of executive functions and metacognitive thinking (e.g., facing activities they found to be cognitively challenging, engaging in problem solving, and partaking in social interactions, all of which develop skills important for self-regulation; Turner, 1995).

c. *Throwing away the instruction manual.* Following the directions or instructions of an established game works on children's ability to comply, and may require children to focus their attention and employ working memory skills, but following established directions seldom promotes problem solving, independent thinking, making logical connections, or reflective thinking, skills integral to the growth of self-regulation. We propose that when the instructions are not laid out for children, they then must engage in the aforementioned cognitive process in order to move forward with the activity, thus they are working on building capacities foundational to the growth of self-regulation.

Using co-construction. Co-construction occurs when individuals work together to form meaning and foster knowledge about their world. The reciprocal nature of co-regulated interactions provides generous opportunity for using co-construction to target executive functioning skills (e.g., focusing attention, planning and organizing, and depending on the complexity of the task, possibly working memory capacities). Co-construction could involve providing children with opportunities to participate in making choices, setting and negotiating rules, solving problems, generating questions, or playing an active role in decision processes.

When using co-construction, guidance should be provided, rather than leaving the children to develop the ideas independently. However, we propose that ideas should be offered or suggested with an option for the child to accept, reject, or modify the idea. In a study examining the impact of adult involvement in children's play, children spontaneously repeated actions they saw the adults previously perform in play, and developed more novel symbolic play ideas, than children who did not have the opportunity to play with an adult (Nielsen & Christie, 2008). Additionally, the extent of the guidance ought to be adjusted to the developmental level of the child. For example, some children may be able to respond to open ended questions that offer the child an opportunity to make the choice about what activity to engage in next, while other children benefit from having the clinician constrain the choice by hinting about possible choices, or offering a binary choice. Not only does the use of co-construction provide children with opportunities to practice executive functioning skills important for self-regulating but use of this strategy also affords children some autonomy in controlling the challenge (amount of cognitive stress), supports them to feel comfortable with sharing preferences and communicating their thoughts and needs with others, and potentially increases children's motivation to participate in the interaction (Butler et al., 2017; Bodrova & Leong, 2008; Ostrosky & Kaiser, 1991). Research has shown that classrooms considered high in fostering self-regulated learning involved children in decision processes (e.g., developing rules for games, activities, or social situations) and provided children with opportunities to select their own activities, take initiative, and engage in challenging and collaborative learning activities throughout the day (Blair & Diamond, 2008; Lillard & Else-Quest, 2006; Perry, 1998; Riggs, Greenberg, Kusché, & Pentz, 2006).

Scaffolding to support the comprehension of self-regulation concepts. A deep understanding of the *vocabulary of self-regulation* is essential for growing children's capacity to self-regulate. This includes vocabulary for expressing emotions, physiological states, social

interactions, and learning goals. SLPs can play an important role in ensuring children have a deep and broad understanding of the vocabulary of self-regulation, and in supporting parents, teachers, or other professionals to discern the difference between labeling a concept and truly having embodied comprehension of the concept.

Mental state vocabulary. Attaining an understanding of mental state vocabulary is proposed to occur within the context of social interactions, conversations, pretend play, storytelling, and other activities that link actions and behaviors with vocabulary of mental states that are typically inaccessible to direct observation (Bodrova & Leong, 1996; Nelson, 2005). Exposing children, even those with limited verbal language, to simple discussions about emotion relevant contexts (e.g., commenting on their actions) can support emerging comprehension of emotion vocabulary and also help children develop the ability to read the intentions and emotions of others (Dunn, Brown, & Beardsall, 1991; Prizant & Meyer, 1993). Once children learn the words associated with what they feel emotionally and physically, they are better able to externalize their feelings, which is key to their ability to shift toward more autonomous self-regulation (Vygotsky, 1986). Prescriptive programs targeting emotion comprehension in children experiencing challenges in social emotional development have yielded positive results, however, they have yet to demonstrate that children can generalize their learning to contexts outside of treatment (Dimitrovsky, Spector, Levy-Shiff, & Vakil, 1998; Hobson, Ouston, & Lee, 1988; Silver & Oakes, 2001). This could in part be due to the fact that children who are able to use self-regulation vocabulary do not necessarily have adequate comprehension of the concepts. Explicit teaching may support children to use self-regulation vocabulary, but this alone will not support its growth. Labeling emotions or physical states is only one component of the complex process of fully comprehending these concepts.

Pons, Harris, and de Rosnay, (2004) identified three distinct phases of emotion

comprehension development, which can be used to inform intervention goals that target a comprehensive, embodied understanding of emotions. Explicit ages are cited within each phase, however, there will inevitably be individual differences in how children develop (Pons et al., 2004). The first phase occurs around 5 years old and entails children developing an understanding of important *public aspects of emotions.* This includes having an understanding that certain situations and objects from past emotional experiences can trigger emotions and recognizing how emotions might be outwardly expressed (e.g., sad face, angry voice). The second phase occurs around 7 years old and is characterized by having an understanding of the *mentalistic nature of emotions.* This involves understanding how desires and beliefs might impact emotions, and also understanding that emotions can be hidden (e.g., just because Sally is smiling after another child made fun of her, it doesn't mean that she is happy). The third phase occurs around 7-11 years old and involves understanding *how a person can reflect on emotions from various perspectives*. This includes understanding the mixed nature of emotions (e.g., being excited and nervous about going to a birthday party), recognizing that emotions can be regulated via cognition (e.g., positive self-talk vs negative self-talk), and knowing that moral beliefs can impact emotional reactions (Pons et al., 2004).

  Creating pragmatically appropriate self-regulation vocabulary. Interventions commonly used with children who have self-regulation challenges include the Alert Program (Williams & Shellenberger, 1996) and Zones of Regulation (Kuypers, 2011). Both rely on the idea that children using the program have developed the capacity to be introspective and have a solid comprehension of emotional, physiological, and social vocabulary (Butler et. al, 2016). SLPs can recommend use of these programs, although typically they are introduced to children by other professionals or classroom educators. Of note, introducing these programs when children are in a stressed state, or prior to a child developing the necessary foundational skills (e.g., emotion

comprehension; Pons et al., 2004), would likely diminish their effectiveness. SLPs can support the use of these programs by directly targeting the vocabulary used within them during intervention. Furthermore, we suggest that SLPs work with children to generate alternate vocabulary that we propose might be more meaningful than the typical language used within the programs. For example, rather than labeling oneself as being in the *yellow zone* (a term that may not have a shared meaning between communication partners), clinicians can engage children in a reciprocal interaction discussing emotions and physical manifestations that are associated with each zone, thus developing more pragmatically appropriate language to describe the state.

Scaffolding to Support Autonomy

Scaffolding to support understanding of one's own regulation, what strategies work, and when they work (meta-cognition). When children demonstrate developmental readiness though deep understanding of vocabulary important for engaging in self-regulation and use executive functioning skills within everyday dynamic interactions, SLPs can add goals to focus on enhancing children's knowledge of their own regulation and learning needs using the following co-regulation strategies.

Thinking aloud: Modelling the process of self-regulating. SLPs can take opportunities to model vocabulary and comment on a child's physical state to bring a child's awareness to how her body may be physically responding to her current state of regulation (e.g., I notice that your hands are tight fists and your face looks tense. I'm wondering how you're feeling right now?). This work can be incorporated throughout daily routine activities (e.g., lunch, getting ready for bed, bath time, coming in from recess etc.), movement based activities (e.g., playing on a playground, moving through an obstacle course), and also pretend play interactions. Commenting to highlight physical manifestations of regulation states can help children recognize the dynamic nature of how these states can be expressed and expand their comprehension of

regulation concepts, while also validating the feelings the child is having. Ultimately, we want children to understand the signs that they are becoming dysregulated and learn to implement strategies to help themselves recover before their stress is such that it has compromised PFC functioning and their ability to independently recover. Additionally, when SLPs comment on children's physical states, it can draw a caregiver or educator's attention to children's stress responses and help the adults to understand the downstream impact that stress can have on capacities important for self-regulating and learning.

Children can also learn specific tools to regulate themselves by watching how adults self-regulate (Boekaerts & Corno, 2005; Perry & VandeKamp, 2000). Initially, adults may use simple language and model the cause-effect relationship between a stress and a behavior (e.g., I'm so sleepy, so I'm going to take a nap; Sometimes when I feel really hungry, I have trouble paying attention to my work, and I get very grumpy! I need to get a snack so I can pay attention to my work and not feel so grumpy; The noise of the fan makes it difficult for me to concentrate reading my book. I'm going to turn it off). As children's language comprehension grows and their ability to engage in more complex conversations develops, the adult can begin modelling language explaining both the skill used to self-regulate and the cognitive process involved in performing the skill, by *using self-talk* or *making their thinking visible*. For example, during an interaction, a child may grab a toy from the adult's hand. The adult can use this opportunity to model aloud his thinking process behind how this action makes him feel and how he thinks through de-escalating these feelings to solve the problem. This process aims to deepen the child's comprehension of how stressors can impact how he feels, thinks, and relates to others; how a past accumulation of seemingly small stressors can impact how he currently responds to seemingly unrelated stressful encounters; and ultimately how to recover from stress in order to keep other systems optimally functioning.

Adults could also model their thought process related to selecting strategies to help them with learning. For example, while engaging in a reading activity, the adult could share with the child that she is going to make a plan to remind her of what she needs to think about prior to reading the newspaper article. She could write down the two strategies she is going to use during the activity. After completing the reading, the adult could then reflect on what strategies worked or didn't work, and why. Through this process the clinician could use gentle encouragement to engage the child in the discussion, or the child may be inclined to volunteer to make his own plan for the activity and participate in the reflective discussion.

Using co-construction to develop a toolbox of strategies. SLPs can engage children in decision making about how to best support their own self-regulation. For example, the SLP could engage children in deciding how to set up the therapy room to best support their own regulation. Together, they can make a plan for what materials would best support their individual needs, negotiate how to best support everyone's needs, decide which suggestions or materials can logically be included, make adjustments to their plan according to what is available in the context, and then monitor the impact of their choices. During this interaction, the SLP can adjust the level of co-regulatory supports and scaffolding as the interaction unfolds in order to support the child to maintain regulation. For example, a clinician might notice that while working with the child on how to set up the room, the child is requiring frequent redirection because he keeps shifting attention to a conversation occurring in an adjacent room. The clinician could infer that both the noise (a biological stressor) and the complex task (a cognitive stressor) are contributing to this change in behavior and elect to integrate co-regulatory strategies to reduce the noise (e.g., changing the environment) and reduce the cognitive load (e.g., use of visuals) in the current activity. If the clinician also makes her thinking visible, and draws the child's attention to the reasons why they changed the environment and added visuals, the goal of fostering the child's

awareness of his own regulation is still addressed, but requires less cognitive energy of the child.

Co-construction can also be used to enhance children's understanding of the learning process. Engaging children in the process of setting learning goals can provide them with the opportunity to think about the level of challenge they are ready for, plan and work toward achieving the goal, and evaluate their progress toward meeting the set goal (Zimmerman, 1998). Similarly, developing questions to evaluate one's own learning also has positive effects on that learning. For example, when children are included in the process of developing their own high-level questions to examine their own reading comprehension, comprehension of the material improves. By working through the process of generating their own questions, children are required to focus their attention on important aspects of the information presented, organize the information, and integrate new information with prior knowledge (Brown et al., 1993; Palincsar & Brown, 1984). Similarly, we propose that a child who has a social communication goal of asking peers questions might benefit from engaging in a co-construction activity considering *why we ask questions* or *what makes a good question* prior to being asked to generate questions.

Strategic questioning. Explicit questions that direct children's attention to thinking about their own regulation and learning can also be used to develop metacognitive skills and awareness of one's own regulation capacities (Butler et.al., 2017). If children require more scaffolding, SLPs can guide a child's learning through use of *pointed questions* (e.g., I noticed you were having trouble blowing those bubbles. Do you think holding the bubble wand away from your mouth might make it easier to blow the bubbles?). Strategic questioning can also be used to work toward more autonomy in the self-regulation process, through the use of *open ended questions* (e.g., How might we solve the problem [of those bubbles not blowing] in a different way?). Additionally, they can be used to gauge a child's understanding of what is being asked of him (e.g., What is this question asking you to do? or What are the criteria you used to determine if

you were successful in answering this question?). They can be used to scaffold a child in setting

a plan (e.g., What strategies worked for you last session?, or I noticed you were using deep

breaths. Was that a strategy you were using to have smooth speech?). Furthermore, strategic

questions help children learn to monitor and adjust their use of strategies (e.g., How did you do

with your /s/ sound? How do you know? or Is there anything you would do differently next

session?; Butler et al., 2017). Appendix A provides case examples applying our clinical

framework for addressing stressors and supporting the growth of self-regulation.

Summary

In this article, we reviewed the concept of self-regulation and examined how it develops

through co-regulated and socially-shared interactions. We identified potential stressors children

may encounter and considered the impact these stressors could have on cognition and self-

regulation. While much of the research demonstrating the impact of stress on cognition and self-

regulation has involved adults and children with typical development, the results still represent

critical areas of consideration for children with communication disorders.

Within our clinical framework, we shared co-regulation strategies SLPs could implement

to mitigate negative effects of stress and target foundational skills such as executive functioning

and comprehension of self-regulation concepts. Additionally, we provided co-regulation

strategies that could be used to assist children in developing the autonomy implied in self-

regulation. Many of the strategies we suggested may already be used by clinicians to address

communication challenges. However, our hope is that we have provided insight into how these

strategies may also be used to support the growth of self-regulation. The strategies are intended

to be accessible for SLPs to integrate into clinical practice regardless of the child's diagnosis,

treatment program, or aspect of communication being targeted. Certainly, more research is

needed to further our understanding of the interaction of co-regulation, self-regulation, stress,

and cognition in children with communication disorders. Nonetheless, we hope that this tutorial established the important role SLPs can take in supporting the growth of self-regulation, and that this information will ultimately advocate for a more comprehensive view of the role of the SLP in child development.

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