

Play as Regulation

Promoting Self-Regulation Through Play

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The nature of play and an overview of the stages of play in the first 5 years of childhood are discussed. The core features of sensorimotor, functional, and symbolic play are identified. Vignettes describing how play serves a regulatory function punctuate each section. A conceptual framework for the construct of regulation is presented and counterpointed against the primary sources of dysregulation in young children, including excessive psychosensory stimulation, states of intense emotional arousal, anxiety, and conditions of toxic stress. Factors are reviewed that contribute to the development of self-regulatory capacity, including temperament and constitutional factors, cognitive control in the form of executive function; positive parenting, attachment, and internal representation; and the capacity for symbolization, along with the expected progression of the acquisition of self-regulatory capacity. Specific regulatory functions of play are identified and explicated including play as regulatory practice, novelty and investigation, and roles and rules. The article concludes by summarizing the state of current empirical evidence with regard to play and self-regulation.

Key words: *development, dysregulation, empirical, play, regulation*

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PLAY AND THE STAGES OF PLAY

Play is the portal through which young children are afforded access to a vast array of developmental opportunities. Like language, play is both a means and a catalyst that propels development forward. Among the argosy of riches that play promotes is the evolution and construction of intelligence and knowledge through the acts of exploration, discovery, and mastery. The unfolding inner and emotional life is shaped by play and revealed in play through the mechanisms of projective attribution and displacement. Play gives children a means to compensate for felt limitations and deprivations—a self-curative process. Play is a source of pleasure, a road to social competence, and a dress rehearsal for life skills and roles. Play is a fountainhead of neural stimulation and, by its very nature, play is a form of regulatory practice.

Play is an action arena in which children practice regulation in spontaneous, holistic, and responsive ways. Play is not engineered.

It may be shaped by the venue, available materials, and playmates, but play arises spontaneously and is intrinsically motivated. Play is holistic in that all areas of development are potentially engaged. Play is responsive and reactive to external and internal stimuli, materials, other children, accidental occurrences, and the unfolding moment. Thus, play is creative, generative, and rich with novelty.

All of these attributes mean that in play, children are in a relatively constant flow of shifting attentional focus and selection, starting and stopping, planning and grading movement, modulating states of arousal and activity level, changing vocal volume, responding to social bids, problem solving, and so forth. The demand on children-in-play to adjust, process, and respond to such a complex and dynamic array of stimuli and experiences invests play with abundant opportunities for the practice and acquisition of self-regulation.

Novelty, which is intrinsic and ubiquitous to play, has unique features that bear on play as regulation. The ball unexpectedly rolls under a book case or over a fence; a child accidentally knocks down a structure in the making; a playmate refuses. Novelty is disjunctive and imposes nonrecurrent problems to be solved. There is also a tendency for complexity to increase as novelty increases. Solutions to novel problems require agency, intentionality, and self-reflection, all integral components of the development of self-regulation (Bandura, 2001; Kanazawa, 2010).

When play becomes symbolic, the act of pretense implies a heightened capacity for self-regulation. To engage in pretend play, which assumes ascendancy after 3 years of age, demands ability on the part of the child intentionally to suspend reality, shift between reality and pretense, and exercise greater agency. Thus, to engage in pretend play is to engage in self-regulation, and, even more important, all this is possible without the need for an imposed task.

A broad definition of play may be the most useful because play itself covers a spectrum of activity. For the purpose of this discussion, play is understood to be the “child’s sponta-

neous and pleasurable actions on objects, others, and self, which contribute to the discovery, expression and mastery of physical and social reality, ideas and feelings” (Sheridan, Foley, & Radlinkski, 1995, p. 1). Spontaneity and pleasure (including a range of positive affects) are operative concepts in play development. Play may become increasingly organized, even structured, but early play is unplanned and spontaneous. The dimension of spontaneity embraces the qualities of play as intrinsically motivated, self-directed, flexible, and unfolding. It is within this arena of novelty and change that regulation is practiced and shaped as play progresses from unplanned to repetitive and cyclical to a mindful, purposeful, and eventually a rule-governed experience. Pleasure and playfulness both motivate and serve as reinforcing bridges between and among play experiences, learning, and idea formation. During the early stages of play, children find pleasure in the act of playing, a large component of which is delight in sensation and movement, without regard to the success of the activity. Later, the child derives pleasure or satisfaction in play from the completion of a task. However, even as play becomes more goal-directed and rule governed, it retains a foot in the service of pleasure as a leave-of-absence from reality and relief from both external and internal demands. Play can be characterized to develop in three broad overlapping stages: sensorimotor, functional, and symbolic (Sheridan et al., 1995).

Sensorimotor play

Early play, virtually from birth, is sensorimotor in nature and typically involves action, pleasure seeking, and getting and taking in sensory data (Piaget, 1952). Sensation is mediated through the body, and the bodies of the child and the primary caregiver are the first sources of comfort, novelty, and discovery—essentially the first play things. Qualities of the body are then transferred to inanimate objects with similar attributes and emerge as first toys. A rattle, for example, can be an object of arousal and attention not unlike the alerting voice of the parent may sometimes be; a soft

toy that brings comfort may share qualities with skin-to-skin contact. Sensorimotor play serves an important role in getting and taking in physical/descriptive data from the environment, which become the raw material of cognitive development. Motivated out of curiosity about the world, sensorimotor play becomes organized, systematic, and repetitive. The early schemes of mouthing, banging, and shaking are proto-experiments. Objects are all subjected to the same manipulations but do not all respond in like manner, thus the baby begins to differentiate and discriminate among the properties of objects. Sensorimotor play may arise and dominate during one developmental period but returning to a sensorimotor means of knowing persists even into adulthood, especially when language fails. We have probably all had the experience of being given a wrapped gift and spontaneously wanting to pick it up and shake it with the aim of identifying, by sensorimotor means, the unknown surprise contained within. Or, most people have had the experience of encountering an unfamiliar implement for which we have neither a name nor knowledge of its function and quickly turn to sensorimotor ways of knowing by wanting to manipulate it.

Self-regulation is a superordinate construct that incorporates modulation and recovery from disorganized states in the service of goal-directed activity and also subsumes effortful control, the ability to voluntarily inhibit and activate a response, glimmers of which can be clearly observed in sensorimotor play by the midpoint of the first year (Eisenberg, Smith, & Spinard, 2016). The infant may pause shaking a rattle when the parent interjects with a vocalization, wide-eyed gaze, and facial expression of bated breath, but then, in virtual reciprocity, the infant may reactivate shaking the rattle with renewed vigor with the intent to keep the game going. The parent may spin a pinwheel that entrances the baby but then ceases spinning; at that point, the infant may become vocal and animated in posture to make the spectacle recur. These experiences of stopping, starting, activating, and sustain-

ing become the germinal seeds of what will become waiting, refined selecting, and shifting of attention and complex goal-directed action (Ursache, Blair, Stifter, Voegtline, & Family Life Project Investigators, 2013).

Functional play

With a growing repertoire of information about the world and the properties of objects paired with refined motor means, young children next begin to combine objects in functional ways. Now, a child drops the cube in the cup instead of only banging cube and cup together, or a child pulls the string to retrieve the toy rather than exploring string and toy as discrete objects. Functional play becomes increasingly involved with mastery and a growing sense of competence. It also serves as an expression and relief from age-specific emotional themes such as ambivalence during toddlerhood, which is a time when struggles around separateness and fusion, holding on and letting go, and dependence and autonomy are normative. It is not unusual at this period to see toddlers preoccupied with hoarding and giving, filling and dumping, and pulling and throwing. The increase of assertion and drive-to-action at this time serves to propel development forward and is expressed in “muscularity” and intrusiveness as seen in the vigor and robustness of motor play, interest in locomotor toys, and satisfaction in increasingly forceful and repetitive buildup and knockdown play.

The vigorous toddler will begin by 24–30 months to slow down motor action on command, start and stop building and rebuilding with blocks, and intentionally fill a reservoir with beans or sand that spills to activate a wheel and then watch and wait until the action stops and start the process again. This growing capacity for selective and effortful inhibition is a critical component of self-control, which will be operative in the more refined capacity for self-regulation.

Symbolic play

A spawning representational capacity overlaps with functional play. It emerges around

18 months with the child's ability to reenact in play the now internalized routines of daily life, such as eating and sleeping observed in feeding the doll and putting it to bed or giving it a bath. This growing ability to remember, encode, and enact develops into true symbolic play, beginning around 24–30 months, and reaches a zenith during what Erikson (1950) characterized as the "play age" (3–5 years). Cardinal characteristics of symbolic play include the use of pretense to reach beyond the literal through the combination and creation of dramatic themes and plots that go beyond personal experience. The specific features that particularize symbolic or pretend play include the following: a capacity for object substitution; the creation of imaginative sociodramatic plots and action that go beyond personal experience; and the "imaginative anticipation of future roles played out with toys and costumes in tales and games" (Erikson, 1975, p. 213). These are increasingly shaped and governed by roles and rules. Object substitution suggests a decreasing dependence on toy replicas as play things. For example, the child may now pretend that a block is a car or a banana held to the ear is a phone. Sociodramatic action is organized around themes, which are enacted progressively, from a simple story line of logically linked ideas to complex and unfolding plots driven by imagination and fantasy. For example, play by a group of preschoolers engaged in cooperatively recreating a building and enacting worker roles with improvised tools, after having visited a construction site, is more literal and linear than the complex and imaginative enactment of a team of "scientists" planning and making a rocket ship to go to the moon, about which they have no experiential referent. Roles increasingly defined by reified rules of conduct, dress, props, or equipment, for example, structuralize pretend sociodramatic play. Although solitary and onlooker play persists, cooperative capacity takes center stage during the "play age," as children grow in their ability not only to use materials from a common stockpile (associative play) but, eventually, to share ideas and contribute

to a common endeavor, such as building a castle with a division of labor (cooperative play).

This progression of play from sensorimotor through symbolic serves development along many lines, including the following: the formation of motor skills, relationships to inanimate objects, and social capacities. Play contributes significantly to symbol formation and the consolidation of language, both of which are salient to the development of self-regulation. Representational and early pretend play continues to be driven primarily by sensation, action, and use of concrete toys and props that are replicas of the real world. These are employed to reenact experienced events and rehearsed routines encoded as rudimentary ideas. For example, the child feeds the doll as she has been fed or has been bathed. The weight afforded the concrete in this representational play scaffolds the capacity for a still forming abstraction and imagination that later will characterize truly symbolic play. The balance of representational play derives primarily from the real experience of being fed or bathed rather than pretense, and thus, representational play serves as a relatively concrete touch point from which play becomes increasingly driven by pretense. The early object-dependent representational play could be thought of as platform on which the capacity for abstraction and language builds. This construct is consistent with an analysis of the empirical literature, summarized with the statement that "Children's levels of pretend play and their early language development do appear to be related, with pretending preceding language" (Lillard et al., 2013, p. 19).

As children's play develops toward greater pretense and abstraction, it is informed primarily by ideas and language, with literal enactment in action and objects increasingly serving a supporting, affirming, and validating role. Thus, when abstraction fails, the child can fall back on the concrete to scaffold confidence in abstraction via language and symbol use. When pretending that a jungle gym is a rocket ship becomes too great a stretch for imagination alone, for example, children might search for a toy replica of a rocket ship

to validate and embellish their imaginative play.

Play also serves as an important passage, constituting an intermediate or transitional space between the worlds of magical thinking and reality (Winnicott, 1971). Thus, the child can find relief from the real world in play by compensating for deprivations and resolving conflict. In play, the child who feels insignificant and powerless in an adult world can assume the role of superhero, or the child who feels deprived can turn passive to active, cooking a feast for all. Likewise, play can test and affirm reality when fantasy threatens the psychological integrity of the inner life. The monster can be put in cage or box, and thus, the menacing boundlessness of imagination can be contained. The castle destroyed by knights can be rebuilt, assuring children that repair is possible and that aggression will not destroy those they love. Within the safe container of toys, tales, costumes, and props, children can try out new ideas and rehearse roles, relationships, and affects in fantasized anticipation of future roles and passions. Among the almost myriad functions that play serves is its role as regulation and a context in which to practice and promote regulation of sensation, feelings, and behavior.

The symbolic play stage is the high point during which play and regulation become mutually interdependent, one promoting the other. Pretense, a key marker of symbolic play, requires children to suspend reality and thus volitionally select and assume control of attentional focus and mentation. A child, among a group of children cooperatively engaged in building a fort, may act "as if" he were going to knock it down, but by conscious effort may inhibit the impulse through a growing capacity to self-monitor and anticipate the consequences that he may be rejected by his peers if he did so. The imaginative role of bricklayer that the children are enacting is constructive, not destructive, and thus role expectations in play support a growing capacity to self-regulate in the service of social norms. In fact, the whole endeavor of building the fort or castle de-

mands a good deal of planning. Who will play what role? How will the necessary materials be secured and stockpiled? How will the construction be sequenced and coordinated? Thus, executive functions, which are nodal in higher order self-regulation, are exercised in play.

REGULATION

The construct of regulation has roots in the classical concept of homeostasis (Cannon, 1932), which describes the self-correcting tendency of the body to maintain a relative constancy or biological equilibrium among a range of functions, even in the face of changing external and internal dynamics. Although the homeostasis research focused originally on physiological functions, such as heart rate, temperature, and respiration, the concept of homeostasis has been extended to systems such as emotion, cognition, and sensation. This recognizes the functional similarities between physiological systems and other complex social and even self-regulatory systems.

A working definition of self-regulation for this article is the child's developing capacity to flexibly modulate and grade reactivity to sensation, affect arousal, and behavior with relative autonomy in support of goal-directed actions across a broad range of functions (Carver & Scheier, 2016; Murray, Rosanbalm, Christopoulos, & Hamoudi, 2015). Self-regulation is not a static process and no one is always in a regulated state, so subsumed in the definition of self-regulation is the ability to recover from episodes of excessive reactivity to stimuli and strong emotional states of arousal or disinhibited behavior (dysregulation) and return to a homeostatic baseline employing self-calming mechanisms.

Whereas the regulatory construct can be applied to almost all dynamic physiological and behavioral systems, the regulation of sensation and affect are two closely related processes in very young children (particularly during the sensorimotor and early functional play periods), which, in turn, find

expression in behavior. Before sensory and emotional experiences can be discriminated physiologically and semantically (as emerges during the symbolic play period), they are likely experienced by young children in an embodied and relatively undifferentiated way. Both sensation and affect have common origins in neurophysiological arousal at the subcortical level, and only later in development can they be registered in awareness as a particular type of localized sensation of a particular intensity or as a differentiated feeling state or emotion with associated experience. In common parlance, it is not unusual to use the word “feeling” to represent both sensory and emotional states synonymously.

Even when the capacity for physiological and semantic differentiation of sensation and emotion is developmentally possible, the two are often correlated. For example, strong negative or positive emotions may be associated with the perception of the sound, tone, and volume of another’s voice, or with the nature and intensity of a touch, or with the visual memory of a facial expression or an event. Thus, positive or adverse sensory experiences tend to have an associated emotional valence. This connection is frequently observed in individuals with posttraumatic stress disorder, for whom specific sensory experiences in the present hold the potential to trigger associated memories and emotional reactions similar to those experienced in relation to the actual adverse events of the past. Likewise, traumatic events may impose a lasting mark on the arousal system, causing individuals to become protectively hypervigilant to sensory cues, or conversely, to become blunted, even dissociated from sensory signals and the associated affect arousal they may trigger, suggesting that disorders of trauma may precipitate secondary disorders of arousal.

Because sensory regulation and affect regulation, especially in infancy (during the sensorimotor play period) and junior toddlerhood (during the functional play period), are experienced as essentially co-occurring phenomena, they might be better understood

and expressed conjointly as “psychosensory” regulation. What will become affect regulation may have common origins with sensory regulation until these channels become differentiated.

FACTORS CONTRIBUTING TO STATES OF DYSREGULATION

Because the ability to recover from dysregulated states is an integral part of the capacity for self-regulation, the expression and causes of dysregulated states in young children are critical to this discussion. Four broad factors can contribute to provoking dysregulated states in young children—excessive psychosensory stimulation, states of intense emotional arousal, anxiety, and conditions of toxic stress. In infancy (i.e., in the sensorimotor stage of play), these dysregulated states are usually associated with distress behaviors, including crying and other signaling, hyperarousal, and difficulty calming. Typical toddlers (i.e., in the functional stage of play) are likely to exhibit tantrum-like behavior, which is expressed by breaks in emotional control expressed physically or in oppositional and withholding behaviors. In the preschool years (i.e., in the symbolic stage of play), dysregulation may be expressed by verbal combativeness, overtly directed physical aggression, and noncompliance or withdrawal.

Excessive and/or prolonged psychosensory stimulation in very young children (i.e., during the sensorimotor stage of play) may result from intense input to all five sensory systems, including vestibular stimulation involving abrupt movement or antigravitational positioning (e.g., sensation of being dropped, moved suddenly, or swung) and proprioceptive stimulation (e.g., in the form of bouncing or rough handling). The sensory challenge protocol (McIntosh, Miller, Shyu, & Hagerman, 1999) replicates some of these sensory stress experiences in a controlled, supportive, and nonharmful manner for purposes of research. In the context of a trusting relationship and playful ambiance, some of these behaviors and associated

sensations may assume a pleasurable quality, suggesting the import of context. The child in the functional stage of play, who may seem eager and insatiable for rough and tumble fun with Dad, for example, may find the same experiences at the hands of a stranger terrifying. Similarly, the ambient environment, if experienced in the form of chronically chaotic or overstimulating conditions, may require an infant to resort to protective mechanisms, such as turning away or tuning out to cope.

As suggested previously, these sensory states in infancy and early toddlerhood may co-occur with states of emotional overarousal. Tolerance for stimulation increases with maturation and the support of good-enough parenting (Gartstein, Bridgett, Young, Panksepp, & Power, 2013; Winnicott, 1960), essential components of which are literal and psychological “holding,” aimed to protect children against excessive “impingements” from the external and internal environment. In early infancy, during the sensorimotor stage of play, this protection takes the form of external regulation by the parents including proximity, preoccupation with the baby, physical caregiving, and soothing. Thus, rocking, singing, and contact comfort play contain and regulate the baby, protecting her from being overcome by excessive stimulation. There is a growing body of evidence that some infants and older children fail to accommodate to average expectable sensory stimulation and persist in having challenges processing and modulating their response to sensory stimulation. Among these children, experiences that may be neutral or even fun for typical children, such as tickling or rough-house play, are experienced as aversive (Davies & Gavin, 2007; Owen et al., 2013; Zero to Three, 2016).

When emotions and feeling states are more differentiated from sensory stimulation (which occurs more crisply by the symbolic play stage), prolonged emotional overarousal holds the potential to dysregulate children. States of prolonged threat, fear, deprivation, and neglect in the absence of the buffering effect of good-enough caregiving hold

the potential to activate the cortisol system and, if prolonged, pose both a psychological threat and a physical threat to the child, with the potential for long-lasting consequences (Shonkoff, Garner, & The Committee on Psychosocial Aspects of Child and Family Health, Committee on Early Childhood, Adoption and Dependent Care and Section on Developmental and Behavioral Pediatrics, 2011).

The average expectable developmental anxieties of early childhood, when coregulated within the context of a supportive relationship, actually can serve as developmental affordances to promote tolerance of frustration, coping capacity, and confidence in mastery. Included among the average expectable anxiety-tinged tasks and themes of infancy and early childhood are the following: weaning, stranger anxiety, separation anxiety, fear of aggression, toilet training, fear of the loss of the love of the love object, sleeping alone, and fear of bodily harm. Because anxiety is so ubiquitous over the course of early development, it is classified here as a distinct factor rather than being subsumed under emotions and feeling states. Anxiety suggests a condition of disquiet tinged with fear and discomfort that, when excessive and prolonged, holds the potential to dysregulate in an acute, situation-specific way or in a milder but less focused, free-floating way. Prolonged intense anxiety situations (i.e., toxic stress) can compromise the child’s ability to regulate by precipitating psychophysiological changes and defensive positions, resulting in excessive internalizing or externalizing patterns of adaptation. Internalizing can paralyze and constrict children from playing or exploring, for example, or externalizing can render them unbridled and unable to settle, attend, and be goal-directed.

The term, *toxic stress*, refers to prolonged adversity that overwhelms the child’s coping capacity and chronically activates the hypothalamic-pituitary-adrenergic axis in the absence of the buffering benefit of a sensitive, responsive, and reliable caregiver (Kryski et al., 2013). Adverse states frequently precipitate excessive anxiety, expressed in hyperactivation of the sensory and

affective systems. Adverse childhood experiences, including physical abuse, sexual abuse, exposure to violence, and prolonged neglect, are examples of chronic stress situations (Felitti et al., 1998; Shonkoff et al., 2011). Trauma refers to events that threaten life or physical well-being, such as a natural disaster, an automobile accident, or a severe illness.

The impact of living with toxic stress and the victimization of trauma may have long-lasting deleterious effects on the developing child's capacity to self-regulate, including impaired inhibitory control and inability to delay gratification, as well as excessive or muted emotional responsivity, impulsivity, and disorganized thinking. The long-term effects may include altered brain architecture, increased health risks, impaired economic sustainability, and even mortality. The impact may be moderated by resilience and protective factors related to the caregiving environment and individual differences; for example, not everyone who has experienced trauma develops posttraumatic stress disorder (Bonanno, 2004). Empirical evidence, however, strongly tips in the direction to indicate that toxic stress and trauma pose risks of significant magnitude to the developing child (Hamoudi, Murray, Sorenson, & Fontaine, 2015).

CONTRIBUTIONS TO THE DEVELOPMENT OF SELF-REGULATORY CAPACITY

Four broad factors contribute to the development of self-regulatory capacity. They are temperament and constitutional factors, executive functions, positive parenting, and a capacity for symbolization.

Temperament and constitutional factors

Constitutional and temperamental factors contribute to differences in thresholds of sensory registration and patterns of reactivity to sensory stimuli (Rothbart, Ahadi, & Hershey, 1994). These patterns of biological arousal and reactivity are among the variables identified to differentiate among the temperamental styles and are further linked to the forma-

tion of behavioral inhibition and disinhibition, predictors of future maladjustment (Egger & Angold, 2009; Eisenberg, Spinard, & Eggum, 2010). Temperament is further thought to subsume biologically based tendencies to an inclined level or range of emotionality in infancy, both positive and negative (Rothbart, Ellis, Rueda, & Posner, 2003).

These individual temperamental differences suggest that each child's homeostatic baseline or "regulated state" and pattern of psychosensory responses are entitled to look different, virtually from birth. In an interview with Stella Chess (personal communication, March 2000), she suggested that mothers and nurses in the newborn nursery always knew about the different temperamental styles. She further suggested asking any nurse in the newborn nursery what happens if the nursery room door is accidentally slammed shut. The answer you are likely to get is that some of the babies will startle, get fussy, maybe cry and scream, and present a challenge to calm; others will alert, look around, but quickly and quietly calm and return to a relatively contented state; and others will not react until after an interlude of time has passed and the nurse has all but forgotten the incident. Thus, the three basic temperamental types fall out: difficult (feisty), easy (flexible), and slow to warm (shy), which have a strong empirical basis (Thomas, Chess, & Birch, 1968; Trofimova & Robbins, 2016; Zentner & Bates, 2008). These patterns moderate but tend to persist (Raffaelli, Crockett, & Shen, 2005), so that when a preschool teacher suggests to children to keep their bodies still and their voices soft, the "still and soft" of one child is entitled to look different than the "still and soft" of another, within a range. The implication is that each child's resting affect and level of arousal should be assessed to give clues as to what "regulated" looks like for each individual child.

These temperamental characteristics of sensory reactivity are likely to be reflected in sensorimotor play styles; in turn, play experiences exert a modulating influence on reactivity and arousal, suggesting a bidirectional

relationship. Although most attention to the relationship of play and regulation has focused on symbolic play, presymbolic play (i.e., sensorimotor and functional stages of play) also may serve an important sensory regulatory function. Sensorimotor and functional play experiences afford the child opportunities to habituate and desensitize to intense stimuli and to practice modulating levels of psychosensory arousal and state. For example, Jack-in-the-box play (more typical in the functional stage of play) may be initially alerting if not hyperarousing for many young children, and fear evoking for some. With repeated exposure to the stimulus, however, most children habituate, and their patterns of overreactivity desensitize and mute into a modulated anticipatory excitement, which affords opportunities to practice inhibitory control, transforming fear into delighted surprise. Empirical research using the sensory challenge protocol has demonstrated that an initial “gating” or hyperalerting response, as measured by electrodermal activity, moderates over time in typical children as they habituate to repeated exposure to strong stimuli. This research has also shown that the habituating response can differentiate typically developing children and those with a sensory modulation disorder, who continue to exhibit the same intensity of electrodermal activity in spite of repeated exposures to the same stimuli (McIntosh et al., 1999; Miller, Schoen, & Nielson, 2012; Zero to Three, 2016).

Executive functions

Executive functions are interrelated cognitive operations that contribute to planning, monitoring of behavior, and goal setting. They include the following: working memory, inhibitory control, and flexible attentional selection. Executive control can be thought of within a top-down framework. It is associated with the prefrontal cortex (Blair, 2016).

By 4–5 years of age (i.e., during the symbolic stage of play), children begin to acquire self-control and to apply effortful processes in a variety of situations. The possession of these skills is highly adaptive over

the life span, as demonstrated by the now well-known “marshmallow test.” In this experiment, 4-year-olds were presented with a challenge. If they could resist eating the marshmallow placed in front of them, they would be rewarded in the near future with two more marshmallows. The trajectories of those children with higher self-control capacity included becoming adults who were more likely to finish college and have greater incomes and to be less likely to be overweight (Mischel, 2014; Mischel, Shoda, & Rodreguez, 1989).

As in almost every aspect of development, the coaction of nature and nurture is contributory. It is now recognized that inhibitory control can be learned. Many traditional childhood games, such as Red Light-Green-Light, Statues, Simon Says, and Musical Chairs, all incorporate the practice of executive skills including response inhibition and modulation of arousal, flexibility of attentional sets, and working memory (Yeager & Yeager, 2014). Whereas these are semistructured, rule-governed play experiences, the exercise and practice of executive and effortful control capacities can be observed in more open-ended symbolic play as well. Consider complex constructive play typical of the symbolic play stage, in which children shift attention from the structure at hand to return to the stockpile of blocks but have to wait a turn before returning to the building-in-progress and then pick up the work where it was left off. Or, consider children with riveted attention, intent on securing a piece of cloth atop the walls of a block structure to serve as a roof, in spite of quasi-chaos around them and the blaring of a school loudspeaker. These naturalistic, intrinsically motivated, and self-directed play scenarios are rich with opportunities for practicing executive function skills.

Positive parenting

A body of evidence indicates that the quality of parenting influences the formation of self-regulatory capacity beginning in infancy (Bocknek, Brophy-Herb, & Banjeree, 2009; Crossley & Bruckner, 2012; Kochanska

& Kim, 2014; Moilanen, Shaw, Dishion, Gardner, & Wilson, 2009). Supportive emotional availability, responsiveness, and reliability are parental qualities that promote the growth of self-regulatory abilities in young children (Kidd, Palmeri, & Aslin, 2013). These attributes are consistent with those that also lend themselves to the formation of a secure attachment in infancy (Bretherton, 1992; Sroufe, Egeland, Carlson, & Collins, 2005). At its core, attachment has meaning for surviving and thriving.

The dance of attachment formation has long roots in parental history and, although spawned in gestation, becomes vitally alive with the birth of the baby. The baby is born with a remarkable array of inborn patterns of action and reaction (e.g., sucking, clinging, and smiling) that prepare the infant to play an active participatory role (but not a symmetrical or equal role with the parents) in the infant's own survival by "wooing" the caregiver into active falling in love (Brazelton, Koslowski, & Main, 1974; Foley, 2006). However, the baby's regulatory resources are less well formed than its signaling and reactive capacities. The baby can approach toward pleasurable stimuli or avert from negative stimuli; alert positive, signal distress, shut down into drowsy sleep-like states, or sleep itself to escape aversive experience. Physiological mechanisms such as yawning, sneezing, and coughing also serve a discharge function to reduce tension and promote return to a homeostatic or regulated state. When these limited inborn patterns fail, the infant is likely to become dysregulated and signal distress, which is aimed to evoke the proximity and ministrations of a positively attached caregiver.

Thus, caregivers play a crucial role not only in sustaining the life of the baby but also in serving as external regulators to protect the baby from excessive stimuli and toxic stress. They do this by maintaining the baby in a relatively homeostatic state, keeping the baby fed, safe, warm, contained, and content. In this role, the parents act as an "auxiliary ego," an external source of regulation, vigilance, and

reality testing to supplement the infant's rudimentary ego capacity, or in a more contemporary conceptualization, parents serve as an "auxiliary prefrontal cortex." This kind of sensitive, responsive, and reliable caregiving promotes a secure attachment that provides the infant with a feeling of "confident expectation" that survival is assured, which liberates the infant to turn to the world with increasing periods of alertness, contentedness, and curiosity. Parent as primary external regulator quickly gives way to mutual or coregulation (Gianino & Tronick, 1988), in which the infant plays an increasingly active and participatory role in regulatory efforts, often taking the form of repairing interactive mismatches and engaging the parent.

With the onset of upright locomotion (i.e., in the functional play stage), the junior toddler actively "falls-in-love with the world" and explores it from the secure base of an available coregulating parent. Outward bound excursions are punctuated with returns to the parent for "emotional refueling" when memory of mother fades and anxiety assumes ascendancy. Progressively, the toddler learns to manage separation anxiety in increasingly abstract and internalized ways, such as through checking back visually instead of by physical reunion. Later, this occurs symbolically by "reaching out to touch" through language. By about 3 years (i.e., during the symbolic play stage), it occurs through evoking and holding in memory and mind, an "idea" of the internally represented coregulating parent.

The preschooler who is worried about the absence of mother might play out her role as comforting physical caregiver by feeding, bathing, and dressing the dolls. Thus, by enacting in play the coregulating mother represented in mind, the child is able to evoke the feeling memory of mother's comforting and to bind the anxiety. Later, simply talking about mother being at work, what she is doing and what she is wearing might be sufficient to evoke the comforting mother held in mind and may soothe the child's worries.

This regulatory progression or hierarchy of anxiety management (Foley, 2006), proceeds from concrete to abstract and from external to internal. It is a prototypic marker in the formation of executive functions and the trajectory of self-regulatory development. A cardinal feature in the emergence of executive functions during the symbolic stage of play is the ability of the child to sustain a relatively constant and positively introjected symbolic representation, such as that of the secure coregulating parent, and to use that “internal working model” to guide and regulate her or his own behavior (Davies, 2011; Zelazo, Muller, Frye, & Marcovitch, 2003). Thus, by about 3 years of age, children who are now equipped with symbolic capacity, more complex language, and an inner representation or working model of the coregulating securely attached parent are launched on the road to self-regulation.

The capacity for symbolization

Because symbols mediate between a felt need and behavior by binding and modulating impulses and feelings, they play a nodal role in the attainment of self-regulation. Thus, the little boy who does not want to go to bed until dad gets home may don dad’s shirt and walk about in his shoes until his worry and longing are sufficiently soothed to allow him to make the transition to bed. Symbols stand for concrete objects, people, and experiences in the real world; they afford the developing child progressive cognitive flexibility and communicative efficiency.

Words “are images of matter . . . having a life of reason and invention” (Bacon, 1605/1973, p. 25). They subsume and organize myriad discrete concrete and sensory attributes of objects and coordinate experiences into coherent, economical, functional descriptive schemas, which vastly streamline and speed up cognitive processing. Theoretically, symbols serve to bind negative impulses and feelings from direct behavioral enactment by neutralizing and/or displacing them into expression in language, or by more appropriate action, such as symbolic play, or by

“mentalizing” them in thought and reflection. Freud (1962) expressed the construct concisely, “The man who first flung a word of abuse at his enemy instead of a spear was the founder of civilization” (p. 36).

From an evolutionary perspective, symbols may have evolved to serve survival by promoting social discourse and thus connectedness and cohesion. Freud (1900/2004) suggested that even the precursors to symbols in the form of fleeting screen memories serve a regulatory function, as when the infant “hallucinates” or has a fleeting visual memory of the breast, which helps it wait for physical satisfaction. Greenspan and Shanker (2004) suggested that symbols are spawned when “perception is separated from its action” (p. 25). The interruption of fixed action patterns such as hunger–food and fear–avert opens a mental window for perceptions to germinate and eventually for thought and reflection to form where action had prevailed. An active ingredient in symbol formation is affect. Affect charges experience with meaning, consistent with the idea that symbols are “signs charged with meaning.” For example, a gate is typically a signifier of no particular significance beyond being a location boundary marker or keep out “sign.” However, if a preschooler has had a dog lunge up at him at a particular gate, when approaching it in the future, that gate would now be charged with meaning by evoking memories, associations, and feeling states. Thus, it would be transformed from a sign into a symbol.

Symbols, whether in the form of pretend play, expressive language, subvocal private speech, inner self-talk, imagery, or gestural systems, intervene between impulse and action by interjecting a pause, a generative gap that allows for the spawning of thought and reflective function. Language plays a critical role in regulatory development as attested by the fact that many first words, such as *more*, *no*, *stop*, and *go*, all have regulatory implications. Therefore, symbolizing serves a critically significant and refining role in the service of regulation.

THE DEVELOPMENTAL PROGRESSION OF SELF-REGULATORY CAPACITY

Kopp (1982) provided an important early developmental map of the progression from state modulation to effortful control to self-initiated regulation, which has been supported by increasing research evidence (Murray et al., 2015). In the first few months of life (i.e., during the sensorimotor stage of play), the antecedents of regulatory capacity are found in modulation of state of arousal and activation of patterns of action and reaction. For example, the baby is able to orient attention away from a stressor, which may represent a distant precursor to what will become executive control. The ability to self-soothe and reduce stress and frustration through thumb sucking may prefigure self-sufficiency and what will become internally mediated emotion regulation. Neurophysiological maturation and early external regulation provided by parents in the form of warm, responsive, contingent, and soothing interaction, along with the establishment of predictable routines, are important antecedents to what will become internally mediated mechanisms.

By the midpoint to end of the first year, infants actively modulate sensorimotor responses and begin to select and shift attention. Patterns of modulation may serve to increase infants' awareness of their own actions and establish a foundation for what will emerge into a capacity for self-observation at around 18 months (late functional and early symbolic play stages), the active ingredient in a growing ability to self-monitor (Lewis & Brooks-Gunn, 1979; Rochat, Broesh, & Jayne, 2012). Prior to the emergence of self-regulation are the beginnings of self or effortful control, which emerge between 22 and 33 months (i.e., at the early symbolic play stage), which are expressed by the following markers: slowing down motor activity, suppressing or initiating activity to signal, lowering of voice, effortful attention, compliance to delay or inhibit a response on caregiver request with decreasing amounts of external mediation, and increasing participatory regu-

lation (Kochanska, Murray, & Harlan, 2000). As self-control emerges into self-regulation during the symbolic play stage, children gain an increasing understanding of the conventions and accepted patterns of daily life such as expectations that govern eating, dressing, and going for a walk. Parental coregulation stands as an important mediating function in the forms of reassurance and calming by removing their children from situations of excessive stress and giving affection, modeling self-calming strategies, and teaching rules and behavioral consequences.

The origins of self-regulation are found in the child's growing ability, which emerges around 30–48 months, to employ symbolic play, thought, language, and evocative memory as internal modulators and mediators of attention, affect, and behavior. At this time, behaviors, such as the ability to recover independently from small hurts, engaging in play with a toy as a means to modulate distress through displacement and shifting attention, and coping with short separations from the parent without significant loss of composure, are markers of a growing internal locus of control. Cognitive self-regulation in the form of set shifting between internal representation and external environmental stimuli and growing selective attention in the form of focusing on a specific task while filtering extraneous stimuli become increasingly integrated and are important mechanisms of self-regulation (Kannass, Oakes, & Shaddy, 2006). Emerging linguistic ability serves to "cool" emotional reactivity and intensity by imposing control over actions and increasingly assuming ascendance as an internal regulator. For example, the anxious preschooler may be relieved by self-talk that, the "lion is in the zoo," or by simply identifying and labeling a feeling state, so that its intensity may be "cooled." Language skills promote self-reflection, which supports self-regulation.

Likewise, parental coregulation during the symbolic play period increasingly allows opportunities for children to practice self-regulatory skills through shifts in parenting style toward greater use of coaching and

words to express emotion, solve problems, and give guidance in rule-following and task completion. For example, previewing in narration what the child can expect to happen and how to behave at a forthcoming social event may well pave the way to a successful outcome.

THE REGULATORY FUNCTIONS OF PLAY

Among the early and often cited references to play as regulation are (Vygotsky, 1962, 1967) descriptions of private speech and pretend play as having pivotal roles in the development of regulatory capacity. Private speech consists of self-directed utterances that inhibit impulse and direct behavior, antecedents of internalized self-talk. Pretend or symbolic play is theorized to promote self-regulation in two ways. Pretend play deals with the interface of the imagined and the real. The former suspends the latter by imposing intentional control over external stimuli, thus exerting regulated mentalization and fantasy over physical/descriptive reality.

Furthermore, in pretend play, children assume roles that, over time, assimilate societal conventions, norms, and rules, thus defining and codifying behavior. This is a precursor to later rule-governed play in the form of organized games. For example, the child who plays policeman early in the representational phase of symbolic play may assume the role by proudly displaying his badge. The concrete prop subsumes and stands for the role. Later in the fully symbolic phase, the child's imagination is expanded and the child becomes able to play "as if" being the policeman, with specific parts, lines, and roles and functions, by relying on commonly understood rules. Thus, play affords the child "free movement within presented limits" (Erikson, 1972, p. 133).

Three regulatory functions of symbolic play are discussed in the sections later. They are play as regulatory practice, play as novelty and investigation, and play as roles and rules. Each of these functions has bearing on the development of regulatory capacity.

Play as regulatory practice

Play as regulatory practice is a potent form of regulatory shaping. Because play by its nature involves action, object manipulation, and enactment, it affords children the opportunity to experience and experiment with a wide range of states of arousal, feeling states, activity levels, shifts in attentional focus, and range of vocal volume, sometimes all within any one play scenario. Often, this regulatory practice is experienced in experimentation, with such things as extremes from pretend sleep to frolicking with abandon; whispers to shouts; darting attention to focused concentration; and gentleness to acceptable expressions of aggression at the work bench or rough and tumble play. This interplay of opposites in dialectical fashion acts to create a sensory-affective and behavioral middle. Demands for changes in levels of activity and attention coming from authority figures or peers in the social context of play, such as they constitute spontaneous transitions from one state to another, afford the child opportunities to experiment with grading and modulating sensation, inhibition, emotion, and behavior. An important aspect of self-regulation is the ability to recover from states of dysregulation with increasing autonomy. This suggests that experiencing a range of dysregulated states may be a necessary prerequisite to practicing and forming pathways and strategies of recovery from dysregulation, progressively leading to more internalized, efficient, and symbolic modes of regulatory recovery. A hypothesis might be entertained that temper tantrums, which are expected during the functional play stage, serve such a developmental function. They hopefully bring the caregiver into proximity to coregulate recovery and thus afford the toddler guided practice in learning and internalizing recovery strategies. Play in the symbolic stage provides a socially acceptable forum for experimentation with states of dysregulation and recovery. In play, children experiment with the latitude and limits of sensation, affect, and behavior by creating model situations as in rough and tumble play and faux fighting. Rough and tumble play is a

unique type of play that may contribute to the development of social competence, in part by the helping the child learn to discriminate real threat from pretense and to practice the regulation of aggression (Pellis & Pellis, 2007).

Play as novelty and investigation

Play as novelty and investigation (Sutton-Smith, 1964) arises as a part of the spontaneous and unfolding nature of play, particularly sociodramatic play, which may shift course, theme, and plot at the whim of a playmate or an unanticipated accident. Learning to deal with novelty requires the development of abilities, such as cognitive flexibility, shifting attention, problem solving, adaptability, and coping—all dimensions of self-regulation. Novelty is apt to stimulate exploratory investigation, initially as curiosity and then as effort at learning, controlling, adaptation, and mastery. Children who are positively stimulated by the challenge of exploring, negotiating, and discovering novel circumstances, objects, and environments in play are apt to experience them as positive stress responses (i.e., sources of zestful arousal, mastery motivation, and perseverance). Thus, they come to perceive novelty as an exhilarating challenge rather than a threat. Over time, the ability to draw upon and generalize from successful exploratory and investigative play experiences of novel circumstances serve to regulate perceived stress to within manageable limits. This is reflected in data demonstrating that playing well predicts coping well (Christiano & Russ, 1996).

Play as roles and rules

Roles and rules (Bodrova, Germeroth, & Leong, 2013) unfold out of symbolic sociodramatic play and are powerful play functions that promote the development of self-regulation in the preschool years. In sociodramatic play, children assume and experiment with roles employing increasing symbolic imagination so that the child moves beyond roles based on concrete props alone to a growing understanding of playing “as if” one were the doctor or the fireman.

Eventually, these roles begin to be defined by increasing reliance on commonly understood rules. Doctors save lives by healing and firemen save lives by rescuing, which circumscribe and regulate behaviors by proscriptions and prohibitions. These roles and rules are initially adhered to in obedience to the order of the adult world, the desire to participate in the adult world, and a security found in regularity. By the high point of the “play age,” roles and rules become governed progressively by mutual and collective obedience to the will of the play group. Rules tend to become more complicated and the play to become increasingly about playing with the rules themselves. This means that children must regulate impulse in the service of rule following, which is consistent with the idea that the “maximum degree of willpower” or greatest self-control is afforded and acquired by children through pretend play (Vygotsky, 1967, p. 14).

Examples occur when, in the play corner, a preschooler 5 years of age dons a policeman’s motorcycle helmet but holds that role in suspense and assumes his place behind the cash register selling a variety of foodstuffs—taking play money, giving change, and dispensing the purchased items. Continuing the scene, a little girl pushing a baby stroller buys a chicken, which he hands her, but she refuses to pay. This precipitates some verbal exchanges about the rules of trade but to no avail. The girl runs off with the chicken in the carriage and the boy now switches roles to officer and chases after her. When he catches her, she hands back the chicken. They do a little tug of war and then become calm as they break role and respond to the call for cleanup.

Just within these brief few frames of a real play scenario, one observes the intentional and pleasurable suspension of daily preschool life through pretense, and the assumption of a variety of roles defined and regulated by props and prescribed functions, as well as the injection of impromptu novelty and a deviation from expected roles and rules. In the related scenario, when the first attempt using a higher order solution involving considerable restraint and willpower via a verbally

mediated plea to self-regulation and rule conformity fails, there is a playful regression to more toddler-like chase and catch. The players assume new roles and expectations, acting “as if” thief and police officer, with heightened activity level, vocal volume, and affect arousal. Upon being caught, there is a coregulated recovery to a homeostatic state and self-regulated return to business as usual. This scene exemplifies an act of practicing regulation through play that involves negotiating state changes, coping with novelty, use of roles and rules, and various levels of regulatory effort in the service of co- and self-regulation and without the need for an imposed task or external intervention.

SUMMARY OF EMPIRICAL EVIDENCE FOR PLAY AS REGULATION

The empirical evidence for the formative impact of symbolic or pretend play on the development of self-regulation defined by executive function and emotion regulation is at best inconclusive. Lillard et al. (2013) conducted a systematic and careful descriptive examination of existing research evidence supporting the impact of pretend play on a range of developmental domains, including executive function and emotion regulation. They examined three possible relationships between pretend play and the targeted developmental domains of executive function and emotion regulation. The three relationships were as follows: a direct causal/critical relationship; a contributory relationship involving only one possible pathway (i.e., equifinality); and a relationship to any by-product variable of pretend play (but not exclusively) that may impact, in this case, executive function and emotion regulation (epiphenomenon).

The summary evidence from an analysis of 14 studies on the impact of pretend play on executive function and emotion regulation is that pretend play is not likely causal with regard to executive function categorically, but it may impact executive function for specific subsets of children when measured by some tests or subtests. It was unclear whether pretend play contributed to other pathways to

executive function or is reliably associated with any by-product variable that may impact executive function. As to pretend play and emotion regulation, the investigators found suggestive evidence of a possible causal relationship, but there were outcome inconsistencies based on parent report across studies. It was not clear that pretend play was contributory to some other pathway to emotion regulation and there were too few studies to suggest any contribution from some by-product variable. Underlining the entire analysis is a weak pool of research data, and the investigators described having to resort to a descriptive analysis, “because so many studies in this area are methodologically unsound” (Lillard et al., 2013, p. 5). With such a spongy database, inferences need to be made carefully and conclusions drawn with extreme caution.

Responses to the aforementioned analysis acknowledge the paucity of well-designed research to draw any clear conclusions about the role of pretend play on the development of self-regulation, but they tend to shed a more optimistic light on the matter. Bodrova et al. (2013) suggested, for example, that there was insufficient attention to both the cognitive and noncognitive contributions in the complex play regulation trajectory in the analysis by Lillard et al. (2013). Berk and Meyers (2013) acknowledged the inconsistent findings but went on to suggest a balanced “wait and continue to research” perspective. They reviewed a small but growing body of research that suggests positive associations particularly between pretend play and inhibitory control and also suggested that the connections between pretend play, private speech, and self-regulation may shed new light on the question. Further research in the area is strongly recommended, but Berk and Meyers pointed out the methodological challenges, including the complex and unfolding nature of pretend play, which makes it challenging to control and measure—a critical point considering how research favors reductionism.

A recent evaluation (Blair & Raver, 2014) of the Tools of the Mind curriculum (Bodrova & Leong, 2007) found that kindergarten children in randomly assigned schools where the

curriculum was implemented had moderately higher executive function abilities as well as mathematics and reading achievement. The curriculum is explicitly designed to promote child self-regulation through a combination of structured child-directed and teacher-scaffolded play activities that are sequenced with attention to the “zone of proximal development” and based on Vygotskian principles. Notably larger effects (effect sizes = 0.30–0.80) were found in high-poverty schools, including measures of ability to control attention in the face of fear-evoking stimuli.

In conclusion, the collective clinical knowledge and wisdom, ranging from Fröbel (1826) to the American Academy of Pediatrics (Ginsberg, 2006), suggests the potency of play to shape development in a positive man-

ner. Without the need for imposed tasks, play can be a spontaneous and pleasurable contribution to regulation, learning, and symbol formation, a dress rehearsal for life and a “royal road” to the inner life. It has been described as, “a way to dream and create, a way to come face-to-face with the forbidden, the magical and miraculous” (Sheridan et al., 1995, p. 3). Although the evidence for the relationship between play and self-regulation is still inconclusive, the balance of experience and evidence supports affording young children every opportunity to play. Play sets a meaningful context for practicing foundational capacities from learning and language acquisition to reality testing and self-regulation for all children; it can also be a source of joy and can serve as a self-corrective force for children whose development is unique.

REFERENCES

- Bacon, F. (1973). The first book. In G. W. Kitchin (Ed.), *The advancement of learning* (pp.1-60). London: Dent. (original work published 1605).
- Bandura, A. (2001). Social cognitive theory: A genetic perspective. *Annual Review of Psychology*, 52, 1–26. doi:10.1146/annurev.psych.52.1.1
- Berk, L. E., & Meyers, A. B. (2013). The role of make-believe play in the development of executive functions: Status of research and future directions. *American Journal of Play*, 6(1), 98–110.
- Blair, C. (2016). The development of executive functions and self-regulation: A bidirectional psychobiological model. In K. D. Vohs, & R. F. Baumeister (Eds.), *Handbook of self-regulation: Research, theory and applications* (pp. 417–439). New York, NY: Guilford Press.
- Blair, C., & Raver, C. C. (2014). Closing the achievement gap through modification of neurocognitive and neuroendocrine function: Results from a cluster randomized control trial of an innovative approach to the education of children in kindergarten. *PLoS One*, 9(1), e112393.
- Bocknek, E. I., Brophy-Herb, H. E., & Banjeree, M. (2009). Effects of parental supportiveness on toddlers' emotion regulation over the first three years of life in a low-income African American sample. *Infant Mental Health Journal*, 30(5), 452–476.
- Bodrova, E., Germuroth, C., & Leong, D. J. (2013). Play and self-regulation: Lessons from Vygotsky. *American Journal of Play*, 6(1), 111–123.
- Bodrova, E., & Leong, D. J. (2007). *Tools of the mind: The Vygotskian approach to early childhood education* (2nd ed.). Upper Saddle River, NJ: Pearson.
- Bonanno, G. A. (2004). Loss, trauma and human resilience: Have we underestimated the human capacity to thrive after extreme adverse events? *American Psychologist*, 59(1), 1–28. doi:10.1037/1003-006x59.1.20
- Brazelton, T. B., Koslowski, B., & Main, M. (1974). The origins of reciprocity: The early mother-infant interaction. In M. Lewis, & L. A. Rosenblum (Eds.), *The effect of the infant on its caregiver* (pp. 49–76). New York, NY: Wiley.
- Bretherton, I. (1992). The origins of attachment theory: John Bowlby and Mary Ainsworth. *Developmental Psychology*, 28, 759–775.
- Cannon, W. B. (1932). *The wisdom of the body*. New York, NY: Norton.
- Carver, C. S., & Scheier, M. F. (2016). Self-regulation of action and affect. In K. D. Vohs, & R. F. Baumeister (Eds.), *Handbook of self-regulation: Research, theory and applications* (pp. 3–23). New York, NY: Guilford Press.
- Chess, S. (2000, March). *An evening with Dr. Stella Chess*. Planned program and interview (Dr. Gilbert Foley) with Dr. Stella Chess. New York, NY: Teachers College Columbia.
- Christiano, B. A., & Russ, S. W. (1996). Play as a predictor of coping and distress in children during an invasive dental procedure. *Journal of Clinical Child Psychology*, 25(2), 130–138.
- Crossley, I. A., & Bruckner, J. C. (2012). Maternal-related predictors of self-regulation among low-income youth. *Journal of Child and Family Studies*, 12(2), 217–227.

- Davies, D. (2011). *Child development: A practitioner's guide* (3rd ed). New York, NY: Guilford.
- Davies, P. L., & Gavin, W. J. (2007). Validity of the diagnosis of Sensory Processing Disorder using EEG technology. *American Journal of Occupational Therapy, 62*(2), 176-189.
- Egger, H. L., & Angold, A. (2009). Classification of psychopathology in early childhood. In C. H. Zeanah (Ed.), *Handbook of infant mental health* (pp. 285-300). New York, NY: Guilford Press.
- Eisenberg, N., Smith, C. L., & Spinard, T. L. (2016). Effortful control: Relations with emotion regulation, adjustment and socialization in childhood. In K. D. Vohs, & R. F. Baumeister (Eds.), *Handbook of self-regulation: Research, theory and applications* (pp. 458-478). New York, NY: Guilford Press.
- Eisenberg, N., Spinard, T. L., & Eggum, N. D. (2010). Emotion-related self-regulation and its relationship to children's maladjustment. *Annual Review of Clinical Psychology, 6*, 495-525.
- Erikson, E. H. (1950). *Childhood and society*. New York, NY: Norton.
- Erikson, E. H. (1972). *Play and actuality*. In M. W. Piers (Ed.), *Play and development* (pp. 127-167). New York, NY: Norton.
- Erikson, E. H. (1975). *Life, history and historical moment*. New York, NY: Norton.
- Felitti, V. J., Anda, R. F., Nordenberg, D., Williamson, D. F., Spitz, A. M., Edwards, V., et al. (1998). Relationship of childhood abuse and household dysfunction to many of the leading causes of death in adults: The adverse childhood experiences (ACE) study. *American Journal of Preventive Medicine, 14*(4), 245-258.
- Foley, G. M. (2006). Self, social-emotional development in infancy: A descriptive synthesis. In G. M. Foley, & J. D. Hochman (Eds.), *Mental health in early intervention: Achieving unity of principles and practice* (pp. 139-173). Baltimore, MD: Brookes Publishing.
- Freud, S. (1962). On the psychological mechanism of hysterical phenomenon. In J. Strachey (Ed.), *Standard edition of the complete works of Sigmund Freud* (pp. 25-42). London: Hogarth. (Original work published 1893).
- Freud, S. (1953). The psychology of the dream-processes: Wish-fulfillment. In J. Strachey (Ed. & Trans.), *The standard edition of the complete psychological works of Sigmund Freud* (Vol. 5, pp. 550-572). London: Hogarth (Original work published 1900).
- Fröbel, F. (1826). *On the education of man (die Menschenerziehung)*. Keilhau/Leipzig: Wienbrach.
- Gartstein, M. A., Bridgett, D. J., Young, B. N., Panksepp, J., & Power, T. (2013). Origins of effortful control: Infant and parent contributions. *Infancy, 18*, 149-183.
- Gianino, A., & Tronick, E. (1988). The mutual regulation model: The infant's self and interactive regulation and coping capacities. In T. Field, P. McCabe, & N. Schneiderman (Eds.), *Stress and coping* (pp. 47-68). Mahwah, NJ: Erlbaum.
- Ginsberg, K. R., & The Committee on Communications and Committee on Psychosocial Aspects of Child and Family Health (2006). The importance of play in promoting healthy child development and maintaining strong parent-child bonds. *American Academy of Pediatrics Clinical Report, 1*, 1-31.
- Greenspan, S. I., & Shanker, S. G. (2004). *The first idea*. Cambridge, MA: De Capo Press.
- Hamoudi, A., Murray, D. W., Sorenson, L., & Fontaine, A. (2015). *Self-regulation and toxic stress: A review of ecological, biological and developmental studies of self-regulation and stress*. OPRE Report #2015-30. Washington, DC: Office of Planning, Research and Evaluation, Administration for Children's and Families, U.S. Department of Health & Human Services.
- Kanazawa, S. (2010). Evolutionary psychology and intelligence research. *American Psychologist, 64*(4), 279-289.
- Kannass, K. L., Oakes, L., & Shaddy, J. (2006). A longitudinal investigation of the development of attention and distractibility. *Journal of Cognition and Development, 7*, 381-409.
- Kidd, C., Palmeri, H., & Aslin, R. N. (2013). Rational snacking: Young children's decision-making on the marshmallow task is moderated by belief about environmental reliability. *Cognition, 126*, 109-114.
- Kochanska, G., & Kim, S. (2014). A complex interplay among the parent-child relationship, effortful control, and internalized, rule-compatible conduct in young children: Evidence from two studies. *Developmental Psychology, 50*, 8-21.
- Kochanska, G., Murray, K., & Harlan, E. T. (2000). Effortful control in early childhood: Continuity and change, antecedents, and implications for social development. *Developmental Psychology, 36*, 220-232.
- Kopp, C. B. (1982). Antecedents of self-regulation: A developmental perspective. *Developmental Psychology, 18*(2), 199-214.
- Kryski, K. R., Dougherty, L. R., Dyson, M. W., Olino, T. M., Lipton, R. D., Klein, D. N., et al. (2013). Effortful control and parenting: Associations with HPA axis reactivity in early childhood. *Developmental Science, 16*, 531-541.
- Lewis, M., & Brooks-Gunn, J. (1979). *Social cognition and the acquisition of self*. New York, NY: Plenum Press.
- Lillard, A. S., Lerner, M. D., Hopkins, E. J., Dore, R. A., Smith, E. D., & Palmquist, C. M. (2013). The impact of play on children's development: A review of the evidence. *Psychological Bulletin, 139*(1), 1-34. doi:10.1037/a0029321
- McIntosh, D. N., Miller, L. J., Shyu, V., & Hagerman, R. (1999). Sensory modulation disruption, electrodermal responses, and functional behaviors. *Developmental Medicine & Child Neurology, 41*, 608-615.

- Miller, L., Schoen, S., & Nielson, D. (2012). Sensory processing disorder: Implications for multisensory function. In B. E. Stein (Ed.), *The new handbook of multisensory processing* (pp. 707-721). Cambridge, MA: MIT Press.
- Mischel, W. (2014). *The marshmallow test*. New York, NY: Little Brown and Company.
- Mischel, W., Shoda, Y., & Rodreguez, M. L. (1989). Delay of gratification in children. *Science*, *244*, 933-938.
- Moilanen, K. L., Shaw, D. S., Dishion, T. J., Gardner, F., & Wilson, M. (2009). Predictors of longitudinal growth of inhibitory control in early childhood. *Social Development*, *19*(2), 326-347.
- Murray, D. W., Rosanbalm, K., Christopoulos, C., & Hamoudi, A. (2015). *Self-regulation and toxic stress: Foundations for understanding self-regulation from an applied developmental perspective*. OPRE Report #2015-21, Washington, DC: Office of Planning, Research and Evaluation, Administration for Children's and Families, U.S. Department of Health and Human Services.
- Owen, J. P., Marco, E. J., Shivani, D., Fouri, E., Harris, J., Hill, S. S., et al. (2013). Abnormal white matter microstructure in children with sensory processing disorder. *NeuroImage: Clinical*, *2*, 844-853.
- Pellis, S. M., & Pellis, V. C. (2007, April). Rough and tumble play and the development of the social brain. *Current Directions in Psychological Science*, *16*(2), 95-98.
- Piaget, J. (1952). *The origins of intelligence in children*. New York, NY: International Universities Press.
- Raffaelli, M., Crockett, L. J., & Shen, Y. L. (2005). Developmental stability and change in self-regulation from childhood to adolescence. *The Journal of Genetic Psychology: Research and Theory on Human Development*, *166*(1), 54-75.
- Rochat, P., Broesh, T., & Jayne, K. (2012). Social awareness and early self-recognition. *Cognition and Consciousness*, *21*, 1491-1497.
- Rothbart, M. K., Ahadi, S. A., & Hershey, K. L. (1994). Temperament and social behavior in childhood. *Merrill-Palmer Quarterly*, *40*, 21-39.
- Rothbart, M. K., Ellis, L. K., Rueda, M. R., & Posner, M. I. (2003). Developing mechanisms of temperamental effortful control. *Journal of Personality*, *71*, 1113-1143.
- Sheridan, M. K., Foley, G. M., & Radlinkski, S. (1995). *The supportive play model: Individualized intervention in early childhood practice*. New York, NY: Teachers College Press.
- Shonkoff, J. P., & Garner, A. S., & The Committee on Psychosocial Aspects of Child and Family Health, Committee on Early Childhood, Adoption and Dependent Care and Section on Developmental and Behavioral Pediatrics (2011, December). The lifelong effects of early childhood adversity and toxic stress. *Pediatrics*, *21*, 2011-2663. doi:10.1542/peds.2011-2663
- Sroufe, L. A., Egeland, B., Carlson, E. A., & Collins, W. A. (2005). *The development of the Person: The Minnesota study of risk and adaptation from birth to adulthood*. New York, NY: Guilford Press.
- Sutton-Smith, B. (1964). What play tells you about children. *Education*, *13*(4), 31-36.
- Thomas, A., Chess, S., & Birch, H. (1968). *Temperament and behavior disorders in children*. New York, NY: New York University Press.
- Trofimova, I. N., & Robbins, T. W. (2016). Temperament and arousal systems: A new synthesis of differential psychology and functional neurochemistry. *Neuroscience and Biobehavioral Reviews*, *64*, 382-402.
- Ursache, A., Blair, C., Stifter, C., Voegtline, K., & Family Life Project Investigators. (2013). Emotional reactivity and regulation in infancy interact to predict executive functioning in early childhood. *Developmental Psychology*, *49*, 127-137.
- Vygotsky, L. S. (1962). *Thought and language*. Cambridge, MA: MIT Press.
- Vygotsky, L. S. (1967). Play and its role in the mental development of the child. *Soviet Psychology*, *5*, 6-18.
- Winnicott, D. W. (1960). The theory of the parent-infant relationship. *International Journal of Psychoanalysis*, *41*, 585-595.
- Winnicott, D. W. (1971). *Playing and reality*. London: Tavistock Publications.
- Yeager, M., & Yeager, D. (2014). Self-regulation. In C. E. Schaefer, & A. A. Drewes (Eds.), *The therapeutic powers of play* (pp. 269-293). New York, NY: Wiley.
- Zelazo, P. D., Muller, U., Frye, D., & Marcovitch, S. (2003). The development of executive function in early childhood. *Monographs of the Society for Research in Child Development*, *68*(3), vii-137.
- Zentner, M., & Bates, J. E. (2008). Temperament: An integrative review of concepts, research programs and measures. *European Journal of Developmental Science*, *2*, 7-37.
- Zero to Three. (2016). *DC: 0-5: Diagnostic classification of mental health and developmental disorders of infancy and early childhood*. Washington, DC: Zero to Three.