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Priming as a way of understanding children's mental representations of the social world



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ABSTRACT

Priming is a well established tool for experimental examination of how mental representations drive thoughts, feelings, and behaviors that has been widely used in adult research. Priming is also a well established technique in cognitive development research. Social development research, however, has rarely used priming as a research method despite evidence that this technique is promising for helping researchers untangle causal connections between children's mental representations and children's social development outcomes. This paper discusses how priming methods may yield important insights into the role that children's mental representations of the social world play in children's social functioning. We begin by discussing the theoretical conceptualization underlying priming and priming methods. We next review evidence demonstrating the effectiveness of priming techniques in child development research. We conclude by suggesting ways in which priming can inform future research in social development using research examining attachment, social-information-processing, gender development, and mood and mental health as examples.

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Introduction

A core concept in social development has long been the idea that children's experiences with their environment are organized into mental representations or schemas and that these mental representations guide children's processing of responses to social stimuli (e.g., [Bowlby, 1969/1982](#); [Dweck & London, 2004](#)). Social development research that explores how children process social information

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has largely relied on non-experimental designs as the field progresses from describing the associations among children's experiences with the social environment, their social behavior, and their mental representations to explaining the causal cognitive mechanisms that mediate the link between exposure to social stimuli and children's responses to this social information. An extensive body of observational and correlational research has accumulated in this progression from description to explanation and has established a wealth of rich empirical descriptive and predictive information about the many factors associated with children's processing of social information (for reviews see Bugental & Grusec, 2006; Dodge, Coie, & Lynam, 2006; Dykas & Cassidy, 2011; Eisenberg, Fabes, & Spinrad, 2006; Parke & Buriel, 2006; Rubin, Bukowski, & Laursen, 2009; Saarni, Campos, Camras, & Witherington, 2006; Thompson, 2006). Causal explanations of how children's mental representations drive their processing of and responses to social stimuli, however, are lacking due to a dearth of experimental social development research. In order to fill this gap in our understanding of the causal role of mental representations in children's social development, experimental manipulation of children's mental representations is necessary.

One possible means for experimental manipulation of children's mental representations is the use of priming methods in an experimental design. By randomly assigning children to be exposed to schema-relevant stimuli or to a control group (which is either not primed or exposed to neutral stimuli or stimuli unrelated to the concept of interest), researchers can experimentally activate a mental representation of interest and possibly expand our understanding of children's social development to include explanations of the causal role that children's cognitive representations play in their responses to social stimuli.

Our goal is to demonstrate how priming offers the possibility for future research in social development to provide important and unique insights into the role of children's mental representations of the social world in their responses to social cues. We begin by providing the theoretical conceptualization underlying priming and describing priming methods. Next, we review evidence demonstrating the effectiveness of priming techniques for examining how children's mental representations drive their thoughts, feelings, and behaviors. We end with suggestions about how priming methods can inform future research in social development using attachment, social-information-processing, gender development, and mood and mental health as examples.

Priming: Concepts and methods

According to schema theory, psychological reactions to environmental events are driven by mental representations, or schemas, which are organized knowledge structures of past experiences (Bartlett, 1932; Bruner, 1960; Fiske & Taylor, 1991; Piaget, 1973; Rumelhart, 1980). Environmental events are filtered through mental representations, which, in turn, guide thoughts, feelings, and behavior (Bowlby, 1969/1982; Taylor & Crocker, 1981). Environmental cues can activate relevant mental representations which then serve to guide attention, interpretation, encoding, storage, retrieval, emotions, and behavior. By exposing participants to schema-relevant cues, researchers prime or activate these mental representations that serve as the driving force behind how people respond to environmental cues (Bargh, 2003, 2006; Bargh & Chartrand, 2000; Hamilton, 2005).

Priming methods can be divided into two categories (supraliminal priming and subliminal priming) based on the level at which priming stimuli are perceived and processed. *Supraliminal priming* techniques present priming stimuli at or above the threshold of conscious perception; participants are consciously aware of the priming stimuli. Supraliminal priming can be accomplished by asking participants to focus on schema-relevant information by recollecting, imagining, reading, viewing, or writing about an event. For example, attachment security has been primed by asking participants to write about a close relationship in which they felt secure to examine the effects of attachment security on lying (Gillath, Sesko, Shaver, & Chun, 2010).

Supraliminal priming can also be accomplished more inconspicuously by priming participants discreetly via subtle exposure to the priming stimuli (e.g., by placing schema relevant stimuli in the environment rather than asking participants to focus on the stimuli). For example, having the experimenter ask participants to briefly hold a cup of hot or iced coffee while recording their names and the

time of their participation during the elevator ride to the lab (Williams & Bargh, 2008; Study 1) subtly primes mental representations of warmth and coldness. Priming warmth led participants to judge a target person's personality as warmer (e.g., more generous, caring) than priming coldness.

It is also common to prime participants consciously but surreptitiously by incorporating the priming stimuli into the experimental protocol as part of an ostensibly unrelated task. This slight variation ensures the participant is attending to the priming stimuli, but permits researchers to prime without making the participant aware of such. For example, the commonly used “scrambled sentence test” (Costin, 1969) in which participants are asked to construct a grammatically correct sentences from several word sets covertly exposes participants to words related to the concept that the experimenter intends to activate. One seminal study that used this priming technique activated mental representations of the elderly by including words such as *Florida* and *wrinkle* in a scrambled sentence test (Bargh, Chen, & Burrows, 1996; Study 2). By temporarily activating the availability of participants' mental representations of the elderly, researchers were able to observe changes in behavior that were consistent with stereotypes of the elderly. Specifically, participants exposed to elderly stereotype-related primes walked down the hallway more slowly after leaving the experiment than those in the control condition. (See also Cesario, Plaks, and Higgins (2006) and Hull, Slone, Metayer, and Matthews (2002) for replications and extensions of these findings, but see Doyen, Klein, Pichon, and Cleeremans (2012) who failed to replicate these findings.)

Arguably the most inconspicuous priming technique is *subliminal priming* in which participants are exposed to priming stimuli below the threshold of conscious perception. Despite the priming stimuli being presented too quickly to perceive consciously, subliminal priming has yielded numerous important insights into how mental representations drive responses to social information (see Cameron, Brown-Iannuzzi, & Payne, 2012; DeCoster & Claypool, 2004). Interestingly, long-term subliminal priming effects have also been noted. For instance, students subliminally exposed to intelligence-related words (e.g., smart, brilliant, brainy, genius) scored higher on both a practice exam taken immediately after the priming session and higher on the actual course exam taken up to 4 days later compared to students who were primed with neutral words unrelated to intelligence (e.g., intact, smock, birch, garden; Lowery, Eisenberger, Hardin, & Sinclair, 2007; Study 2). See also Dijksterhuis and van Knippenberg (1998) who had similar findings using supraliminal priming.

Priming in childhood

Copious research using priming as a tool for activating mental representations has uncovered many important insights into how mental representations drive thoughts, feelings, and behaviors (for a review, see Wheeler & DeMarree, 2009). This research, however, has been conducted largely with adults. Of the research that has used priming with children, the overwhelming majority has been in the study of cognitive development; only a handful of studies have used priming in the study of social development. From a historical perspective, this imbalance in the use of priming methods is not surprising. Cognitive psychologists initially established priming as a useful research tool. From cognitive psychologists, cognitive developmental researchers discovered the utility of priming methods in understanding children's minds. During the social–cognitive revolution, social psychologists quickly realized the merit of priming techniques, and as a result, have frequently used priming methods. Social developmental researchers, however, seem to have been left in the dark. Despite the relative lack of developmental research that has employed priming techniques, many important insights into children's thinking have been revealed via priming, and we review these studies in this section.

Cognitive development

For the most part, research with children that has used priming techniques has come from cognitive development. Cognitive developmentalists have employed priming techniques to gain important insights into how children mentally represent numbers, language, and memories of specific events.

Numerical representations

Investigations of how numbers are processed have provided evidence that Arabic numbers are represented on a mental number line with each number represented as a distribution around the number's true location (e.g., Cordes, Gelman, Gallistel, & Whalen, 2001; Dehaene, Bossini, & Giraux, 1993). Studies with adults have found a priming distance effect such that the processing of a particular number is faster when it is preceded by a number prime that is numerically closer to the target number than when it is preceded by a number prime that is numerically more distant (e.g., Dehaene et al., 1998; Reynvoet & Brysbaert, 1999). This effect is thought to occur because the prime activates the mental representation of the number that was primed and also the numbers that lie numerically close to the prime. This increased activation of surrounding numbers facilitates the processing of subsequent numbers that are numerically close to the prime. This priming distance effect has been extended to work with children: Reynvoet, De Smedt, and Van den Bussche (2009) found that first, third, and fifth graders were able to determine with increased speed and accuracy whether a number was smaller or larger than 5 when they were supraliminally primed with a number that was numerically close to the target number.

Linguistic representations

Priming has also proven to be a useful paradigm to investigate the development of linguistic representations in children. Several studies have assessed the effects of priming a particular syntactic structure on children's descriptions of target stimuli to determine whether children possess and use mental representations of syntax structures (e.g., Hupp & Jungers, 2009; Huttenlocher, Vasilyeva, & Shimpi, 2004; Miller & Deevy, 2006; Savage, Lieven, Theakston, & Tomasello, 2003; Shimpi, Gámez, Huttenlocher, & Vasilyeva, 2007; van Beijsterveldt & van Hell, 2009). If children possess mental representations of particular syntactic structures then exposure to them should enhance their accessibility and increase the likelihood that children use the particular syntactic structures when processing subsequent stimuli. Consistent with this prediction, researchers have found that exposure to particular syntactic structures increases children's subsequent use of these structures, some of which are rare in young children's spontaneous speech. In addition, priming has proven to be useful for addressing the debate surrounding this literature as to whether children's early syntactic knowledge is based on frequently used lexical items that develop into abstract mental representations of syntax that are dependent on lexical learning (see Tomasello (2000, 2003) for representative theoretical accounts of this position) or whether children, like adults, possess substantial early grammatical knowledge in the form of abstract mental representations of syntactic structure that are independent of lexical content (Kemp, Lieven, & Tomasello, 2005; Savage, Lieven, Theakston, & Tomasello, 2006). In addition, Castles and colleagues' (Castles, Davis, Cavalot, & Forster, 2007; Castles, Davis, & Forster, 2003; Castles, Davis, & Letcher, 1999; see also Pratarelli, Perry, & Galloway, 1994) research has successfully utilized subliminal priming techniques to examine how children as young as seven-years-of-age develop a means for differentiating a written word from all other words in their visual lexicon.

Event memory

Perceptual priming has also been useful for researchers investigating the development of infant event memory. Whether infants can mentally represent an event has been a long-standing debate (for a review see Howe, Courage, & Edison, 2003). Some researchers have argued that infants are not capable of mentally representing an event (Nelson, 1990; Piaget, 1952), whereas other researchers, by using infants' nonverbal behavior as evidence for what infants recall about a specific event, have demonstrated that infants are able to form lasting event memories (e.g., Meltzoff, 1988a, 1988b).

The usefulness of priming methods for investigating young infants' memory capacities has been evident in the work of Rovee-Collier and colleagues (see Rovee-Collier, 1999). These researchers trained 2–6-month-olds to move a mobile by kicking via a ribbon tied to their ankle and the mobile and 6–18-month-olds to move a toy train by pressing a lever. These studies have yielded evidence that, not only do infants form memories of the training event, but the length of time that infants retain their memories of the original training event increases linearly across the first year and a half of life, from 1 to 2 days at 2 months to more than 13 weeks at 18 months (Hartshorn et al., 1998). More impressive, however, is that two of these studies (Hartshorn, 2003; Rovee-Collier, Hartshorn,

& DiRubbo, 1999) have demonstrated that periodically priming infants with an isolated component of the original training event (e.g., the original cue, such as the mobile or the train) extends infants' memory of the event for up to a year and a half after infants' have forgotten the original task (Hartshorn, 2003; Rovee-Collier et al., 1999).

Social development

Although fewer in number than studies that have used priming to address questions related to cognitive development, several studies have demonstrated the usefulness of priming as a method for examining how children's mental representations of the social world influence their reactions to the social environment. In particular, social developmentalists have used priming to gain important insights into how children's mental representations drive their reactions toward outgroup members, eating behavior, responses to emotional cues, affiliative behavior, and self-concept.

Reactions toward outgroup members

Priming competition in kindergarteners has been useful in untangling the links between ingroup bias and mental representations of competition (Spielman, 2000; Study 1). Ingroup bias, or showing preferential treatment to one's ingroup members compared to outgroup members, has been widely replicated in adults in the minimal group paradigm, in which people are assigned arbitrarily to a group (e.g., coin toss). There is evidence to suggest that this ingroup bias effect may be due to priming mental representations of competition by assigning participants into one of two groups (e.g., Hartstone & Augoustinos, 1995). The research available on ingroup bias in children suggests that children younger than seven may not show ingroup bias in the minimal group paradigm, perhaps, as Spielman suggests, because assignment to one of two groups does not prime competition in young children. Spielman examined the effects of priming competition on ingroup bias in the minimal group paradigm with kindergarteners to determine whether children younger than seven have the capacity to demonstrate ingroup bias in the minimal group paradigm and whether ingroup bias is the result of competition. Competition was primed with a story about two children racing each other to the sandbox. As expected, children in the neutral and unprimed conditions did not preferentially allocate play money to ingroup members over outgroup members, however, children primed with competition did. These results suggest children younger than seven have the capacity, but not the tendency, to demonstrate in-group bias in the minimal group paradigm and that arbitrary assignment into one of two groups does not prime competition. In addition, this study also suggests that the ingroup bias effects found in adults in the minimal group paradigm may be the result of priming competition by assignment into one of two groups.

A different but related study used priming to examine how priming influences children's attitudes toward older individuals (Hoe & Davidson, 2002). First and fifth graders were randomly assigned to either the neutral priming condition or one of four experimental conditions (i.e., negative, positive, elderly, or grandparent priming) before evaluating ambiguous depictions of older individuals. The priming task was introduced as a memory game in which experimenters read to children a list of words (that included both target and filler words) followed by a set of several sentences from which children were asked to identify the words from the list. Results indicated that positive and grandparent priming lead to more positive evaluations of older individuals compared to the negative, elderly, and neutral priming conditions. These findings are interesting because they demonstrate that by age seven, children have negative mental representations of older individuals that can be over-ridden when accessibility to mental representations of positive characteristics or grandparents are increased. (For a related, yet conceptually and methodologically distinct, set of studies with children using the Implicit Association Test [IAT; an assessment of implicit attitude through the measurement of automatic, non-conscious evaluations; Greenwald, McGhee, & Schwartz, 1998], see Baron & Banaji, 2006; Cvencek, Greenwald, & Meltzoff, 2011; Cvencek, Meltzoff, & Greenwald, 2011; Rutland, Cameron, Milne, & McGeorge, 2005; Steffens, Jelenec, & Noack, 2010.)

Eating behavior

"Real world" primes have been used to examine the effects of advertising on children's eating behavior (Harris, Bargh, & Brownell, 2009; Study 1). Children ranging from 7 to 11 years were

randomly assigned to watch a cartoon that included 30-s advertisements for waffle sticks and syrup, fruit roll-ups, potato chips, and a high sugar cereal or the same cartoon with four 30-s non-food advertisements. While children watched the cartoon alone, they were given a bowl of goldfish crackers and a glass of water. Children who saw commercials advertising food during the 14-min cartoon ate 45% more goldfish crackers than children who saw non-food commercials. Moreover, the amount of goldfish crackers that children ate did not vary as a function of their age, body mass index, sex, the length of time that had elapsed since they had eaten, or their parent's reports of their appetite. Importantly, these results establish that television food advertising is causally related to increased snack consumption and may contribute to childhood obesity.

Responses to emotional cues

Priming has also been used to investigate children's processing of social information as a function of the extent to which cues of fear, empowerment, and helplessness are present. Guided by the hypothesis that, in threatening situations, children with low levels of perceived control would show increased distress and regulatory efforts which, in turn, would reduce their ability to attend to, encode, and retrieve information compared to children with high levels of perceived control, [Cortez and Bugental \(1995\)](#) primed kindergarteners with a 6-min video of a fairy tale in which the child either saved his or her parents from disaster (empowerment prime) or the mother saved the child (helplessness prime). Following the prime, children watched a 6-min video of a child's visit to the doctor's office in which the child had either a fearful or neutral facial expression. As expected, after exposure to fearful cues, children who were primed with helplessness had poorer recall of the doctor visit sequence compared to children who were primed with empowerment. These results are in line with the authors' stance that activating mental representations of empowerment may enhance young children's memory for fear-inducing events; the lack of a neutral control group, however, means that it is unknown whether the between-group differences were due to (a) enhancing effects of empowerment or (b) deleterious effects of helplessness. Nonetheless, this study does indicate that mental representations of control influence children's memories of threatening stimuli.

Priming has also provided insight into the automatic processing of emotional facial expressions of individuals with pervasive developmental disorders (PDD). Automatic processing of emotional facial expressions is thought to be impaired in individuals with pervasive developmental disorders. To investigate this idea, [Kamio, Wolf, and Fein \(2006\)](#) subliminally and supraliminally primed a group of high-functioning individuals with pervasive developmental disorders (HFPDD) and a matched control group of typically developing individuals with happy faces, fearful faces, and neutral objects to examine how affective priming influenced participants' ratings of ambiguous Japanese ideographs. Results revealed that, as expected, neither subliminal nor supraliminal affective priming influenced the degree to which the HFPDD group liked the ideographs, whereas both subliminal and supraliminal priming influenced the degree to which the typically developing control group liked the ideographs. These findings support the idea that automatic processing of emotional facial expressions is impaired in individuals with PDD.

More recently, [Stupica, Cassidy, and Cassidy \(2013\)](#) have found that subliminal attachment security priming reduces young children's physiological fear reactions. Six- and seven-year-old children observed a set of fear-inducing pictures (e.g., snakes, spiders, sharks) and a set of happy/excitement-inducing pictures (e.g., hang gliding, water skiing, birthday cake). Prior to viewing the picture sets, children played a computer-based cognitive categorization game during which they were subliminally primed. Children who were randomly assigned to the security priming condition were exposed to pictures of a calm mother and child in close contact. Children who were randomly assigned to the happiness control priming condition were exposed to pictures of smiling adults, and children who were randomly assigned to the neutral control priming condition were exposed to pictures of colorful shapes. Children's electrodermal activity was collected throughout the picture presentations. Results indicated that children in the attachment security priming condition had fewer skin conductance responses during observations of the fear-inducing pictures than children in the happiness or neutral control priming condition. In addition, there were no differences in skin conductance responses between the three priming groups during observations of the happy/excitement-inducing pictures. These findings support the notion that attachment security priming reduces children's physiological

fear responses, and that subliminal social primes are an effective research tool in children as young as six.

Affiliative behaviors

Over and Carpenter's (2009a, 2009b) studies provide evidence of the utility of priming as a way to examine children's social schemas as they influence reactions to social events. One study tested the possibility that there is continuity in development between imitation in infancy and early childhood to mimicry in adulthood as a behavioral strategy to increase affiliation by examining how priming ostracism in 5- and 6-year-old children influenced their subsequent imitation of an experimenter's actions (Over & Carpenter, 2009a). Children were primed with ostracism using two short videos of four shapes moving around a computer screen. One video depicted three pentagons playing as a group and then moving away from a fourth pentagon attempting to approach the group four times before withdrawing to the far side of the screen. The second video depicted two teardrop-shaped objects playing ball to the exclusion of a third teardrop-shaped object that attempted to join the game before withdrawing to the far side of the screen. Following priming, the experimenter demonstrated different ways of acting on a novel toy before handing the toy to the child. Children in the ostracism condition imitated more of the experimenter's actions compared to children who watched the control videos. These findings indicate that children, like adults, modify their behavior in ways that increase affiliation after being exposed to social exclusion. It is noteworthy that this effect was observed using an abstract depiction of third party ostracism compared to research with adults in which the participants are socially excluded by conspecifics.

Also noteworthy is Over and Carpenter's (2009b) finding that priming 18-month-olds with affiliation increases helpfulness. Infants were primed with affiliation by showing them eight pictures of familiar household objects in the foreground with two small dolls facing each other in the background. Following priming, an experimenter entered the room with a bundle of sticks that she "accidentally" dropped on the floor. Infants exposed to the affiliative prime were three times more likely to spontaneously help the experimenter during the first 10 s compared to infants exposed to the neutral prime (two small stacks of blocks) and those exposed to the individuality primes (one doll alone, or two dolls back-to-back).

Self-concept

Research using Silverman's "Mommy and I are one" (MIO) priming stimulus (see Hardaway, 1990) was designed to activate representations of a nurturing and accepting mother, which in turn, were thought to serve as a gratification for the need to "merge" with "the good mother of early childhood" (Silverman & Weinberger, 1985; pp. 1296–1297). Although the idea that a desire for oneness with mother is security enhancing is not consistent with the perspective of attachment theory (Bowlby, 1969/1982), activating representations of a nurturing and accepting mother is consistent with the concept of priming representations of felt security. There is some evidence to support this idea. In particular, the more positive the emotional tone of memories of interaction with mother, the more positive is the response to exposure to MIO (see Sohlberg, Claesson, & Birgegard, 2003).

Of particular interest to the present argument that priming may be a useful tool for examining how children's mental representations of the social world drive their reactions to social cues is Bryant-Tuckett and Silverman's (1984) use of the MIO subliminal priming paradigm to examine the effects of activating representations of a nurturing and accepting mother on academic performance. A group of institutionalized, emotionally disturbed children and adolescents in a residential treatment school ($N = 90$; mean age = 15.7, range = 10.8–19.3; enrolled in grades 5–12) who were below age norms on measures of academic achievement and intellectual ability and had extensive histories of truancy were randomly assigned to receive four trials of either a security-enhancing prime (subliminal exposure to "Mommy and I are one" which is thought to evoke images of a nurturing and accepting mother) or a neutral prime (subliminal exposure to "People are walking") five times a week for 6 weeks. At the beginning of each of the 30 priming sessions, students were asked to imagine a tense situation related to school (e.g., anxiety before a test), which served to pair the anxiety-provoking situation with the tension reduction that resulted from the security-enhancing prime. Post-treatment, compared to students who were exposed to neutral primes, students who were exposed to the security-enhancing

prime had not only more positive self-concepts, but also higher standardized reading and math scores, more frequent homework completion, more time spent working independently in the classroom, and less time spent watching television as recorded by their counselors.

Bryant-Tuckett and Silverman's (1984) study is noteworthy because most priming studies, regardless of participant age, are conducted in one brief laboratory session. Moreover, the majority of priming studies conducted from a social cognition perspective rely on participant self-report. This study, however, not only looked at the long-term effects of repeated subliminal priming, but also contained priming sessions conducted outside of the laboratory. In addition, the effects of subliminal exposure to a security-related priming stimulus were assessed in relation to an extensive range of outcomes, including observed behavior. Nonetheless, it is important to consider the issue of generalization: Participants were from a group of emotionally disturbed children and adolescents in a residential treatment school, and the extent to which these findings would replicate with a group of typically developing children is unknown.

Future directions and conclusions

We have described how priming techniques have allowed researchers to gain important insights into how mental representations of the world drive the ways in which individuals process and respond to environmental cues by activating these existing mental representations. We have also reviewed evidence that priming is an effective and useful tool for research with children. We conclude by providing examples of ways in which priming may serve to inform researchers' understanding of how children's mental representations of the social world drive their responses to social cues. In doing so, we use attachment, social information processing, gender development, and mood and mental health to exemplify some of the possible ways that priming may be an informative tool for social developmentalists. We note that it is likely that consideration of results from priming studies in the context of results from studies using other methodologies should prove an additional fruitful endeavor.¹

Attachment theory and research

In the same way that mental representations are thought to drive psychological reactions to environmental events, mental representations of attachment are thought to drive reactions to attachment-relevant events in particular and social events more broadly. Thus, according to attachment theory, and consistent with social-cognitive theory (Hamilton, 2005; Schneider, 1991), attachment-related cues and information are filtered through mental representations of attachment, which, in turn, guide thoughts, feelings, and behavior (Bowlby, 1969/1982; see also Bretherton & Munholland, 2008). In addition, just as schemas are thought to develop based on past experiences, mental representations of attachment develop based on past attachment-relevant experiences. Specifically, experiences with the availability and responsiveness of attachment figures are at the core of attachment mental representations, which, subsequently, are brought to bear in novel attachment-relevant situations (Bowlby, 1973). Mental representations that reflect attachment security develop from experiences of one's attachment figures as sensitive and appropriately responsive to one's bids for attention. Mental representations that reflect attachment insecurity develop from experiences of attachment figures as rejecting, unavailable, ineffective, or frightening in response to bids for attention (Bowlby, 1969/1982, 1973; Bretherton & Munholland, 2008; Main, Kaplan, & Cassidy, 1985). Just as it is possible to activate a mental representation of interest by exposing people to schema-relevant stimuli, it is also possible to activate mental representations of attachment security using stimuli that are related to

¹ For instance, as described earlier, priming studies have indicated that priming with words such as smart, brilliant, brainy, and genius (as opposed to neutral words) has led to children's improved academic performance (Dijksterhuis & van Knippenberg, 1998; Lowery et al., 2007). Yet, interestingly, in both correlational and experimental studies using non-priming methods, it is children who believe that academic performance is linked *not* to intelligence but to increased effort who show enhanced performance (e.g., Blackwell, Trzesniewski, & Dweck, 2007). Consideration of both sets of (perhaps seemingly contradictory) findings in concert will inform a rich understanding of children's motivation, learning, and performance.

attachment security. Activating mental representations of attachment security using priming methods offers the possibility of exploring how mental representations of attachment drive affect, cognitions, and behavior in social and attachment-relevant situations when used in an experimental design (Mikulincer & Shaver, 2007a, 2007b).

Adult attachment researchers have recently extended the use of priming techniques to investigate whether increased security leads to improved adult psychosocial outcomes (for reviews see Mikulincer & Shaver, 2007b, and Gillath, Selcuk, & Shaver, 2008)—an idea that is central to attachment theory (Bowlby, 1973). In particular, this body of research has shown that activating mental representations of security leads to more adaptive responses to stress-inducing information, increased concern for others, and improved mood and mental health-related outcomes. Published findings, however, are limited to research with adults and one study with older adolescents (17–19 years; Taubman-Ben-Ari & Mikulincer, 2007). Another concern with this body of research is that, for the most part, the outcomes assessed are both self-reported and short-term (yet for two studies with long-term outcomes, see Carnelley & Rowe, 2007, and Gillath & Shaver, 2007; for two studies that include an outcome of observed behavior, see Mikulincer & Shaver, 2007b, and Mikulincer, Shaver, Gillath, & Nitzberg, 2005). Nevertheless, there are two main reasons to believe that security priming will prove to be as fruitful for developmentalists who research attachment as it has been for adult attachment researchers.

First, Bowlby characterized attachment as a phenomenon that spans from the “cradle to the grave” (Bowlby, 1979, p. 126), and as such, it is reasonable to expect that activating mental representations of security might have similar effects to those found in adults. Second, priming may allow attachment researchers to make some initial causal inferences about the effects of security on developmental outcomes by conducting experimental research on one of many areas that remain experimentally unexplored. Correlational evidence and theory suggest that security in childhood may contribute to less fear in the face of novel objects, environments, and people; greater willingness to explore the physical and social environment (e.g., see Thompson, 2008); more harmonious relationships with others (see Berlin, Cassidy, & Appleyard, 2008); less reliance on hyperactivating and deactivating strategies of emotion regulation (see Cassidy & Berlin, 1994; Cassidy & Kobak, 1988; Mikulincer & Shaver, 2007a, 2008); and more positive views of the self (see Thompson, 2008). There is little experimental research examining the causal effects of security on these outcomes. Security priming offers researchers the possibility of using an experimental methodology that targets representations of security directly to address the central question of whether security enhances children’s psychosocial functioning. In light of recent evidence that attachment security priming reduces children’s physiological fear responses (Stupica & Cassidy, 2013, April), it seems all the more promising that attachment security priming will be a useful tool for future investigations.

Social-information processing research

Dodge and his colleagues (Crick & Dodge, 1994; Dodge & Crick, 1990; see also Lemerise & Arsenio, 2000) proposed that children’s behavioral responses to problematic social events are mediated by a series of cognitive processes whereby children (a) encode the event, (b) interpret the event, (c) formulate a goal or select a desired outcome, (d) generate strategies to achieve the desired outcome, (e) evaluate the likelihood that the strategies generated will achieve the desired outcome, and finally, (f) behaviorally enact the selected strategy. Children’s mental representations or schemas of the social environment are thought to serve as the cognitive mechanism through which children proceed from one step to the next.

A large body of research has emerged in support of this model of social information processing (see Dodge & Pettit, 2003, for a review). Only two studies, however, have tested this model experimentally (Rabiner & Coie, 1989; Slaby & Guerra, 1988). Priming offers researchers another methodological tool for determining whether children’s mental representations direct how they attend to, encode, and interpret social events, and how they draw upon their social schemas to formulate a goal and to generate and evaluate strategies for achieving their goal. For example, future research could examine the effects of increased accessibility to mental representations of aggression and benevolence on children’s social information processing by priming these concepts.

From a social information processing perspective, the end result of aggressive social information processing is chronic aggression (Dodge et al., 2006). Chronic aggression is a central concern of social development and clinical researchers because of the links between chronic aggression and delinquency, violence, and psychopathology (see Flannery, Vazsonyi, & Waldman, 2007). Priming offers researchers the possibility of better understanding the causes of chronic aggression in children. To date, no study has examined whether aggression is the result of increased accessibility to mental representations of aggression and hostility (see Bandura's classic Bobo doll studies for examination of behavioral modeling; Bandura, 1965; Bandura, Ross, & Ross, 1963). Increasing accessibility to mental representations that inhibit aggressive and hostile schemas by priming prosocial mental representations would provide an initial examination of this unexplored area of research. Findings that chronically aggressive children, after being primed with prosocial-related stimuli, are in the short term (i.e., in response to experimental outcome assessments) less attentive to hostile social cues, are less ready to attribute hostile intentions to others' behaviors, formulate more prosocial goals, access more competent and fewer incompetent responses, evaluate aggressive responses more negatively, or behave more competently would provide initial evidence that children's aggressive behavior is the result of increased accessibility to aggressive and hostile mental representations.

In addition, priming may generate important insights into the extent to which children's social information processing is influenced by emotions, gender schemas, and mental representations of attachment. For example, Crick and Dodge (1994) posit that anger might lead to the formation of a retaliatory goal, or anxiety might lead to the desire to remove oneself from the situation. Affective priming would afford researchers the ability to address these questions experimentally. Recently, Ostrov and Godleski (2010) have built upon social information processing theory by pointing to gender schemas as particularly important mental representations that influence children's encoding, interpretation, goal formulation, and generation and evaluation of strategies to achieve their goals. Increasing accessibility to mental representations of gender using priming could address whether and how children's gender schemas influence social information processing. Furthermore, research and theory suggest that social information processing mediates the link between children's mental representations of attachment and social and emotional outcomes (see Dykas & Cassidy, 2011, for a review); priming offers the possibility of using an experimental design to examine this mediating process. If mental representations of attachment drive social information processing which, in turn, drives psychosocial outcomes, increasing accessibility to representations of security using priming should lead to improved social information processing, which, in turn, should lead to improved social and emotional outcomes.

Gender-related research

According to gender schema theory (see Martin & Ruble, 2004; Martin, Ruble, & Szkrybalo, 2002), children's mental representations of gender-related concepts about themselves and others (i.e., their gender schema) influence their information processing and behavior. In particular, gender schema theory posits that the emergence of gender identity (i.e., recognition of being either a girl or a boy), leads to increased motivation to selectively attend to and recall information about the same-gender group and to behave in gender consistent ways (Martin et al., 2002). Experimental evidence has emerged indicating that, consistent with theory, children's gender schemas do, indeed, influence children's information processing and behavior (see Martin & Dinella, 2002, for a review). This research has employed the use of gender-labeling of novel non-gender-typed toys or activities to examine the direct link between gender stereotypes and children's responses. In these studies, experimenters most often labeled the novel gender-neutral toys and activities by telling the children that most girls or most boys like a particular toy or do well at a particular task. This vein of research has demonstrated that children pay more attention to, have better memory for, have better performance with, and have greater expectations of success with toys and activities that were labeled by experimenters as appropriate for their sex. These studies, however, are few, and, as Martin and Dinella (2002) have noted, interpretation of findings can sometimes be difficult due to methodological limitations.

Priming offers researchers the opportunity to determine how children's mental representations of gender influence their information processing and behavior in a manner that is more covert than those

currently described in the literature. For instance, placing children in a waiting room with either dolls or trucks or having children watch a cartoon depicting gender stereotyped behavior or characters prior to entering the lab would activate children's gender schemas in a more subtle manner than methods previously used and would provide information about the degree to which demand characteristics may account for previous findings. Researchers might, for example, subliminally expose children to gender stereotyped words or pictures of gender-typed objects and assess how children's knowledge of gender stereotypes colors their interpretation of gender-neutral stimuli. In particular, researchers could examine how subliminally exposing children to gender cues influences how they categorize and further process and respond to novel non-gendered objects, people, and events. Furthermore, priming children's mental representations of gender would address [Martin et al.'s \(2002\)](#) suggestion that the links between children's gender schemas and behavior may be more apparent when stereotypes are salient. Priming would allow researchers to make children's gender schemas salient and assess whether this activation leads to more gender consistent behavior. The potential for using priming to activate children's gender schemas is further supported by related research using the IAT ([Greenwald et al., 1998](#)) to tap preschoolers' implicit gender-related social cognitions ([Cvencek, Greenwald, et al., 2011](#)). Given that researchers found that preschoolers' implicit gender attitudes (as assessed using an IAT) were correlated with explicit attitudes, sex, and gendered-play behavior, it is plausible to expect that priming can be used to activate children's gender schemas. As such, it stands to reason that future research using priming to examine how representations of gender drive children's information processing and behavior may prove particularly useful in ruling out alternative interpretations and addressing unanswered questions.

Affect and mood research

[Beck's \(1967\)](#) cognitive theory of depression suggests that depression is the result of heightened accessibility to negative self-schema, and much empirical support exists for this proposition ([Clark, Beck, & Alford, 1999](#); [Lakdawalla, Hankin, & Mermelstein, 2007](#)). In particular, research with children has revealed a robust inverse relation between children's reports of self-esteem and depression ([Garber & Hilsman, 1992](#)). What is lacking, however, is experimental research examining whether increases in negative self-schema are causally related to the development of depression. Findings that children's state depressive symptomatology in the laboratory decreases following exposure to positive self-schematic cues would provide initial experimental evidence that children's views of themselves directly influence their level of depressive symptoms.

In addition, an internal locus of control—perceptions of oneself as able to control one's own life events through positive attributes or effort—is thought of as a protective factor against depression and anxiety in children and adolescents, whereas an external locus of control—perceptions that one's life is controlled by outside forces like powerful others, chance, or luck—has been associated with increased vulnerability ([Chorpita & Barlow, 1998](#); [Ostrander & Herman, 2006](#)). To the best of our knowledge, no study has examined whether external locus of control is causally related to either depression or anxiety in children. Future experimental research that increases perceptions of oneself as in control of one's own life events by activating mental representations of empowerment using priming techniques would provide the opportunity to examine whether locus of control is causally related to the development of depression and anxiety.

Conclusions

Priming is a widely used tool for examining how mental representations drive thoughts, feelings, and behaviors that has been widely used in adult research. Researchers have also used priming to gain important insights into children's cognitive development. Social development researchers, however, have rarely used priming as a research tool despite evidence that this technique is promising for helping untangle causal connections between children's mental representations and social development outcomes. Given the important insights that have been gained by applying priming techniques to psychological research, it is clear that priming will be useful in advancing the field of social development.

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