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The Cultural Transmission of Gender Roles in Childhood

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Abstract

In the present work, I summarize extant theories and evidence on how children learn about gender roles and test an ecological framework for gender-role learning (i.e., the Gendered Ecology Model). Existing theory has demonstrated that children begin to form symbolic representations of gender as young as 9 months and acquire basic gender stereotypes about behaviors and activities considered appropriate for each gender by 3 years. Theories have proposed several potential sources and moderators of how children learn about the roles that women and men generally hold. However, no theories have examined these sources from an ecological approach, leaving open the question of how the prevalent cultural patterns children encounter inform their gender-role beliefs. I first, therefore, review existing theories of gender-role learning, then discuss evidence regarding the way that children learn about gender, and then propose a framework for quantifying and causally examining the influence of cultural patterns on children (i.e., the Gendered Ecology Approach; GEA). Finally, I conducted a series of studies to quantify the patterns of nonverbal behavior found in children's nonverbal environments and test their causal influence on children's gender-role beliefs and behavior. Results indicate an ecological pattern of televised nonverbal bias in which gender stereotypical characters are treated more positively than gender counterstereotypical characters which reinforces girls' beliefs about gender roles and causes them to present themselves as less competent to peers.

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ABSTRACT

In the present work, I summarize extant theories and evidence on how children learn about gender roles and test an ecological framework for gender-role learning (i.e., the Gendered Ecology Model). Existing theory has demonstrated that children begin to form symbolic representations of gender as young as 9 months and acquire basic gender stereotypes about behaviors and activities considered appropriate for each gender by 3 years. Theories have proposed several potential sources and moderators of how children learn about the roles that women and men generally hold. However, no theories have examined these sources from an ecological approach, leaving open the question of how the prevalent cultural patterns children encounter inform their gender-role beliefs. I first, therefore, review existing theories of gender-role learning, then discuss evidence regarding the way that children learn about gender, and then propose a framework for quantifying and causally examining the influence of cultural patterns on children (i.e., the Gendered Ecology Approach; GEA). Finally, I conducted a series of studies to quantify the patterns of nonverbal behavior found in children's nonverbal environments and test their causal influence on children's gender-role beliefs and behavior. Results indicate an ecological pattern of televised nonverbal bias in which gender stereotypical characters are treated more positively than gender counterstereotypical characters which reinforces girls' beliefs about gender roles and causes them to present themselves less competently to peers.

TABLE OF CONTENTS

LIST OF FIGURES

A REVIEW OF GENDER ROLE LEARNING

Children are exposed to countless sources of information about what is considered appropriate for each gender and how they themselves fit within those predefined roles. Children gather information about gender quickly and research has shown that even preverbal infants can understand gender categories and categorize faces by gender (Levy & Haaf, 1994). As early as the age of 2 and by the age of 7, girls believe that they are worse at math than boys, believe angular shapes and rough textures are masculine, and tend to play with stereotypical "girl toys" (e.g., tea set, doll) more than stereotypical "boy toys" (e.g., skateboard, baseball; Freeman, 2007; Gunderson, Ramirez, Levine, & Beilock, 2012; Leinbach, Hort, & Fagot, 1997). These examples are a few of the diverse range of beliefs and behaviors that are gender-specific and that are commonly exhibited by girls and boys in the United States and elsewhere (Shutts, Kenward, Falk, Ivegran, & Fawcett, 2017; Zosuls, Miller, Ruble, Martin, & Fabes, 2011). *Gender-role learning* refers broadly to the components of social norms and sex differences that children learn ranging from the permanence of gender identity across the lifespan to the behaviors and attributes expected of girls versus boys (Zosuls et al., 2011). An enormous amount of scholarship in psychology, including both theory and empirical research, has examined the developmental trajectory for gender-role learning. Theories range from those that highlight the influence of the child's environment (especially models such as peers and parents) to those that dissect the cognitive stages that motivate a child's learning

(Bem, 1983; Bigler & Liben, 2007b; Bussey & Bandura, 1999; Eagly, 1997; Eagly & Steffen, 1984; Kohlberg, 1966; Martin & Halverson, 1981; Martin & Ruble, 2009; Mischel, 1966). In this dissertation, I will review the prominent theories of gender-role learning, each of which has contributed meaningfully to the scientific understanding of gender-role learning.

My review reveals a critical component that is missing from current theorizing. While some theories and research have aimed at identifying specific sources of the environment that might influence kids (e.g., role models), research on gender-role learning is limited by the lack of a framework for characterizing the cultural environment (Adams & Markus, 2004; Pauker, Brey, Lamer, & Weisbuch, 2019; Weisbuch, Lamer, Treinen, & Pauker, 2017) and exploring its causal influence. Children's social environments contain numerous recurring patterns present across situations and contexts. Patterns can be behaviors, objects, sounds, or low-level cues repeatedly perceived by many people (i.e., a *cultural* or *nomothetic pattern*) or be repeatedly perceived by one person (i.e., an *individual* or *idiographic pattern*). In relation to gender, cultural patterns, such as patterns between hair length, emotion expression, or clothing color and gender, are widespread and likely communicate gender roles. However, scientists have *assumed* that exposure to those cultural patterns influence children's beliefs and behaviors. As of yet, however, it is unclear what children infer from the culturally prevalent patterns around them. Thus I propose a theoretical framework based on the ecological approach to perception (Brunswik, 1956; E. J. Gibson, 1969; E. J. Gibson & Pick, 2000; J. J.

Gibson, 1960; McArthur & Baron, 1983) to examine if and how the social ecology that children are regularly exposed to influences their gender-role learning.

The ecological approach to perception was originally used to describe the process of perceiving and acting upon physical environments (E. J. Gibson, 1969; J. J. Gibson, 1979). The value of this approach is in enabling researchers to examine the cognitive processes that attune (i.e., adapt) to patterns in the environment. For example, two identical circles moving towards each other can be made to appear that they are colliding or passing one in front of the other. Which version someone perceives can be adapted by what they hear such that the addition of a "thunk" at the exact time when the objects begin to overlap can cause a perceiver to see the circles as colliding instead of just passing in front of each other (Sekuler, Sekuler, & Lau, 1997). In this illusion, sound is adaptive because it disambiguates the stimulus and indicates to the perceiver what has occurred in the environment. The ecological approach assumes that perception a) is adaptive (i.e., provides useful information to the perceiver), b) indicates what a perceiver can do with the environment (i.e., what the environment affords), and c) is dictated by what features of the environment perceivers actually attend to (McArthur & Baron, 1983).

The principles of the ecological approach were later extended to social psychology in order to understand how the features of people's physical environments shape beliefs, attitudes, and behavior (McArthur & Baron, 1983). For example, Zebrowitz and colleagues argue that attunement to social environments often includes overgeneralization processes whereby perception becomes biased toward well-learned

patterns (McArthur & Baron, 1983; Montepare & Zebrowitz, 1998; Zebrowitz, 2003, 2011; Zebrowitz, Fellous, Mignault, & Andreoletti, 2003). Applications of the ecological approach to social perception have explored the influence of well-learned patterns on perception such as when sound and emotion occur at the same time or sex differences in height cause people to see male faces higher in space, on average, than female faces (Lamer, Weisbuch, & Sweeny, 2017; A. Sherman, Sweeny, Grabowecky, & Suzuki, 2012). Once learned, these patterns serve to disambiguate stimuli by causing a smile to look more intense when paired with laughter or a face to look more feminine when low in space.

Following extensions of the ecological approach to social psychology, work in the field of ecological social perception has demonstrated that the mind is constantly adapting to the environment, even at a visual level. The features of the faces that people consistently encounter in their social environments, for example, can shape perceived norms, stereotypes and even self-concepts. Consider the role of gendered facial features; sex-typical female faces have baby-faced features, but consistent exposure to baby-faced men and mature-faced women weakens traditional gender stereotypes (H. Friedman & Zebrowitz, 1992). Perceivers also encode features such as gait and can make relatively accurate judgments of a walker's sexual orientation, gender, and even identity given only information about gait (if it is a known person to the perceiver; Cutting & Kozlowski, 1977; Johnson, Gill, Reichman, & Tassinary, 2007; Kozlowski & Cutting, 1977). Patterns – in this case idiographic – can also influence how people feel about themselves; perceivers exposed to angry, averted-gaze faces had higher self-esteem than perceivers

4

exposed to happy-averted gaze faces (Lamer, Reeves, & Weisbuch, 2015). Thus, ecological patterns inform adult perceivers about norms, attitudes about groups, and attitudes about the self.

The ecological approach to characterizing and manipulating the cultural environment has been relatively absent in the developmental literature, however, and thus ambiguity remains of how children are drawing inferences about gender roles from the cultural patterns present in their frequently encountered social environments. In reference to the study of gender-role learning, research in ecological social perception suggests that identifying regularities in the environment and testing their effects is essential to understanding how children learn about gender-roles from the complex environmental cues around them.

In this manuscript, I will first review the prominent theories of gender-role learning and highlight what each has contributed to the scientific understanding of gender-role learning. Then, I will lay out an ecological framework for the study of gender-role learning and what this new approach can contribute to the scientific understanding of gender-role learning.

Prominent Gender-Role Learning Theories

There is a long history of scholarship in psychology regarding the appropriate language to capture the development of gender roles, and my terminology throughout this review will respect modern APA standards for discussing gender and sex (2010). These standards specify that humans are to be referred to with gender terms (e.g., woman, girl, man, boy) unless using the term as an adjective where sex terms (e.g., female, male,

5

intersex) are appropriate because they are more grammatically correct (see Chrisler &

Lamer, 2016). *Scientific* interest in the development of gender roles can be traced, in part,

to an early study demonstrating that children as young as 5-years-old understand and

enact gender stereotypes (Fauls & Smith, 1956). In this study, children were shown

paired feminine and masculine activities and asked to indicate a) which activity they

would like to do, b) which activity mothers and fathers would like a girl to do, and c)

which activity mothers and fathers would like a boy to do. Children selected gender-

stereotypical activities (e.g., playing with a doll, playing baseball) for themselves

significantly more often than gender-counterstereotypical activities. Furthermore,

children could infer that parents would like their *girls* to do feminine activities and their

boys to do masculine activities. This study was followed a year later by a chapter on

gender roles in which Sears, Maccoby, and Levin (1957) reported qualitative interviews

with mothers to examine parental influence in gender-role development. These forays

into gender-role learning ignited scholarship in developmental psychology, leading to the

publication of two influential theories published in 1966 –Mischel's Social Learning

Theory and Kohlberg's Cognitive-Developmental Theory.

Social Learning Theory

In Social Learning Theory, Mischel (1966) argued that children learn about

gender roles from the other people (i.e., *social models*) they observe in their

environments and the positive feedback they receive when acting in gender stereotypical

ways. Social Learning Theory stemmed directly from the behaviorist tradition that

predominated research and theory across Psychology at the time, and that emphasized

influential aspects of the social environment such as role models and social reinforcement (see Martin, Ruble, & Szkrybalo, 2002): children observe the behavior of parents, peers, and other people and then emulate it to learn about what behaviors are considered appropriate for each gender. In Social Learning Theory, Mischel argues that children first emulate others' behaviors, then through social reward learn to distinguish between behaviors appropriate for each gender, generalize to other similar behaviors, and finally enact a single set of gendered behaviors themselves. And in fact, children appear to emulate other's behaviors as young as 3, respond to social reward and punishment about their behavior by increasing or decreasing the behavior, respectively, as young as 3.5, generalize behaviors to other similar behaviors and even metaphorical associations (e.g., angularity as masculine, curved lines as feminine) as young as 4, and enact gendered-typed behaviors by the age of 5 (Bandura, 1965; Freeman, 2007; Frey & Ruble, 1992; Hicks, 1965; Leinbach et al., 1997; Levy & Haaf, 1994). In contrast to cognitive theories such as Cognitive Developmental Theory (see below; Kohlberg, 1966), Mischel argues for the predominance of observed behavior over internal cognitive mechanisms. That is, Mischel argues that observed behavior determines what children learn about gender, not internal motivation or perception. This is likely an artifact of behaviorism, where it was argued that it was not necessary to use the mind to explain behavior (Martin et al., 2002). That assumption has been roundly refuted across psychology (G. A. Miller, 2003) and thus, updated social learning theories, such as Social Cognitive Theory (Bussey & Bandura, 1999; see below) have to some extent incorporated cognitive mechanisms.

Gendered ecology critique. Social Learning Theory was the first significant theory to try to characterize environmental influences on gender-role learning. However, for role model behavior to be a plausible cause of the gender role behavior that is learned by *many different children*, it must be presupposed that role models similarly exhibit gender-typical behavior when they are around children. Although it is reasonable to predict that different adults will exhibit similar gender-typical behaviors around children, Social Learning Theory does not describe (a) what these specific collective behaviors might be, (b) how frequently and in what contexts those behaviors should be observed by children to support gender-role learning, or (c) how to scientifically identify "a" and "b". Moreover, most role models will not *only* exhibit behavior typical for their gender but instead exhibit gender-typical, gender-neutral, and gender-atypical behavior at different times. In this context, it is not a simple matter to extract signal (behaviors typical for girls/boys) from noise (neutral or gender-atypical behavior). And even if young children can extract this signal, it is not clear that this signal would be sufficiently strong to influence children. In short, a theory that focuses on role model behavior as the basis for children's gender roles should specify (a) the cultural patterns of behavior that are perceived by children and influence what they learn about gender and (b) the broader context in which these cultural patterns occur and how children separate gendered signals from noise. The ecological approach introduced later in this article describes a framework for addressing these issues in Social Learning Theory, which is otherwise consistent with my ecological approach.

The limitations to Social Learning Theory that I have described above bleed into the scientific methodology used to test its postulates, and the postulates of modified versions of this theory. These theories are typically tested by requiring children to watch or read about a contrived scenario with a person exhibiting one or a limited set of behaviors (e.g., Bandura, 1965; Bussey & Bandura, 1984). This methodology fails to experimentally model the manner and ecology in which children would have to learn gendered behaviors – by perceiving repeated instances of behavior that are embedded over time among many non-gendered or gender-typical behaviors, with each specific behavior embedded in specific perceptual contexts.

The ecological approach I outline earlier emphasizes the very characteristics often ignored in extant approaches. In brief, my approach emphasizes the importance of quantifying the gendered behaviors that children commonly and consistently perceive, presenting gendered behaviors to children in the temporal and spatial contexts in which those behaviors are *typically* perceived, and testing causation via experimental methodology. In short, careful testing of ecological stimuli that represents the cultural patterns found in the environments is critical for understanding the relationship between social models' and children's behavior.

Cognitive Developmental Theory

When Kohlberg (1966) introduced Cognitive Developmental Theory, it was a distinct departure from predominant theoretical viewpoints because it emphasized the child's *active* role in learning about gender ("I am a girl, thus it is rewarding to do feminine things"). In the predominant behaviorist approaches, exemplified by Social

9

Learning Theory (see above; Mischel, 1966), children's gender-role learning was theorized as a passive learning process whereby children's behavior was shaped by social reward ("I am rewarded when I do feminine things, thus I must be a girl"). That is, socialization perspectives suggest that a child will learn that she should behave in feminine ways because she sees other women behaving in those ways and is rewarded when she behaves in those same ways. Alternatively, Cognitive-Developmental Theory suggests that childhood learning of gender-roles derives from children's active attention to information about gender in their environments. Kohlberg suggests that children are motivated to actively attend to information about gender-roles once they can identify their own gender because they want to master their gender role (Martin et al., 2002). He suggests that gender identity emerges during a critical period (at about 2.5 years old) and then structures further learning. Similar to Social Learning Theory, Kohlberg suggests that the gender identity a child learns is based on reward up to that age, but then social reward becomes less critical. The popularity of this approach derived in part from the growing attention toward cognitive processes and away from behavioristic approaches (Martin et al., 2002). Cognitive Developmental Theory assumes that learning about the permanence of gender identity coincides with the Piagetian principle of conservation (see below; Kohlberg, 1966). As children learn that objects are the same regardless of factors such as appearance, they grasp the permanence of gender across context and situation. Cognitive Developmental theorists recognize that self-socialization (i.e., actively seeking out information that socializes gender roles; E. Maccoby & Jacklin, 1974) begins once children can identify their own gender, but suggest that learning and behavior changes

10

once children understand that their gender identity is not going to change over time (i.e., age) or context (e.g., outfit, hair length; Martin, Ruble, & Szkrybalo, 2002). Thus, the primary differences between Cognitive Developmental Theory and Social Learning Theory are a) the depiction of the child as active or passive, respectively, in the learning process and b) the acquisition of gender identity occurring alongside the cognitive principle of conservation.

In Cognitive-Developmental Theory, Kohlberg (1966) applied Piaget's developmental stages (1932) to the study of gender-role learning. Kohlberg argued that children's knowledge that gender is constant, despite changes in appearance (i.e., *gender constancy*), is the ultimate motivator in gender-role adherence. This stage is an application of Piaget's stage of conservation of physical properties in which children learn that an object is the same despite changes in appearance (Martin et al., 2002; Piaget, 1932). Kohlberg separated gender constancy into stages of knowledge which Slaby and Frey (1975) later demonstrated that children move through: the identification of one's own gender and other people's gender (i.e., gender labelling), the understanding that gender is stable over time (i.e., gender stability), and the understanding that gender is stable over variations in appearance (i.e., gender consistency). At about 2 or 2.5 years old, Kohlberg argued that children learn to label their own gender and within the subsequent 2 years learn to label other people's gender (i.e., gender identity; e.g., "I am a girl"; Gouze & Nadelman, 2017; Leinbach, Hort, & Fagot, 1997; Money, Hampson, & Hampson, 1957). By the age of 6 or 7, he suggested that children would learn both that their gender will be stable over time (i.e., gender stability; e.g., "I will always be a girl";

Ruble et al., 2007) and that their gender is consistent across situations (i.e., gender consistency; e.g., "I will be a girl even if I cut my hair or play football; Martin, Ruble, & Szkrybalo, 2002; Ruble et al., 2007). Slaby and Frey (1975) later demonstrated that children reach stability between 36 and 68 months and reach consistency between 41 and 67 months.

Critical to this review, Kohlberg (1966) was imprecise about the stage at which children were motivated to begin learning about gender roles. Although he emphasized gender constancy in his writing, it is unclear what Kohlberg expected to uniquely emerge once a child acquired gender constancy versus gender identity. This imprecision has led to substantial controversy in the literature regarding this theory. Modern day scientists who take a Cognitive Developmental approach theorize a more specific relationship between gender constancy and gender role learning that Kohlberg did. Specifically, they argue that progression through the stages is positively correlated to the strength of adherence to gender roles even though children begin to learn about gender-roles before reaching the final stage of gender constancy (i.e., gender consistency).

Although he was imprecise with respect to when gender-role learning would first appear, Kohlberg (1966) did suggest specific ages at which children began learning gender identity and the time by which they would have learned gender constancy. Despite the lack of precision about the strength of gender-role learning expected at each stage, this theory remains important historically and as a basis of future theorizing because it a) laid out clear qualitative stages of gender-role learning and b) reframed the child as an active agent in their learning process. This and other cognitive theories of gender

development posit that gender typing should increase with gender-role knowledge up until middle childhood when gender typing becomes more flexible once other social cognitive skills develop (Bigler & Liben, 2007; Liben & Signorella, 1980; Halim, Ruble, & Amodio, 2011).

Gendered ecology critique. The emphasis of Cognitive Developmental Theory is on cognitive processes—especially attention—and its task was never to characterize what it is in the environment that shapes gender roles. Nonetheless, this theory fails to answer critical questions that are critical to its assumptions and that an ecological approach could help resolve. Specifically, the stimuli to which children attend may vary at each stage of development and their attunement to these stimuli must be tested rather than assumed. Even in a self-socialization framework (wherein it is theorized that the child is actively seeking out information that socializes their gender roles), the development of gender roles depends on *how* gender roles are communicated, because some environmental patterns are only meaningful to older children whereas other environmental patterns (those involving nonverbal cues) are meaningful within the first months of life and can inform children about gender. For example, a study employing the ecological approach may test how attention is deployed towards different types of environmental patterns (e.g., nonverbal, verbal, vicarious, direct) at different stages of development and how attentional processes mediate the influence of nonverbal patterns on behavior. Children respond to gestures as early as 18 months (Iverson & Goldin-Meadow, 2005) but are only able to accurately identify subtle emotion expressions like sadness at about 10 years old

13

(Gao & Maurer, 2009). Thus, children may attend to different cues at different stages of development.

Furthermore, nonverbal cues in children's environments may direct *what* children learn from vicarious reinforcement (Repacholi & Metzoff, 2007). Children reference nonverbal behavior (e.g., gestures) early in development, even before the acquisition of language (Iverson & Goldin-Meadow, 2005) suggesting that nonverbal behaviors capture attention early in development and contribute to the formation of gender identity and categorization. Indeed, social referencing research firmly demonstrates that infants learn about appropriate behavior by observing adults' nonverbal responses to (a) specific stimuli, like toys (Hornik, Risenhoover, & Gunnar, 1987; Meltzoff, 1988; Mumme, Fernald, & Herrera, 1996) and (b) others' behavior (Repacholi & Metzoff, 2007). Nonverbal responses capture infants' attention (Peltola, Leppänen, Palokangas, & Hietanen, 2008), and in theory, cause them to attend to and thus learn about behaviors that tend to receive approval or disapproval. Accordingly, nonverbal cues may direct what children learn about appropriate behavior for each gender, even before they learn their own gender or that gender is stable.

Once children recognize the similarity between themselves and other girls or boys, vicarious reinforcement received by members of their own gender may be more closely *attended* to than vicarious reinforcement received by members of another gender. Thus, patterns in a child's own gendered environment (e.g., nonverbal cues) can drive attention along with internal cognitive mechanisms. Hence, identifying *how* gender roles are communicated in the environment is important even to self-socialization accounts.

14

In short, a theory that focuses on active attention to environmental patterns as the basis for children's gender roles should specify the patterns of behavior that are perceived by and influence children's gender roles before and after the acquisition of each stage of gender constancy. However, existing research has generally taken a correlational approach to the evaluation of Cognitive Developmental Theory by testing the relationship between the stage of gender constancy that a child has acquired and the strength of her gender stereotypes. The ecological approach directly examines the role of environment by using experimental stimuli that feature the patterns that children actually encounter situated in the environments they are actually encountered in (i.e., representative design; McArthur & Baron, 1983; Todd & Gigerenzer, 2000). Thus, the ecological approach could be used to identify the cultural patterns a child uses at each stage of development.

Gender Schema Theory

According to Gender Schema Theory (Bem, 1983; Martin & Halverson, 1981), children learn about gender-roles through cognitive schemas that they build to organize information. Schemas are organizational cognitive structures that facilitate efficient interpretation and interaction with stimuli. In any given schema, there is a central organizing concept and other concepts that link to the central one. Interpretation of the environment is then filtered through this schema, but only when the schema is activated (Martin & Halverson, 1981). Accordingly, schemas guide attention and facilitate memory biases.

Theorists argue that in the absence of gender cues, children would not develop gender schemas because schemas are formed to facilitate behavior and optimize

15

interaction with an environment. Schemas are only useful if they enable the perceiver to be more efficient in a setting. However, in most known societies, gender is used to organize and structure social environments (e.g., which bathroom to go in, where to shop for clothing, what activities to participate in). In these settings, Martin and Halverson (1981) propose that children form two schemas for gender-role learning – first, an ingroup/outgroup schema to determine whether information in the environment is relevant to them and second, an ingroup schema that details complex information about the expected behaviors and traits of their own gender (Martin & Halverson, 1981). Once children acquire gender identities (i.e., identify as a girl or boy), theorists argue that they use the first ingroup/outgroup schema to sort through environmental input with the purpose of identifying information to attend to (i.e., information about their ingroup). The ingroup information gleaned from this input is then used to build a more complex schema about ingroup behaviors.

Much like Cognitive Developmental Theory (Kohlberg, 1966), Gender Schema Theory emphasizes the active role that children's cognitions play in gender-role learning. That is, once children have identified environmental stimuli as relevant to themselves (i.e., about their gender ingroup), they are motivated to attend to and learn about it. Thus, both Cognitive Developmental Theory and Gender Schema Theory highlight the role of gender identity in determining the stimuli that children pay attention to. However, in contrast to Cognitive Developmental Theory, Bem (1983) as well as Martin and Halverson (1981) argue that unless gender is a useful heuristic to categorize people on, gender is unlikely to arise as a salient social category for children to build schemas on. In

16

other words, children's internal schemas will reflect the organization of their external worlds (Bem, 1981; Martin & Halverson, 1981). Thus, if gender is central to the organization of everyday life, Gender Schema Theory argues that children will come to focus on learning about gender and identifying themselves within that structure. Thus, Gender Schema Theory assumes a role of environment in guiding gender-role learning but does not specify the specific environmental features that might signal gender salience to children.

Martin and Halverson (1981) argue that the two-step schema structure makes unique predictions about the content of gender stereotypes. First, they argue that children will have better memory for behaviors that define their gender ingroup. This is in contrast to Social Learning Theory and Social Cognitive Theory (Bussey & Bandura, 1999; see below) where it is argued that children learn about both feminine and masculine behaviors, but enact one or the other (Martin et al., 2002). Furthermore, schemas are theorized to be subject to distortion and error as they are being constructed and facilitate the development of (sometimes flawed) knowledge about categories. For example, children may misremember the gender of a target in a scene where the target was behaving gender counterstereotypically to allow their memories to be congruent with their schemas (e.g., misremembering a picture of a girl sawing wood as having been a boy sawing wood; Martin & Halverson, 1983). Theorists argue that children are motivated to also have their own behavior be congruent with their schema. Thus, as they acquire a schema for gender-typical behavior, children will behave in ways that are consistent with the schema for their gender group.

Gendered ecology critique. From an ecological approach, not only is it critical to examine the patterns available to children, but also the noise surrounding them. Attention is oriented toward a dynamic and complex perceptual environment, so understanding the specific structure of behaviors that are gendered, as well as the noise and context surrounding this signal, seems important to understanding how active perceivers deploy their attention to information in the environment. Children may detect a particular pattern that informs their schemas (e.g., parents' attention towards a particular toy) but only in the context of the noise that the pattern appears in (e.g., other emotional expressions, busy environment, smells). Similarly, the context in which patterns are embedded may not only include noise but also statistical correlates of the pattern. For example, perhaps boys outnumber girls in playground scenes but not school scenes. In this case the existence of the gender pattern would be correlated with scene-type, and what children learn may not be that boys outnumber girls but rather that boys are more likely to be on playgrounds than girls. Isolating a pattern from its natural correlates and/or removing the accompanying noise (as so often occurs in lab settings) may change how children process the pattern of interest.

Gender Schema Theory (Bem, 1983; Martin & Halverson, 1981) also argues that, once identified with one gender, children selectively attend to patterns related to their own gender (e.g., a girl would attend to a woman behaving in a particular way but not necessarily to a man behaving in the opposite way). Thus, an ecological approach can enable researchers to examine what children do or do not attend to in perceiving cultural patterns containing only members of the other gender. This theory argues that girls have

a more complex knowledge of things that girls are supposed to do than of things that boys are supposed to do. Gender Schema theorists would argue that girls would stop attending to boys' behavior once she had decided that their behavior is not relevant to *her* future behavioral repertoire as girl. An ecological approach would clarify how attention is allocated towards observation of members of the other gender.

Social Identity Theory

Social Identity Theory (Tajfel & Turner, 1979) posits that when a person identifies herself as a member of a particular group, she adopts a number of cognitive-motivational biases (i.e., biases in what information is attended to, how it is perceived, and how it is remembered). This assumption is quite similar as those made in Gender Schema Theory (Bem, 1983; Martin & Halverson, 1981) where it is argued that gender-role learning sharply increases once a child identifies herself as a girl. The reason for the adoption of cognitive-motivational biases, however, varies between the two theories. Social Identity Theory would posit that once a child identifies as a girl or boy, she or he would then be motivated to maintain a positive perception of that group so that it contributes positively to self-esteem (i.e., self-enhancement motives; Lorenzi-Cioldi, 1991; Zemore, Fiske, & Kim, 2000). Gender Schema Theory, on the other hand, argues that these biases exist because children are motivated to maintain cognitive consistency, not a positive self-concept (i.e., dissonance theory). Despite the differences between Gender Schema Theory and Social Identity Theory in the motives driving biases in information processing, the particular types of biases that arise are similar (e.g., between-group polarization). Although Social Identity Theory has only infrequently been applied

to the study of children, it is a simple shift to use it to describe how children think about ingroups and outgroups across the lifespan. Accordingly, scientists have suggested that the social identity processes observed in adults may also help to explain social category learning and intergroup prejudices among children (Nesdale, 1999; Nesdale & Flesser, 2001).

Social Identity Theory has relatively recently been extended to the examination of children's group biases, for example, specifically as they relate to race and minimal group paradigms (Nesdale, 1999; Nesdale & Flesser, 2001). Applications of an adult theory to children requires some adaptations based on cognitive development. Specifically, with race, theorists argue that children go through four stages of learning about race: undifferentiated (i.e., prior to 3 years of age, children do not attend to racial cues), ethnic awareness (i.e., at about 3 years old, children develop an awareness of racial groups and their own racial identity), ethnic preference (i.e., between ages 3 and 7 years old, children begin to exhibit some of the motivational biases that favor their racial ingroup), and ethnic prejudice (i.e., at about 7 years old, children begin to hold not only a positive view of their ingroup, but also a negative view of outgroups; Nesdale, 1999; Nesdale & Flesser, 2001). Thus, for race, theorists argue that cognitive-motivational biases emerge in a particular order such that positive ingroup biases emerge before negative outgroup biases. An application of Social Identity Theory to gender-role learning would follow a similar but not identical framework given that gender cues become salient earlier than race cues (i.e., by 6 months of age when infants are able to discriminate between the voices of women and men; Miller, 1983).

In the context of gender, Social Identity Theory would suggest that once children identify with a gender (e.g., "I am a girl."), they would generally prefer members of their own group (i.e., *in-group favoritism),* assume that there is more similarity between members of the same gender than different genders (i.e., *within-group assimilation),* value prototypical group members more and reject counterstereotypical group members (i.e., *within-group differentiation),* exaggerate differences between women/girls and men/boys (i.e., *between-group contrast),* assume that outgroup members are very similar to each other (i.e., *out-group homogeneity),* and even respond negatively toward outgroup members (i.e., *out-group hostility;* Zemore, Fiske, & Kim, 2000).

Gendered ecology critique. A common theme in Social Identity Theory and the other cognitive theories reviewed thus far (i.e., Cognitive Developmental Theory, Gender Schema Theory) is the argument that a child's cognitive processes (e.g., ingroup-outgroup identification) predispose her to learn about social groups. However, these theories do not explain what causes gender to emerge as a critical category to group oneself and other by. There are likely many relevant environmental patterns that could inform a child of her gender identity, such as verbal labelling and social feedback. However, for the most part it has been *assumed* that patterns exist to inform children of their gender identities and are not measured (cf. Gelman, Taylor, Nguyen, Leaper, & Bigler, 2004). The ecological approach addresses this paucity by emphasizing the measurement and testing of patterns present in the environment.

Furthermore, Tajfel and Turner (1979) argue that children develop cognitive-motivational biases once gender identity is formed. Yet it is unclear whether children

attend to different patterns in the environment and, if so, what those patterns are. For

example, children may be more attentive to negative information about outgroup

members (e.g., boys showing up late to class) or positive information about ingroup

members (e.g., girls showing up early to class). Generally, the emergence of biases in

information processing has been documented using fictitious memory paradigms or rating

scales (see Martin, Ruble, & Szkrybalo, 2002). However, the way that perception,

attention, and memory may adapt in the context of ecologically valid environments is a

crucial gap in this literature. The ecological approach addresses these issues in the

existing literature both by enabling scientists to identify patterns present in the

environments children encounter and by testing how children attune to these patterns

across stages of cognitive development.

Developmental Intergroup Theory

Developmental Intergroup Theory (Bigler & Liben, 2007) was put forth as an

initial response to a gap in the theorizing by explaining why some categories (e.g.,

gender) emerge as salient social dimensions whereas others (e.g., toe length) generally do

not. Developmental Intergroup Theory has three sequential core components: first, an

attribute (e.g., gender) must be made salient to a child; then, the child must categorize

people by that salient dimension; and finally, the child develops knowledge based on that

salient group dimension. Similar to Cognitive Developmental Theory, Gender Schema

Theory, and Social Identification Theory, being able to categorize people by gender is an

important component linking cultural patterns with gender-role learning (Bem, 1983;

Kohlberg, 1966; Martin & Halverson, 1981; Tajfel & Turner, 1979). A critical point of

divergence, however, is the emphasis on forming one's own gender identity or categorizing others by gender. As a reminder, past theories (e.g., Social Identity Theory) have primarily emphasized self-categorization as the impetus to gender-role learning. However, the focus of Developmental Intergroup Theory is on how children categorize *others*. Furthermore, whereas earlier theories tended to focus solely on the cognitive processes linking gender categorization to gender-role learning, Developmental Intergroup Theory was novel in that Bigler and Liben aimed to identify environmental patterns that make a social category salient in the first place.

Developmental Intergroup Theory posits that perceivers come to categorize people on a particular dimension if (1) the cues associated with group membership are clearly perceptible (e.g., hair length, clothing type, facial features), (2) the category label is explicitly used by others, even in ways that do not necessarily reinforce a stereotype (e.g., a teacher saying *boys and girls* instead of just *students*), (3) one group is proportionally smaller than another group, causing minority group members to draw more attention, or (4) de facto segregation is present thereby allowing perceivers to conclude, for example, that there is something inherently different about members of the two groups that would explain their segregation from each other. Once a category is salient and the child can categorize on that salient dimension, Bigler and Liben (2007) argue that the child then develops stereotypes and prejudice about the groups. Some features of this part of the theory resemble previous theories. For example, much like Gender Schema Theory (Martin & Halverson, 1981) and Social Identity Theory (Tajfel & Turner, 1979), Developmental Intergroup Theory posits that gender categorization leads

children to learn about gender-roles because children infer that members of groups share an underlying essence that makes them similar (i.e., essentialism) and develop preferences toward ingroup members (i.e., ingroup bias). Much like Social Cognitive Theory (Bussey & Bandura, 1999) and to some extent Social Learning Theory, Developmental Intergroup Theory also posits that gender categorization leads children to attend to things explicitly said about gender and to the attributes of social models. However, what sets Developmental Intergroup Theory apart from theories that preceded it is a) the specificity in the environmental patterns that are theorized to lead children to schematize on gender and b) the emphasis on categorization of others (vs. identification of the self) by gender.

Gendered ecology critique. Developmental Intergroup Theory (Bigler & Liben, 2007b) details some specific environmental components and has emerged as an important theory in explaining children's social learning. An assumption in empirical testing up to this point has been that these patterns of interest are present in environments children frequently encounter. For example, the salience of gender in classrooms has been frequently manipulated in this area of literature, but without analyses of how prominent that pattern is in the classroom environments children regularly encounter, nor if the concrete procedures used to highlight gender in the classroom are the same procedures that children consistently encounter (Hilliard & Liben, 2010; Patterson & Bigler, 2006).

Developmental Intergroup Theory researchers have, however, maintained the natural confounds and noise present in these environments (e.g., Hilliard & Liben, 2010). This is consistent with my ecological approach. For example, when children encounter

an environment where gender is made salient, such as a classroom, there are numerous features of that classroom that children have to process and potentially filter out in order to attune to the pattern of gender salience. In a classroom, children are learning behavioral expectations, social skills, and basic knowledge about everything from language and mathematics to cultural symbols. The amount of noise and co-occurring environmental patterns could render gender salience unimportant. Children are also still developing basic cognitive skills so testing the effect of gender salience in the context that it presumably naturally appears – as Hilliard and Liben (2010) have done – is critical to evaluating the theory. Of course, the lack of careful identification of the patterns present is problematic; not only can researchers not be sure of the prevalence of a pattern without careful, methodological measurement of it, but researchers are also blind to other potentially less conspicuous but equally influential patterns that may also be present in that environment.

Social Role Theory

In Developmental Intergroup Theory, Bigler and Liben (2007) emphasize physical segregation and visible cues in the environment but other theories emphasize other sorts of distinctions. For example, according to Social Role Theory, gender stereotypes are learned from the distribution of women and men into social roles (i.e., professions, household chores) of differing status and task demand (Eagly & Steffen, 1984). When types of people (e.g., women vs. men) are unequally distributed into social roles, perceivers assume that those types of people have the characteristics associated with the social role. For example, women are more likely than men to be nurses, teachers,

and other professions where being nurturing is required. According to Social Role

Theory, then, perceivers will assume that any given woman is more likely than any given

man to be nurturing, even if both are in a non-nurturing profession (e.g., athlete).

Social Role Theory (Eagly & Steffen, 1984; Eagly & Wood, 1982) resembles

both Social Learning Theory (Mischel, 1966) and Developmental Intergroup Theory

(Bigler & Liben, 2007b); in it, Eagly and colleagues argue for learning through the

perception of social models, much like Social Learning Theory. However, in contrast to

observation of a single social model, Social Role Theory includes the assumption that

information about gender is conveyed by *patterns* of social models. This is like

Developmental Intergroup Theory wherein Bigler and Liben argued that de facto

segregation can convey to children that the two groups are different and that there is a

reason why they are separated. However, Social Role Theory specifies that the

segregation of women and men into different roles conveys not only that they are

different, but also conveys the specific qualities that women and men possess because

those are the qualities required to be successful in those roles. Also, like Developmental

Intergroup Theory, theorists focus on categorization of others' gender and is mute on how

the individual's *own* gender identity impacts the inference from social roles to gender

stereotypes.

Applied to how children learn gender roles, Social Role Theory would suggest

that children infer group-based traits and status from the roles that they see women and

men occupy in their social environments (Eagly, Wood, & Diekman, 2000). Children

would infer that women possess communal qualities like being nurturing, whereas men

would possess agentic qualities like being dominant. However, it has yet to be studied whether children are able to infer such complex social patterns in learning gender roles (Zemore, Fikse, & Kim, 2000) and more work is needed to know in what capacity the mechanism described in Social Role Theory impacts children's gender-role learning.

Gendered ecology critique. Social Role Theory (Eagly & Steffen, 1984) suggests the presence of one cultural pattern in particular present in the social environment: role distributions of women and men. This pattern has been documented in various ways – division of household labor (e.g., who completes most of cooking), the proportion of women (vs. men) serving in leadership roles (e.g., as CEO, heads of state), and even the types of jobs women (vs. men) hold (e.g., nursing, teaching). However, assumed in extending Social Role Theory to children is a) that patterns of gendered role distributions are present in the environments *children* regularly encounter, b) that children can attune to those relatively complex patterns, and c) that children are directly influenced by the pattern. In most societies, caretaking roles are typically held by women and thus it is likely that the environments children encounter contain the inequitable distribution found in workplace hierarchies, for example. However, this assumption must first be tested. For a scientific theory to be valid, each of its relationships must also be tested and validated.

Furthermore, it is important to determine not only *if* kids are exposed to these patterns but also how. The presence of a pattern in children's social environments does not necessitate that it has an influence on them. For example, how do children perceive that someone is in a leadership role? Does the person have to be introduced alongside a

title, such as CEO? What concrete elements of leadership roles do children perceive? Similarly, even if a pattern exists in children's environments, children may not attune to it. For example, children may not notice nonverbal cues to hierarchy but only notice when someone is in a leadership position when an explicit label is used. Regardless of the patterns that children notice, integrating cues into a *pattern* is complex and requires advanced cognitive mechanisms to do so. Children would have to integrate the gender of targets and the tasks targets are performing across time and contexts. This is no simple task, especially for a developing child. It has yet to be tested whether children can draw such complex social patterns from natural environments. Finally, the presence of a pattern does not necessitate its influence on children, thus exposure to the pattern needs to be experimentally tested to examine its influence on children's beliefs and stereotypes.

Social Cognitive Theory

Social Cognitive Theory (Bussey & Bandura, 1999) is a revision to Social Learning Theory (see above; Mischel, 1966) in which children emulate observed behavior. However, in Social Cognitive Theory, there are three modes of influence responsible for gender stereotype learning: modeling (the observation of peers, parents, and mentors), enactive experiences (evaluative feedback from others about one's behavior), and direct tuition (being told how to act). Reliance on any given mode varies based on cognitive development. For example, Bussey and Bandura (1999) argue that enactive experience only emerges as children begin to enact gendered behaviors, such as when children begin playing with toys or engaging in shared social activities. However, the authors also argue that learning occurs most strongly and quickly through modeling

because it is present from birth and children begin to emulate models at very young ages (e.g., as young as 25 months of age; Bussey & Bandura, 1999). They argue that modelling is more critical than either enactive experience (given its indirect nature) or tuition (given its abstraction from the behavior itself).

Bussey and Bandura adapted Social Learning Theory to recognize the role of cognitive mechanisms in gender-role learning. Thus, Social Cognitive Theory has some features of Cognitive Developmental, Gender Schema, and Social Identity Theories, but remains distinct from these cognitive theories for its focus on social modeling and reward (Bem, 1983; Kohlberg, 1966; Martin & Halverson, 1983; Tajfel & Turner, 1979). Specifically, like Cognitive Developmental Theory, gender identity is a critical step that motivates learning such that Bussey and Bandura argue that children are going to be more attentive to socially available information about gender once it becomes more relevant to them. However, dissimilar from Cognitive Developmental Theory, Bussey and Bandura do not characterize the child as intrinsically motivated to learn about their gender group, but instead indirectly motivated by social reward and expectation (Martin et al., 2002). Martin and colleagues have also pointed out inconsistency in Bussey and Bandura's integration of gender categorization and identification into the theory. In some places (e.g., Bussey & Bandura, 1999), they argue that children do not need to have a gender identity themselves for gender-role learning to begin, but just need to be able to differentiate between women and men and note patterns of associated objects and behaviors. In other places (e.g., Bussey, 1983; Bussey & Bandura, 1984), however, they argue that children need to have evaluated the similarity of themselves to others before

they can encode behaviors as feminine or masculine. A lack of precision in this theory has rendered it difficult to apply in the context of environmental influences on gender-role learning, although it has motivated some interesting work about same-gender modelling (see Evidence section below).

      Gendered ecology critique. Bussey and Bandura (1999) suggest several cultural patterns that convey gender-roles such as the behavior of role models and rewarding gender-stereotypical behavior. However, for any of these patterns to convey meaning to a child, the child must be able to *perceive* that cultural pattern amongst noisy perceptual environments. As mentioned previously, role models may exhibit gender-stereotypical, -neutral, and -atypical behavior over time. Piecing together a pattern requires a child to connect pieces of behavior over time. And beyond the temporal noise, there is spatial noise that can be critical to the gendered meaning of behavior. From the perceptual features of the context (e.g., bright, quiet, cluttered) to the semantic characteristics of context (e.g., classroom, living room, funeral), it is not simple matter to extract the meaning of dynamic behavior from the surrounding noise. Is a signal sufficiently strong to be extracted *and* to influence cognition? The ecological approach addresses this question by first examining the environmental contexts for frequently encountered patterns and second tests the effects of exposure to these culturally-prevalent patterns.

EVIDENCE

Gender-role learning has long been a topic of scientific inquiry. Prominent theories have addressed features ranging from socialization by peers to cognitive processes that moderate learning. Here, I review the research regarding these aspects of gender-role learning including, a) developmental stages of gender-role learning, b) information biases in gender-role learning, c) content of gender-role learning, and d) what is processed in gender role learning.

Developmental Stages of Gender-Role Learning

Cognitive-Developmental Theory (Kohlberg, 1966) was the first gender-role learning theory to outline distinct cognitive stages that children reach. Kohlberg argued that children first learn the verbal labels to refer to different things called boy and girl, then learn that boys and girls retain their gender forever, and then finally learn that boys and girls retain their gender even in different situations. Only a small portion of children (i.e., between 1% and 10%) report understanding the stages in reverse order - consistency before labels or consistency before stability, for example (Eaton & von Bargen, 1981; Gouze & Nadelman, 1980; Lisi & Gallagher, 1999; Munroe, Shimmin, & Munroe, 1984; Slaby & Frey, 1975). Research suggests that this finding is stable across sociocultural environments such that children from various countries understand gender stages in the order that Kohlberg initially proposed (e.g., Argentina, Canada, Kenya, Nepal; Eaton & von Bargen, 1981; Lisi & Gallagher, 1999; Munroe, Shimmin, & Munroe, 1984).

It is also worth noting that work with the verbal measures has shown that sociocultural environment has substantial effects on the acquisition of knowledge about gender constancy. This is in direct contrast to Kohlberg's (1966) theorizing that the stages of gender constancy emerge in a critical period and their timing does not vary based on sociocultural stimuli. For example, children from middle-class Canadian families achieve gender constancy by the age of 5 (Eaton & von Bargen, 1981) whereas children from preindustrial cultures (e.g. Kenya) tend to achieve gender constancy only by the age of 8 (Munroe et al., 1984). It is unclear whether these same sociocultural effects would emerge using habituation paradigms.

Correlates of gender labelling. Evidence suggests that gender categorization (i.e., labelling others) and identification (i.e., labelling oneself) – the first stage of Cognitive Developmental Theory and a critical cognitive component of Gender Schema Theory, Developmental Intergroup Theory, and Social Identity Theory – do correlate with and even predict gender-role learning (Bem, 1983; Bigler & Liben, 2007b; Kohlberg, 1966; Martin & Halverson, 1981; Tajfel & Turner, 1979). Researchers have found that children who are able to label others or themselves by gender spend more time with peers of the same gender, are more likely to play with gender-stereotypical toys, and are more likely to engage in gender-stereotypical behaviors (Fagot, 1985; Fagot, Leinbach, & Hagan, 1986; Weinraub et al., 1984). In one study, children were tested on gender label acquisition and gender-stereotypical preferences monthly beginning at 16-months (before gender labelling emerged; Fagot & Leinbach, 1989). Children who had acquired gender labels by 27-months (i.e., early labelers) displayed increased gender

stereotypical play in subsequent assessments compared to children who did not acquire

gender labels by 27-months. Thus, gender-labelling did precede gender-stereotypical

play. In another study, researchers found that correct use of gender labels at 24 months

predicted gender stereotypes at 36 months (Zosuls, Ruble, & Tamis-Lemonda, 2014).

Other work has documented that children at about the age of 36 months (i.e.,

when gender-labelling emerges) begin to emphatically embrace stereotypical attributes of

their gender group. Girls, for example, tend to embrace dresses and the color pink – a

phase that has been termed the "Pink Frilly Dress" phenomenon (Halim, Ruble, &

Amodio, 2011). Boys, on the other hand, are noted during this period to reject feminine

appearance and behavior (i.e., between-group contrast; Halim et al., 2014). These trends

have been documented across multiple sociocultural groups and environments though

they sometimes express differently in different groups. For example, strictly wearing

only gender stereotypical clothing (i.e., appearance rigidity) was more pronounced

among low SES ethnic minority 4-year-old boys than White middle class or Chinese

middle class boys (Arredondo et al., 2014; Halim et al., 2014). Between the ages of 3

and 5, American children also engage in less gender counter stereotypical play (Halim et

al, 2013) and, by preschool and kindergarten, interact with children of the other gender

only about 10-15% of the time (Martin & Fabes, 2001).

The role of gender labelling in gender-role learning however, is still somewhat

ambiguous for a few reasons. First, the aforementioned studies are correlational or

longitudinal, leaving open several alternative explanations about the relationship between

stereotyping and gender labelling. It is unclear whether the acquisition of gender labels is

33

the cause of gender-role learning, the outcome of gender-role learning or whether both are caused by a third variable. For example, given the lack of experimental methods, it is difficult to disentangle changes in gender-role learning from simple changes based on age. Children could simply be learning gender-roles at the same time that labelling emerges, rather than one causing the other.

Second, it is unclear whether it is labelling of the self (i.e., gender identity) or others (i.e., gender categorization) that is more critical. Some work has found that gender stereotypical behavior or knowledge is correlated with children's ability to label themselves (e.g., Weinraub et al., 1984), whereas other work has found that gender stereotypical behavior or knowledge is correlated with children's ability to label *others* (e.g., Fagot, Leinbach, & Hagan, 1986). Recent research suggests that adherence to gender norms is not just about a child knowing her gender identity , but instead about having some knowledge of *both* genders (Zosuls et al., 2014). For example, a child has knowledge of both genders if she can accurately point to a girl doll when asked which one is a girl and to a boy doll when asked which one is a boy *even if she is unable to say that she is a girl*. Alternatively, a child has knowledge of both genders if she can accurately say that she is a girl and point to a boy doll when asked which one is a boy *even if she is unable to point to a girl doll when asked which one is a girl*. In this recent study, children who possessed knowledge of only the other gender or of only their own gender were less likely to play in gender-typed ways than children who possessed knowledge of both genders.

Third, the documentation of gender labelling has relied primarily on verbal measures in which children are asked logic-based questions about gender (e.g., "When this girl grows up, can she be a mom?", "When this girl grows up, can she be a dad?"; Lisi & Gallagher, 1999). The evidence indicates, however, that it is at least possible that the ability to distinguish between women and men is not inherently tied to verbal ability. Hence, for Kohlberg's ordering to be falsifiable, it must be possible to evaluate whether children have gender knowledge before they learn gender labels. In fact, looking habituation paradigms have suggested that children can distinguish between and gain preference for members of a particular gender as early as 6 to 8 months (Cornell, 1974; Fagot & Leinbach, 1993; C. L. Miller, 1983; Pakizegi, 1985; Younger & Fearing, 1999), can hold both gender categories in mind while observing a new face as early as ten months (Younger & Fearing, 1999), and can learn rudimentary gender stereotypes by associating female and male faces with objects as early as 9 to 11 months (Levy & Haaf, 1994). Thus, although it was initially estimated that children learn gender identity between 24 and 30 months old and learn gender categorization within the year after that (Kohlberg, 1966), scientists now understand that children's understanding of gender categories emerges much earlier even before gender identity and before children have the linguistic labels to describe them. This does not directly contradict Cognitive Developmental Theory but does suggest that gender categorization may come before gender identity and that the timing at which they emerge may be inconsistent with Kohlberg's (1966) original proposals. Furthermore, research regarding gender-role learning and stereotype acquisition suggests that children learn about stereotypes before

they understand the permanence of their own and others' gender – in direct contrast to Kohlberg's primary proposal. Research on how children's gender-role learning relates to this preverbal understanding of gender categories will be critical to know the extent to which gender categorization and identification are important cognitive stage as proposed in many of the theories outlined above.

Correlates of gender constancy. The emergence of gender-role learning prior to the acquisition of gender suggests that gender constancy is not the critical motivator in gender-role learning as Kohlberg (1966) seems to have suggested. However, in support of Cognitive Development Theory, the acquisition of gender constancy does serve a meaningful role in gender-role *enactment* and the data are mixed on whether gender constancy causes increased rigidity or increased flexibility.

In support of gender constancy causing increased rigidity, whether children have acquired knowledge of gender constancy seems to be particularly meaningful when children are weighing two attractive but gendered alternatives, such that those who have acquired gender constancy are more likely to choose gender stereotypical options (Frey & Ruble, 1992). Consistent with this work, although gender constancy does not determine whether or not a child will emulate another person of the same gender, it does modulate how *closely* the child will emulate the behavior of that other person suggesting a unique role of gender constancy in gender-role learning (Bussey & Bandura, 1984; O'Keefe & Hyde, 1983). As mentioned earlier, theorists argue that increased rigidity may result because children learn that their gender will be a permanent part of their identity and thus are more motivated to master their knowledge of the group.

36

However, in support of gender constancy being related to increased flexibility, children do become more flexible in their gender adherence over time and theorists argue that increased flexibility may result because children learn that gender is constant and will not change if they violate a widely-held norm.

Information Biases in Gender-Role Learning

Children learn about gender categories and develop gendered associations prior to the acquisition of gender identity (see Martin, Ruble, & Szkrybalo, 2002) which is inconsistent with Cognitive Development Theory. However, cognitive processes of gender-role learning appear to change once gender identity is acquired. Social Identity Theory, Developmental Intergroup Theory, and Gender Schema Theory, for example, each describe in varying detail the ways that perception, memory, and attention can be biased once children know their gender identity (Bem, 1983; Bigler & Liben, 2007b; Martin & Halverson, 1983; Tajfel & Turner, 1979). In Social Identity Theory, these biases are referred to as cognitive-motivation biases because theorists suggest that children begin to enact these biases in their thinking through the motivation to maintain positive self-esteem (see Social Identity Theory section above for more information). In Gender Schema Theory, Martin and Halverson suggest that these biases emerge because children are motivated to master knowledge about their gender group. Although the source of children's motivation remains unclear, evidence does support that these biases in information processing do emerge at about the time gender identity is acquired. Consistent with Social Identity Theory, Developmental Intergroup Theory, and Gender Schema Theory, for example, children begin to pay more attention to and have better

37

memory for attributes of their own gender group at about 3 years of age (i.e., at about the time gender identity emerges). Children also tend to attribute positive qualities and behaviors to their ingroup (i.e., ingroup favoritism). Five-year-old children, for example, overwhelmingly guess that a "really, really smart" person is likely to be of their own gender than of the other gender (Bian, Leslie, & Cimpian, 2017) and award more prizes if a picture was drawn by members of their own gender than another gender (Halim, Ruble, Tamis-LeMonda, Shrout, & Amodio, 2017). Furthermore, childhood is marked by mild hostility between girls and boys with some version of "cooties" often being attributed to the other gender (i.e., out group hostility; Glick & Hilt, 2000). As heterosexual romantic relationships begin to develop, and children interact with those of the other gender more, outward hostility becomes more ambivalent. However, girls begin to display less of these biases as they learn about the lower status of their gender group (see below regarding the content of stereotypes).

What is Learned in Gender-Role Learning

Gender stereotypes are extensive, applying to seemingly everything from colors and shapes to traits and behaviors. It is difficult, in fact, to find an object or trait that is consistently perceived as gender-neutral. Despite (or perhaps because of) the vast number of things that are linked to one gender or the other, children begin to form their gender schemas very early – generating associations between gender categories and vocal tone as early as 6 months and associations between clothing and hair styles as early as 9 months (C. L. Miller, 1983; Pakizegi, 1985). This contradicts Cognitive Developmental Theory in which Kohlberg (1966) argues that gender-role learning emerges as children

acquire an understanding of the Piagetian principle of conservation. Instead, children appear to learn gendered associations much earlier. Despite the complexity and extent of gender stereotypes, children tend to hold basic gendered associations as early as 26 months of age (Weinraub et al., 1984). Three-year-old children "correctly" categorize toys by gender typicality and tend to wholeheartedly embrace gender stereotypical appearance (Freeman, 2007; Halim et al., 2011). By the age of 5, children have acquired stereotypes about the activities (e.g., play with dolls), occupations (e.g., be a dancer), and traits (e.g., weak) considered appropriate for each gender (Hilliard & Liben, 2010). Even more, 4-year-old children can grasp gendered associations with shapes (e.g., squares, hearts), textures (e.g., burlap, cotton), and lines (e.g., angular, curved) attesting perhaps to the arbitrary nature of other gender stereotype content that children learn these seemingly unimportant associations at the same time as more prominent ones (Leinbach et al., 1997).

Some stereotypes seem to emerge later in childhood, particularly as children begin to learn about group differences in status. In most modern societies, women and girls possess less power, have lower status, and are considered less competent than men and boys (Fiske, Cuddy, & Glick, 2007). Children in the US learn about status differences between women and men between the ages of 4 and 6 and, consistent with Social Identity Theory, this learning changes how girls adhere to gender roles (Bian et al., 2017; Halim, Ruble, & Tamis-Lemonda, 2013). For example, at approximately age 6, girls begin to guess that a "really, really smart" person is more likely to be a man than a woman and associate math more strongly with boys than girls (Bian et al., 2017;

Cvencek, Meltzoff, & Greenwald, 2011). Many girls also often begin to reject feminine appearance and behavior, opting instead for androgynous "tomboy" personas (Halim et al., 2011).[1] It is unclear how boys respond to information of gendered status. Extrapolating from work on groups in positions of privilege (e.g., Eibach & Keegan, 2006), it is possible boys become aware of gender differences in status more slowly and to a lesser extent than girls. In fact, among adult populations, women consistently score higher on measures tapping into social status awareness (Jones, 2005). Once boys become aware of group status differences, the content of their stereotypes likely reflects inferences about competence and ability. Learning status differences may also encourage higher group boundaries consistent with past work demonstrating less gender stereotype flexibility and greater gender policing among boys than girls (Reigeluth & Addis, 2016; Signorella, Bigler, & Liben, 1993). Consistent with the goal of maintaining status and power, higher status groups tend to be more strict about members behaving in prescribed ways than lower status groups (Munsch & Willer, 2012; Reigeluth & Addis, 2016).

Some children, however, do not adhere to traditional gender stereotypes and the scientific study of gender-role learning has generally ignored this subgroup. In the mid-1900s, gender-role theories were intended to explain deviations from traditional gender roles (i.e., gender non-conforming children). Theorists considered traditional gender

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[1] Of note, however, are substantial variations by sociocultural group. African American parents report observing more tomboy behaviors among girls than do Dominican American parents, for example (Halim et al., 2014). Zosuls and colleagues (2014) suggest that this is due to stricter gender norms among Dominican American families. Thus, the way that girls' adherence to gender roles may change as a result of learning about their lower group status may differ by what is perceived to be appropriate within each sociocultural group. Among some groups, it may be less appropriate to embrace a more androgynous behavioral repertoire.

roles the ideal and deviations from that to be a failure of social modelling, cultural reinforcement, or cognitive structures. In fact, children who deviated from traditional norms were hypothesized to be "confused," "delayed," and to even have psychological disorders (McHugh, 2014; Zucker et al, 1999).

However, research on this subgroup of children can greatly inform scientists on the processes of gender-role learning and what may render a child less susceptible to cultural patterns that communicate gender roles. This is because gender non-conforming children are likely exposed to similar environmental stimuli and cultural patterns as their peers yet acquire different sets of behaviors. For example, girls who choose to play with Legos or boys who go to ballet are likely exposed to the same broad sociocultural information as their peers – Legos being in the boys' section of the toy store, their friends not participating in ballet, and not seeing models of the same gender participating in the activity. However, these children emerge with gender counter-stereotypical behaviors nonetheless. Although previously seen as a failure of cognitive development, modern psychological scientists perceive members of this group to be highly informative to the scientific understanding of gender-role learning. When gender-role learning is treated as an outcome of gendered ecology not a natural byproduct of cognitive development, it becomes more critical for theories of gender-role learning to be able to explain deviations from the norm – otherwise these theories are merely descriptive and not predictive.

Of course, it is important to note that the subgroup of gender non-conforming children includes transgender children and psychologically androgynous children – each of whom can reveal different mechanisms in gender-role learning. Transgender children

41

identify with the gender that is not their natal sex and embrace behaviors that are stereotypical of their chosen gender group. Transgender children have implicit associations, explicit attitudes, and chosen behaviors that are indistinguishable from cis-gender children of the same age and chosen gender (Olson, Key, & Eaton, 2015). The emergence of gender identity in these children may inform researchers about the cultural and idiographic patterns that teach children which gender group they fit within and what individual factors may moderate the influence of negative feedback about gender-counterstereotypical behaviors on gender-role adherence. Gender non-conforming children reject traditional gender role norms and are highly androgynous in terms of their chosen behaviors – appearing to have great overlap not only with other children of their gender but also children of the other gender (Olson et al., 2015). These children can inform researchers about a) factors that modulate a child's susceptibility to the cultural patterns that communicate gender roles and b) idiographic patterns that reduce the impact of cultural patterns on gender-role learning.

What is Processed in Gender-Role Learning

The communication of gender roles is a key component of many gender-role theories. Social Role Theory, for example, argues for the communication of gender roles through the distribution of women and men into different kinds of professions and chores (Eagly & Steffen, 1984; Eagly et al., 2000). Social Cognitive Theory (and in part Social Learning Theory) emphasize communication of gender roles through the emulation of same-gender models, nonverbal and verbal reward for gender-stereotypical behavior, and direct verbal feedback (Bussey & Bandura, 1999; Mischel, 1966). Developmental

Intergroup Theory also posits the role of various types of communication in transmitting gender roles, such as explicit labels or perceptual salience (Bigler & Liben, 2007b). Here I will discuss evidence for how gender roles are transmitted, separated by their mode of communication (i.e., verbal and nonverbal).

Verbal communication. Verbal communication is an important route by which gender roles may be communicated to children. One study, for example, tested the effect of being a student in a preschool classroom where gender was made salient on gender-stereotypic behavior and intergroup bias (Hilliard & Liben, 2010). For two weeks, teachers in the high salience classroom made frequent use of explicit gender labels by organizing bulletin boards and class materials by gender labels as well as having children organize themselves by gender. For these children – aged 3 to 5 years old - gender labels increased intergroup bias and gender-stereotyping relative to a low-salience condition.

Other studies have examined the role of explicit gender salience more naturalistically. For example, one study compared gender stereotyping among 3 to 6-year-old children in a gender-neutral preschool to those in a traditional preschool (Shutts et al., 2017). Like the teachers in the experimental study conducted by Hilliard and Liben (2010), teachers at gender-neutral preschools in Sweden where the study was conducted are instructed to a) avoid gendered pronouns (the Swedish language contains a gender-neutral pronoun), b) to adapt stories to not reinforce gender stereotypes, and to avoid interacting with children in ways based solely on their gender. Children enrolled in the gender-neutral preschool were more interested in playing with an other-gender peer and were less gender-stereotypical in their traits and activities than children enrolled in the

traditional preschool. However, these children were no less accurate at gender

categorization than those in the traditional preschool.[2] Thus, the use of explicit gender

labels is a pattern that increases gender stereotyping and segregation but does not

necessarily reduce gender categorization processes.

The language used to talk about groups is also influential in generating the belief

that gender groups are highly differentiated. For example, generic language to describe

behavior (e.g., "boys are good at math", "girls love to play dress-up") increased 4-year-

olds' beliefs that girls (boys) are similar to each other but different from boys (girls)

relative to specific language (e.g., "Joe is good at math", "Josie loves to play dress-up";

Cimpian & Markman, 2011).

However, there are limitations to the influence of verbal feedback. In the above

study, for example, generic generalizations only led to increased essentialism if the

property was applied to all members of the gender (e.g., not when it was said that "boys

at this school are good at math"). In another study, the effect of mothers' explicit

comments about gender – regardless of whether the mother was supporting or arguing

against stereotypes – had no impact on the child's own beliefs (C. K. Friedman, Leaper,

& Bigler, 2007) In sum, verbal patterns that children encounter can shape gender-role

learning, but often does not influence children's beliefs about gender.

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[2] The persistence of gender categorization is an interesting component of the study. Traditionally, Gender Schema Theory would argue that an increase in gender labelling would relate to an increase in gender stereotyping. However, it could be that even though children's preschool environments do not make gender a category to schematize on, their other social environments, such as family, television, and social settings, do. Thus, children learn gender labelling quickly and are thus attuned to gendered information in their environments, but in the gender-neutral environment, learn that gender is not a critical predictor of traits or abilities.

Nonverbal communication. Children begin to use verbal language between 12 and 18 months, but even then, their grasp of language is rudimentary. Gestures, on the other hand, appear to be important for children early in their development; children begin to use gestures such as pointing between 9 and 12 months (Iverson & Goldin-Meadow, 2005). Even for adults, nonverbal behavior is not rendered unimportant once they acquire proficiency in language. For example, patterns of nonverbal behavior found in televised media are sufficient to influence adults' racial beliefs and body image perceptions (Weisbuch & Ambady, 2009; Weisbuch, Pauker, & Ambady, 2009). Thus, even for adults, but *particularly* for children, patterns of nonverbal behavior enacted by and towards people based on gender may have substantial influences on gender-role beliefs.

Children emulate the nonverbal behaviors of the people around them. From mere observations of fathers with their sons, of girls leaving a showing of *Wonder Woman*, or of children following their older siblings around, it is apparent that children emulate the people in their environment and, once they acquire basic levels of gender constancy, children are particularly likely to emulate models of the same gender. In one study, for example, children aged 29 to 68 months were more likely to emulate simple behaviors (e.g., marching around a room, selecting a particular color of hat) if they had observed models of the same gender perform them than if they had observed models of the other gender perform them (Bussey & Bandura, 1984). Furthermore, consistent with Cognitive Developmental Theory, this pattern only emerged for children who already had medium to high levels of gender constancy. Children are also likely to emulate behavior from

45

other children in their social environments. Consistent with Social Learning and Social

Cognitive Theories, watching children of the other gender play with a toy causes children

to avoid that toy or stop playing with it altogether (Ruble, Balaban, & Cooper, 1981;

Shell & Eisenberg, 1990), watching superheroes in the media (who are primarily male)

leads boys to engage in stereotypically masculine play (Coyne, Linder, Rasmussen,

Nelson, & Collier, 2014), and television viewing broadly is predictive of children holding

stronger gender stereotypes (Freuh & McGhee, 1975; Kimball, 1986; McGee & Freuh,

1980; Rothschild, 1984; Signorielli, 1990; Williams, 1986). The nonverbal behavior of

socialization agents that children encounter appears to be one way that gender roles are

communicated to children and this form may be particularly predominant early in life.

Summary

The scientific research on gender roles has a long history and, to date, several

clear findings have emerged about the progression of knowledge about gender roles,

cognitive mechanisms moderating learning, and the specific content about gender

stereotypes. Children's gender-role learning begins within the first year of life, and the

ability to label *both* genders seems to predict gender-role adherence (Levy & Haaf, 1994;

Zosuls et al., 2014). Children can gather information about complex and often arbitrary

associations with each gender early in development demonstrating the ability to associate

abstract objects with one gender or the other at about 4 years old (Leinbach et al., 1997).

Some work has even started to accumulate evidence regarding individual differences in

gender role conformity (Olson et al., 2015).

Taken together, the evidence in the gender-role learning literature has supported some components of each of the theories summarized in the beginning of this review. Consistent with Social Learning Theory and Social Cognitive Theory, children emulate the behavior of other people in their social environments and are rewarded when behaving in gender-stereotypical ways. Yet, consistent with Cognitive-Developmental Theory, stereotype adherence increases with the acquisition of gender constancy. Children have several information-processing biases that cause memory distortions and ingroup favoritism, for example, consistent with the predictions of Social Identity Theory and Gender Schema Theory. Preliminary evidence suggesting that children's gender-role beliefs are correlated with exposure to women doing more household work than men suggest some support for Social Role Theory, but more work is necessary to understand children's ability to extract these complex patterns across contextual and temporal noise. In fact, the evidence accumulated thus far has noteworthy gaps.

It is unclear what cultural patterns of behavior children observe in their environments and whether they can extract these patterns from the noise around them. Scientists still do not know how children's patterns of attenuation change across development in ways that facilitate memory biases and characterize the content of gender stereotypes. It is also unclear what kinds of cultural patterns encourage the development of gender identity or discourage it, accounting for changes in the average age of gender constancy across cultures. An ecological approach would highlight what aspects of gender-role learning are derived from behavioral imitation and at what stages children can attune to different complexities of cultural patterns present in their environments.

Finally, an ecological approach could be used to elucidate moderators that may render children more or less susceptible to the influence of cultural patterns on gender-role learning.

The field of gender-role learning has a long history and, as summarized, quite a bit is known about features of how children learn gender. Yet, there is some substantial gaps in the scientific understanding of this process and I will detail below a model based in the ecological approach intended at filling in some of those gaps.

THE GENDERED ECOLOGY APPROACH

Up to this point, I have presented a case for the role of an ecological approach in understanding children's gender-role learning processes. Extant approaches to gender-role learning have revealed that children are influenced by cultural patterns but there are still many missing pieces to understanding mechanisms of gender-role learning among children – many of which can be addressed by an ecological approach. Specifically, an ecological approach can clarify a) the cultural patterns that are present in the environments children encounter, b) the cultural patterns to which children attune, and c) the influence of cultural patterns on children's intersubjective norms, stereotypes, and behaviors. Thus, I propose the Gendered Ecology Model (GEA; see Figure 1) to apply the ecological approach to the study of gender-role learning.

Social environments feature many repeated instances of objects, people, and even low-level visual cues (i.e., cultural patterns) that carry meaning for perceivers (Weisbuch et al., 2017). These patterns may even define culture – which can be any domain where behaviors and ideologies are shared among a group of people, such as ethnic groups, artists, or familial groups (Adams & Markus, 2004). The social environments found in a given culture (e.g., sporting events) may contain unique cultural patterns that carry forward cultural ideologies (e.g., sexist attitudes). These patterns communicate about the ways that people should behave, what kinds of objects to avoid, and the value of certain social groups. Children and adults are both likely to learn from

the cultural patterns available to them. When watching television, for example, adults are exposed to patterns of more negative nonverbal behavior toward black than white characters and this pattern influences their racial attitudes (Weisbuch et al., 2009). Children's environments are also replete with potentially influential cultural patterns. For example, when reading award-winning books or watching prime-time television, children are more likely to see illustrations or scenes that feature male than female characters (i.e., 74% of book illustrations and 63% of scenes feature male characters; Crabb & Bielawski, 1994; Smith & Granados, 2009). Children may infer from this cultural pattern that men are more important or more interesting than women. When women and girls *are* featured, they are often featured in caretaking roles, in subordinate positions, and as followers, whereas when men and boys are featured, they are often featured outside of the house, in agentic positions, and as leaders (Anderson & Hamilton, 2005; Smith & Granados, 2009). These cultural patterns may infer that women and girls are more communal, less dominant, and less capable of leadership than men and boys. In schools, children may also observe disproportional numbers of men (versus women) in leadership positions. Children are also likely to encounter gendered patterns in their families or neighborhoods such as observing men making more jokes than women, women smiling more than men, or women doing more housework more than men. Each of these patterns may communicate about the behaviors and demeanors appropriate for each gender. Yet the presence of these and other patterns does not necessitate an influence.

These types of patterns may be present in children's environments, but to determine their effects, it is critical to examine children's abilities to learn and infer

50

meaning from them. Babies start out with relatively little knowledge, but they do possess a remarkable capacity to learn. Thus, it is likely that cultural patterns are meaningful even at the earliest stages of gender-role learning. Yet the patterns that are attended to may vary by age – both because of the complexity of those patterns and the child's own attentional biases.

Ecological approaches that directly examine the types of patterns present *and* their influence on children's gender roles have been absent in the literature on children's gender-role learning thus far.   What role does socialization have in producing beliefs about genders and the behaviors that people consequently enact? From the literature, scientists have demonstrated that children's environments contain gendered cultural patterns, but it is unclear whether children can extract information from those patterns and whether those patterns can, in part, account for gender-role learning. Existing approaches cannot test this explicitly broad claim because they focus on one component (e.g., whether children imitate the behavior of social models) instead of testing the full causal chain from environmental pattern to personal beliefs. The Gendered Ecology Model addresses this limitation by laying out a framework for a) methodically examining children's social ecology for the presence of cultural patterns, b) testing children's attunement to these patterns, and c) experimentally examining the outcomes of exposure to these patterns.

Measuring Cultural Patterns: What are the Contents of Gendered Culture?

The first step in examining the role of cultural patterns on children's gender-roles is to measure the actual patterns present in the environments children encounter. There

51

exist many nonverbal patterns, for example, regarding the way that women and men behave and are treated. Women and men enact significantly different patterns of nonverbal behavior. Men are more likely to display dominant nonverbal behaviors by enacting expressive postures and high visual dominance ratios, whereas women are more likely to display submissive nonverbal behaviors by enacting listening gestures and smiling (Hall, 2006). Women and men are also treated differently nonverbally by others in ways that may perpetuate gender stereotypes and sexism. Women are given less personal space, touched more, and looked at less while they are talking than men are (Kang, 1997; Koch, Baehne, Kruse, Zimmermann, & Zumbach, 2010). These patterns are all related to dominance as demonstrated by evidence suggesting that subordinates, too, are given less personal space, touched more, and looked at less while they are talking than leaders are (Dovidio et al., 1988; Goldberg & Katz, 1990; Hall, Coats, & LeBeau, 2005; Schwartz, Tesser, & Powell, 1982). In the extant research on gender-role learning, however, these and other patterns have generally been assumed to occur in children's social ecology, but not measured. For example, Bigler and Liben (2007) suggested a few cultural patterns (e.g., de facto segregation) that may lead children to learn about gender-roles. Yet, research testing Developmental Intergroup Theory thus far has examined *effects* of exposure, but not the prevalence of those patterns in the environments that children frequently encounter.

Measuring cultural patterns requires careful consideration of many components: the population of interest (e.g., American children aged 5 to 6) the context of interest (e.g., classrooms), representative exemplars (e.g., classrooms in varying geographic

regions and neighborhood types), variables of interest (e.g., amount of time teacher spends speaking to boys versus girls), and a set of rules to methodically select instances of the hypothesized pattern (e.g., code the gender of the child being talked to every fifth minute; see Weisbuch, Lamer, Treinen, & Pauker, 2017). The benefit of carefully collecting these instances (i.e., *cultural snapshots*) is that they are both representative and unbiased. We know from scientific research that people are biased to remember and see what they expect to be there, but research in gender-role development has frequently fallen into the error of not checking the assumptions of what patterns are present for children to observe (e.g., Mickes, Walker, Parris, Mankoff, & Christenfeld, 2012; A. Sherman, Sweeny, Grabowecky, & Suzuki, 2012; J. W. Sherman & Frost, 2000). However, as you will read below, quantifying cultural patterns is but one step in determining an effect on cognition.

Integrating Cues into Cultural Patterns: How are Gender Roles Perceived?

Once researchers identify a pattern in the environment, the next step is to determine whether it is noticed (i.e., attuned to) and learned from. Not only do children have to discern a pattern from surrounding noise and aggregate percepts of a particular behavior over time, but children are also still acquiring basic cognitive skills and may be ignorant of some patterns that would otherwise be attuned to.

Discrimination (E. J. Gibson, 1969; J. J. Gibson, 1979) is a key process in learning about anything in the world. That is, a pattern may exist in children's frequently-encountered environments (e.g., an association between gender and who completes household chores), but the *presence* of a pattern does not necessarily indicate that a child

53

will notice it. Culturally prevalent patterns convey information (e.g., who will feed you, who is higher status), but the first step in learning from that information is distinguishing the *pattern* from the vast amount of noise around it. In the present example, gender and chore completion must be discriminated from the multitude of other cues in the environment such as the other activities performed by women and men, varying gender-typicality of targets, and merging different contexts into a single category.

Despite the complexity of cultural patterns, children are capable extracting complex social information. Work on social referencing has demonstrated that children clearly gather information from others' nonverbal behavior and work has begun to explore the role of nonverbal behavior in conveying race attitudes to children (Castelli, De Dea, & Nesdale, 2008; Klinnert, Emde, Butterfield, & Campos, 1986; Murray et al., 2008). In one such study, exposure to a White person expressing uneasy (vs. friendly) nonverbal behavior toward a Black person led children aged 41 to 78 months to have more negative views of that Black person and even Black people in general (Castelli et al., 2008). This work suggests that children are capable of extrapolating from patterns of nonverbal behavior and are likely to be doing so in the case of gendered nonverbal behavior.

However, testing whether children attune to a pattern in the context of naturally occurring noise is an often-ignored step in laboratory research. In the rare cases that noise is added to a stimulus, it is not clear that the configuration of noise is the same that surrounds that pattern in the real world. Generally, noise is added out of convenience and not in an ecologically-representative manner. For example, in studies examining gender-

54

linked modeling of behavior, female and male actors enacted particular behaviors (e.g., marching in a square, calling a sticker a "stickeroo") but both the particular patterns of behavior and the noise around these patterns (e.g., how many women and men were present, how frequent behaviors occurred) were set by the researchers rather than being based on the patterns found in children's environments. The issue with not replicating actual patterns and the noise around them is that *attunement* to a pattern is a learning process through which affordances of an environment are signaled by patterns and distinguished from noise (e.g., see Brunswik, 1943; McArthur & Baron, 1983). If children become attuned to some specific gender pattern (e.g., women enacting postural contraction), they may not be able to exhibit such attunement when they must distinguish the pattern in an unusual cacophony of noise. Furthermore, children are still developing cognitively and thus some patterns may be too complex or nuanced for them to attune to until a particular cognitive skill is acquired.

Influence of Cultural Patterns: **Pathway to Socialization**

Some research exists regarding what sorts of patterns are present in children's ecological environments. However, these approaches are sometimes limited in their sampling methods (see Manganello, Franzini, & Jordan, 2008) and, of course, often stop before testing how these patterns directly impact children (Anderson & Hamilton, 2005; Browne, 1998; O'Kelly, 1974; Signorielli, 1990; Smith & Granados, 2009). This work, although not without limitations, has advanced the scientific understanding of gender-role learning. Yet it does not allow scientists to make inferences about the causal mechanisms of gender-role learning.

The ecological approach advances this body of literature by directly testing how exposure to the cultural pattern (versus no pattern or the reverse pattern) influences perceived norms, attitudes, and behavior. For example, in an ecological study of how exposure to gendered distributions of household labor impact children's beliefs about group status, children would see a series of cultural snapshots of women (or men) doing household chores (or a control task) to examine effects on the children's beliefs about status. The benefit of this approach is that it probes a causal link between frequently-encountered cultural patterns and beliefs that perceivers endorse.

In contrast to the ecological approach to social perception, experimental research to date has only been able to demonstrate the way that patterns contrived in the lab (that may or may not exist in the environment) influence children. In this work, it is unclear if the observed effect (e.g., the effect of gender salience in a classroom on gender attitudes) can account for the way that children distributed across a geographical region (e.g., the United States) seem to learn highly-similar gender roles. Children may not actually encounter the pattern in the world. Therefore, an effect can exist even if it does not explain variance in actual beliefs. Correlational research, on the other hand, has only been able to demonstrate relationships between exposure to environments where patterns of interest may exist and gender-role beliefs. In this work, exposure to particular environments is correlated with an outcome of interest. Yet, it is unclear both if children are attuned to the pattern of interest and if the pattern is causally related to the outcome of interest. For example, although in a meta-analysis of stereotype content, television watching was the strongest variable related to stereotype endorsement among children, it

56

is unclear what patterns are present in television and whether those patterns are responsible for changes in stereotype strength (Signorella et al., 1993). The ecological approach to social perception enables researchers to have careful experimental control while recreating an ecologically-valid cultural pattern. Furthermore, the ecological approach enables researchers to test causal influence of exposure to a cultural pattern.

One potential mechanism by which cultural patterns may influence beliefs is through the perception of intersubjective norms (i.e., perceptions of widely held beliefs in a given culture), which may be most proximally impacted by exposure to cultural patterns (Chiu, Gelfand, Yamagishi, Shteynberg, & Wan, 2010). Intersubjective norms are consistent with Social Learning Theory and Social Cognitive Theory wherein people learn about how they are supposed to behave from observing models and receiving reward for behaving in particular ways. Past work has shown that intersubjective norms predict what beliefs are transmitted to others, are directly impacted by exposure to cultural patterns, and mediate effects of cultural patterns on own beliefs (Tam, Lee, Kim, Li, & Chao, 2012; Weisbuch & Ambady, 2009). For example, the values that parents perceive to be important in the current cultural context are conveyed to their children above and beyond personal values (Tam et al., 2012). Furthermore, encountering a pattern of positive (versus negative) nonverbal behavior towards slim women caused people to believe that cultural expectations were shifted toward slimmer women and that these intersubjective norms then mediated women's expectations for their own body size (Weisbuch & Ambady, 2009). Thus, to the extent that cultural patterns inform perceptions of what is valued by members of a given culture, these patterns are likely to

then indirectly influence a person's own beliefs and behaviors. Previous work with adults has shown that this is the case and in the context of children's gender-role learning, the observation of cultural patterns may directly inform their intersubjective norms about what is appropriate for girls and boys and for women and men. For example, girls may hold intersubjective norms about how appropriate it is for women to be leaders or to hold professions in STEM careers based on the frequency of exposure to these instances. Critically, these intersubjective norms may then inform a child's personal beliefs about herself and others; I would expect norms about the suitability of women for STEM careers to directly influence girls' own beliefs and aspirations in science.

Conclusion

Thus far, I have examined prominent theories of gender-role learning, that each focus on specific sources or mechanisms by which children learn about gender. Some identify role models and socialization processes as key to a child's gender-role learning, whereas others identify the acquisition of knowledge about gender constancy (Vafaei et al., 2014). Evidence from the field has generated support for many arguments made in extant theorizing. However, absent from the literature are ecological approaches to social perception that test the causal relationships between environment and gender-roles. Thus, in the Gendered Ecology Approach (GEA), I have laid out a framework for examining not only what patterns *can* influence children's beliefs, but also what patterns are present in children's social environments and thus *do* influence their beliefs. Taking the Gendered Ecology Approach will be critical to advancing the scientific understanding of how children's environments influence them to learn about gender-roles. In the set of

research studies that I propose, I endeavor to do just that by examining children's

environments for cultural patterns and experimentally examining how those patterns

inform gender-role learning.

THE CURRENT RESEARCH: NONVERBAL BEHAVIOR AND GENDERED

ECOLOGY

The social environments that children encounter contain complex patterns of

humans and their behaviors, and I have argued that the childhood development of gender

roles largely depends on how children understand and conform to the patterns that are

repeated throughout the broader cultural environment. The theories I reviewed strongly

suggest that children learn gender roles by virtue of something that is communicated in

their environments, and yet that "something" remains poorly understood, as does its

influence on children. I propose a Gendered Ecology approach (see Chapter 3) to

examine how children's social ecology can explain gender-role learning. Cultural

patterns of nonverbal behavior may be an especially effective mechanism for gender-role

learning.

Children Learn Things from Observing Nonverbal Behavior

Newborn infants do not yet understand language and their initial understanding of

the world is based partially on the observation of nonverbal behavior (Hornik et al., 1987;

Klinnert et al., 1986; Mumme et al., 1996). Although there appear to be established

evolutionary mechanisms through which children learn language (Pinker, 1979), most

children do not utter their first words until they are between 12 and 18 months old

(Iverson & Goldin-Meadow, 2005). In contrast, children demonstrate an understanding of

nonverbal behavior early in development. Infants, for example, can detect eye gaze within the first week of their lives, can reliably recognize facial emotion by the age of 7 months, and begin using gestures to communicate by the age of 9 months (Farroni, Csibra, Simion, & Johnson, 2002; Farroni, Johnson, & Csibra, 2004; Grossmann, 2010; Iverson & Goldin-Meadow, 2005). Their understanding of nonverbal behavior also grows quickly and by age 9 or 10, children's nonverbal sensitivity is not substantially different from that of adults (Balas, Kanwisher, & Saxe, 2012).

Children begin to use social referencing to make inferences about the desirability of an object from the emotion expressed towards that object between 12 and 18 months old (Hornik et al., 1987; Klinnert, Campos, Sorce, Emde, & Svejda, 1983; Klinnert et al., 1986; Repacholi & Metzoff, 2007). Fourteen-month-old children become more avoidant of strangers if they have observed a socially-phobic parent interact with a stranger (Murray et al., 2008). Thus, social referencing can also be applied to learning about people and not just objects. Humans are sensitive to nonverbal behavior from an early age and even after developing speaking ability, continue to rely on others' nonverbal behavior to learn about the world, as in social referencing.

Preschool-aged children can even generalize attitudes directed toward a single person (e.g., a black person) to an entire social group (i.e., black people). For example, in one study children saw either a video in which a white adult (i.e., Gaspare) was interacting with a black adult (i.e., Abdul) in an uneasy manner (e.g., avoiding eye contact, more interpersonal distance, loose handshake) or a friendly manner (e.g., frequent eye contact, little interpersonal space, emphatic handshake; Castelli, De Dea, &

61

Nesdale, 2008). Preschool-aged children (i.e., 4 to 5 years old) who observed Gaspare display uneasy behavior towards Abdul then reported a more negative attitude toward Abdul (e.g., being unwilling to share toys or give a piece of cake to Abdul) and a novel, clearly distinguishable black person (e.g., being unwilling to share toys or give a piece of cake to this new person). Furthermore, the verbal content of the interaction did not seem to have an effect; the nonverbal behavior directed at the black target was the only significant predictor of racial attitudes. Thus, nonverbal behavior may be particularly impactful in gender-role learning because children attend to and understand nonverbal behavior early in life. This is well after children have learned to speak, and even read, so nonverbal behavior continues to be important after verbal abilities emerge.

The ability to accurately read nonverbal behavior emerges throughout childhood (Nowicki & Duke, 1994; Pons et al., 2007; Widen, 2013; Zuckerman, Blanck, Depaulo, & Rosenthal, 1980). By the age of 3, roughly half of children are able to recognize discrete high-intensity emotion expressions (e.g., sad, happy, angry, fearful; Pons et al., 2007). This number increases to 75% at age 5, 90% at age 7, and 100% at age 9. Especially for low-intensity negative emotions (e.g., sadness, fear), children do not reach adult levels of emotion detection until about the age of 10 (Gao & Maurer, 2009). Age accounts for improvement in emotion perception but there is also unique variance that age cannot account for. For example, among 3rd graders, age and emotional sensitivity were significantly corelated with a strength of .44 suggesting that age accounts for some of the variability in the ability to read emotion but that there remains individual variation

as well. Thus, children begin attending to nonverbal information early in development and continue to acquire proficiency in this skill throughout early and middle childhood.

Nonverbal Behavior Exerts an Influence on Perceivers Without Awareness

The second reason that nonverbal behavior may be a key mechanism in communicating gender roles is because it often exerts an automatic influence on perceivers. Perceivers' emotions, attitudes, and behavior effortlessly respond to others' nonverbal cues, including nonverbal cues for which they have no subjective awareness (Dimberg, Thunberg, & Elmehed, 2000; Murphy & Zajonc, 1993; Tiedens & Fragale, 2003; Weisbuch & Ambady, 2009; Winkielman, Berridge, & Wilbarger, 2005). Exposure to subliminally-presented positive facial expressions causes people to consume more food and drink, for example, and, even when explicitly unaware of their partners' posture, exposure to postural expansion causes people to display complementary nonverbal behavior (i.e., postural constriction; Tiedens & Fragale, 2003; Winkielman et al., 2005). Nonverbal behavior patterns may thus be especially impactful because they exert an influence automatically even when perceivers are unable to deliberate about their presence or meaning. Children and adults often lack the resources to deliberate about the nonverbal behavior they see, but research suggests that such deliberation is unnecessary for learning.

Children Can Learn Social Attitudes from Observing Nonverbal Behavior

The third reason that nonverbal behavior may be especially effective at communicating gender roles to children is that it influences other norms in adults. Observing a single instance of nonverbal behavior (e.g., a negative expression toward a

63

toy or person) may not be overly meaningful in learning cultural values.   However, research suggests that people are exposed to the same biased patterns of nonverbal behavior over and over again, such that some people (e.g., slim people) are shown far more often as recipients of positive nonverbal behavior than other people (e.g., heavy people; Weisbuch & Ambady, 2009). Furthermore, exposure to this nonverbal pattern influenced women's own body size goals and their attitudes toward slim people.

Children Encounter Nonverbal Behavior All the Time

The fourth reason that nonverbal behavior may be especially effective at communicating gender roles is that nonverbal behavior is widely and consistently encountered. A large body of literature in social perception has focused on how perceivers attune to this type of information and make inferences from it. Unless a person is unable to see or lives in social isolation, nonverbal behavior is unavoidable. Whenever one person sees another person (e.g., on television), she typically sees body-posture, eye-gaze, facial-expressions (neutral or emotional), and other nonverbal cues (Ambady & Weisbuch, 2010). Thus, children are going to be frequently exposed to nonverbal behavior, making it a key candidate for the cultural transmission of gender-role beliefs. Nonverbal behavior is rapidly attuned to and people make (sometimes incorrect) inferences based on the patterns they encounter.

Influences of Nonverbal Behavior are Subtle

The fifth and final reason that nonverbal behavior may be especially effective at communicating gender roles is that nonverbal behavior is "off of the record". Nonverbal behavior influences people but does not remain in cultural discourse at the same level as

does explicit discrimination (DePaulo, 1992). Nonverbal behavior, however, is difficult to suppress and an expresser may be unaware of their nonverbal expression or bias. Furthermore, nonverbal behavior is not legally prohibited and thus may be a particularly meaningful route by which otherwise prohibited cultural values are perpetuated.

How Might Cultural Patterns of Nonverbal Behavior Influence Children's Minds?

Having argued that cultural patterns of nonverbal behavior may be especially effective at influencing children's beliefs about gender, I now turn my attention to the psychological process that may mediate the impact of nonverbal behavior patterns on children's own beliefs and behavior: intersubjective norms. Intersubjective norms are beliefs about what others in a cultural group hold (Chiu et al., 2010). Indeed, research has hinted at the mediating role of intersubjective norms in the link between social ecology and human beliefs and behaviors (see Chiu, Gelfand, Yamagishi, Shteynberg, & Wan, 2010 for review). For example, people evaluating the fit a job applicant inferred that role conformity (i.e., having similar personality traits) was valued when job mobility within the company was low (Chen, Chiu, & Chan, 2009). Furthermore, intersubjective norms inform behavior, particularly when behavior is going to be evaluated by an ingroup audience. For example, Asian and Caucasian American participants tended to negotiate a business deal with a collectivist or individualist orientation, respectively, but *only* if they were told that another person of the same cultural group would evaluate their decision afterward (Gelfand & Realo, 1999). Thus, intersubjective norms influenced people's behavior only when people thought they were subject to evaluation by an ingroup audience. Cultural patterns of nonverbal behavior may contribute to children's

gender roles by influencing intersubjective norms and consequently influencing beliefs and behavior. I expect that children will also be susceptible to this same mechanism of influence on gender-role learning through exposure to nonverbal behavior patterns.

In sum, nonverbal behavior has high communicative value and may be a primary route for the cultural transmission of gender roles among children. Not only do patterns of nonverbal bias favor members of certain social groups, but observation of these patterns influences beliefs (Weisbuch & Ambady, 2009; Weisbuch et al., 2009). Nonverbal behavior is ubiquitous and children begin to use and infer from nonverbal behavior as early as 7 months old (Grossmann, 2010; Hornik et al., 1987; Iverson & Goldin-Meadow, 2005; Klinnert et al., 1986; Peltola et al., 2008; Repacholi & Metzoff, 2007; Weisbuch, Slepian, Clarke, Ambady, & Veenstra-VanderWeele, 2010). Furthermore, nonverbal behavior can account, at least in part, for the intergenerational transmission of social anxiety and prejudice (Castelli et al., 2008; Murray et al., 2008). In the current research, I propose to examine how patterns of nonverbal behavior that children encounter may favor gender-stereotypical people and how that cultural pattern may influence the content of children's gender-role beliefs and behaviors, perhaps via intersubjective norms.

Gendered Nonverbal Behavior

It is clear from the prior review of literature that patterns of nonverbal behavior are likely to be important to the maintenance of cultural values, and this may be particularly true of the maintenance of gender-role values. As reviewed earlier, nonverbal behaviors vary substantially by gender – both as a function of who is

expressing the behavior and who is the target of the behavior (Adair & Semnani-Azad, 2011; Hall, 2006; Hess et al., 2000; Hewig, Trippe, Hecht, Straube, & Miltner, 2008). Women, for example, smile more often than men do (Hall, Carter, & Horgan, 2000), and the observation of this pattern may cause children to infer that women are warmer, kinder, or more nurturing than men. Similarly, women are more likely to display postural constriction than men (Hall et al., 2000) and this may convey that women are lower status, weaker, or less dominant than men.[3]

Nonverbal behavior patterns may also account for gender-role learning through social referencing. Social referencing is the phenomenon by which people refer to how others are behaving towards an object in order to inform their own beliefs about that object (Klinnert et al., 1986). Children use this mechanism to learn about novel situations, such as encountering a stranger or being given a new toy. As reviewed previously, a single instance of nonverbal behavior can inform a child's subsequent behavior toward an object or a child's subsequent attitudes toward a person (Castelli et al., 2008; Hornik et al., 1987; Klinnert et al., 1986; Repacholi & Metzoff, 2007). I propose that *patterns* of nonverbal behavior may account for the cultural transmission of children's beliefs. In other words, children may reference nonverbal behavior in multiple instances and aggregate across those instances into a single perception of what is valued broadly in a cultural group. For example, children may see people smile more at girls

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[3] This pattern may emerge for several reasons. On an individual level, a woman is on average going to be lower status than men and postural constriction is related to nonverbal subordinance (Brandt, 2011; Tiedens & Fragale, 2003). On a group level, women are considered lower status than men (Eagly & Wood, 1982). Thus, women tend to enact subordinate posture regardless of individual variations in status. Women's and girls' clothing, such as dresses and skirts, also encourage postural constriction.

who play with Barbies than at girls who play with Transformers, and across numerous instances of seeing this pattern, children may infer that girls who play with Barbies are more valued than girls who play with Transformers and this intersubjective norm may then shape children's own behaviors.

The Current Research

In the current research, I proposed that gender-stereotypical people receive more positive nonverbal behavior than gender-counterstereotypical people and that children infer from observing this nonverbal pattern that people who conform to gender-stereotypes are more culturally valued.

In Study 1, I took a cultural snapshots approach to examine patterns of nonverbal behavior that children are likely to encounter on a regular basis. The nonverbal patterns that children are exposed to likely vary ideographically, but also by region, neighborhood, and school, thus quantifying a generalizable pattern across many children may seem difficult. However, television shows provide a unique source of *shared* nonverbal behavior patterns that often cut across socioeconomic status, region, race, and gender. Televised patterns of nonverbal behavior can therefore provide a unique and well-qualified way to examine culture-wide nonverbal patterns. Children are also frequently exposed to televised patterns of nonverbal behavior; the average child in the US watches five hours of television per day (Rothman, 2013). Cultural patterns quantified within this medium are therefore likely to generalize across a large portion of children. I examined children's popular television shows for patterns of nonverbal behavior that favors gender-stereotypicality. Specifically, I expected that gender-

68

stereotypical characters are the targets of more positive nonverbal behavior than gender-countersterotypical characters in the television that children regularly watch.

In Study 2, I tested the causal link between exposure to this pattern and children's own gender-role beliefs. Children acquire the ability to attend to increasingly complex patterns of cues over time and thus the patterns of nonverbal behavior they observe in television may become particularly meaningful once they can decode emotion expression. I generated one pattern of *"traditional"* nonverbal bias that favored feminine female and masculine male characters and another pattern of *"reverse"* nonverbal bias that instead favored feminine male and masculine female characters (see Figure 4). I expected that exposure to the "traditional" pattern would cause children to explicitly endorse gender-stereotypical beliefs more strongly than would exposure to the "reverse" pattern.

Finally, in Study 3, I conducted a close replication focusing on how exposure to these patterns influences children's interpersonal behavior. I also tested the moderating role of age, emotional perceptivity, and gender-role flexibility on this causal link. Together, these three studies a) quantified the cultural patterns that children across multiple demographic groups likely encounter, b) suggested that children are able to integrate individual snapshots into a single cultural pattern, and c) tested whether this pattern informs their beliefs about gender-roles.

STUDY 1

The purpose of Study 1 was to examine children's cultural ecology for patterns of *nonverbal bias* (i.e., members of one category are treated more positively than members of another category; (Weisbuch et al., 2009) associated with gender roles. Following established methodology, I selected gender-stereotypical and gender-counterstereotypical characters (i.e., *targets)* from children's television shows to quantify how targets are treated by other characters (i.e., *partners*).

Method

Participants and Setting

Adult participants were recruited from the Denver community to complete a 2-hour in-lab study. The experiment was conducted on computers using MediaLab$^{©}$ software. To determine sample size, I consulted similar past studies where participants rated nonverbal behavior in television clips, and high interrater consistency was observed with 17-23 judges (Weisbuch & Ambady, 2009; Weisbuch et al., 2009). Thus, I randomly assigned 15-20 participants per condition (i.e., 35 in total).

Materials

One of the primary benefits of Cultural Snapshots is in the external validity of those snapshots. Thus, following established Cultural Snapshots methodology (Pauker et al., 2019; Weisbuch & Ambady, 2009; Weisbuch et al., 2017, 2009; Weisbuch, Treinen,

Zad, & Lagerwaard, 2016), I selected a) a broad sample of popular shows on different

television networks with the highest viewership totals in the US, b)

clips from episodes that actually aired during the time period of interest, c) characters

within each show that are matched on gender, race, and age and d) multiple snapshots of

each character. Each of those sampling procedures only occurred in accordance with *a*

priori rules (see below), and steps b, c, and d were performed by hypothesis-blind

experimenters. These procedures help to prevent biased selection of programs, episodes,

characters, and snapshots.

Of the children's television shows that are currently airing, I selected 12 shows

(e.g., *Scooby Doo, Johnny Test*) and sampled nonverbal behavior from the episodes that

were aired during the selection timeframe (e.g., during the months of June and July). Of

the available shows, I selected those that had well-matched gender-stereotypical and

gender-counterstereotypical characters. Specifically, I selected four characters per show:

one stereotypical girl/woman, counterstereotypical girl/woman, one stereotypical

boy/man, and one counterstereotypical boy/man. All characters were matched on

attractiveness, age, and status within the show. For example, from the television show

Johnny Test, I selected Sissy (gender-stereotypical girl), Susan (gender-

counterstereotypical girl), Johnny (gender-stereotypical boy), and Eugene (gender-

counterstereotypical boy). I had these selections evaluated for accuracy by asking adult

raters to evaluate each character for gender stereotypicality. These ratings confirmed

character selection; stereotypical female and male target characters were rated as more feminine and masculine, respectively, than counterstereotypical female and male target characters, $F(1, 428)=87.18$, $p<.001$. After having identified characters and shows, I took cultural snapshots: Each of three episodes were divided into three equal sections and, from each section, I sampled the first 10-second clip in which the target character was interacting with another character or other characters. I thus selected 9 cultural snapshots per target character. Each section of the episode had to contain *different* clips of all four target characters to be eligible, thus more than three episodes were used to collect nine clips for some targets. Across these 12 shows then, I selected 432 cultural snapshots.

To quantify patterns of nonverbal bias, I asked adult judges to rate how positively each target character was being treated by other characters. This molar coding of emotion is preferred to molecular coding (e.g., number of smiles) because molar coding captures emergent properties and has been shown to be quite accurate in describing felt emotion, above and beyond the accuracy of molecular coding (Widen, 2013). Furthermore, I focused on valence instead of specific emotions because valence seems to be more easily and immediately perceived by both children (Herba, Landau, Russell, Ecker, & Phillips, 2006; Widen & Russell, 2008) and adults (Lindquist, Gendron, Feldman Barrett, & Dickerson, 2014). I used ratings from adult judges because adults should be emotion experts. Children's perception of this emotion should replicate adults' perception to the extent children are able to accurately decode emotion. To prevent judges from being influenced by the gender or behavior of the target character, I created two versions of each clip: one with only the partner(s) visible and one with only the target

72

visible (see Figure 2). Ratings of the partner clips were used to quantify nonverbal bias, and ratings of the target clips were used to test alternative hypotheses (see below). Adult judges rated *either* clips of targets or clips of partner.

Procedure

Participants viewed each of 432 silent 10-second clips (of *either* targets or partners) and rated each on two questions about positivity and liking: "How did the visible character(s) behave towards the "unseen" character?", and "How much did the visible character(s) like or dislike the "unseen" character?". Participants used a 6-point Likert-type scale with no midpoint ranging from 1 (Extremely negative) to 6 (Extremely positive). Past studies have demonstrated high interrater consistency in these ratings (i.e., alphas greater than or equal to .83) and also a high correlation between the responses to these two items (e.g., $r=.87$; Weisbuch & Ambady, 2009; Weisbuch, Pauker, & Ambady, 2009). In the current study, alpha values were between .77 (Target) and .85 (Expresser) while correlations were between .62 (Target) and. 74 (Expresser). Participants then completed a brief demographic questionnaire regarding their gender, race, sexual orientation, and familiarity with any of the television shows before being debriefed and compensated.

<div align="center">

Results

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Data from this study yielded ratings of each clip across multiple raters. Therefore, cross-classified mixed models were estimated to examine whether the gender and stereotypicality of the target influenced how other characters treated them. Mixed models were estimated in R (R Core Team, 2017) with the lme4 package (Bates,

Maechler, Bolker, & Walker, 2015) using Satterthwaite approximate degrees of freedom

(i.e., lmerTest; Kuznetsova, Brockhoff, & Christensen, 2017). Positivity and liking

scores were highly correlated so I averaged them into a single nonverbal bias score for

subsequent analyses. Expresser positivity and liking was analyzed as a function of target

gender (woman/girl (1) vs. man/boy (-1); contrast-coded), target stereotypicality

(stereotypical (1) vs. counterstereotypical (-1); contrast-coded), and the interaction

between them. The model was fully specified (i.e., with random effects). The predicted

effect of target stereotypicality was significant, $b=.12$, $se=.05$, $t(303.20)=2.32$, $p=.021$,

such that stereotypical characters were treated more positively and liked more ($M=4.03$,

$SD=1.55$) than counterstereotypical characters ($M=3.79$, $SD=1.50$). I made no prediction

that characters would be treated differently based on gender and, accordingly, there was

no effect of gender, $b=.04$, $se=.05$, $t(403.80)=.86$, $p=.388$, such that women and girls

($M=3.95$, $SD=1.53$) were treated similar to men and boys ($M=3.87$, $SD=1.53$). Finally,

there was no interaction of stereotypicality and gender, $b=-.03$, $se=.05$, $t(330.80)=-.68$,

$p=.498$, such that the effect of stereotypicality on liking was similar for male characters,

$b=.15$, $se=.03$, $t(657.90)=5.85$, $p<.001$, as for female characters, $b=.01$, $se=.003$,

$t(302.90)=3.25$, $p=.001$. (See Figure 3.)

One possible explanation for these effects is that ST characters (i.e., feminine

girls and masculine boys) behave more positively than CST characters (i.e., masculine

girls and feminine boys). If that was the case, an analysis of target emotion should yield

the same pattern of effects with a main effect of stereotypicality. To rule out this

explanation, target positivity and liking was analyzed in the same way as partner

positivity as a function of target gender (woman/girl (1) vs. man/boy (-1); contrast-coded), target stereotypicality (stereotypical (1) vs. counterstereotypical (-1); contrast-coded), and the interaction between them. The model was fully specified (i.e., with random effects). The effect of target stereotypicality was not significant, b=.04, se=.05, t(409.50)=.78, p=.449, such that stereotypical characters behaved similarly (M=4.37, SD=1.45) as counterstereotypical characters (M=4.30, SD=1.44). There was also no effect of gender, b=.02, se=.05, t(278.20)=.31, p=.761, such that women and girls (M=4.35, SD=1.43) behaved similarly as men and boys (M=3.32, SD=1.45). However, there was an interaction of stereotypicality and gender, b=.10, se=.05, t(408.80)=2.09, p=.038, such that counterstereotypical male characters behaved similarly as stereotypical male characters, b=-.05, se=.07, t(216.76)=-.93, p=.353, whereas stereotypical female characters were more positive than counterstereotypical female characters, b=.13, se=.07, t(210.19)=2.04, p=.043. The presence of an interactive effect on target emotion suggests the nonverbal emotion directed by partners toward targets was not simply a function of targets' own nonverbal positivity.

Discussion

These data suggest that American children are regularly exposed to a cultural pattern in which gender-stereotypical characters are treated more positively than gender-counterstereotypical characters. Consistent with the view that this pattern is culturally-prevalent in children's social ecology and it is practically important to understand how these patterns might influence American girls. Following the steps in the Gendered

Ecology Approach then, I next examined how exposure to this pattern of nonverbal bias

influences children's gender role beliefs.

STUDY 2

In this study, I explored how exposure to a cultural pattern of nonverbal gender bias influences children's gender norms and stereotypes. Child participants viewed a set of silent, 10-second television show clips (i.e., the unedited clips from Study 1) and then completed a variety of outcome and moderator measures. I recruited participants between the ages of 6 and 9 to acquire substantial variability in emotion perception ability. Children's precision in interpreting nonverbal emotion improves with age, especially for subtle emotion expressions (Gao & Maurer, 2009; Herba et al., 2006; Nowicki & Duke, 1994; Zupan, 2015). Given the complexity of perceiving emotion expression in real-time on television, children who are most sensitive to the meaning of subtle nonverbal behavior should be the most influenced by the patterns of nonverbal bias contained in the clips. Any given scene in a television show may contain low-level cues like color and visual complexity but also high-level cues like subtle emotion and plot development. Thus, emotion perception may moderate the influence of nonverbal bias on gender role learning in this context.

Consistent with the Gendered Ecology approach, I expected intersubjective norms to be a key mechanism from observation of cultural patterns to gender-role beliefs. Specifically, repeated observations of different people exhibiting the same emotional pattern should cause observers to draw inferences about what sorts of behaviors those people like and dislike. Indeed, work on intersubjective norms has suggested that they

can mediate the influence of social ecology on personal beliefs (see p. 57). Here I test

girls' beliefs about intersubjective norms and examine how those norms mediate effects

of cultural norms on beliefs about gender-roles.

Hypothesis 1: I expected that girls exposed to "traditional" (vs "reverse")

nonverbal bias would express stereotypical intersubjective norms for girls and boys.

Hypothesis 2: I expected that girls exposed to "traditional" (vs. "reverse")

nonverbal bias would express more explicit gender stereotypes.

Hypothesis 3. I expected Hypothesis 1 and Hypothesis 2 to occur to the extent that

girls could accurately decode subtle emotion expressions.

Method

Participants and Setting

Participants were recruited from the child and family contact list made available

through the University of Denver Psychology Department. I recruited participants

between the ages of six and nine years old to a) measure how children respond to

nonverbal bias across a range of emotion perceptivity and b) ensure all children within

this sample would be able to complete the measures used. Many measures have been

validated with children age 6 and older which allowed me to use the same measures for

all children within the sample. The experiment was conducted on computers using

MediaLab$^©$ and DANVA software as well as in the lab using games and toys. To

determine sample size, I consulted past experimental studies which examined gender-

typed modelling outcomes or social referencing effects. I focused conservatively on

studies with younger children to ensure that the sample size I chose would be powerful

78

enough even with younger children, who may have a harder time with attention than older children. In these studies, samples ranged from 18 to 24 children between the ages of 3 and 5 (Bussey & Bandura, 1984; Castelli et al., 2008; Cimpian & Markman, 2011). Thus, I aimed to recruit approximately 72 participants for this study, yielding 18 child participants per condition. The adoption of gender roles may be particularly disadvantageous for girls who are taught that they are less competent, weaker, and lower status than boys (Bian et al., 2017; Halim et al., 2013; Karraker & Vogel, 1995). Although it is important to know how both boys and girls respond to patterns of nonverbal bias (and may respond differently; Fivush, Brotman, Buckner, & Goodman, 2000), I was particularly concerned with how such patterns influence American girls. Thus, I focused my recruitment efforts on female participants for Studies 2 and 3. Following exclusions, the sample consisted of 68 child participants, including 61 White, 1 Black, 1 Latina, and 5 multiracial participants ranging in age from 6 years, 1 month to 8 years, 11 months (*M*=7 years, 5 months).[4]

Materials

    Experimental manipulation. I began by separating the clips by target gender, then within each gendered set, I divided the clips into two further sets – one *"traditional"* set and one *"reverse"* set (see Figure 4). I matched character across condition such that the same characters appeared in the "traditional" set and in the "reverse" set, but those characters were either the targets of positive or negative nonverbal behavior. Each gender-stereotypical character appeared in the "traditional" condition with the clip in

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[4] One participant was excluded because she did not complete the study.

which they were treated most positively and appeared in the "reverse" condition with the clip in which they were treated most negatively. The reverse was true for gender-counterstereotypical characters, such that they appeared in the "traditional" condition with the clip in which they were treated most negatively and in the "reverse" condition with the clip in which they were treated most positively.

In each set of clips, each show is represented and child participants observed the pattern across many different contexts. The "traditional" set, for example, contained 24 clips – two from each show. One clip featured the gender-stereotypical character being treated positively and the other featured the gender-counterstereotypical character being treated negatively. These clips were the full, unedited clips that contain both targets and partners.

It is important to note that the purpose of the second, orthogonal factor was to examine what girls infer from observing behavioral patterns directed at boys and men versus girls and women. This factor was examined using exploratory analyses. Children rated each clip on how much they liked it on a 6-point visual scale (i.e., accompanied with frowning and smiling faces) from 1 (Really don't like) to 6 (Really like). Children were first trained on the use of these scales by being given sample items such as how much they like ice cream or swimming.

Intersubjective norms: Popularity and approval. I generated cartoon avatars that are stereotypical and counterstereotypical in appearance (see Figure 5 for examples). In this task, participants' goal was to indicate how much other kids would like the people in the drawings. To do so, they used the same 6-point visual scale (i.e., accompanied with

80

frowning and smiling faces) used for the clips, so they rated each drawing from 1 (Really don't like) to 6 (Really like). This measure was modelled after an established measure of popularity with children (Moller, Hymel, & Rubin, 1992). Pre-testing with a community sample of parents (*N*=61) confirmed that stereotypical avatars were perceived as more gender-typical than counterstereotypical avatars for both female avatars ($F(1, 60)$=200.03, p<.001) and male avatars ($F(1, 60)$=144.49, p<.001). I calculated a stereotypical bias score by subtracting liking for gender counterstereotypical targets from liking for gender stereotypical targets.

Intersubjective norms: Felt pressure for conformity. This scale (Pauletti, Cooper, & Perry, 2014) consists of seven items intended to measure how much pressure children feel from peers and parents to behave in gender-stereotypical ways. This scale, a modified version of the 10-item Felt Pressure scale (Egan & Perry, 2001) has demonstrated good reliability (Cronbach's alpha=.81) and stability over time (stability coefficient=.82). The scale asked girls to respond about how true statements like "My parents would be upset if they saw me acting like a boy" are on a four-point scale from -2, Definitely Not, to 2, Definitely. Scores are calculated as an average of items after reverse scoring. Due to the potential difficulty of these questions and the scale for girls at the younger end of our target age range, I provided an example item first that gets children thinking about evaluative sources: "My parents would get upset if I didn't do well in school."

Ambiguous scenarios. In this task, I measured children's own liking for stereotypical and counterstereotypical children. Girls were presented with scenarios

81

featuring stereotypical or counterstereotypical characters (i.e., a masculine girl, feminine girl, masculine boy, or feminine boy) and rated those characters on the same 6-point visual scale used for video clips and drawings (i.e., accompanied with frowning and smiling faces and from Really don't like to Really like). For example, "Betsy is 8. She likes to play football. How much do you think you would like her?". This measure was modeled after the well-established "ambiguous situations" measure used in studies on race (McGothlin et al., 2005). Children tend to be highly gender-segregated in their playgroups during middle childhood. Thus, I calculated a stereotypical bias score separately for female and male targets by subtracting liking for gender counterstereotypical targets from liking for gender stereotypical targets.

Isolated play. In this task, children were provided with an array of traditionally feminine to traditionally masculine toys and, during a "break", were given an opportunity to play with these toys which have been pre-rated as masculine or feminine. The child's choices and behavior during this time period were videotaped. However, this measure is exploratory; I will include it to provide the child with a break between the first and second round of clip viewing. Critically, unlike Study 3, the behavior in this task is not interpersonal and thus has low likelihood of being influenced by intersubjective norms. Nonetheless, I calculated a stereotypical bias score by subtracting how long each child spent with masculine toys from the time she spent with feminine toys.

Career and task aspirations. In two sets of questions, children were asked about their own aspirations to do several activities and careers as well as the prescriptive gender norms regarding these activities. The original list included 43 adult occupations and

82

activities (e.g., teaching a class, being a ballerina) that were pre-tested among children and adults (Shepard & Hess, 1975). The goal of this original study was intended to measure "liberality" (i.e., the extent to which people indicated that jobs could be done by either gender). However, here I used the list to gauge children's gender-stereotypical beliefs about who should do each task and children's own aspirations. In the original study, there was substantial consistency in how each activity was gender-typed across groups. I have selected a subset of these items that were highly gendered (i.e., less than equal to 30% of responses were that the activity was appropriate for either gender) and continue to be relevant in modern society as gendered occupations and roles. Items included activities such as be a doctor, fix a car, be a ballet dancer, and be a nurse. In one task, children were asked whether they would like to do any of a list of activities and careers (e.g., be a doctor, be a ballet dancer) when they grew up with the scale response options *Yes*, *No*, or *Maybe*. I calculated stereotypical bias scores on this measure by subtracting the number of masculine items that the child said *Yes* to and the number of feminine items that the child said *No* to from the number of masculine items that the child said *No* to and the number of feminine items that the child said *Yes* to. *Maybe* responses will be coded as 0 and have no impact on the stereotyping score. In a second task, children were asked who should complete those activities and careers with the scale response options *Man*, *Woman*, or *Either*. I calculated stereotypical bias scores on this measure by subtracting the number of masculine items that the child said *Woman* to and the number of feminine items that the child said *Man* to from the number of masculine items that the child said *Man* to and the number of feminine items that the child said

83

Woman to. *Either* responses were coded as 0 and had no impact on the stereotyping score.

Diagnostic Analysis of Nonverbal Accuracy (DANVA). In this task, children were shown a series of 24 photographs of children with four different facial emotions (anger, happiness, sadness, fear) and at two different intensities (high, low). The child's task was to correctly identify the emotion on the face from the four options listed above. This measure has demonstrated good reliability across a wide range of subjects between the age of 4 and 10 with high Cronbach's alpha (i.e., .88) and good test-retest reliability four weeks later (.84; Nowicki & Duke, 1994).

Procedure

Parents were asked to bring their child to the Social Perception and Attitudes lab for a series of tasks. The entire procedure took about 90 minutes. Parental consent was obtained after the study was described, any questions were answered, and parents and children were reminded that participation could be ended at any time without loss of benefit. Child participants first viewed a series of brief (about 10-second) TV clips. After the children view all clips, they will complete half of the measures described above (i.e., popularity and approval, isolated play, ambiguous scenarios) to assess beliefs about girls and boys. Children will then view half of the clips again (i.e., the clips with the strongest condition-congruent emotion; e.g., clips in the "traditional" condition with the strongest negative emotion directed at gender-counterstereotypical targets) before they complete the remainder of the measures and the test of nonverbal skill (DANVA-II). The entire procedure for children will be videotaped from two camera angles from the computer and

from a camera set up on a tripod in the corner of the room. This will enable me to code, on an exploratory basis, the child's own gender-typed behavior during interactions with the experimenter, emotional mimicry during the television show clips, and emotional incongruence between facial expression and response. Parents will be then debriefed about the purpose of the study and I will share with them some resources on how to talk to their children about gender stereotypes.

Results

Analytic Plan

To examine Hypotheses 1 (that girls exposed to "traditional" (vs "reverse") nonverbal bias would express stereotypical intersubjective norms) and Hypothesis 2 (that girls exposed to "traditional" (vs. "reverse") nonverbal bias would express more explicit gender stereotypes), I conducted a series of independent samples *t*-tests (Nonverbal Bias Condition) on each of the stereotypical bias scores calculated from the above measures. I expected a main effect of nonverbal bias condition such that girls in the traditional bias condition would have stronger stereotypical bias scores than girls in the reverse bias condition. In order to examine Hypothesis 3 (that Hypothesis 1 and Hypothesis 2 would occur to the extent that girls could accurately decode subtle emotion expressions), I added a continuous factor to the model and thus conducted multiple regression analyses in which the factor was dummy-coded and DANVA scores were mean-centered, with each term evaluated at the step it is entered (Step 1: main effects; Step 2: 2-way interactions; Step 3: predicted 3-way interaction; Aiken & West, 1991). I expected a 2-way interaction of nonverbal bias and DANVA scores on stereotypical bias scores such that only girls

85

with high nonverbal accuracy will respond to traditional bias with stronger gender stereotypical bias.

Intersubjective Norms

Popularity and approval. An independent samples *t*-test revealed a trending effect such that girls in the Traditional condition rated stereotypical (relative to androgynous) kids as more popular (*M*=.67, *SD*=.92) than girls in the Reverse condition (*M*=.36, *SD*=.68), *t*(66)=1.57, *p*=.121, 95% CI [-.08, .70], *d*=.39. Furthermore, adding emotion accuracy as a moderator revealed a significant interaction, *F*(1, 64)=5.42, *p*=.023, *d*=.59 (see Figure 6A). Among girls who were skilled at reading nonverbal emotion, those who watched Traditional clips rated stereotypical (relative to androgynous) kids as more popular than did those who watched Reverse clips, *b*=-.77, *t*(64)=-2.79, *p*=.007, 95% CI [-1.33, -.22], *d*=.70. Among girls who were not very skilled at reading nonverbal emotion, the clip condition produced no significant effects on popularity ratings, *b*=.14, *t*(64)=.52, *p*=.603, 95% CI [-.40, .69], *d*=.13.

Felt pressure for conformity. Girls in the Traditional condition felt similar pressure to be feminine (*M*=2.25, *SD*=.55) as girls in the Reverse condition (*M*=2.23, *SD*=.64), *t*(66)=.17, *p*=.862, 95% CI [-.26, .31], *d*=.41. However, adding emotion perceptivity as a moderator revealed a significant interaction, *F*(1, 64)=5.01, *p*=.029, *d*=.56 (see Figure 6B). Among girls who were skilled at reading nonverbal emotion, those who watched Traditional clips felt marginally more pressure to be feminine than did those who watched Reverse clips, *b*=-.36, *t*(64)=-1.79, *p*=.078, 95% CI [-.77, .04], *d*=45. Among girls who were not skilled at reading nonverbal emotion, the clips

produced no pressure to be feminine, $b=.28$, $t(64)=1.41$, $p=.164$, 95% CI [-.12, .68], $d=.35$.

Summary. Emotion perceptivity predicted changes to girls' intersubjective norms about gender roles. Specifically, girls who were perceptive of subtle emotion learned from the traditional clips that stereotypical kids would be more popular than androgynous kids and derived more pressure to be feminine.

Explicit Gender Stereotypes

Ambiguous scenarios. Girls in the Traditional condition had a marginally stronger preference for the stereotypical (vs. counterstereotypical) girls in the scenarios ($M=1.12$, $SD=2.53$) compared to the girls in the Reverse condition ($M=.00$, $SD=2.42$), $t(66)=1.86$, $p=.067$, 95% CI [-.08, 2.32], $d=.46$. Adding emotion accuracy as a moderator revealed a trending interaction, $F(1, 64)=2.62$, $p=.110$, $d=.40$. Among girls who were skilled at reading nonverbal emotion, those who watched Traditional clips had a stronger preference for stereotypical playmates than did those who watched Reverse clips, $b=-2.08$, $t(64)=-2.42$, $p=.019$, 95% CI [-3.79, -.36], $d=.61$. Among girls who were not skilled at reading nonverbal emotion, the clips produced no effects on playmate preference, $b=-.10$, $t(64)=-.12$, $p=.908$, 95% CI [-1.79, 1.59], $d=.03$.

I also conducted an exploratory analysis to test the effect of nonverbal bias condition on explicit gender stereotypes via intersubjective norms. In this moderated mediation, there was a significant indirect effect of condition on stereotypical play preferences via felt pressure for conformity as moderated by girls' ability to read emotion, $b=-4.16$, $se=2.01$, 95% CI [-9.34, -1.09] (see Figure 7). In other words, the

87

more pressure that emotionally perceptive girls felt to be feminine from watching the Traditional clips, the more they indicated they would like to play with stereotypical girls, $b=-.67$, $se=.33$, 95% CI [-1.35, -.11].   The same was not true for girls who were not yet skilled at reading emotion, $b=.52$, $se=.44$, 95% CI [-.16, 1.54]. Furthermore, the moderated indirect effect of nonverbal bias through popularity and approval was not significant, $b=-.89$, $se=1.41$, 95% CI [-3.96, 1.83], suggesting that felt pressure may be a better measure of intersubjective norms.

An independent samples t-test revealed that girls in the Traditional condition had similar preference for the stereotypical (vs. counterstereotypical) boys in the scenarios ($M=-1.18$, $SD=3.31$) compared to the girls in the Reverse condition ($M=-.62$, $SD=2.69$), $t(66)=-.77$, $p=.447$, 95% CI [-2.02, .90], $d=.19$. Adding emotion accuracy as a moderator did not reveal any interaction, $F(1, 64)=1.11$, $p=.296$, $d=.26$.

Isolated toy play. An independent samples t-test indicated that girls in the Traditional condition played similarly ($M=7.26$ fewer seconds playing with feminine than masculine toys, $SD=154.18$ secs) as girls in the Reverse condition ($M=35.56$ more seconds playing with feminine than masculine toys, $SD=176.92$), $t(66)=-1.06$, $p=.291$, 95% CI [-.41, .13], $d=.26$. Adding emotion accuracy as a moderator did not have an effect, $F(1, 64)=1.03$, $p=.315$, $d=.25$.

Career and task aspirations. Girls in the Traditional condition had similar career and task aspirations ($M=.05$, $SD=.41$) as girls in the Reverse condition ($M=.16$, $SD=.57$), $t(66)=-.93$, $p=.355$, 95% CI [-.35, .13], $d=.23$. Adding emotion accuracy as a moderator did not have an effect, $F(1, 64)=.15$, $p=.696$, $d=.10$.

88

Career and task stereotypes. Girls in the Traditional condition had similarly stereotypical career and task norms (*M*=.73, *SD*=.47) as girls in the Reverse condition (*M*=.71, *SD*=.52), *t*(66)=.15, *p*=.884, 95% CI [-.22, .26], *d*=.04. Adding emotion accuracy as a moderator did not have an effect, *F*(1, 64)=.36, *p*=.552, *d*=.15.

Summary. I observed some evidence that traditional (vs. reverse) clips influenced the types of kids that girls would chose to interact with; girls in the traditional condition wanted to play with stereotypical (more than counterstereotypical) female peers to the extent they were good at perceiving subtle emotion. Furthermore, I observed some exploratory evidence that this change in peer preferences occurred by way of intersubjective norms (i.e., felt pressure). I observed no effects on the careers and tasks girls wanted to do, the careers and tasks girls expected women and men to do, or the toys that girls chose to play with.

Discussion

These results suggest that patterns of nonverbal bias inform girls' gender roles – especially among those who are perceptive of subtle emotion. I observed especially strong evidence of changes to girls' beliefs about what they think their peers and parents want girls to do and look like. Girls who were good at reading emotion felt more pressure to be feminine and thought stereotypical peers would be more popular if exposed to traditional nonverbal bias. This is consistent with past evidence suggesting that intersubjective norms are more proximal to sources of social influence than own behavior and act as mediators to those eventual changes on own behavior (Chiu et al., 2010; Tam et al., 2012; Weisbuch & Ambady, 2009).

I did not observe many effects on girls' own behavior. Girls played with similar toys, reported similar career aspirations, and held similar stereotypes about what careers members of each gender should hold regardless of which pattern of nonverbal bias they were exposed to. One possible explanation for these null effects is that they were more distal from the manipulation and therefore the effects were too weak to influence behavior. Participants were not engaged in interactions with peers or even imagined interaction. Thus, another possible explanation is that these outcomes did not imply ingroup evaluation and were therefore not influenced by the manipulation. Past research has suggested that intersubjective norms inform behavior *particularly* when people think that their behavior is going to be evaluated by an ingroup audience (Gelfand & Realo, 1999). In this case, girls in the study may not have felt their peers would be evaluating their responses.

One departure from the general paucity of findings on girls' own behavior was stereotypical peer preferences. To the extent that girls were good at reading subtle nonverbal emotions, those who watched the traditional (vs. reverse) clips preferred to play with stereotypical (vs. counterstereotypical) female peers. We can speculate that girls may have imagined ingroup evaluation when selecting their peer preferences because people are often evaluated based on who they spend time with. However, this is purely speculative. We did not ask girls about whether they imagined that they would be judged by other girls for who they decided to play with. The observed pattern was also not evident among changes to male peer preferences.

90

Finally, I observed preliminary evidence of an indirect effect on own behavior by way of changes to intersubjective norms. In this case, the more that emotionally perceive girls responded to the traditional (vs. reverse) condition with felt pressure to be feminine, the more their peer preferences shifted toward feminine girls. Thus, in the following study, I examined changes to own behavior not only in the context of anticipated ingroup evaluation but also by way of changes to intersubjective norms (i.e., felt pressure for conformity and popularity and approval). I expected that girls would change their behavior to be more or less feminine by way of intersubjective norms when they thought they would be evaluated by other girls of similar age.

STUDY 3

In Study 3, I examined how cultural patterns inform children's interpersonal behaviors. I made a few methodological adaptations to increase the precision of the effect. Specifically, work on intersubjective norms suggests that effects may emerge most strongly when people feel accountable to the ingroup (Chiu et al., 2010; Han & Shavitt, 1994). Thus, I made changes to the methods to be able to examine the relationship between norms and behavior when children feel accountable to ingroup members for that behavior.

First, I aimed to examine if and how exposure to a cultural pattern of nonverbal gender bias causes girls to exhibit feminine interpersonal behavior. Work on intersubjective norms suggests that the impact of perceived norms may be particularly impactful when people feel accountable to an ingroup audience (Chiu et al., 2010; Gelfand & Realo, 1999), such as when stating their beliefs out loud or anticipating evaluation by the ingroup.

Second, to maximize power in this study I limited the clips to those with female targets. Cognitive theories of gender role development (e.g., Gender Schema Theory; Bem, 1983; Martin & Halverson, 1981) suggest that children attend most closely to patterns regarding their own gender, so if my hypotheses reflect natural processes, they should definitely be observed when clips include own-gender targets.

Finally, I proposed to examine the role of age as a moderator of girls' susceptibility to this gendered cultural pattern. Age may be a critical moderator to children's susceptibility because the relationship between gender role adherence and age is curvilinear such that children start out as quite flexible before they know much about gender roles but then adhere strictly to gender roles by about the age of 3 (i.e., the *Pink Frilly Dress phenomenon*; Halim et al., 2014). Peak rigidity is hit between age 5 and 6 (Trautner et al., 2005). As children enter middle childhood, however, they again become more flexible in their gender roles (Katz & Ksansnak, 1994). This transition, which occurs at about the age of 7 or 8, may moderate the impact of nonverbal patterns on children either by causing them to be more susceptible to counter-stereotypical patterns or to be less attentive to social norms for gender-specific behavior. Thus, I sampled girls between 5 and 10 to examine whether age moderates susceptibility. I also measured gender role flexibility to confirm that this is the mechanism by which age moderates susceptibility.

In summary, in Study 3 I utilized a 2 (Nonverbal Bias Condition) between-groups design testing the moderating effects of emotion perception accuracy, age, and gender-role flexibility on development of intersubjective norms and enactment of gender-stereotypical behavior.

Hypothesis 1: To the extent that girls could accurately decode subtle emotion expressions, I expected that girls exposed to "traditional" (vs "reverse") nonverbal bias would express stereotypical intersubjective norms for girls and boys.

Hypothesis 2: To the extent that girls could accurately decode subtle emotion expressions, I expected that girls exposed to "traditional" (vs. "reverse") nonverbal bias would behave more gender stereotypically.

Hypothesis 3: To the extent that girls could accurately decode subtle emotion expressions, I expected that intersubjective norms would mediate the relationship between nonverbal bias and stereotypical behavior.

Hypothesis 4: I expected Hypotheses- 1-3 to occur among older girls (instead of among emotionally perceptive girls).

Hypothesis 5: I expected Hypotheses 1-3 to occur to the extent that girls had rigid gender-roles (i.e., low gender-role flexibility; instead of among emotionally perceptive girls).

Method

Participants and Setting

I recruited 95 girls for this study to have a sufficient sample size in each condition to test the manipulated factors and have enough variation in the moderators to test their impact. Following exclusions, the sample consisted of 91 child participants, including 61 White, 2 Black, 4 Latina, and 22 multiracial participants ranging in age from 6 years, 3 months to 10 years, 5 months (*M*=8 years, 1 month).[5]

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[5] Four participants were excluded because they did not complete the study (*n*=1) or there were computer errors (*n*=3). One parent refrained from listing their child's race.

Materials

  Experimental manipulation. I used the same manipulation as described in Study 2 above with the exception that only the female target conditions were used (i.e., there is only one between-subjects manipulation).

  Introductory video. Following established procedure (Pauker, Apfelbaum, Dweck, & Eberhardt, in preparation), children were asked to record three brief introductory videos to be seen by ostensible "partners". To strengthen this manipulation, children were told that their partners would be girls who were the same age or slightly older and were shown pictures of these girls. After viewing the pictures, participants were asked a series of questions. To evaluate intersubjective norms, children were given a questionnaire to evaluate how much they thought the other girls would like various kinds of kids (i.e., the cartoon characters from the *Popularity and Approval* measure in Study 2).

  Girls were then instructed to draw message prompts from each of three bowls with folded pieces of paper. Unbeknownst to the girls, all prompts within each bowl were the same and were written to get girls to talk about themselves and other girls. The first prompt read, "Imagine you are introducing yourself to these kids. What are 3 things you would tell them about yourself so that they could get to know you?". The second prompt read: "In what ways are you like most girls and in what ways are you different from most girls?" The third prompt read: "Tell these kids about one of your favorite cartoon characters. What makes that character special? How are you like the character you chose?" The experimenter read the prompt to girls to confirm that they understood

them. Participants were given up to 1 minute to prepare for each recording. The prompts were available to the girls while recording their videos. Following the videos, children reported reflected appraisals on how much they thought the girls watching their video and girls in general would want to be their friend and would like them.

Children's videos were coded for nonverbal (e.g., postural constriction) and paraverbal (i.e., vocal tone)/verbal (e.g., feminine traits and activities) gender-stereotypicality. Seventy-nine undergraduate students (65% women; 73% white) rated children's nonverbal behavior in each of the videos (without sound) and 55 undergraduate students (64% women; 76% white) rated children's audio in each of the videos. They either rated the child on competence (i.e., intelligent, smart, and capable) or warmth (i.e., friendly, caring, and sociable).[6] Ratings for each child were aggregated across raters and video responses. Popularity and approval scores were calculated the same as in the previous study with liking for counterstereotypical characters subtracted from liking for stereotypical characters as an index of intersubjective norms.

Gender role flexibility. Children's gender-role flexibility was gauged with responses to the Child Occupations, Activities, and Traits (COAT) measure (Liben & Bigler, 2002). This scale includes gender-stereotypical occupations, activities, and traits for children to rate themselves and others on. Previous uses of this scale to operationalize gender-role flexibility have counted the number of occupations, attitudes, and traits that children indicate is appropriate for either gender. Thus, children were asked to respond to each of several items with whether it is appropriate for women, for men, or for either.

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[6] Adjective descriptors of competence and warmth based on those used by Judd and colleagues (Judd, James-hawkins, & Yzerbyt, 2005).

Children were also allowed to respond with *I don't know* if they did not know what an activity was. We did this so that children were not swayed by the description of a task that they did not already know about (e.g., shooting pool). I therefore quantified gender-role flexibility as the number of items that children respond with 'either' to as a proportion of the items that they understood.[7] This scale has demonstrated good reliability and has been used with children as young as 6 (Schmalz & Kerstetter, 2017).

Activities Preferences Scale. Children's preferences for feminine and masculine activities was gauged with responses to the Activity Preference Scale (Martin & Dinella, 2012). This scale includes feminine, masculine, and neutral activities for children to indicate their preferences for with 0 (*not at all*), 1 (*a little),* or 2, *(a lot).* I selected a subset of these items that did not overlap with the COAT scale to include here as a measure of stereotypical play preferences. Specifically, I selected three traditionally feminine activities (i.e., dressing up, playing with dolls, and playing jump rope) and three traditionally masculine activities (i.e., climbing trees, playing football, and skateboarding). After recording their video messages, children were asked to indicate their preferences to each of these items. They were told that their answers would be sent along with the videos they recorded so that the other girls could get to know them better. I calculated a scale score as the difference between the averages of the feminine and masculine activities with higher values meaning for stereotypical activity preferences.

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[7] One child was removed from gender-role flexibility analyses because she misunderstood the instructions and used the *I don't know* response to indicate when she did not know who was supposed to do particular activities instead of not knowing what a particular activity was.

Procedure

Like Study 2, parents were asked to bring their child to the Social Perception and Attitudes lab for a series of tasks. The entire procedure took about 60 minutes. Parental consent was obtained after the study had been described, any questions had been answered, and parents and children were reminded that participation can be ended at any time without loss of benefit. After a 5-minute play warm-up, child participants were assented and began watching the television clips. After the children viewed all clips, they completed the video interaction task (including the popularity and approval measure and reflected appraisals), the Felt Pressure measure, and the moderator measures (i.e., gender-role flexibility and DANVA). The child was then invited to pick out a toy to thank them for participation.

As with the previous study, the entire procedure for children was videotaped from two camera angles – one from the view of the computer monitor to capture the child's facial reactions during the tasks and another from a tripod to the side of the child to capture the experimenter's and child's full bodies. Parents responded to demographic and television watching habit questionnaires while their child was working with the experimenter. Parents were then debriefed about the purpose of the study and I shared with them some resources on how to talk to their children about gender stereotypes.

<div align="center">

Results

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Analytic Plan

To evaluate Hypotheses 1 and 2, I conducted a series of (Nonverbal Bias Condition) regressions testing the effect of nonverbal bias on paraverbal/verbal content,

nonverbal behavior, and intersubjective norms as moderated by girls' emotional

perceptivity using the PROCESS macro (Hayes, 2013). In order to evaluate Hypothesis

3, I conducted a bootstrapped mediation model to test the indirect effect of nonverbal bias

on stereotypical behavior through intersubjective norms using the PROCESS macro

(Hayes, 2013; see Figure 6). I had hypothesized the potential importance of three

moderators: age, the ability to read subtle emotion, and gender role flexibility. As

expected, age positively correlated with emotional perceptivity, $r(89)=.40$, $p<.001$, and

gender-role flexibility, $r(89)=.24$, $p<.001$. These correlations are small to medium

suggesting that age only accounts for some variation in increases among emotion

perceptivity or gender-role flexibility. Therefore, to evaluate Hypothesis 4, I replaced

emotional perceptivity with age as a continuous moderator in each of the above statistical

models. To evaluate Hypothesis 5, I replaced age with gender-role flexibility as a

continuous moderator in each of the above statistical models.

Intersubjective Norms

Popularity and approval. Girls in the Traditional condition rated ST (relative to

CST) avatars as similar in popularity as girls in the reverse condition regardless of age,

$F(1, 87)=1.21$, $p=.275$, $d=.24$, or emotion perceptivity, $F(1, 87)=1.11$, $p=.295$, $d=.23$.

Thus, this effect did not replicate from Study 2. However, adding gender role flexibility

as a moderator revealed a trending interaction, $F(1, 86)=2.22$, $p=.140$, $d=.32$. Among

girls who held rigid gender roles, those who watched Traditional clips considered gender-

stereotypical (vs. counterstereotypical) kids more popular than did those who watched

Reverse clips, $b=-.84$, $se=.44$, $t(86)=-1.91$, $p=.059$, 95% CI [-1.72, .03], $d=.41$. Among

girls who held more flexible gender roles, the clips did not influence perceived popularity of the stereotypical and counterstereotypical children, $b=.09$, $se=.44$, $t(86)=.20$, $p=.843$, 95% CI [-.79, .96], $d=.04$.

Felt pressure for conformity. Replicating Study 2, a regression of felt pressure on nonverbal bias condition and emotion perceptivity revealed a significant interaction, $F(1, 87)=5.78$, $p=.018$, $d=.52$. Among girls who were skilled at reading nonverbal emotion, those who watched Traditional clips felt significantly more pressure to be feminine than did those who watched Reverse clips, $b=.85$, $se=-.36$, $t(87)=-2.15$, $p=.034$, 95% CI [-.68, .03], $d=.46$. Among girls who were not skilled at reading nonverbal emotion, the clips produced no significant pressure to be feminine, $b=.21$, $se=.21$, $t(87)=1.26$, $p=.212$, 95% CI [-.12, .54], $d=.27$. Replacing emotional perceptivity with age revealed a marginal interaction, $F(1, 87)=2.77$, $p=.099$, $d=.36$. Among older girls (i.e., 1 SD above the mean = 9 years, 4 mos), those who watched Traditional clips felt more pressure to be feminine than did those who watched Reverse clips, though this effect was only trending; $b=.26$, $se=.17$, $t(87)=1.55$, $p=.124$, 95% CI [-.58, .07], $d=.33$. Among younger girls (i.e., 1 SD below the mean = 6 years, 11 mos), the clips produced no significant pressure to be feminine, $b=.13$, $se=.17$, $t(87)=.81$, $p=.421$, 95% CI [-.19, .46], $d=.17$. Replacing age with gender role flexibility did not reveal any significant interaction, $F(1, 86)=.01$, $p=.913$, $d=.02$.

Summary. Gender role rigidity predicted changes in popularity and approval ratings; girls who had rigid gender roles learned from the traditional clips that stereotypical kids would be more popular than androgynous kids. In contrast, age and

100

emotion accuracy predicted changes in felt pressure to be feminine; girls who were older

or were more emotionally perceptive felt more pressure to be feminine if they watched

traditional than reverse clips. This latter moderator (i.e., emotional perceptivity) is

consistent with findings from Study 2.

Gendered Behavior: Competence

Nonverbal. Nonverbal bias did not interact with age, $F(1, 87)=.77$, $p=.382$,

$d=.19$, or emotional perceptivity, $F(1, 87)=.60$, $p=.441$, $d=.17$, to predict nonverbal

competence. However, adding gender role flexibility as a moderator revealed a

significant interaction, $F(1, 86)=4.24$, $p=.043$, $d=.44$. Among girls who held more rigid

gender roles, those who watched Traditional clips conveyed less competence than did

those who watched Reverse clips, $b=.27$, $se=.19$, $t(86)=1.40$, $p=.164$, 95% CI [-.11, .66],

$d=.30$, though this effect is only trending. Among girls who held more flexible gender

roles, those who watched Traditional clips conveyed more competence than did those

who watched Reverse clips, $b=-.29$, $se=.19$, $t(86)=-1.52$, $p=.132$, 95% CI [-.68, .09],

$d=.33$, though this effect is also only trending.

There was no indirect effect of condition on nonverbal competence via felt

pressure for conformity, $b=.02$, $se=.04$, 95% CI [-.06, .12]. However, this indirect effect

of condition on nonverbal competence via felt pressure was significantly moderated by

age, $b=.005$ $se=.003$, 95% CI [.0002, .01] (see Figure 8A). Among older girls, the

traditional bias led them to feel more pressure to be feminine and consequently conveyed

less competence in their nonverbal behavior, $b=.09$ $se=.05$, 95% CI [-.001, .22]. Among

younger girls, the traditional bias had no moderated indirect effect on nonverbal

101

competence, *b*=-.05, *se*=.06, 95% CI [-.19, .06]. Similar effects were observed with

emotional perceptivity as a moderator, *b*=.67, *se*=.36, 95% CI [.12, 1.57] (see Figure 9A).

Girls who were good at reading subtle emotion felt more pressure to be feminine in the

traditional (vs. reverse) condition and consequently conveyed less competence in their

nonverbal behavior, *b*=.12, *se*=.07, 95% CI [.02, .28]. No effect emerged among girls

who were not yet good at reading emotion, *b*=-.07, *se*=.06, 95% CI [-.24, .03]. No

indirect effect of condition on nonverbal competence via felt pressure emerged when

moderated by gender-role flexibility, *b*=.02, *se*=.20, 95% CI [-.43, .40].

There was no indirect effect of condition on nonverbal competence via popularity

and approval ratings, *b*=.01, *se*=.03, 95% CI [-.02, .12]. Nor was this indirect effect

moderated by girls' age, *b*=.00, *se*=.002, 95% CI [-.01, .001], ability to read emotion, *b*=-

.07, *se*=.20, 95% CI [-.82, .13], or gender role flexibility, *b*=-.06, *se*=.16, 95% CI [-.59,

.10].

Verbal and paraverbal. Nonverbal bias interacted with age to predict how

competent girls sounded, *F*(1, 87)=7.14, *p*=.009, *d*=.57. Among younger girls, those who

watched Traditional clips sounded less competent than did those who watched Reverse

clips, *b*=.46, *se*=.18, *t*(87)=2.60, *p*=.011, 95% CI [.11, .82], *d*=.56. Among older girls,

there was no effect of clips on verbal and paraverbal competence, *b*=-.21, *se*=.18, *t*(87)=-

1.20, *p*=.235, 95% CI [-.57, .14], *d*=-.26. Neither emotional perceptivity nor gender role

flexibility accounted for this effect. Adding emotion accuracy as a moderator did not

reveal any interaction on how competent girls sounded, $F(1, 87)=.005$, $p=.945$, $d=.02$.

Nor did adding gender role flexibility as a moderator, $F(1, 86)=1.84$, $p=.179$, $d=.29$.[8]

Effects on paraverbal and verbal competence were similar those above on nonverbal competence. There was no indirect effect of condition on verbal and paraverbal competence via felt pressure for conformity, $b=.02$, $se=.04$, 95% CI [-.04, .12]. However, there was a significant indirect effect of condition on paraverbal and verbal competence via felt pressure emerged when moderated by age, $b=.004$, $se=.002$, 95% CI [.002, .01] (see Figure 8B). Among older girls, the traditional bias led them to feel more pressure to be feminine and consequently sounded marginally less competent, $b=.07$, $se=.05$, 95% CI [-.002, .21]. Among younger girls, the traditional bias had no moderated indirect effect on nonverbal competence, $b=-.04$, $se=.05$, 95% CI [-.16, .04]. Similar effects were observed with emotional perceptivity as a moderator, $b=.54$, $se=.34$, 95% CI [.06, 1.46] (see Figure 9B). Girls who were good at reading subtle emotion felt more pressure to be feminine in the traditional (vs. reverse) condition and consequently conveyed less competence in their verbal and paraverbal behavior, $b=.10$, $se=.07$, 95% CI [.01, .27]. There was no observed effect among girls who were low in emotional perceptivity, $b=-.06$, $se=.06$, 95% CI [-.22, .02]. Again though, no indirect effect of condition on verbal and paraverbal competence via felt pressure emerged when moderated by gender-role flexibility, $b=.01$ $se=.16$, 95% CI [-.32, .34].

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[8] Given the relatively small p value, I report the simple effects here. Among girls who held more rigid gender roles, those who watched Traditional clips sounded non-significantly less competent than did those who watched Reverse clips, $b=.30$, $se=.21$, $t(86)=1.39$, $p=.167$, 95% CI [-.13, .72], $d=$. Among girls who held more flexible gender roles, those who watched Traditional clips similarly competent as those who watched Reverse clips, $b=-.11$, $se=.21$, $t(86)=-.53$, $p=.598$, 95% CI [-.53, .31], $d=$.

There was no indirect effect of condition on verbal and paraverbal competence via popularity and approval ratings, $b=.03$, $se=.04$, 95% CI [-.01, .15]. Nor were there indirect effects as moderated by age, $b=-.002$, $se=.002$, 95% CI [-.01, .001], girls' ability to read emotion, $b=-.16$, $se=.27$, 95% CI [-1.05, .10], or gender role flexibility, $b=-.15$, $se=.18$, 95% CI [-.72, .04].

Summary. In the video messages that girls recorded, patterns emerged regarding how competent they seemed. Specifically, girls conveyed less competence in both their nonverbal behavior and what they said/how they said it after watching traditional clips. This occurred by way of their intersubjective norms (i.e., felt pressure to be feminine). Yet, consistent with findings from Study 2, this effect was only observed among girls who were good at reading subtle emotion expressions.

There were also some effects of gender-role flexibility and age. Specifically, girls who had rigid gender roles responded to the traditional clips by behaving more competent nonverbally, but this had no impact on what they said or how they said it. Furthermore, younger girls *sounded* less competent if they watched traditional (vs. reverse) clips. Consistent with preliminary evidence from Study 2, intersubjective norms as measured by popularity and approval did not mediate any effects on nonverbal and verbal competence.

Gendered Behavior: Warmth

Nonverbal bias did not interact with age to predict how warm girls behaved nonverbally, $F(1, 87)=.17$, $p=.684$, $d=.09$. Nor did adding emotional perceptivity as a

moderator, $F(1, 87)=.09$, $p=.762$, $d=.06$. Adding gender role flexibility as a moderator did not reveal any interaction, $F(1, 86)=.14$, $p=.704$, $d=.08$.

Adding age as a moderator did not reveal any interaction on how warm girls sounded, $F(1, 87)=.97$, $p=.329$, $d=.21$. Nor did adding emotional perceptivity, $F(1, 87)=.08$, $p=.784$, $d=.06$, or gender role flexibility as moderators, $F(1, 86)=1.42$, $p=.237$, $d=.26$.

There was no indirect effect of condition on nonverbal warmth via felt pressure for conformity, $b=-.002$, $se=.03$, 95% CI [-.08, .04]. Furthermore, this effect was not moderated by girls' age, $b=-.001$, $se=.003$, 95% CI [-.01, .003], ability to read emotion, $b=-.12$, $se=.41$, 95% CI [-.98, .71], or gender-role flexibility, $b=-.01$, $se=.12$, 95% CI [-.34, .20].

Effects on paraverbal and verbal warmth were similar those above on nonverbal warmth. There was no indirect effect of condition on verbal and paraverbal warmth via felt pressure for conformity, $b=.001$, $se=.02$, 95% CI [-.03, .04]. Furthermore, this effect was not moderated by girls' age, $b=.00$, $se=.002$, 95% CI [-.005, .003], ability to read emotion, $b=-.02$, $se=.25$, 95% CI [-.55, .52], or gender-role flexibility, $b=-.004$ $se=.08$, 95% CI [-.23, .14].

There was no indirect effect of condition on nonverbal warmth via popularity and approval ratings, $b=.00$, $se=.04$, 95% CI [-.07, .08]. Nor were there indirect effects moderated by girls' age, $b=.00$, $se=.002$, 95% CI [-.005, .01], ability to read emotion, $b=-.02$, $se=.26$, 95% CI [-.78, .37], or gender role flexibility, $b=.001$, $se=.17$, 95% CI [-.39, .35].

105

There was no indirect effect of condition on verbal and paraverbal warmth via popularity and approval ratings, *b*=.02, *se*=.03, 95% CI [-.01, .12]. Nor were there indirect effects as moderated by girls' age, *b*=-.001, *se*=.002, 95% CI [-.01, .001], ability to read emotion, *b*=-.16, *se*=.23, 95% CI [-.90, .08], or gender role flexibility, *b*=-.12, *se*=.15, 95% CI [-.60, .04].

Summary. Nonverbal bias had no impact on how warmly girls behaved or sounded.

Activity Preference Scale

There was no interaction of nonverbal bias condition and age, *F*(1, 87)=.82, *p*=.367, *d*=.19, emotional perceptivity, *F*(1, 87)=.08, *p*=.783, *d*=.06, or gender role flexibility, *F*(1, 86)=.14, *p*=.714, *d*=.08, on play preferences.

There was no indirect effect of condition on play preferences via felt pressure for conformity, *b*=-.01, *se*=.03, 95% CI [-.11, .03]. This indirect effect of condition on activity preferences via felt pressure was marginally moderated by age, *b*=-.003 *se*=.002, 95% CI [-.01, .00] and significantly moderated by girls' ability to read emotion, *b*=-.42, *se*=.31, 95% CI [-1.26, -.01]. Replicating Study 2, girls who were good at reading subtle emotion felt more pressure to be feminine in the traditional (vs. reverse) condition and consequently reported more stereotypical play preferences (see Figure 10), *b*=-.08 *se*=.06, 95% CI [-.25, -.001]. No indirect effect of condition on play preferences via felt pressure emerged when moderated by gender-role flexibility, *b*=-.01 *se*=.13, 95% CI [-.34, .21].

There was a marginal indirect effect of condition on play preferences via popularity and approval ratings, *b*=-.03, *se*=.03, 95% CI [-.12, .01]. Girls in the

traditional condition had more stereotypical play preferences to the extent that nonverbal

bias influenced how popular they thought stereotypical (vs. counterstereotypical) kids

would be (see Figure 11A). This indirect effect was not moderated by girls' age, $b=.002$,

$se=.002$, 95% CI [-.001, .009] or ability to read emotion, $b=.16$, $se=.21$, 95% CI [-.08,

.82]. However, this indirect effect was marginally moderated by gender role flexibility,

$b=.15$, $se=.13$, 95% CI [-.02, .56] (see Figure 11B). Girls in the traditional condition who

had rigid gender roles had marginally stronger stereotypical play preferences to the extent

that nonverbal bias influenced how popular they thought stereotypical (vs.

counterstereotypical) kids would be, $b=-.06$, $se=.05$, 95% CI [-.22, .001]. Girls in the

traditional condition who had flexible gender roles did not vary in their stereotypical play

preferences relative to how popular they thought stereotypical (vs. counterstereotypical)

kids would be, $b=.006$, $se=.04$, 95% CI [-.06, .09].

Summary. I observed effects on the activity preference scale that girls completed

to send along with their video message consistent with effects observed on competence.

Specifically, girls reported more stereotypical preferences after watching traditional clips

by way of their intersubjective norms (i.e., felt pressure to be feminine). Yet, consistent

with findings from Study 2 and previous findings in Study 3, this effect was only

observed among girls who were good at reading subtle emotion expressions.

Although felt pressure for conformity emerged as the indirect pathway for other

effects throughout this study, here stereotypical play preferences were also predicted by

way of popularity and approval ratings. Specifically, girls reported more stereotypical

preferences to the extent that traditional bias led them to think that stereotypical kids

would be more popular than counterstereotypical kids. This effect was strongest among girls who had more rigid gender roles.

Discussion

This study provided a close replication and extension of effects observed in Study 2. First, I observed a replication of nonverbal bias on the pressure girls felt to be feminine especially among girls high in emotional perceptivity. These moderated effects replicate those of Study 2, including replication of the pattern of moderated mediation. The replication of this pattern provides confidence in the indirect effect through intersubjective norms. See General Discussion for a more thorough exploration of this topic.

This study also provided convergent validity on outcomes related to competence. I observed indirect effects of nonverbal bias on competence conveyed not only through visible nonverbal behavior but also through verbal behavior and/or paraverbal behavior. Girls conveyed less competence to the extent that the traditional clips caused them to feel more pressure to be feminine than the reverse clips. It is unclear whether inferences about competence from raters listening to the girls' responses were derived primarily from what the child was saying or the tone in which she communicated her response. Past work, for example, has suggested that vocal femininity leads people to perceive a target as less competent (Sei Jin Ko, Judd, & Stapel, 2009) and therefore vocal tone may account for effects. Further research is needed to disentangle the role of what girls said compared to *how* they said it. Regardless, the effects on these subtle outcomes are

particularly compelling given their potential consequences for how other people would then perceive these girls. Implications are discussed below in the General Discussion.

In Study 2 and Study 3, I observed moderated indirect effects on competence in the absence of direct effects. Traditional approaches to mediation emphasize the presence of a direct effect (c) for an indirect effect to exist (Baron & Kenny, 1986). Yet, statisticians have highlighted some limitations of this approach (Fritz & Mackinnon, 2007; Hayes, 2009, 2013; Mackinnon, Krull, & Lockwood, 2000; Shrout & Bolger, 2002). Most importantly, multiple indirect paths could account for a direct effect and may even operate in opposite directions that render the direct effect small and statistically non-significant (Hayes, 2009; Mackinnon et al., 2000). For example, the effect of nonverbal bias on competence may operate through felt pressure to be feminine but also potentially through other mechanisms that I did not measure here. Thus, numerous scholars have argued that direct effects need not be present for an indirect effect to exist (Hayes, 2009, 2013; Mackinnon et al., 2000; Shrout & Bolger, 2002). Furthermore, indirect effects that are in opposite directions for the a versus b paths may cancel each other out and make a direct effect seem non-significant. Therefore, readers can interpret the effect of nonverbal bias on competence and stereotypical activity preferences through felt pressure to be feminine as one of the possible indirect effects informing how girls present themselves to peers. Further research may identify co-occurring mechanisms that also inform how competently girls present themselves.

Preliminary evidence of what effects emerged regarding gender-role flexibility suggested that girls who held rigid gender roles were more susceptible to patterns of

109

nonverbal bias. However, emotional perceptivity also emerged as a consistently

important moderator of any effects. These two individual differences may work together

to amplify effects of gender role learning such that girls who are high in emotional

perceptivity but low in gender-role flexibility are most influenced by cultural patterns of

emotion regarding gender. Because both emotional perceptivity and gender-role

flexibility are positively correlated with age, it may be uncommon for girls to be high in

one but low on the other. Therefore, more evidence is needed to determine the role of

gender-role flexibility in gender-role learning. For example, gender-role rigidity may

predict gender-role learning from patterns that are less reliant on subtle emotion

perception. Although evidence has demonstrated that children become less adherent to

traditional gender roles as their ideas about gender become more flexible (Levy, 1989;

Ogletree, Denton, & Williams, 1993), there is a paucity of work on how the strength of

gender role socialization varies with how flexible or rigid a perceiver's gender roles are.

See General Discussion for more on this issue.

GENERAL DISCUSSION

The ecological environments that children encounter contain both cultural patterns and noise. These studies demonstrate not only that meaningful patterns of nonverbal bias exist in children's television shows but also that these patterns inform girls' understanding of gender roles and shape their own behavior. Findings from this research thus contribute to a broader understanding of knowledge about cultural influence, nonverbal behavior, and gender-role learning in middle childhood.

Gendered Ecology Approach

Children learn about gender from a very early age from a variety of sources. Some studies suggest that children understand and behave consistent with stereotypical gender roles as early as two years of age (Eichstedt, Serbin, Poulin-Dubois, & Sen, 2002; Freeman, 2007; Gunderson et al., 2012). Prior theory and research has highlighted the importance same-gender modelling, gendered behavioral reinforcement, and group distinctiveness (Anderson & Hamilton, 2005; Bigler & Liben, 2007a; Bussey & Bandura, 1999; Fagot, 1985; Reigeluth & Addis, 2016). The present work suggests that children may also learn about gender roles from subtle patterns of nonverbal behavior they observe.

Many theories have proposed how children come to learn gender roles throughout childhood (Bigler & Liben, 2007a; Bussey & Bandura, 1984; Kohlberg, 1966; Martin &

111

Halverson, 1981; Mischel, 1966; see Chapter 1 for a review). Yet, what scientists can draw from tests of these theories has been limited for two primary reasons. First, it is unclear what children attend to in complex social environments. It is possible that they attend to the cues that are hypothesized to inform gender role socialization (e.g., positive feedback towards gender stereotypical target characters). However, it is also possible that these cues are not noticed in the context of other patterns and noise present in typical social environments (e.g., visual complexity, temporal distribution of nonverbal emotion over time). For example, Social Cognitive Theory and Social Learning Theory posit that children learn about gender roles from the other people (i.e., social models) they observe in their environments and the positive feedback they receive when acting in gender stereotypical ways (Bussey & Bandura, 1999; Mischel, 1966). Yet it is unclear what models and types of feedback children attend to in complex environments and how this evolves throughout childhood. Second, it is unclear what *patterns* children are typically exposed to. Tests of Social Cognitive Theory and Social Learning Theory have typically generated behavioral patterns to test in the lab such as marching around the table or wearing a hat of a particular color (e.g., Bussey & Bandura, 1984). Researchers have then quantified whether children emulate behaviors performed by gender-matched models. Yet these patterns are both arbitrary and perceptually prominent. What patterns that children notice are actually available to them as they learn gender roles?

The Gendered Ecology Approach I have taken in these studies draws on and extends these and other theories by examining how children learn gender roles from patterns they typically encounter when those patterns are situated in the environments

112

where children typically encounter them. For example, Developmental Intergroup

Theory proposes environmental patterns that cause children to categorize people on a

particular dimension, such as gender (Bigler & Liben, 2007a). Tests of this theory have

positioned cues within noisy environments (e.g., classrooms) which addresses one

concern with existing gender role socialization theories, but have not typically quantified

the prevalence of those cues in environments where girls typically go (Hilliard & Liben,

2010). The Gendered Ecology Approach I employed in this set of studies tested both the

prevalence of nonverbal bias and its influence on children in the context of television

shows.

Consistent with social learning theories of gender role learning (Bussey &

Bandura, 1984; Mischel, 1966), girls attended to patterns of modelling in nonverbal

behavior. However, simply observing other girls who looked and behaved in

stereotypical or counterstereotypical ways did not drive behavior. In that case, there

would have been no effect on girls given that clips of both stereotypical and

counterstereotypical targets were contained in each condition. Instead, girls were also

learning from the subtle *reward* being given to characters who modelled stereotypical and

counterstereotypical behavior. In the Traditional condition, models (i.e., target characters)

were rewarded for stereotypical behavior by other characters' emotion. Only girls who

were able to detect this pattern (i.e., those who were emotionally perceptive) felt more

pressure to be feminine (Studies 2 and 3). Furthermore, consistent with Social Cognitive

Theory, this pressure extended to enactive experience wherein children anticipate

evaluative feedback from others about their own behavior (see p. 28 for a discussion of

113

Social Cognitive Theory; Bussey & Bandura, 1999).   Specifically, in Study 3, girls in the Traditional condition conveyed less competence than did girls in the Reverse condition. Yet, an ecological approach enabled me to identify the extent to which the pattern that children were attending to was present in one environment that children typically encounter: television. Study 1 revealed a significant pattern of televised nonverbal bias in which stereotypical characters were treated more positively than counterstereotypical characters in popular American shows. Thus, not only did girls attend to this subtle pattern of nonverbal bias (if they were good at reading emotion) but this was also a pattern they likely encountered on a regular basis (see p. 67 for a discussion of television watching habits).

　　This work also uniquely contributes to the literature on gender role learning. Gender Schema Theory posits that children form two schemas for gender-role learning – first, an ingroup/outgroup schema to determine whether information in the environment is relevant to them and second, an ingroup schema that details complex information about the expected behaviors and traits of their own gender (Martin & Halverson, 1981). This theory would argue that girls would filter out information about boys' behavior. Yet, how boys were treated yielded valuable information for girls' gender role beliefs. In Study 2, girls were assigned to either watch clips of Traditional or Reverse bias that *either* contained female or male target characters. There were no meaningful differences between whether girls observed female or male targets in the clips suggesting that girls inferred how *they* should behave based on how television show characters responded to boys acting in stereotypical or counterstereotypical ways. When stereotypical male

114

characters were treated better than counterstereotypical male characters, girls felt more pressure to be feminine. So, girls may learn how they are expected to behave not only from seeing how people respond to stereotypical and counterstereotypical girls (consistent with Gender Schema Theory), but also from seeing how people respond to kids of other genders (e.g., boys).

Questions remain about how children attend to cultural patterns that feature models of their own and other genders. For example, Social Identity Theory (Tajfel & Turner, 1979) would argue that children would preferentially attend to positive information about their own group in order to maintain a positive ingroup identity. Therefore, girls may attend to positive feedback directed towards girls and negative feedback directed towards boys. It would be informative to understand how attention to negative and positive emotion interacts with the targets of that emotion. Available cues may be weighted in ways that facilitate a positive ingroup bias.

Thus, the application of a Gendered Ecology Approach in these studies enabled me to quantify a prevalent pattern that children are typically exposed to and that children are able to attend to and notice that pattern. In this set of studies, girls learned from this particular pattern to the extent that they could read subtle emotion expressions accurately. A traditional test of gender role socialization would have highlighted either a prevalent pattern or a learning mechanism. The Gendered Ecology Approach allowed me to quantify both.

Cultural Influence

Children consistently encounter information about how they are expected to behave, especially regarding gendered expectations that others have for them (Browne, 1998; Coltrane & Messineo, 2000; Fivush et al., 2000; Glascock, 2001; Leve & Fagot, 1997; Martins & Harrison, 2012; Reigeluth & Addis, 2016; Thompson & Zerbinos, 1997; Vincent, Davis, & Boruszkowski, 1987). I here explored how patterns available in frequently encountered cultural environments (i.e., television) convey meaningful information about gender roles. Girls quickly learned about traditional (or reverse) gender roles from subtle patterns of nonverbal behavior. Three minutes of silent television show clips were sufficient to shift how girls thought they should behave and how they chose to present themselves. It is somewhat surprising that such a subtle manipulation was sufficient to shift beliefs about well-learned gender norms. In fact, the malleability of girls' gender roles in these studies highlights why children may learn gender roles so quickly.

This work also supports theories of cultural influence and specifically those that highlight the indirect role of intersubjective norms on own behavior. Past work has suggested that cultural patterns may impact behavior indirectly by changing beliefs about what other people in the culture value (i.e., by changing *intersubjective norms*) (Chiu et al., 2010). Furthermore, norms are most predictive of behavior when people anticipate being evaluated by ingroup members.(Wan, Torelli, & Chiu, 2010) Thus, in Study 3, I focused on behavior in the context of ingroup evaluation. Girls viewed either the traditional or intervention clips and then recorded a video message to introduce themselves to girls who were similar in age or slightly

116

older. As compared to girls in the traditional condition, I expected girls exposed to intervention clips to behave and describe themselves in a less feminine way to the extent that they were good at perceiving subtle emotion. This hypothesis was supported, and I observed convergent validity across nonverbal behavior, verbal/paraverbal content, and activity preferences. Furthermore, there was an indirect effect of nonverbal bias on how girls behaved through how they thought peers and parents wanted them to behave. This provides support for previous findings on cultural influence (Chiu et al., 2010; Tam et al., 2012; Wan et al., 2010) and bolsters the scientific understanding of how children learn about social prescriptions.

This indirect effect was replicated with felt pressure for conformity across the two studies, but not with popularity and approval as the measure of intersubjective norms. I can speculate a couple of reasons this may be. In Study 3, girls were asked to evaluate how much the girls they were going to record their video message for would like each of the avatars. It is possible that our participants were tentative to state that the other girls would negatively evaluate the avatars because they were about to be evaluated by those girls themselves. Accordingly, the ratings of female avatars were non-significantly more positive in Study 3 ($M=4.80$, $SD=.53$) than in Study 2 ($M=4.64$, $SD=.91$), $t(157)=1.39$, $p=.166$. It is unclear if this explains the difference between the two studies; of course, this explanation is purely speculative and requires further investigation.

It is unclear how this same pattern of learning via intersubjective norms may apply to other social category learning. Children learn about gender exceptionally early and tend to identify quickly with their gender group sometimes leading to the vehement adherence to gendered behavior and appearance (Halim et al., 2014). It would be valuable to see how this

117

model of cultural transmission via intersubjective norms applies to other broad social categories (e.g., race, culture, religion) and idiosyncratic groups (e.g., *Broncos* fans, video game players).

Nonverbal Behavior

Children are attentive to and influenced by others' nonverbal behavior (Castelli et al., 2008; Hornik et al., 1987; Klinnert et al., 1986; Murray et al., 2008; Skinner, Meltzoff, & Olson, 2017). However, these effects were found based on a single observation of nonverbal behavior clearly directed at a target person or object. The pattern of nonverbal bias that I quantified in the television shows was not only subtle but situated in complex environments. Stereotypical girls and boys were treated more positively than counterstereotypical girls and boys, but this was in the context of numerous other cues such as the age of the characters, the art style of the television show, and the content of the episode. This is some of the first evidence to demonstrate that children are perceptive to patterns of nonverbal behavior directed at particular groups of people amidst the noise and co-occurring patterns that they might encounter in social environments. In addition to this pattern of nonverbal bias being situated in complex visual and social environments, this pattern was also distributed temporally (i.e., across clips). Successful pattern detection therefore required girls to a) correctly label the meaning of nonverbal behavior, b) integrate their observations of that behavior, and c) attribute gender-stereotypicality to the targets of nonverbal behavior. Despite the complexity of this task, girls who were good at reading subtle nonverbal emotion expressions consistently responded to the traditional (vs. reverse) pattern of nonverbal

118

bias with more pressure to be feminine (Study 2 and Study 3) and by conveying less competence via their nonverbal and verbal behavior (Study 3).

In this study, I examined changes to girls' own behavior by having nonverbal behavior and verbal/paraverbal content of each child's response rated on competence and warmth. Competence and warmth are considered basic dimensions of social perception (Fiske et al., 2007; Fiske, Cuddy, Glick, & Xu, 2002) and, accordingly, have been used previously as dimensions on which to quantify others' behavior (Guerrero & Miller, 2009; Sei Jin Ko et al., 2009). These dimensions have also been closely mapped onto traditional gender stereotypes with traditional masculinity being associated with competence and traditional femininity being associated with warmth (Eckes, 2002; Huddy & Terkildsen, 1993; Kray, Kennedy, & Van Zant, 2014; Rudman & Glick, 2001). Girls' nonverbal and verbal/paraverbal behavior changes in response to the clips they saw, but only along the dimension of competence. There were no changes in girls' warmth. With regard to verbal and paraverbal content, this is consistent with some past work showing that perceived competence (but *not* perceived warmth) varies as a function of verbal femininity (Sei Jin Ko et al., 2009).

Evidence from another domain (i.e., leadership) may also help to explain this relationship. Research on women in leadership suggest that women are expected to be either warm or both warm and androgynous (Rudman & Glick, 2001). The absence of warmth causes backlash for agentic women such that women are not penalized for the expression of traditional masculine traits (e.g., agency) when accompanied by traditional feminine traits (e.g., warmth). Findings from Study 3 are consistent with these effects

119

such that girls maintained warmth during their video recordings and only modulated how competent they appeared. We can speculate that manipulations to gender stereotypicality may primarily impact the extent to which girls express competence and other traditionally masculine traits. This awaits further investigation and it is worth noting that the backlash effect seems to be particular to white women and effects may operate differently among members of minority groups (Tinkler, Zhao, Li, & Ridgeway, 2019). It is also ambiguous what patterns on warmth and competence would be observed among boys. Boys may also only modulate their behavior along the counterstereotypical dimension or may modulate behavior along both competence and warmth.

Gender Role Flexibility

Children become less rigid about their gender roles between the ages of 5 and 11 (Banse, Gawronski, Rebetez, & Morton, 2010; Katz & Ksansnak, 1994). However, the extent to which they are flexible about what people *should* do based on their gender is unrelated to spontaneous stereotyping about what people typically do based on their gender (Banse et al., 2010). In other words, the range of acceptable behaviors for people of each gender increases, but the average behavior to describe each gender stays the same. Based on this relationship, I had hypothesized two alternative ways that gender role flexibility may interact with cultural patterns that children observe. First, children who have rigid gender roles may be particularly attentive to information in their environments about how they should behave. Thus, girls low in gender role flexibility would be most responsive to the pattern of nonverbal bias. Second it is possible that children who have *flexible* gender roles may be more likely to adapt to new information

120

about how girls and boys should behave because they may be more willing to shift their stereotypes and behaviors. In this case, girls high in gender role flexibility would be most responsive to the pattern of nonverbal bias.

What effects did emerge in Study 3 provide some preliminary support for the first mechanism that girls who hold more rigid gender roles are more responsive to sociocultural patterns about how they and other girls and boys should behave. First, girls who held more rigid gender roles responded to the traditional (vs. reverse) bias by thinking that stereotypical avatars would be more popular than counterstereotypical avatars. Second, girls who held more rigid gender roles responded to the traditional (vs. reverse) bias by displaying less competent nonverbal behavior. Third, girls who held more rigid gender roles responded to the traditional (vs. reverse) bias by indicating more stereotypical activity preferences to the extent that they thought stereotypical avatars would be more popular than counterstereotypical avatars. Thus, children may be most influenced by socialization of gender roles when they hold rigid gender roles about who should do what behaviors. Of course, this is difficult because as children get older (and also better able to read subtle emotion), their gender roles also tend to become more flexible. Nonetheless, rigidity may render children even more attentive to gendered information and more likely to adjust their own attitudes to that information. As discussed earlier, however, the complexity of the nonverbal pattern that children saw here may account for the minimal number of effects that rigidity moderated. A pattern that does not rely on complex emotion perception may better highlight the role of rigidity in gender role learning.

Gendered Cultural Patterns and Stereotypical Behavior: Implications

In Study 2, I observed effects primarily on girls' intersubjective norms – their beliefs about how others want girls and boys to behave. In that study, I only found preliminary evidence of effects on explicit stereotypes and none on girls' own behavior. This is important for a few reasons. First, attitudes do not always correspond with behavior (Ajzen & Dasgupta, 2015; Fazio & Zanna, 1981; McHale & Crouter, 1992). Thus, although an effect on attitudes is a potentially important precursor, one cannot assume that those shifted attitudes will impact behavior. Second, for nonverbal bias to account for the enactment of traditional femininity, it is important to demonstrate that the bias change how girls present themselves and not just how they think others want them to present themselves. Therefore, in Study 3, I examined effects of nonverbal bias on own behavior and observed effects on how competently girls presented themselves as a function of changes to their intersubjective norms. This particular outcome is valuable for a number of reasons. How competent people are perceived as has direct applications for how they are treated. Most notably, perceived competence has direct applications for how girls are perceived in classroom settings and later in pursuing career paths. For example, competence judgments of teachers made from brief two second clips of nonverbal behavior predicted teacher evaluations months later (Ambady & Rosenthal, 1993) and evidence suggests that perceivers are especially sensitive to indicators that women are less competent that men (i.e., confirmation bias; Biernat & Fuegen, 2001). Thus, changes to how competently girls present themselves to peers may have direct impacts on how other observers (e.g., teachers, parents) treat them in the classroom. To

122

the extent that this pattern also predicts gender socialization among adult women, changes to perceived competence could have direct impacts on how bosses, mentors, and subordinates treat them across a range of settings. According to past work on evaluations of female leaders, women and girls are always be high on warmth (Phelan, Moss-Racusin, & Rudman, 2008; Rudman & Glick, 2001). Consequently, interpersonal warmth offsets negative evaluations of agentic female leaders. We can then speculate that manipulations to gender stereotypicality may primarily impact the extent to which girls express competence and other traditionally masculine traits, but not warmth and other traditionally feminine traits.

Gender of Participants

I focused on girls in this study given the negative impact that traditional gender stereotypes can have on girls' career aspirations and self-esteem (Bian et al., 2017; Rudman, Greenwald, & McGhee, 2001; Shapiro & Williams, 2012). However, there are reasons to also examine gender role learning among boys. Specifically, boys learn from a young age to avoid healthy emotional expression and this can lead to detrimental mental health effects later in life (Chaplin, Cole, & Zahn-Waxler, 2005; Fivush et al., 2000). Furthermore, daughters who observe their fathers contributing to domestic labor are more interested in counterstereotypical occupations (e.g., STEM careers) and are less likely to believe that women and girls are considered less important than men and boys (Croft, Schmader, Block, & Baron, 2014; Halim et al., 2013). There are reasons to believe that these effects would be similar among boys. Therefore, traditional masculinity is also highly problematic; understanding how boys learn about traditional masculinity and how

123

to intervene to reshape gender role learning has positive outcomes for children of all genders.

There are some reasons to expect that boys may be highly attentive to information about how they should behave. Gender policing (i.e., making sure people behave in ways consistent with traditional gender roles) is stronger among boys than girls and one enduring feature of traditional masculinity is the fear of being feminine (Pauletti et al., 2014; Prokos & Padavic, 2002; Reigeluth & Addis, 2016). Boys may therefore be especially attentive to information present in the environment about how they should behave given the level of intolerance for deviating from traditional masculinity.

Nonetheless, there are some reasons to expect these effects to be weaker among boys. Members of low power groups tend to hold their social identity as more important to their sense of self and think about that identity more frequently than members of high power groups (Caccioppoli, Suitner, Lamer, & Maass, 2017; Luhtanen & Crocker, 1992). Thus, girls may be more attentive to patterns related to gender given that they may identify with their gender more intensely than boys do. Future work should explore the influence of nonverbal patterns with boys to identify shared and unique gender role socialization mechanisms.

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Limitations and Future Directions

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Timing Parameters

In these studies, girls watched a set of 18-24 silent clips that lasted approximately three minutes. This number of clips was chosen to maximize the effect without causing girls to stop paying attention to the silent clips. I did not manipulate the number of clips

watched, but the observed effect might change when children watch an entire show as they might in their daily lives. How much nonverbal bias impacts their beliefs and behaviors may be proportionally related to the instances of nonverbal bias they see. Alternatively, the effect may be stronger when girls watch just a few memorable exemplars. It is also unclear how long the effect of nonverbal bias lasts. It may have a short-lived period of influence or it may shift attitudes until alternative information is provided. Future work should examine the mechanisms of nonverbal bias that can optimize its influence. In addition to providing a better understanding of the mechanisms driving gender role socialization, understanding these features would also facilitate the design of effective interventions utilizing reverse nonverbal bias.

I selected popular television shows that children are likely exposed to, but girls undoubtedly varied in the extent to which they identified with each of the target or partner characters. Work on nonverbal bias has not yet examined whether identification with the targets or expressers of nonverbal bias amplifies effects. Existing evidence suggest that effects may be stronger to the extent that girls identified with characters in the shows. For example, people identify more strongly with those who seem more similar to them in terms of attitudes but also social identity (e.g., race, gender, activity group; (Cadinu & Cerchioni, 2001; Ensher & Murphy, 1997; Hoffner & Buchanan, 2005). Furthermore, identification predicts learning in some established cases such as mentor relationships (Allen & Eby, 2003; Ensher & Murphy, 1997). Future work should therefore quantify the role of identification in learning from patterns of nonverbal emotion.

Interaction of Nonverbal Bias with Verbal Content

In this study, girls saw only nonverbal bias directed at particular characters (the audio channel was muted). However, previous Cultural Snapshots work on nonverbal bias suggests that what actors say is not biased in the same way as their nonverbal behavior (Weisbuch et al., 2009). Despite a televised nonverbal bias favoring white over black characters, what the actors were saying to the white and black characters in each of those scenes was not biased. Furthermore, children frequently see nonverbal behavior and it may even frequently be devoid of verbal content, such as when people are far away, speaking another language, or only using nonverbal channels of communication.

Nonetheless, it is unclear how gendered nonverbal bias is perceived in the context of verbal content. It is possible that verbal content works in an additive fashion with nonverbal content and can either amplify or detract from effects. However, some past work suggests that nonverbal bias predicted social learning regardless of what was being said (Castelli et al., 2008). Therefore, it is possible that nonverbal behavior is considered more authentic of people's true feelings and is weighted more heavily in social learning processes. In fact, people are unlikely to express explicitly negative statements and most cultural norms dictate being positive towards others (Blumberg, 1972; Malatesta & Haviland, 1982; Waung & Highhouse, 1997). Though even if this is the case, weighting of nonverbal over verbal information may evolve throughout middle childhood as the ability to read subtle nonverbal emotion develops. Therefore, future work should quantify how nonverbal and verbal content is weighted in its contributions to gender role socialization.

126

Conclusion

Theories have proposed several potential sources and moderators of how children learn about the roles that women and men generally hold. However, no theories have examined these sources from an ecological approach, leaving open the question of how the prevalent cultural patterns children encounter inform their gender-role beliefs. In the Gendered Ecology Approach I took throughout this series of studies, results indicate an ecological pattern of televised nonverbal bias in which gender stereotypical characters are treated more positively than gender counterstereotypical characters (Study 1), girls' sensitivity to this nonverbal bias (Study 2), and the impact this nonverbal bias has on girls' beliefs about gender roles and own behavior (Study 3).

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156

Cognitive Abilities

Ecological Environments

Attunement to Cultural Patterns

Intersubjective Norms and Own Beliefs

Gender Schemas
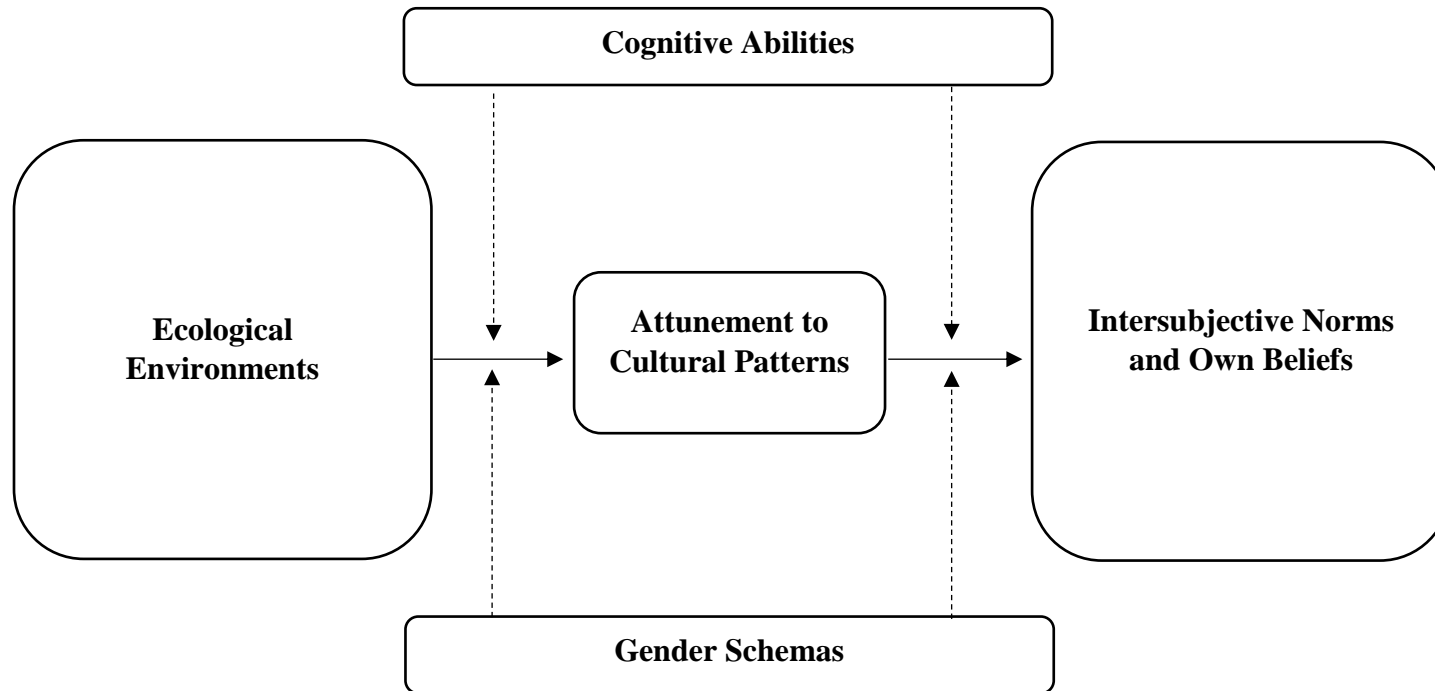
Figure 1. The Gendered Ecology Approach (GEA). The ecological environments that children encounter contain both cultural patterns and noise. The child's cognitive development likely moderates the types of patterns she can attune to and also how those patterns, once attuned to, inform intersubjective norms and beliefs about gender roles. A child's existing gender schemas may also moderate what patterns she attunes to and how those patterns inform her beliefs and norms. For example, gender non-conforming children may attune to different patterns or have weaker links between perceived intersubjective norms and their own beliefs.
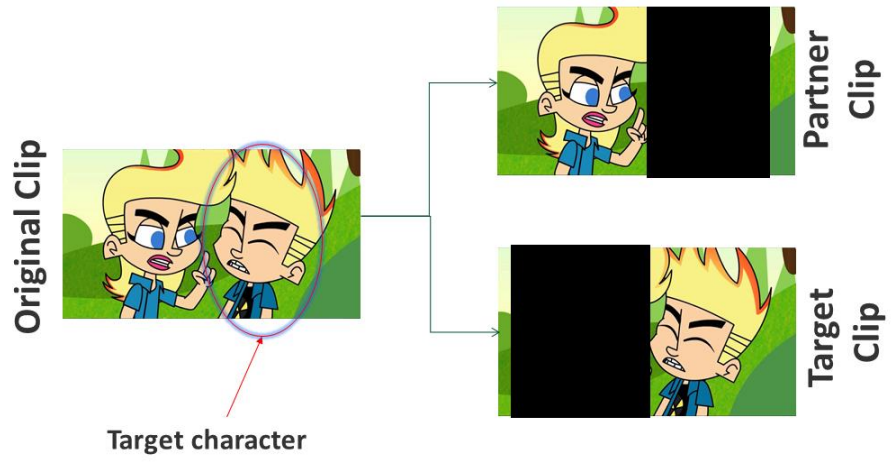
Figure 2. A depiction of the process of isolating nonverbal behavior expressed towards or by a target character in Study 1.
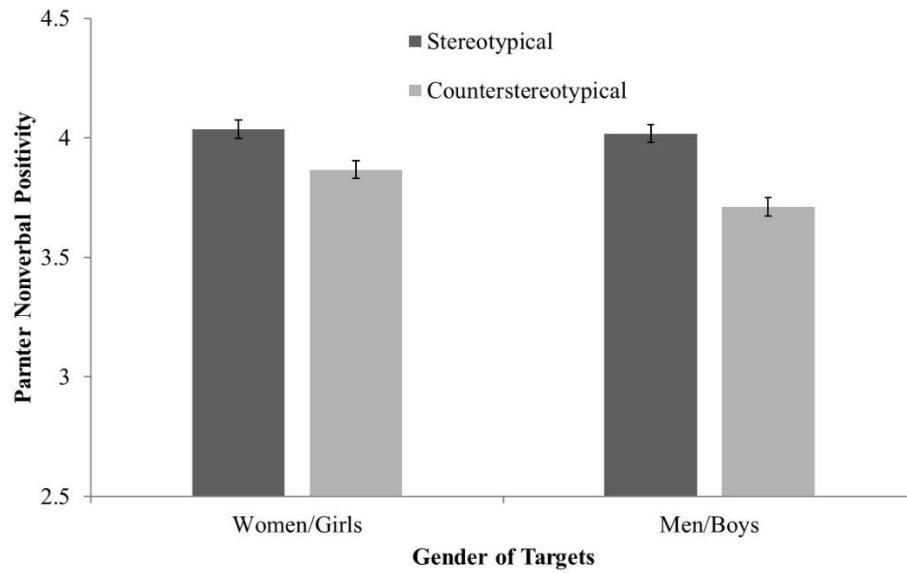
Figure 3. Study 1 results. Nonverbal behavior of partners was more positive when interacting with female and male gender-stereotypical targets than female and male gender-counterstereotypical targets. Note that the effect of stereotypicality was not accompanied by any other effects.
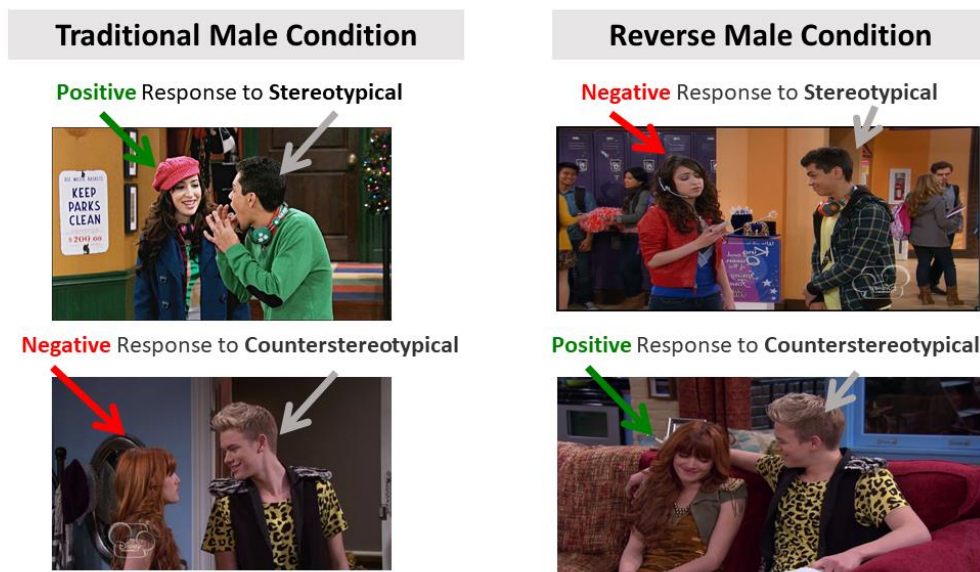
Figure 4. Example clips in each Study 2 and Study 3 conditions. Based on ratings from Study 1, the Traditional Condition will contain the clip with the most negative nonverbal behavior directed toward each gender-counterstereotypical character and the clip with the most positive nonverbal behavior directed toward each gender-stereotypical character. In contrast, the Reverse Condition will contain the clip with the most *positive* nonverbal behavior directed toward each gender-counterstereotypical character and the clip with the most *negative* nonverbal behavior directed toward each gender-stereotypical character. Note that in Study 2, child participants will see only clips of female or male target characters to isolate the impact of cultural patterns that contain own or other gender targets. In Study 3, child participants will see only clips of female targets.

Figure 5. Example cartoon avatars used in the Popularity and Approval task in Study 2 and in the Introductory Video message task in Study 3. A sample gender-stereotypical female character appears on the left and a sample gender-counterstereotypical female character appears on the right.

A

B
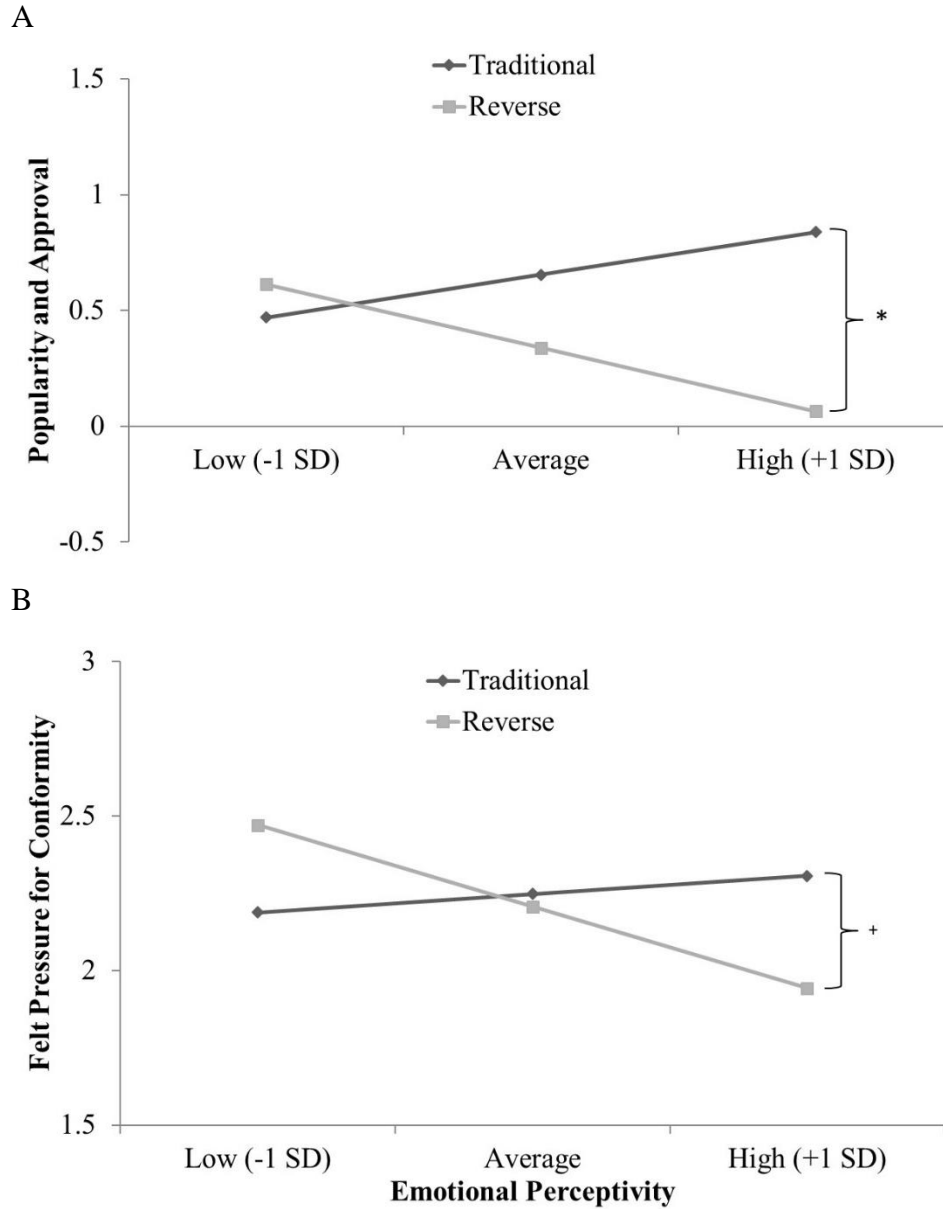
Figure 6. Interactive effect of nonverbal patterns on girls' intersubjective norms in Study 2. Emotionally perceptive girls in the Traditional (vs. Reverse) condition indicated that stereotypical peers would be more popular (Panel A) and reported more pressure to be feminine (Panel B).
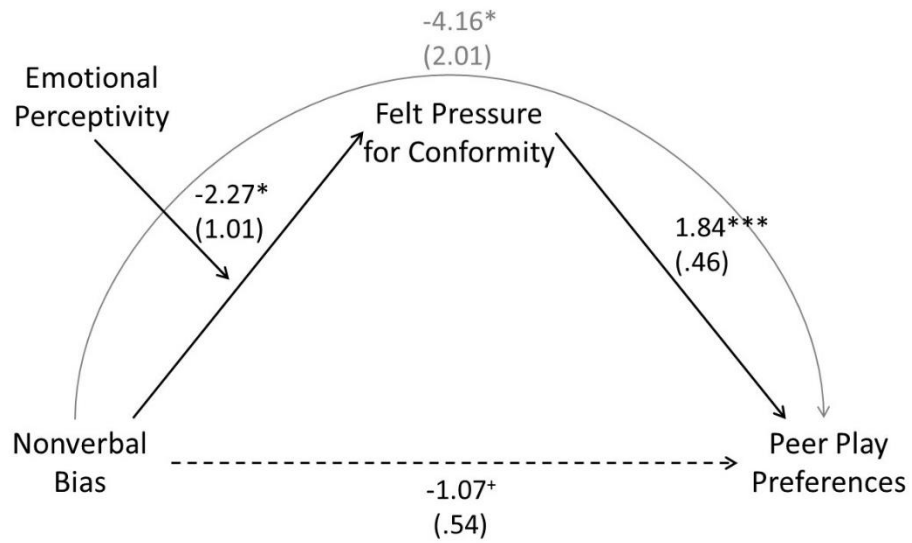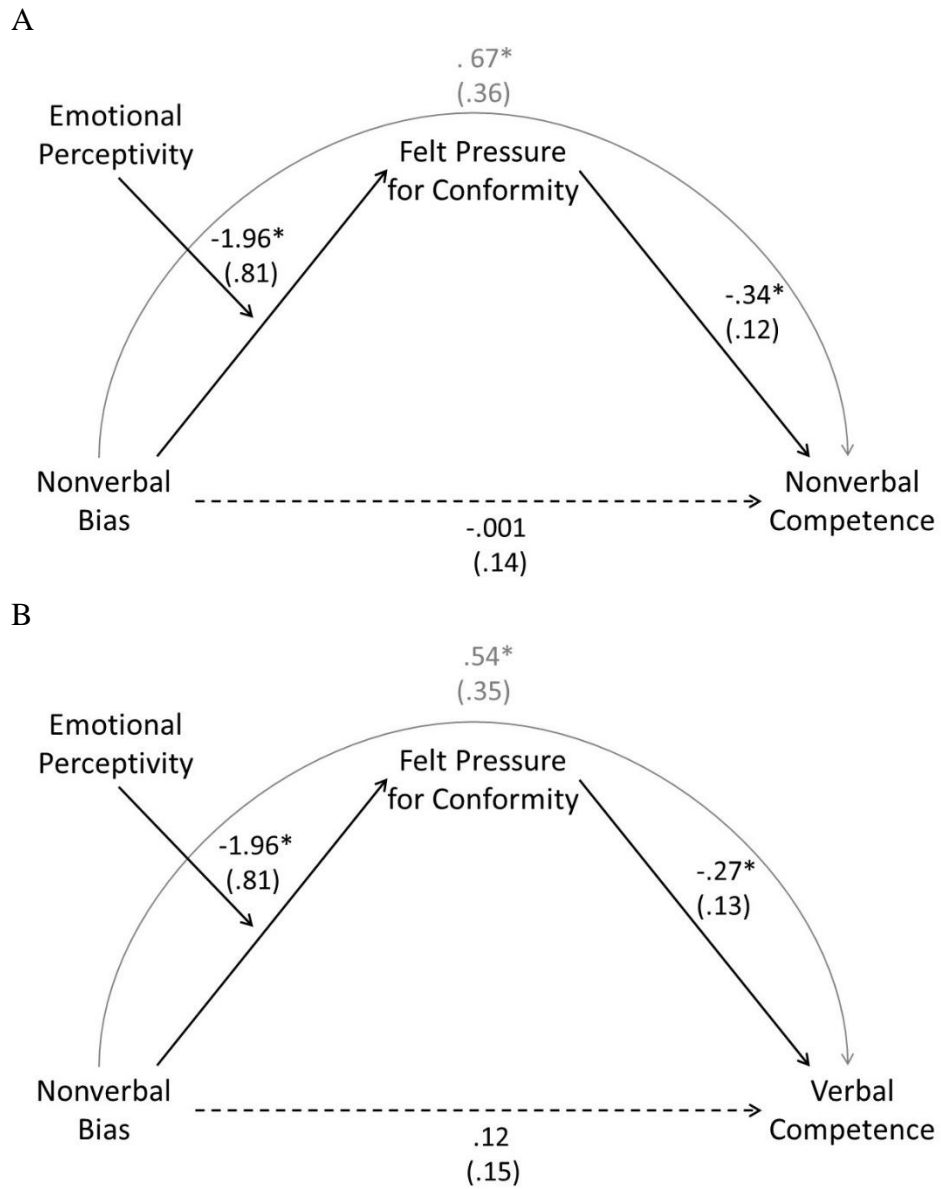
Figure 7. Moderated indirect effect of nonverbal bias on girls' peer preferences in Study 2. Emotionally perceptive girls in the Traditional (vs. Reverse) condition felt more pressure to be feminine and therefore wanted to play with more stereotypical (than androgynous) girls.

***p<.001 *p<.05

A
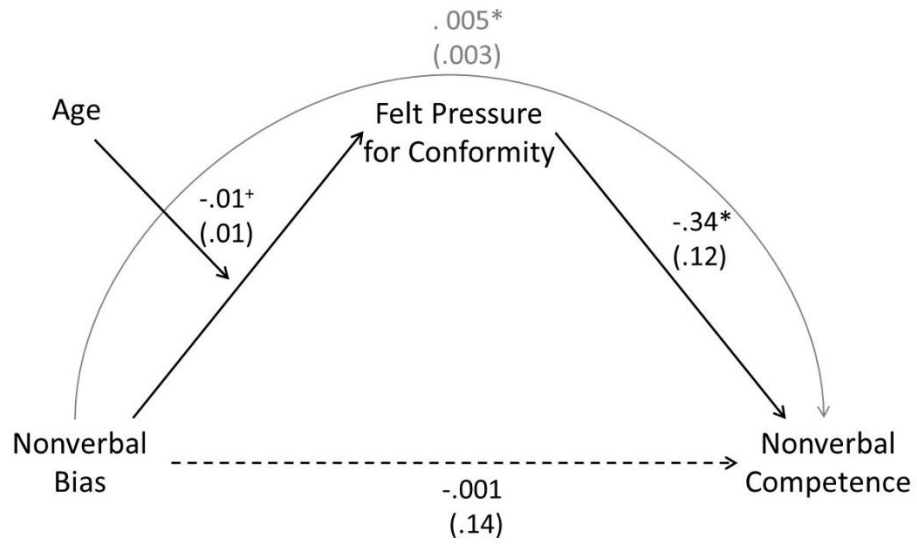
B
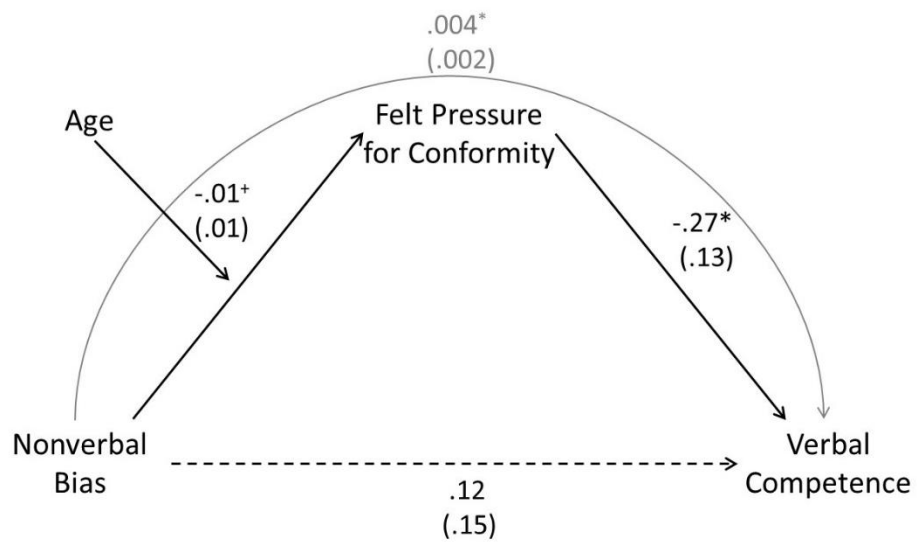
Figure 8. Moderated indirect effect of nonverbal bias on girls' competence in Study 3. Older girls in the Traditional (vs. Reverse) condition felt more pressure to be feminine and therefore conveyed less nonverbal (Panel A) and verbal/paraverbal (Panel B) competence.

A

B

Figure 9. Moderated indirect effect of nonverbal bias on girls' competence in Study 3. Emotionally perceptive girls in the Traditional (vs. Reverse) condition felt more pressure to be feminine and therefore conveyed less nonverbal (Panel A) and verbal/paraverbal (Panel B) competence.
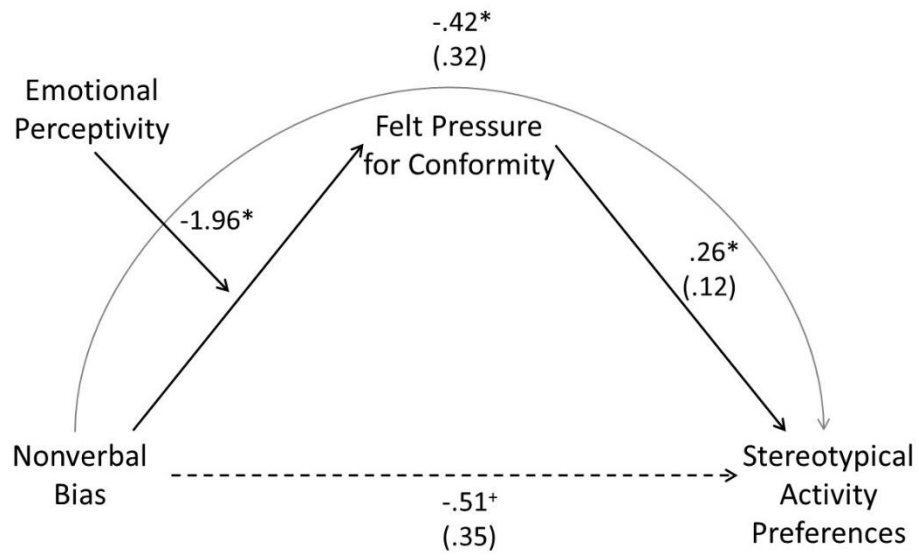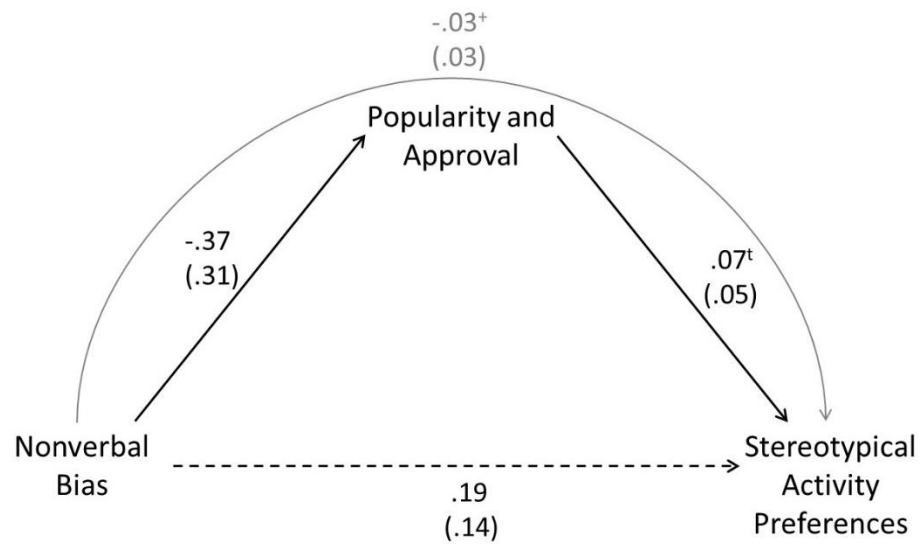
Figure 10. Moderated indirect effect of nonverbal bias on girls' activity preferences in Study 3. Emotionally perceptive girls in the Traditional (vs. Reverse) condition felt more pressure to be feminine and therefore wanted to participate in more stereotypical activities.
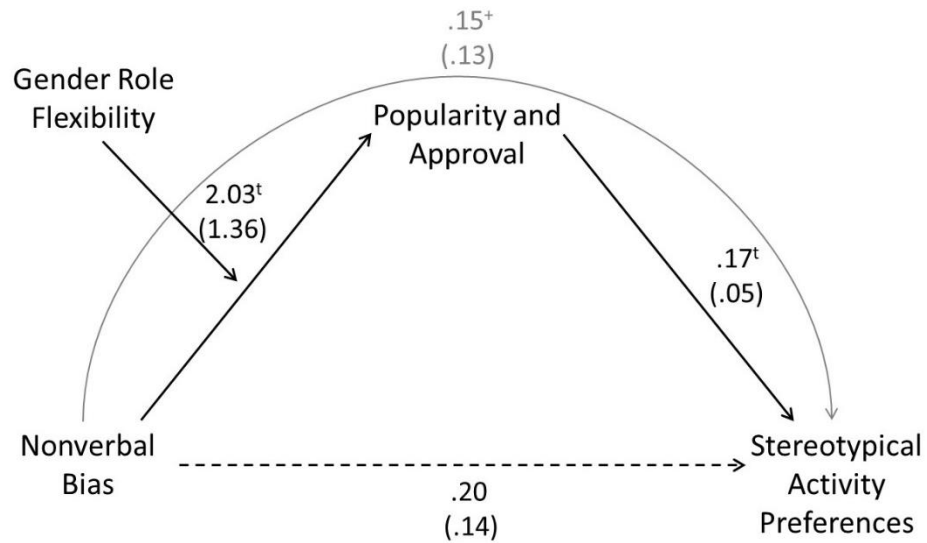
$*p<.05$ $^+p<.10$

A

B

Figure 11. Indirect effects of nonverbal bias on girls' activity preferences in Study 3. Girls in the Traditional (vs. Reverse) condition thought stereotypical avatars would be more popular than counterstereotypical avatars and therefore chose more stereotypical activities (Panel A). This was especially true for girls who held rigid gender roles (Panel B).