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Sensitivity to the Evaluation of Others Emerges by 24 Months

Sara Valencia Botto and Philippe Rochat
Emory University

Although the human proclivity to engage in impression management and care for reputation is ubiquitous, the question of its developmental outset remains open. In 4 studies, we demonstrate that the sensitivity to the evaluation of others (i.e., evaluative audience perception) is manifest by 24 months. In a first study, 14- to 24-month-old children ($N = 49$) were tested in situations in which the attention of an audience was systematically manipulated. Results showed that when the experimenter was inattentive, as opposed to attentive, children were more likely to explore an attractive toy. A second study ($N = 31$) explored whether same-aged children would consider not only the attention of the experimenter but also the values the experimenter expressed for two different outcomes when exploring a toy. We found that children reproduced outcomes that were positively valued by the experimenter significantly more when the experimenter was attentive but were more likely to reproduce negatively valued outcomes when the experimenter was inattentive. A third control study ($N = 30$) showed that the significant effect of Study 2 disappeared in the absence of different values. Lastly, Study 4 ($N = 34$) replicated and extended the phenomenon by showing toddler's propensity to modify their behavior in the presence of 2 different experimenters, depending on both the experimenter's evaluation of an outcome and their attention. Overall, these data provide the first convergent demonstration of evaluative audience perception in young children that precedes the full-fledged normative, mentalizing, and strong conformity psychology documented in 4- to 5-year-old children.

Keywords: evaluative audience perception, impression management, self-consciousness, social cognition, social development

Adults report the fear of public speaking more often than any other fear, including death (Dwyer & Davidson, 2012). This intriguing finding highlights a defining human characteristic: We are concerned with how others might perceive and evaluate us. Indeed, numerous studies show adults' inclination to promote, enhance, and manage their own public image in the presence of others (Leary & Allen, 2011; Mead, Baumeister, Stillman, Rawn, & Vohs, 2011; Tennie, Frith, & Frith, 2010). For instance, adult participants tend to display enhanced generosity (Dana, Weber, & Kuang, 2007) as well as enhanced performance in trivial tasks when others are watching as opposed to being alone (Cottrell, Wack, Sekerak, & Rittle, 1968; Triplett, 1898). Strong conformity to a majority judgment or opinion is also prevalent, even when such judgment is blatantly wrong or untrue (Asch, 1956; Chartrand & Bargh, 1999; Cialdini & Trost, 1998).

These well-documented phenomena are inseparable from what we refer to here as *evaluative audience perception*. Specifically, evaluative audience perception captures the basic human propensity to (a) assume that one's own behavior or appearance could be, or will be, evaluated by others either positively or negatively; and (b) have a general preference toward eliciting positive as opposed to negative evaluations from others (Cooley, 1902; Goffman, 1959). Although much evidence documents evaluative audience perception in adults, it is unclear as to when this central psychological trait emerges in development.

A few recent studies suggest that this phenomenon is clearly evident by 4 to 5 years of age (Banerjee, Bennett, & Luke, 2012; Engelmann, Herrmann, & Tomasello, 2012; Leimgruber, Shaw, Santos, & Olson, 2012; Piazza, Bering, & Ingram, 2011). In a replication of Asch's (1956) classic study, Haun and Tomasello (2011) showed that 4-year-olds, like adults, tended to conform to a majority opinion in public but not in private. By the age of 5, children are more generous (Engelmann et al., 2012; Piazza et al., 2011) and cheat less in the presence of an observer (Engelmann et al., 2012). Furthermore, children also display explicit reputational concerns by 5 years (Engelmann, Over, Herrmann, & Tomasello, 2013; Fu, Heyman, Qian, Guo, & Lee, 2016; Zhao, Heyman, Chen, & Lee, 2018). Fu and colleagues (2016) showed that when primed with a reputational cue, such as telling the child that their peers think positively about them, 5-year-olds were less likely to cheat compared with when not primed. Because 4- to 5-year-olds begin to modulate their behavior depending on the presence or absence of an audience, evaluative audience perception is typically thought to emerge around the preschool years.

Sara Valencia Botto and Philippe Rochat, Department of Psychology, Emory University.

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Correspondence concerning this article should be addressed to Sara Valencia Botto, Department of Psychology, Emory University, 36 Eagle Row, Atlanta, GA 30322. E-mail: sara.botto@emory.edu

However, research on the development of social emotions, like embarrassment, point to the possibility of an earlier emergence. Embarrassment expressed in coy smiles, gaze aversion, and blushing is the quintessential emotional expression of the human sensitivity to the evaluation of others (Keltner, 1996; Leary & Meadows, 1991; Sattler, 1966). When describing blushing in his 3-year-old son, Charles Darwin (1872/1965) remarked, "It is not the simple act of reflecting on our own appearance, but the thinking of what others think of us, which excites a blush" (p. 325). Indeed, research documents embarrassment as a social emotion expressed in situations that can potentially bring unwanted evaluations from others, indexing evaluative audience perception (Lewis & Ramsay, 2002; Sabini, Siepmann, Stein, & Meyerowitz, 2000).

Interestingly, like older children and adults, toddlers will also reliably express embarrassment in contexts that might bring about potential evaluations—such as looking at mirror reflections and discovering a mark on their face (Amsterdam, 1972; Amsterdam & Levitt, 1980), being complimented or asked to perform in public (Lewis, Sullivan, Stanger, & Weiss, 1989), or failing to meet a standard or goal—by 18 to 21 months (Kagan, 1981; Stipek, Recchia, McClintic, & Lewis, 1992). Despite these observations, embarrassment in toddlers is not considered to index evaluative audience perception. For example, Lewis (2011) stated that because toddlers lack the cognitive capacities to understand norms, embarrassment prior to the third year would be a response to being an object of attention and, therefore, not yet evaluative (Lewis, 2011; Lewis et al., 1989). Although this might be the case, few studies have directly assessed the possibility that signs of embarrassment in the second year might already have an evaluative-audience-perception underpinning.

In fact, several relevant social and cognitive abilities already established by the second year support the possibility that evaluative audience perception could emerge by 24 months. By 7 to 9 months, infants seem to acknowledge others as evaluators of the external world, incorporating others' affective reactions (i.e., evaluations) toward ambiguous objects and circumstances into their own behavior (e.g., social referencing; Campos & Steinberg, 1981; Striano & Rochat, 2000). By 10 months, infants distinguish between an attentive versus inattentive audience, engaging more with individuals who direct their gaze toward them (Jones, Collins, & Hong, 1991; Striano & Rochat, 2000; Tomasello, 1995). Furthermore, Repacholi and Meltzoff (2007) showed that by 18 months, infants are less likely to imitate an action if an adult previously responded with anger toward another adult who performed that action, suggesting sensitivity to indirect emotional signals from others. Finally, by 18 to 21 months, infants develop an objectified sense of self, passing the mirror mark test with, seemingly, others in mind (Rochat, 2009; Rochat, Broesch, & Jayne, 2012). It is also at this developmental juncture that infants' first sensitivity to norms and standards are reported (Kagan, 1981; Stipek et al., 1992). In all, these capacities could, in theory, allow toddlers to recognize others not only as evaluators of the external environment (i.e., social referencing) but also as evaluators of their own behavior (i.e., evaluative audience perception). In other words, by 24 months, toddlers could recognize that others can have positive or negative reactions in relation to their behavior as well, and thus might now be inclined to behave in a way that would yield a positive as opposed to negative response when they are being observed. This proposition would complement a developmental perspective, as recent evidence suggests that already by 3 years, children begin to show sensitivity to reputational cues (Zhao et al., 2018). Because it is necessary to understand that others can evaluate your behavior in order to understand aspects of reputation, it would be necessary for children to develop evaluative audience perception prior to the age of 3.

Given that the cognitive "ingredients" necessary for evaluative audience perception are in place by 2 years, we designed four studies investigating whether signs of this phenomenon are already evident by the end of infancy. Specifically, we explored whether 14- to 24-month-olds, like older children and adults, would also modify their behavior depending on whether or not they were being observed. In Study 1, we allowed children to play with a novel toy while systematically manipulating the attention of an adult observer. We expected children to have differential behavior (i.e., show more restrain or inhibition) toward an attractive novel toy in the attentive but not in the inattentive audience condition. Study 2 further probed whether children, in their exploration of the toy, are not just sensitive to the attention of the observer but also to how the observer evaluated possible outcomes of the toy during an initial toy demonstration. We predicted that if children engage in evaluative audience perception by 24 months, then they should modulate their behavior as a function of not only audience *attention* but also audience *evaluation* of different outcomes, reproducing the positively valued outcome more frequently in the attentive condition but the negatively valued outcome more frequently in the inattentive condition. A third control experiment (Study 3) reproduced Study 2 but in a condition in which the experimenter did not differentially evaluate the toy outcomes. Lastly, Study 4 extended the findings of the first three studies by probing whether toddlers would factor both the differential feedback (positive vs. negative) of two experimenters toward a toy's action as well as the attention of each experimenter when the child proceeded to interact with the toy. We reasoned that if toddlers were indeed sensitive to the evaluation of others, they should be significantly more inclined to reproduce the toy's action when the experimenter who assigned a positive value (as opposed to the negative value) was attentive. Together, these studies probed whether evaluative audience perception—the basic foundation of impression management and reputational concern—is already evident by the child's second birthday, pointing to a much earlier developmental origin of what is a particularly enhanced, if not a unique trait of our species (Rochat, 2009).

Study 1

We tested 49 14- to 24-month-old children in a novel paradigm (robot task). The experimenter demonstrated how to activate a novel toy robot by pressing a button on a remote, not giving any instructions to the child. After the demonstration, participants were then free to play with the toy robot for 30 s while the experimenter either observed the child (attentive condition) or turned 45° sideways while pretending to read a magazine (inattentive condition; see Figure 1a). With no clear instructions given to the child, and as index of evaluative audience perception, we expected children to behave differently between audience conditions (within-subject comparison), showing more inhibition in the attentive than inattentive condition. We expected more inhibition in the attentive condition (i.e., refraining from activating the robot) because there were no explicit cues given to the

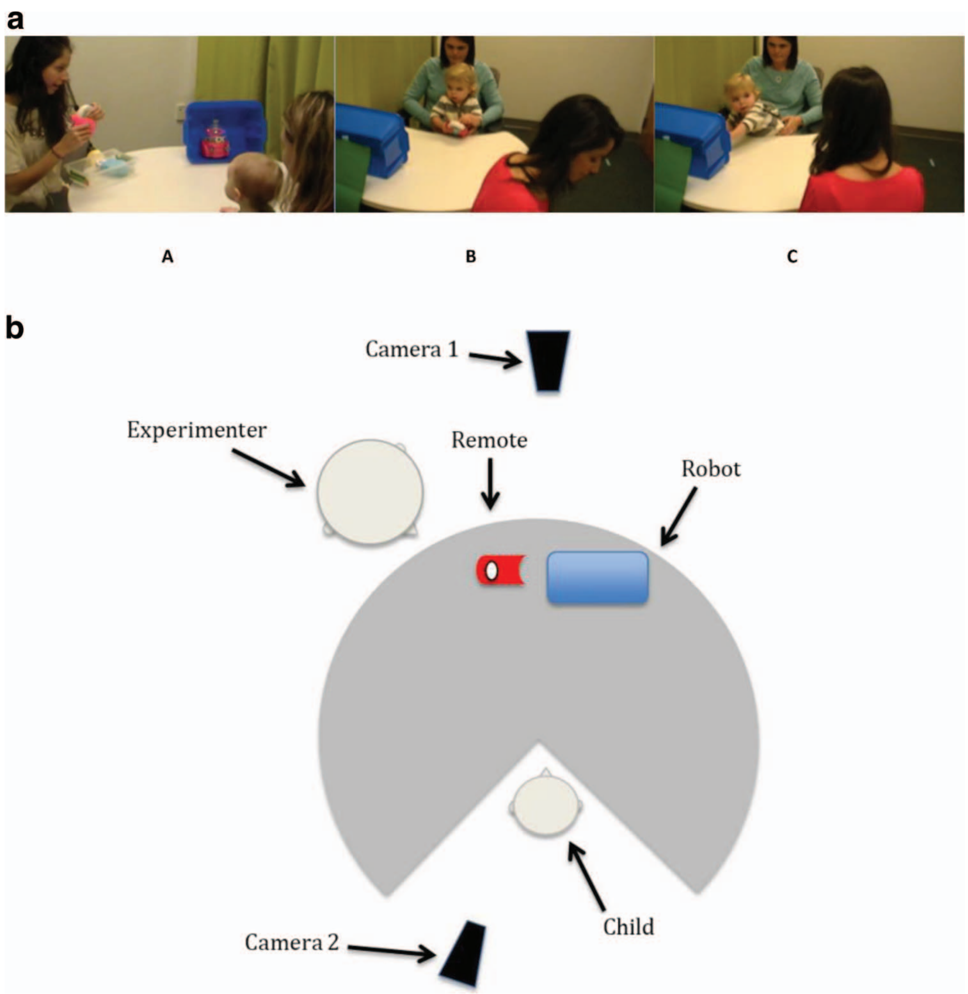

Figure 1. (a) Illustration of the three successive robot task conditions, from left to right: (A) demonstration, (B) inattentive condition, and (C) attentive condition. The authors received signed consent from each individual for their likeness to be published in this article. (b) Bird's-eye-view diagram of the experimental setup. See the online article for the color version of this figure.

child as to whether activating the toy would be positively or negatively evaluated by the experimenter. To measure differential behavior between conditions, we compared the amount of button pressing between audience conditions.

To examine whether an early display of embarrassment by the second year is indicative of a sensitivity to other's evaluation, we measured the amount of embarrassment in the attentive versus the inattentive condition. To provide contrast, we also coded for negative (fear), positive (happy), and control (neutral) emotions.

Method

Participants. Participants were 49 14- to 24-month-old (M = 18.27, SD = 2.97; 30 females) healthy children from predominantly White, middle-class families living in a large urban area, recruited from a large Child Study Center database. Eleven additional children were tested but were excluded from the analysis because of experimental error (n = 2), fussiness (n = 6), or parental interference (n = 3). An a priori G*Power 3.1 analysis was run to determine the appropriate sample size, which showed that a sample of 42 participants was sufficient to achieve 80% power and a medium effect size (Faul, Erdfelder, Lang, & Buchner, 2007). In a single testing session, all children completed both conditions (attentive and inattentive) of the robot task (within-subject design, order of conditions counterbalanced across participants). All studies were approved by the Emory University Internal Review Board under the project name Origins of the Intentional Stance (Study Number IRB00041083).

Materials. A red circular remote-controlled toy robot with a 13 × 13 cm diameter was used in both conditions. The robot was placed in a 32 × 32-cm blue box that was covered by a yellow cloth. The 13.5h × 9w × 2d-cm remote control, which contained one button on each extremity, was placed in a red slip so that only one button was exposed and was placed to the right of the blue box. When the button was pressed, the toy robot lit up and rotated in a circular motion. Both the robot and the remote were placed on a 92 × 76-cm moon-shaped white table (see Figure 1a and 1b).

All sessions were video recorded for coding purposes by two small video cameras. One was placed behind the experimenter to capture a frontal view of the child and the other was placed behind the child to capture both the back view of the child and the frontal view of the experimenter. Both camera views were used to record and code participants' behavior, including their emotional expressions across conditions (see Figure 1b).

Procedure. To get the child acclimated, the experimenter interacted with the child for 5 min, exploring toys on the floor in the waiting area. After this brief warm-up with the experimenter, the child and caregiver were brought to the testing room. Before the start of the study, the experimenter asked the caregiver to remain neutral and quiet during the duration of the experiment. The child then sat on the caregiver's lap facing a table with the experimental props (see Figure 1a and 1b). The experimenter sat 78 cm directly across from the child and began the demonstration phase by lifting the yellow cloth and uncovering the toy robot on the table. The experimenter then demonstrated how to activate the toy robot by pressing the button on the remote control three times, with a 3-s lapse between each press. Contingent with the robot lighting up and rotating, and after each button press, the experimenter smiled and said, "Isn't that great?" We included this feedback after button presses because the toy robot was novel to most children and we wanted to prevent children from being afraid of the robot. This verbal feedback remained consistent throughout the task, contingent on each button press from either the experimenter during demonstration or the child during test. After the demonstration phase, the experimenter placed the remote control on the table within reach of the child. Immediately after placing the remote down on the table, the experimenter either observed the child with a neutral expression (attentive condition) or turned 45° sideways and pretended to read a magazine (inattentive condition). Note that during the attentive condition, the experimenter looked at the child, but not in an insistent way, deviating her gaze from the child briefly throughout the condition. Both conditions lasted 30 s each (see Figure 1a).

Coding. All coding was done using prerecorded videos of each task by research assistants who were blind to both conditions and hypotheses. Modifying behavior as a function of audience in the robot task was measured via button presses. Research assistants recorded the number of presses in each condition using an event-recorder software (Datavyu Team, 2014). Only those presses that successfully activated the robot counted. A second coder coded 20% of participants (the intraclass correlation coefficient was 0.92).

Three additional research assistants coded for emotion using preset criteria based on existing infant and toddler emotion descriptions (Lewis et al., 1989; Reddy, 2000). Although we were particularly interested in the emotion of embarrassment, we also coded for a negative emotion (fear), a positive emotion (happy), and a control emotion (neutral) for contrasts. For each condition, coders used a Likert scale from 0 to 4 (with 4 being the highest) and rated the presence of embarrassment, happiness, fear, or neutral expressions in the attentive versus inattentive audience conditions of the robot task. A "0" rating indicated the absence of that emotion within the condition, whereas "4" indicated a strong display. Coders were trained on identifying emotion using the following criteria:

- Embarrassment: combination of gaze aversion, attempts to hide face, blushing, and/or coy smile.
- Happiness: smiling or giggling.
- Fear: leaning back and widening eyes.
- Neutral: no distinct emotion identified.

In addition, coders recorded the level of engagement in each task using the same Likert scale (0–4, with 4 being the highest). Interrater reliability for all emotion ratings in the robot task had an intraclass correlation coefficient of 0.8 or higher.

Results

Robot task. A preliminary mixed factorial analysis of covariance (ANCOVA), factoring gender and order of condition as between-subjects variables, button pressing between conditions as the within-subject variable, and age as a covariate, showed no main effect of age, $F(1, 46) = 1.40$, $p = .245$, gender, $F(1, 46) = 3.05$, $p = .089$, or order of condition, $F(1, 46) = 2.75$, $p = .106$. There were also no significant interactions between any of these factors and button pressing (all $ps > .05$). Thus, all were collapsed in subsequent analyses. A repeated measures analysis of variance (ANOVA) comparing button presses between attentive and inattentive conditions showed that children were significantly more likely to activate the remote in the inattentive condition ($M = 7.0$, $SE = 0.89$) compared with the attentive condition ($M = 5.7$, $SE = 0.85$), $F(1, 48) = 4.86$, $p = .03$, $\eta_p^2 = 0.09$ (see Figure 2).

Emotion. To examine whether self-conscious emotions would change as a function of audience (attentive vs. inattentive), we performed a 2 (condition: attentive vs. inattentive) × 4 (emotion: happy, embarrassed, fear, neutral) repeated measures ANOVA. Results yielded a main effect of emotion, $F(3, 46) = 13.82$, $p < .001$, $\eta_p^2 = 0.23$, and audience condition, $F(1, 46) = 5.23$, $p = .027$, $\eta_p^2 = 0.1$. Importantly, there was a significant interaction between emotion and condition, $F(3, 46) = 3.99$, $p = .009$, $\eta_p^2 = 0.08$. Follow-up pairwise comparisons after Bonferroni corrections revealed that children displayed significantly more embarrassment

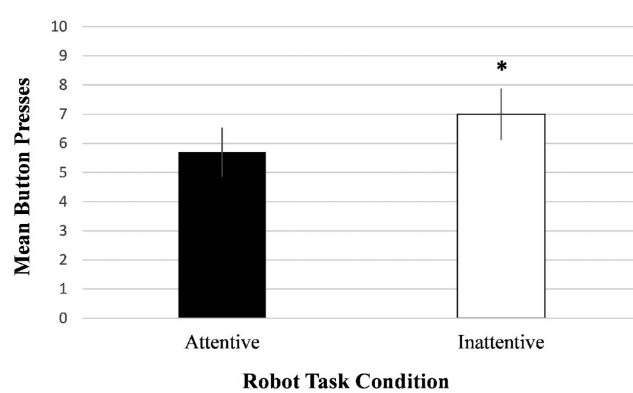

Figure 2. Modifying behavior in the attentive versus inattentive condition as indexed by button pressing in Study 1. Bars represent standard error. A repeated measures ANOVA indicated that children were more likely to press the remote in the inattentive versus attentive condition, $F(1, 48) = 4.86$, $p = .03$, $\eta_p^2 = 0.09$. * $p < .05$.

in the attentive condition ($M = 0.92$, $SE = 0.19$) compared with the inattentive condition ($M = 0.31$, $SE = 0.12$), $F(1, 46) = 10.41$, $p = .002$, $\eta_p^2 = 0.18$ (see Figure 3). In contrast, children did not display differential amounts of happy, fear, or neutral emotions between conditions (p = .195, .177, and .103, respectively).

Discussion

By systematically manipulating the attention of the experimenter toward participants (attentive vs. inattentive), this first study documents 14- to 24-month-olds' propensity to modify their behavior when another is watching. Specifically, children showed more inhibition in activating an attractive toy robot in the presence of an attentive as opposed to an inattentive audience (i.e., experimenter). This pattern of behavior occurred in the absence of a clear instruction or standard that might have prevented or discouraged the child from activating the toy robot. Children also tended to display significantly more embarrassment when the experimenter was attentive as opposed to inattentive while interacting with the remote. These findings are in line with previous works showing that young children tend to display self-conscious emotions when they are the object of social attention (Lewis et al., 1989; Rochat, 2013; Stipek et al., 1992).

Although this first study clearly shows that prior to the second birthday, children already tend to modify their behavior as a function of an attentive versus inattentive audience, important questions remain. In particular, what drove children to inhibit their behavior (i.e., less button presses) when the experimenter was attentive? There are three possible explanations. One is temperament, with children possibly being too shy to interact with the remote while a stranger was watching them. Behavioral inhibition in the presence of others is indeed a characteristic of a shy temperament (Rothbart & Mauro, 1990). Although it is not likely that most children in our sample had a predominantly shy temperament, the extent that temperament could predict relative inhibition across attentive versus inattentive conditions in the robot task is an important question to explore.

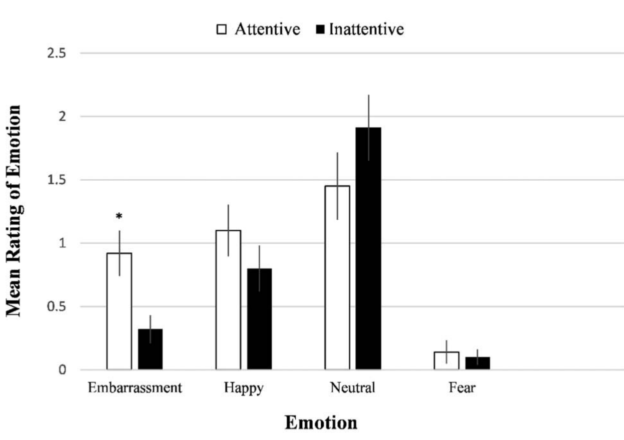

Figure 3. Mean rating of four different emotional expressions as a function of attentive versus inattentive conditions in Study 1. Error bars represent standard error. Mixed factorial analyses revealed an interaction between emotion and audience condition, $F(3, 46) = 3.40$, $p = .009$, $\eta_p^2 = 0.19$. Follow-up Bonferroni-corrected pairwise comparisons showed that children displayed significantly more embarrassment in the attentive condition, $F(1, 46) = 10.41$, $p = .002$, $\eta_p^2 = 0.18$. All other emotions were not significant ($p > .05$). * $p < .05$.

A second possible explanation is that children were fearful of publicly transgressing a rule, not pressing the button while the experimenter was attentive because they did not know whether they were "allowed" to do so, thus avoiding potential punishment and not just a negative evaluation (i.e., affective reaction). Though related, these two motivations to inhibit behavior in the first study are quite different. On the one hand, children could have inhibited their behavior because they might associate touching new things without permission with a negative consequence. In this instance, children would simply manifest in their inhibition a generalized association instead of an evaluative audience perception as defined here. A crucial characteristic of modifying behavior as a function of audience in the context of evaluative audience perception is that behavior is changed according to what others value (i.e., approve or disapprove of). For example, both adults and children are more generous when someone is watching because generosity is generally positively valued (Engelmann et al., 2012). Because there were no explicit values given by the experimenter in Study 1, it is difficult to discern whether children were displaying inhibition in the attentive condition as a true expression of evaluative audience perception.

Finally, although our goal for Study 1 was to create an ambiguous task with no explicit norms or instruction to see what children's spontaneous proclivity would be, the fact that no clear instructions were given could have simply refrained children from activating the remote in the attentive condition because they were expecting the experimenter to keep playing with the remote. After the experimenter turned sideways in the inattentive condition, children could have been more inclined to activate the remote because it was "their turn." Again, this explanation does not demonstrate young children's sensitivity to how others might evaluate their behavior. Study 2 was thus designed to have better control over factors that might still explain the results of Study 1, including variable temperament, fear of reprimand, lack of instructions, and absence of explicit values expressed by the experimenter. Replication of these results while controlling for these variables would serve as better test of evaluative audience perception prior to the second birthday.

Study 2

Study 2 incorporated two remotes: one associated with a positive value and one associated with a negative value. During an initial demonstration, the experimenter pressed one of the two remotes paired with the feedback "Wow! Isn't that great?" and smiling (i.e., positive outcome), whereas the other remote was paired with the negative feedback "Uh oh! Oops oh no!" and frowning (negative outcome; see Method section for details). We predicted that if children were indeed sensitive to another's evaluation, they would selectively reproduce the positive outcome when the experimenter was looking but be more inclined to reproduce and explore the negative outcome when the experimenter was not looking.

To control for temperament, we asked a parent of each child to fill out Putnam, Gartstein, and Rothbart's (2006) short temperament assessment form of the Early Childhood Questionnaire. In our analysis, we were particularly interested in the dimensions of

Fear, Inhibitory Control, Shyness, and Sociability to see whether temperament would have any predictive power on change of behavior in the robot task. Finally, to reduce the ambiguity of the first study linked to the lack of instructions, following the demonstration phase, the experimenter pushed the remote control toward the child, explicitly stating, "Your turn!" With this procedure, the child was explicitly permitted and encouraged to interact with the remotes.

We also coded for emotions in the attentive versus inattentive conditions but also in relation to the positive versus negative remotes. We predicted that if embarrassment by the second year is just a by-product of being the object of attention, then toddlers should display embarrassment significantly more in the attentive condition, as they did in Study 1. However, if toddlers were to reproduce positive outcomes significantly more in the attentive condition, then we should observe reduced embarrassment, because toddlers would be acting in a way that was in line with what the experimenter valued (i.e., no potential for a negative evaluation). Both toddlers' strategic use of remotes and reduced embarrassment would show that by 24 months, children take into consideration both the values and the attentiveness of an observer.

Method

Participants. A total of 31 participants were included in Study 2 (14–24 months; $M = 20.65$, $SD = 2.83$; 21 females). Four additional children were tested but were excluded from the analyses because they were fussy. An a priori G*Power 3.1 analysis was run to determine the appropriate sample size, which showed that a sample of 30 participants was sufficient to achieve 80% power and a medium effect size (Faul et al., 2007).

Procedure. Two remotes were placed side by side in a clear tray on the table, with two buttons triggering different robot motions (one spun in circles and the other moved forward, leading the robot to step out of the surrounding display box). We incorporated these different robot motions to entice the child to explore both remotes. To clearly differentiate the remotes, we covered one remote with an orange sleeve and the other remote with a blue sleeve. For the demonstration phase, the experimenter picked up one remote, pushed its button, and gave positive feedback ("Wow! Isn't that great?") and smiled, or negative feedback ("Uh oh! Oops, oh no!") and frowned, after setting the robot in motion. After pushing the first remote twice, the experimenter then picked up and demonstrated the effect of pressing the button of the other remote, with accompanying positive or negative feedback. The experimenter gave this feedback only during the demonstration phase. The color of remote, movement of the robot, type of feedback, as well as left–right location of the remote on the tray was counterbalanced across participants. After the demonstration phase, the experimenter smiled and pushed the tray with the two remotes toward the child and said, "Your turn!" The experimenter then either turned 45° and pretended to read a magazine for 30 s (inattentive condition) or looked at the child with a neutral face for 30 s (attentive condition), order counterbalanced.

Coding. The same dependent measures (button presses and emotions) as in Study 1 were coded by a research assistant, adding in the analysis of the different remotes that were activated between conditions (positive vs. negative). A second coder coded button pressing and emotion for 20% of randomly selected participants. Reliability testing for both button presses and emotion ratings yielded high intraclass correlation coefficients (all rs $> .80$).

Results

Robot task. A preliminary mixed factor ANOVA, with gender and condition order as between-subject variables, and remote and audience condition as within-subject variables, yielded no significant main effect or interactions for gender or condition order (all were $p > .05$). Age was also not a significant covariate ($p = .669$). These factors were thus not included in subsequent analyses. To see whether children chose to press the negative versus positive remote as a function of audience, we ran a 2 (condition: attentive vs. inattentive) × 2 (remote: positive vs. negative) repeated measures ANOVA. Results yielded a significant interaction between remote and condition, $F(1, 30) = 5.02$, $p = .03$, $\eta_p^2 = 0.14$ (see Figure 4). Pairwise comparisons after Bonferroni corrections revealed that children pressed the negative remote significantly more in the inattentive condition (i.e., when the experimenter was not looking; $M = 4.87$, $SE = 1.17$) than in the attentive condition ($M = 2.13$, $SE = 0.65$), $F(1, 30) = 4.74$, $p = .03$, $\eta_p^2 = 0.14$. Inversely, children chose the positive remote significantly more in the attentive condition ($M = 5.26$, $SE = 1.46$) than in the inattentive condition ($M = 2.45$, $SE = 0.50$), $F(1, 30) = 7.67$, $p = .01$, $\eta_p^2 = 0.1$. Children were thus strategic in their button pressing, considering both the values placed on each remote and the attention of the experimenter.

Temperament. A preliminary correlation matrix exploring the relation between total button pressing and the distinct dimensions of the temperament questionnaire (Sociability, Inhibitory Control, Fear, and Shyness) indicated that there was a significant relation between shyness and total button presses across conditions ($r = -0.467$, $p = .029$). However, follow-up analyses showed that shyness was not a significant covariate for positive or negative

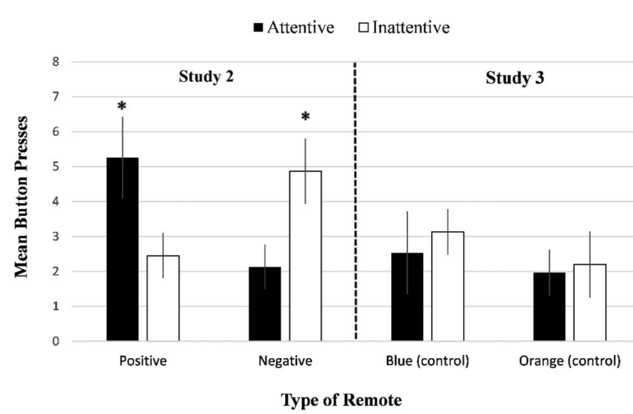

Figure 4. Mean button pressing as a function of condition (attentive vs. inattentive), and both types of remote (positive vs. negative in Study 2; blue vs. orange in control Study 3). Error bars represent standard error. Overall, children in Study 2 pressed the positive button significantly more in the attentive condition, $F(1, 59) = 6.17$, $p = .013$, $\eta_p^2 = 0.1$, but pressed the negative button significantly more in the inattentive condition, $F(1, 59) = 7.77$, $p = .007$, $\eta_p^2 = 0.12$. In contrast, children in Study 3 (control) did not differentially choose one remote over the other between conditions ($p > .05$). * $p < .05$.

button presses between audience conditions of the robot task, $F(1, 29) = 0.46$, $p = .503$.

Emotion. The analysis for emotion (embarrassment) did not yield a significant main effect or interaction (all $ps > .05$; see Discussion section).

Discussion

In the second study, we explored whether children would be strategic in their button pressing as a function of audience attention when the experimenter placed a positive versus a negative value on each remote. We predicted that if 14- to 24-month-old children were truly modifying their behavior in Study 1 as an expression of evaluative audience perception, they should consider both the differential values of the remotes (positive vs. negative) as well as the attention of the experimenter. Supporting our hypothesis, results indicated that children pressed the positive remote significantly more in the attentive condition but, importantly, pressed the negative remote significantly more in the inattentive condition. In particular, children in Study 2, in contrast to Study 1, did not simply inhibit their button-pressing behavior in the attentive condition but were rather strategic. For example, children were not inhibited in pressing the negative remote in both conditions but instead chose to activate the negative remote more in the inattentive compared with the attentive condition, and vice versa. Unlike the results of Study 1, these results cannot be explained by either general inhibition related to the mere presence of a stranger, task ambiguity, or a generalized negative association with either remote.

The expression of evaluative audience perception in Study 2 rests on the fact that children not only pressed the positive remote significantly more in the attentive condition but, importantly, pressed the negative remote significantly more in the inattentive condition. This pattern of behavior resembles that of older children and adults, who tend to reproduce behavior that is positively valued by others when others are attentive but are more likely to behave in a way that might be negatively evaluated (like cheat or steal more) when they are not being observed. Lastly, interindividual differences in temperament are not a significant factor, as we found no evidence of a significant relation between temperament and overall button pressing in either condition.

As predicted, children in Study 2 showed no significant emotional differences between conditions of the robot task. We hypothesized that if children in Study 2 were to be strategic in their button pressing, then they would show no embarrassment because they were behaving in a way that aligned with the values set forth by the experimenter. However, if embarrassment was simply a by-product of attention, as currently proposed in the literature, then we should have observed embarrassment in the attentive condition. Because children in Study 2 showed strategy in their button pressing (increase of positive button pressing in the attentive condition), no embarrassment was displayed in this context. This finding challenges the view that toddlers' display of embarrassment prior to the second year can be reduced to the mere emotional reaction to being an object of attention and not an index of being sensitive to others' evaluation.

Although Study 2 provides strong evidence for evaluative audience perception in the second year, we wanted to assure that the effects observed were because of the values that were given by the experimenter. We thus tested an additional control group of 30 children for which no differential feedback was given for either of the two remotes. If toddlers were indeed being strategic in their choices depending on both the values and the attention of an audience in the experimental group (Study 2), we would expect no differential button pressing in this control group because the experimenter gave no distinct values to either remote during the demonstration.

Study 3

Participants

Thirty 14- to 24-month-old children were included in Study 3 ($M = 19.17$, $SD = 3.23$; 17 males). There were no significant differences in age, gender, or temperament between the participants of Study 2 (experimental) and Study 3 (control; $p > .05$).

Method

The methodology in Study 3 was identical to Study 2, except that the experimenter demonstrated each remote with no distinguished verbal comments or values (same feedback). Following the action of either remote, the experimenter said, "Oh wow!" The color of remote, order of remote demonstration, as well as left–right location of the remote on the tray were counterbalanced across participants. Interrater reliability for button presses and emotion ratings was high (intraclass correlation coefficient greater than 0.8).

Results

Robot task. To explore button-pressing behavior of each remote between conditions, we ran a 2 (condition: attentive vs. inattentive) × 2 (remote: blue vs. orange) repeated measures ANOVA. There was no main effect of remote, $F(1, 29) = 0.45$, $p = .510$, or audience condition, $F(1, 29) = 0.21$, $p = .653$, as well as no significant interaction between remote and condition, $F(1, 29) = 0.08$, $p = .782$. There was also no significant effect of gender, condition order, or age (all $ps > .05$).

To determine whether button-pressing behavior in Study 2 differed from that of Study 3, we ran a 2 (group: Study 2 vs. Study 3) × 2 (condition: attentive vs. inattentive) × 2 (remote: positive [blue for Study 3] vs. negative [orange for Study 3]) mixed factorial ANOVA. Results yielded a significant three-way interaction of group, condition, and remote, $F(1, 59) = 5.35$, $p = .024$, $\eta_p^2 = 0.09$ (see Figure 4). As expected, follow-up Bonferroni-corrected contrasts revealed that, unlike Study 2, children in Study 3 had no differential button pressing between the two remotes in either the attentive, $F(1, 59) = 0.27$, $p = .630$, or the inattentive, $F(1, 59) = 0.05$, $p = .816$, condition. In contrast, children in Study 2 were strategic in their button pressing, pressing the positive remote more often but the negative remote less often in the attentive condition, $F(1, 59) = 6.17$, $p = .013$, $\eta_p^2 = 0.1$, and vice versa in the inattentive condition, $F(1, 59) = 7.77$, $p = .007$), $\eta_p^2 = 0.12$ (see Figure 4). In all, these results indicate that when the experimenter gave no differential values to either remote (control Study 3), the selectivity demonstrated in Study 2 disappeared, providing further evidence of evaluative audience perception by children younger than 24 months.

Emotion. Measures of all four emotions, including embarrassment, did not yield any significant main effect or interaction (all $ps > .05$).

Discussion

Results of the third control study confirm that when differential feedback from the experimenter was removed, children did not systematically vary in their button pressing between conditions. Therefore, it was indeed the positive and negative values demonstrated by the experimenter that drove the differential behavior in Study 2. In a fourth and last experiment, we further assessed toddlers' expressions of evaluative audience perception by probing whether they would differentially modify their behavior when facing two different experimenters who expressed either positive or negative values toward the same action (i.e., button pressing to activate the robot).

Our rationale was that if, indeed, toddlers demonstrate evaluative audience perception, they should differentially act on the remote depending on who is watching and, specifically, whether this audience expressed positive or negative values toward the remote. Unlike the previous three studies, the child would now have an attentive audience throughout the task; therefore, children modifying their behavior between the two conditions could not just depend on whether they were being observed or not but rather on whether a negative or positive evaluator was observing them.

Study 4

Participants

Thirty-four 14- to 24-month-old children were included in Study 4 ($M = 19.57$, $SD = 3.31$; 19 males). Seven additional children were tested but were excluded from the analysis because they were fussy ($n = 2$) or because they failed to interact with the remote across both conditions ($n = 5$). There were no significant differences in age and gender between the participants of Studies 1 and 2 ($p > .10$).

Method

The setup and materials for Study 4 were similar to that of Study 1, except that two experimenters (E1 and E2) were involved, sitting side by side directly in front of the child (see Figure 5a, 5b). To control for appearance, both experimenters were brunette females wearing either blue or orange scrubs (color counterbalanced across participants). During the demonstration phase, E1 (positive feedback) would pick up the remote, direct the child's attention to the remote by saying "Look!" and press the button. After the robot would spin once, E1 would smile, look at the child, and say, "Yay! The toy moved!" This was repeated twice. After E1's demonstration, E2 (negative feedback) repeated the same sequence as E1, but would say "Yuck! The toy moved!" while looking at the child and frowning. We chose the expletives "yay" and "yuck" to match for syllable length as well as to use words that gave values without granting or withholding permission (i.e., without "yes" or "no" words).

After each experimenter's paired demonstrations, both experimenters placed one hand on the remote and pushed the remote within reach of the child while simultaneously saying, "Your turn!" E1 then proceeded to turn their back while E2 faced the child for 30 s (negative-attentive condition). After the 30 s, the experimenters switched conditions: E1 would turn to face the child for 30 s while E2 turned their back (positive-attentive condition; see Figure 5a). The experimenters' side (left or right in relation to the child), the order in which either the positive and negative value was demonstrated first, and in which experimenter turned their back or faced the child first, were counterbalanced across participants.

All coding was done using prerecorded videos of each task by research assistants who were blind to both conditions and hypotheses. Modifying behavior as a function of audience in the robot task was measured via button presses. Research assistants recorded the number of presses in each condition using Boris, an event-recorder software (Friard & Gamba, 2016). Only those presses that successfully activated the robot counted. For reliability, a second coder coded 20% of randomly selected participants, yielding an intraclass correlation coefficient of 0.88.

Results

A mixed factorial ANOVA, with gender, two equally distributed age groups (14–18 months and 19–24 months),[1] and order of condition as between-subjects variables, and condition (positive-attentive vs. negative-attentive condition) as the within-subject variables, yielded no significant main effect or any significant interaction of age or condition order (all $ps > .05$). There was a main effect of gender, $F(1, 25) = 4.8$, $p = .03$, $\eta_p^2 = 0.16$, whereby male participants tended to produce more button presses overall. More importantly, the analysis yielded a significant main effect of condition (positive-attentive vs. negative-attentive condition), $F(1, 22) = 6.7$, $p = .016$, $\eta_p^2 = 0.21$. As shown in Figure 6, children were significantly more likely to activate the remote in the positive-attentive ($M = 7.7$, $SE = 1.04$) compared with the negative-attentive ($M = 5.7$, $SE = 0.92$) condition.

Discussion

Using a different, more complex paradigm, results of Study 4 confirm the phenomenon we observed in the first three studies, reinforcing the interpretation that by 24 months, toddlers do manifest evaluative audience perception. Specifically, when engaging with a novel toy (remote) that was either positively or negatively valued by two different experimenters, toddlers not only factored this value in their subsequent behavior but also considered whether the positive or negative experimenter was attentive toward them.

[1] Unlike the preceding three studies, there was an equal number of children in both of these age groups, allowing us to use age as a between-subjects variable to better explore an age effect. We used 14 to 18 years and 19 to 24 years because this captured an equal 5-month range. Note that it is also by the age of 18 to 21 months, and not earlier, that toddlers are typically reported to show clear signs self-conscious emotions such as embarrassment (Kagan, 1981; Lewis et al., 1989; Stipek et al., 1992). Age entered separately as a covariate did not yield a significant interaction or main effect ($p > .6$).

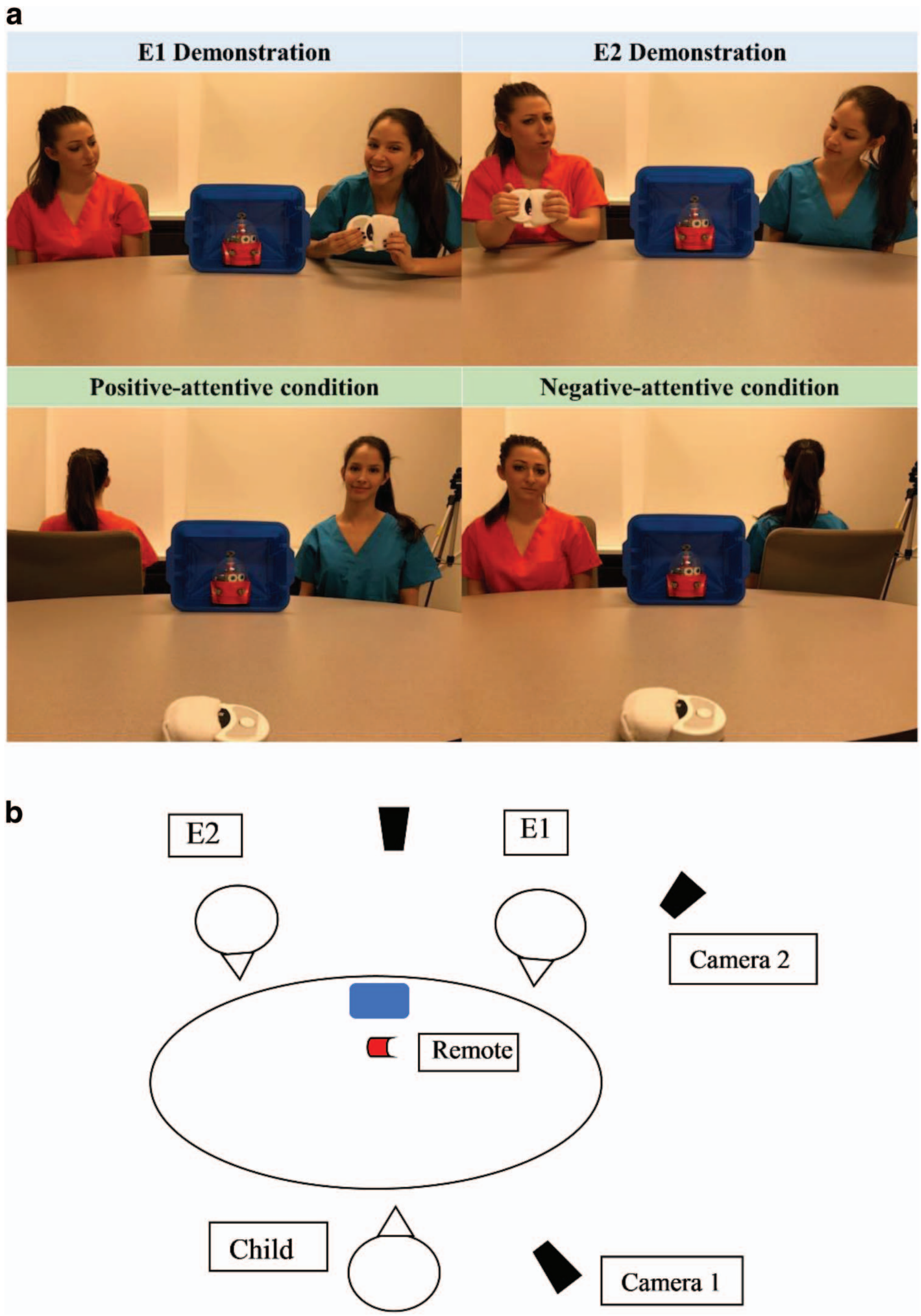

Figure 5. (a) Illustration of the successive phases of Study 4 from the child's perspective. Top row depicts E1 and E2 demonstration with either positive (E1) versus negative (E2) feedback after pressing the button. Bottom row depicts the two test conditions following demonstration with either attentive E1 or attentive E2. The remote is within reach of the child. The authors received signed consent from both individuals for their likeness to be published in this article. (b) Bird's-eye-view diagram of the experimental setup for Study 4. E1 = Experimenter 1; E2 = Experimenter 2. See the online article for the color version of this figure.

This is evident in the fact that children were significantly more inclined to activate the remote when the positive, as opposed to the negative, experimenter was attentive. In contrast, when the negative experimenter was attentive, children tended to inhibit their button pressing. This corroborates the idea that already by 2 years, children are sensitive to how the adult might evaluate them, presumably anticipating a positive or negative response to their behavior, and thus adjusting their behavior accordingly.

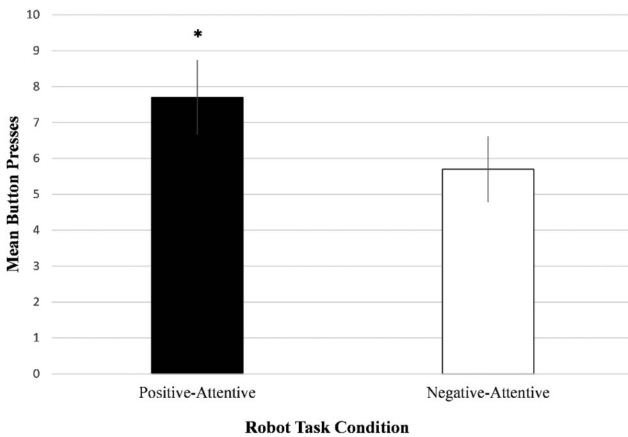

Figure 6. Mean button presses as a function of condition (positive attentive vs. negative attentive) in Study 4. Bars represent standard error. A repeated measures ANOVA showed that children were more likely to activate the robot when the positive experimenter was attentive as opposed to when the negative experimenter was attentive, $F(1, 22) = 6.7$, $p = .016$, $\eta_p^2 = 0.21$. $^* p < .05$.

General Discussion

Self-image, reputation, and impression management prevails from early childhood (Banerjee et al., 2012; Fu et al., 2016) and is a major trademark in adulthood (Schlenker & Leary, 1982; Watling & Banerjee, 2007). Although the human proclivity to care for reputation and impression management is ubiquitous, the question of its origins remains an open question. The present four studies explored signs of an evaluative audience perception (i.e., sensitivity to others' evaluations) in 14- to 24-month-olds, an age at which social emotions like embarrassment emerge (Kagan, 1981; Lewis et al., 1989; Stipek et al., 1992). We asked whether the age at which children first manifest such emotions would also correspond to first signs of systematic change in behavior as a function of an attentive versus an inattentive audience—an index of evaluative audience perception.

In Study 1, we found that toddlers were indeed sensitive to the presence of an audience; when an experimenter was attentive, they tended to inhibit their proclivity to explore a novel remote-controlled toy. We also found that children displayed more embarrassment when the experimenter was watching as opposed to not watching. Study 2 further supports that what might drive such differential behavior is an evaluative audience perception. We found that children strategically chose to activate a button that was associated with a positive as opposed to a negative value from the experimenter in the attentive condition. The reverse was true in the inattentive condition. As a crucial control, when the experimenter did not assign differential values to the remotes (Study 3), we found that children's choice of remote did not vary systematically as a function of attentive versus inattentive audience conditions. Lastly, Study 4 further corroborated these findings by showing that children not only factored whether they were being observed but also *who* was observing them. Specifically, when reproducing button presses, children factored both the experimenters' attention and the value they had previously expressed toward the remote. Together, these four studies provide the first demonstration that evaluative audience perception is evident before a child's second birthday.

Our findings add to a growing body of literature on the emergence of impression management and self-conscious emotions in early development. They indicate that evaluative audience perception, which we consider the foundation for the development of self-presentation and reputation management documented at a later age (3–5 years; Engelmann et al., 2012; Fu et al., 2016), emerges already by the end of the second year. Our data suggest that from this age on, children (a) understand that their behavior can be positively or negatively evaluated by others (i.e., others can have positive or negative reactions to their behavior), and (b) have a general preference toward eliciting positive as opposed to negative evaluations from others. This is an important developmental milestone, as it suggests that by 24 months, children understand that their own behavior can elicit affective reactions from others based on prior expressed values, and accordingly modify their behavior to elicit positive as opposed to negative reactions from attentive others. We propose that these two early developing propensities form the building block of the human concern for reputation and self-presentation.

Evidence for an early emerging evaluative audience perception has consequences at both a methodological and theoretical level. If, by the end of the second year, children do manifest evaluative audience perception, which potentially influences their behavior, then the presence of onlookers might be a significant factor in what is measured in children. Therefore, more consideration should be given as to how the presence of others may affect the young child's behavior in a task. From a theoretical standpoint, our studies challenge the interpretation that by the second year, the kind of embarrassment expressed by the young child is not yet self-conscious or evaluative proper. Accordingly, such early expressions of embarrassment would correspond to the mere direct avoidant response to being an object of attention—an unfamiliar, hence, uncanny, experience—and therefore not yet evaluative. With this interpretation, it would not be until later in development, with first signs of guilt and shame, that a child would perceive others as evaluators (Lewis & Ramsay, 2002). Our studies offer strong support for the alternative account that social emotions emerging by the second year are not simply stress responses to insistent gazing by others but can already be considered as the expression of a sensitivity to how others might respond to the child's behavior.

Although our studies provide clear evidence of evaluative audience perception in children younger than 24 months, many questions remain. For instance, could evaluative audience perception emerge even earlier than 14 months? Because we found no significant age effect in our studies, we have not established the point at which this emerges in development. Furthermore, what might be the cognitive prerequisites of evaluative audience perception? And how does evaluative audience perception develop to become more explicit and metacognitive? Although our studies show that toddlers are sensitive to how others might respond to their behavior, and engage in leveraging positive as opposed to negative responses, the degree to which this represents a theory of mind or metacognitive ability is an open question. In particular, more research is needed to probe how and when children begin to understand that others' evaluation entails not only positive or negative reactions but also mental representations, like opinions or judgments, about the self. As it stands, our data do not provide sufficient evidence to elucidate this critical developmental question. Further investigation should examine how evaluative audience perception becomes more explicit in early childhood.

In summary, evaluative audience perception should be considered as an important index for the study of human social cognition, particularly in regard to self-consciousness and the concern for reputation (Rochat, 2009). Our findings suggest that the basis for these features is present early in human development, and emerges prior to children passing language-based theory of mind tests or manifesting strong conformity. As an important index of social–cognitive development, future studies should investigate predictors of this early outset, how it might vary across individuals, and how, as a function of age, evaluative audience perception develops to become increasingly normative and metacognitive.

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