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The Influence of Maternal Socialization on Infants' Social Evaluation in Two Cultures

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Although a growing body of research has explored the early development of social evaluation, no research has directly compared social evaluations of infants between different cultures. In addition, there has been little understanding regarding socialization's effects on this ability. The goal of this study was to expand on earlier findings on social evaluation in infants by investigating a broader sample from two cultures, and to explore the influence of maternal socialization on infants' social evaluation. Using the violation of expectations and the preferential reaching paradigm, four groups aged 6-, 9-, 12-, and 15–18 months and their mothers from Japan and the United States (159 dyads) were compared in terms of spontaneous social evaluations. Japanese and European American infants showed similar performance in dishabituation to the inconsistent behavior and in their reaching preference for prosocial over antisocial agents, indicating that the emergence of spontaneous social evaluation is not culture-specific. Furthermore, our study provides a novel finding regarding the relationship between mothers' socially evaluative speech and infants' preference for prosocial over antisocial agents. These results suggest that the development of sociomoral understanding results from complicated interactions among evolutionary, cognitive, and social factors.

People constantly strive to derive social meaning from their surrounding environment. When we observe another person's behavior, we spontaneously and immediately make inferences about their goals, intentions, beliefs, traits, social valence, etc. (see Uleman,

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Saribay, & Gonzalez, 2008; for a review). Spontaneous social inferences are critical because we must process socially relevant information rapidly, online, and sometimes automatically to achieve day-to-day social interaction. Recent studies suggest that the foundation for some spontaneous social inferences can be seen extremely early in ontogeny (Baillargeon, Scott, & Bian, 2016).

Spontaneous social evaluation in infants is thought to be an adaptive means of surviving in the complex social world of human beings, because such evaluations make it possible to distinguish individuals who harm from those who help (Hamlin, Wynn, & Bloom, 2007). Certainly, such evaluations are important for all aspects of social life, but two questions remain unanswered: (1) Are there cultural variations in the emergence of spontaneous social evaluation in infancy? And (2) is the emergence of social evaluation influenced by socialization? These two issues are the focus of the present study.

Spontaneous social evaluation in infancy

Seminal work by Premack and Premack (1997) suggested that 52-week-old infants categorize others' positive and negative behaviors. They presented infants with social interactions of inanimate agents (moving balls) that were either performing prosocial behavior (helping or caressing another ball) or antisocial behavior (hitting another ball or preventing the ball from achieving its goal). Infants who habituated to an agent's helping behavior showed dishabituation when presented with the agent's hitting behavior, suggesting that infants formed expectations about the agent's behavior based on the social valence of the previously observed behavior.

A series of subsequent studies by Hamlin and colleagues expanded on this finding by investigating infants' preference for a prosocial and an antisocial agent (Hamlin, 2014; Hamlin & Wynn, 2011; Hamlin, Wynn, & Bloom, 2010; Hamlin et al., 2007). For example, Hamlin et al. (2007) showed 6- and 10-month-olds a "climbing hill" event where the protagonist tries to climb a hill and is then pushed up by a "helper" or pushed down by a "hinderer." After the infants habituated to these events, both the helper and hinderer were presented to infants to determine which character the infants reached for. Result demonstrated that 6-month-olds, as well as 10-month-olds, showed a preference for the helper (or an aversion to the hinderer). Thereafter, Hamlin and colleagues (Hamlin, 2014; Hamlin & Wynn, 2011; Hamlin, Wynn, Bloom, & Mahajan, 2011) extended this work using different stimuli and investigating different age groups and concluded that infants in their first year show a preference for the helping agent.

The results of follow-up studies to Hamlin and colleagues' work have been mixed. Scola, Holvoet, Arciszewski, and Picard (2015) investigated two groups of infants, aged 12–24 months and 24–36 months, respectively, and found that both groups showed a preference for prosocial agents. In contrast, Scarf, Imuta, Colombo, and Hayne (2012) used the hill task in their investigation of 10-month-old infants but found no preference for prosocial agents. Similarly, Salvadori et al. (2015) followed procedural guidelines presented by Hamlin in an attempt to faithfully reproduce the research of Hamlin and Wynn (2011), but obtained no evidence that 9-month-olds preferred a prosocial agent to an antisocial agent. Cowell and Decety (2015) investigated 12- to 24-month-old children for both preferential reaching and neural activation. Although they found differences in EEGs when children observed prosocial and

antisocial agents, no preference was found for a prosocial agent over an antisocial agent when reaching was the indicator.

These mixed results may be attributable to the fact that previous studies only included one or two infant groups, which may have made it difficult to get a clear picture of the developmental process of social evaluation in infancy. Furthermore, most previous studies have been conducted in Western countries, and to date, no studies have directly compared social evaluations of infants between different culture groups. Therefore, the first aim of this study was to expand previous findings regarding infants' social evaluations by investigating a broader sample consisting of four age groups from two cultures.

The effect of socialization on the emergence of social evaluation

Humans are a social species that engages in collaborative problem-solving and cooperative communication, and are unique in the extent to which cultural transmission is crucial to the development of a variety of cognitive skills (e.g., Tomasello, 2010). Considering that social evaluation reflects a psychological understanding of others and is not an ability we exercise independently of others, it seems highly likely that socialization influences the development of social evaluation. Note that to say that social evaluation is likely influenced by the social environment is not to deny that its appearance is universal. Rather, what is more reasonable is that infants have a universal sociomoral sense from a very early age, but when and how they show social evaluation spontaneously is influenced by their social environment.

To the best of our knowledge, only one study by Cowell and Decety (2015) has investigated the influence of socialization on children's social evaluation. They found a relationship between parents' self-reported injustice sensitivity and differences in infants' and toddlers' event-related potentials (ERPs) when observing prosocial and antisocial agents. The higher the parents' injustice sensitivity, the greater the children's differentiation between prosocial and antisocial agents. However, it is still unclear how parental values affect how they communicate with their children and, in turn, whether and how that influences their children's development of social evaluation. Thus, the second aim of our study was to investigate the influence of parental speech on infants' social evaluation.

Parental speech toward children impacts various types of social understanding in children. For example, mothers' speech to their children about mental states is related to children's later development of a theory of mind (Ruffman, Slade, & Crowe, 2002) and children's later use of language expressing desire and emotional understanding (Taumoepeau & Ruffman, 2006). Moreover, mothers' "mind-mindedness" (i.e., the tendency to treat their infants as individuals with minds of their own, including describing them in mentalistic terms) when infants are 26 months old is related to the development of psychological understanding at 51 months of age (Meins, Fernyhough, Arnott, Leekam, & de Rosnay, 2013). Taken together, these findings suggest that mothers' socially evaluative references about others' social interactions may affect the development of social evaluation.

Of related interest is the suggestion that cultural differences exist in the speech of mothers to their preverbal infants (Fernald & Morikawa, 1993; Little, Carver, & Legare, 2016; Rothbaum, Pott, Azuma, Miyake, & Weisz, 2000). For example, Fernald and Morikawa (1993) compared Japanese and American mothers' speech to 6-, 12-,

and 19-month-old infants. They found that American and Japanese mothers focused on distinct aspects of the social situation, with American mothers calling children's attention to object names (e.g., "That's a car. See the car?") and Japanese mothers using objects to engage children in social routines (e.g., "Here! It's a vroom vroom. I'll give it to you."). However, no research to date has investigated cultural variations in socially evaluative speech among mothers. Cultural psychology suggests that North Americans are more likely than East Asians to attribute behavior to internal states (Fiske, Kitayama, Markus, & Nisbett, 1998; Miller, 1984; Nisbett, Peng, Choi, & Norenzayan, 2001). It has also been shown that Americans spontaneously and immediately infer personality traits from others' behaviors more frequently and automatically than do Japanese (Lee, Shimizu, Masuda, & Uleman, 2017; Lee, Shimizu, & Uleman, 2015; Shimizu, Lee, & Uleman, 2017). Most personality traits are evaluative, and given this, we predicted that American mothers would make more socially evaluative references than Japanese mothers.

The present study

We explored the development of social evaluations by examining a broad sample of children in four age groups between 6 and 18 months old from two cultures, Japanese and European Americans. Two distinct paradigms were employed: the violation of expectation paradigm that was used by Premack and Premack (1997) and the preferential reaching paradigm that has been used by Hamlin and other researchers. First, the infants were shown an agent performing a prosocial behavior and another agent performing an antisocial behavior alternately. Following habituation to these presentations, infants were shown two behaviors in a different setting by one of the previous agents that were consistent and inconsistent in valence (a prosocial and an antisocial behavior) with that of the previous behavior. We examined whether infants showed dishabituation for agents' novel behaviors when their valence was inconsistent with prior behaviors. Finally, infants were presented with the prosocial and antisocial agents and encouraged to choose between them.

Note that this study is not a simple replication of Hamlin et al.'s studies. In this study, the dishabituation phase was inserted between the habituation and the preference phases. The reason for this change was to investigate whether infants form expectations based on their prior observation of other's social behavior. In previous studies (Hamlin, 2014; Hamlin & Wynn, 2011; Hamlin et al., 2007, 2010), infants were habituated with a prosocial and an antisocial behavior performed in only one situation and then their social evaluation was examined. Therefore, it is unclear whether infants' evaluations reflect their ability to judge the behavior in a specific situation or rather reflect their ability to attribute enduring sociomoral traits to the agents across different situations. In this study, we showed the agent's novel behaviors to the same recipient in a different situation, which made it possible to establish that expectations pertain to the agent rather than merely to the behavior.

We also explored the influence of maternal socialization on infants' social evaluation. We asked mothers to watch the same prosocial and antisocial events that had been seen by their infants and to talk to their children freely while doing so. We investigated whether the socially evaluative references that mothers made while watching the video were related to the social evaluations of their infants. We also looked for cultural differences in mothers' infant-directed speech.

METHOD

Participants

Participants comprised 86 Japanese and 73 European American infants and their mothers. Each culture group consisted of four age groups: 6-month-olds, 9-month-olds, 12-month-olds, and 15- to 18-month-olds. All infants were full-term and normally developing. A summary of the participant groups is seen in Table 1. Infants were randomly assigned to one of two valence conditions: prosocial or antisocial agent. Twenty-two additional dyads were excluded from data analyses: 18 (10 Japanese and eight European American) due to insufficient looking time in the dishabituation phase (<20% of the event) and four (three Japanese and one European American) due to equipment failure. Japanese infants and mothers were from a suburban area in Japan, and their data were collected in the laboratory of Saitama University. European American infants and mothers were from a suburban area in the United States, and their data were collected in the laboratory of University of Wisconsin—Green Bay. The participants were recruited through flyers and advertisements. No significant difference was found in mothers' educational level (77.8% of Japanese mothers and 84.1% of European American mothers had at least a 4-year college degree, $\chi^2 = 2.00$, $p = .157$). This study was conducted according to guidelines laid down in the Declaration of Helsinki, with written informed consent obtained from a parent or guardian for each child before any assessment or data collection. All procedures involving human subjects in this study were approved by the ethics committees of Saitama University and University of Wisconsin—Green Bay where the project was conducted.

Materials

We made movies of "box events" and "ball events" where puppets interacted with one another. Figure 1 shows selected scenes from the stimulus movies. Events were modeled from Hamlin and Wynn (2011). The characters consisted of a protagonist (elephant) and two intervening puppets (pig and bear). The same movies were used for infants' social evaluations and mothers' social explanations.

TABLE 1
Infant Demographic Characteristics Across Culture and Age Groups

	Culture and age groups							
	Japanese				*European American*			
	6 mo	*9 mo*	*12 mo*	*15–18 mo*	*6 mo*	*9 mo*	*12 mo*	*15–18 mo*
n	25	19	21	21	19	18	14	22
Girl	10	11	9	13	4	10	3	12
Boy	15	8	12	8	15	8	11	10
Mean age (mo; days)	6; 14	9; 14	12; 15	17; 20	6; 11	9; 10	12; 12	17; 16
Age range (mo; days)	6; 0–6; 29	9; 0–9; 29	12; 1–12; 29	15; 20–18; 28	6; 0–6; 27	8; 30–9; 30	12; 0–12; 26	15; 4–18; 26

Note. mo = months.

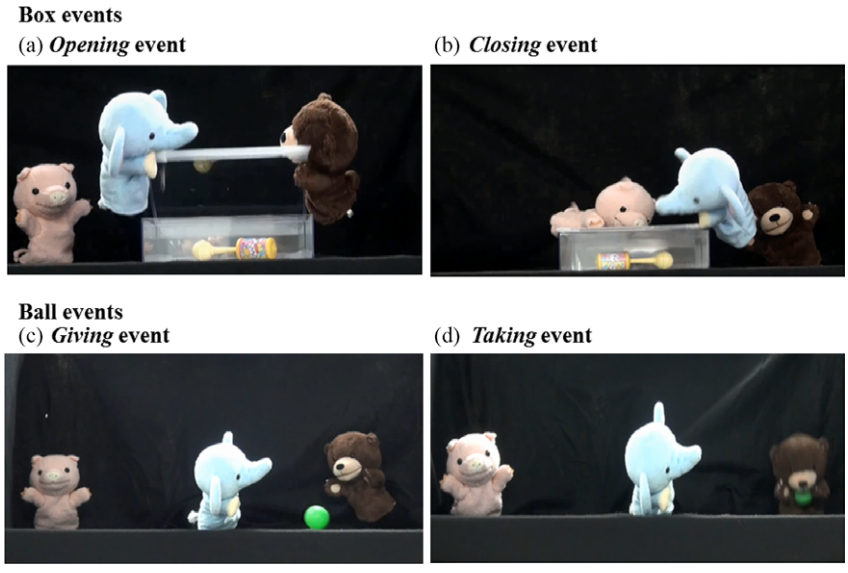

Figure 1 Selected scenes from the stimulus movies. Box events were presented in the habituation phase, and ball events were presented in the dishabituation phase. The *Opening* and *Giving* events show prosocial behavior, and the *Closing* and *Taking* events show antisocial behavior.

Box events

In the center of the stage, there was a transparent plastic box containing a rattle. The bear puppet stood in the left corner of the box, and the pig puppet stood in the opposite corner of the box. Subsequently, the protagonist puppet (elephant) entered from the center of the back of the stage and moved to one side of the box. The elephant attempted to open the box four times by lifting the lid of the box but failed to open it. On the fifth attempt, the bear or pig puppet intervened. In the *Opening* event, the bear puppet (for example) moved forward, grabbed the other corner of the box lid, and opened the box together with the elephant (Figure 1a). Afterward, the elephant retrieved the rattle from the box, while the bear ran off the stage. In the *Closing* event, the pig puppet moved forward and jumped on the lid of the box, slamming it shut (Figure 1b). Then, the pig ran off the stage. The identity of the puppet (pig or bear) that engaged in the prosocial or antisocial behavior was counterbalanced across infants. The duration of each box event was 22 sec.

Ball events

The protagonist puppet (elephant) stood on the center of the stage with the pig and bear standing on each side. The elephant bounced the ball three times at the center of the stage by itself. On the fourth action, the ball rolled over to one side of the stage, then the bear (for example) on that side intervened. In the *Giving* event, the bear rolled the ball toward the elephant, who caught it (Figure 1c). In the *Taking* event, the same puppet ran off-stage with the ball (Figure 1d). In each event, the last scene remained for 10 sec so that infants' reaction to each event could be assessed. The total duration

of each ball event was 22 sec including the last scene that lasted for 10 sec. For half of the events, the pig rather than the bear was the one who intervened.

These events were validated by 36 Japanese and 20 American undergraduates on their prosocial or antisocial valence. There were no cultural differences in valence ratings among pretest participants.

Procedure

The study took place in a laboratory room. Infants sat on their mothers' laps at the end of a table. They faced a 27-inch TV monitor that presented a video. The distance between the infant and the monitor was approximately 80 cm. First, the infants' social evaluations were assessed, and then, the mothers' social explanation was obtained.

Infants' spontaneous social evaluations

The session involving the assessment of infants' social evaluations consisted of three phases: habituation, dishabituation, and preference phases. Mothers were instructed not to view the monitor in the habituation and dishabituation phases and to close their eyes in the preference phase. In the *habituation phase*, two box events (*Opening* and *Closing*) were repeatedly presented in alternation. The infants saw the events repeatedly until a habituation criterion was reached. The habituation criterion was that either (1) the infants' looking times on three consecutive sets were less than half of their looking times on the first three sets, or (2) they had seen 15 sets, whichever occurred first.

After seeing the habituation events, participants were shown a set of ball events (a Giving and a Taking) in the *dishabituation phase*. Infants had been randomly assigned to one of two valence conditions: prosocial or antisocial agent. In both conditions, the previously appearing agent character (bear or pig) interacted with the protagonist (elephant) playing with the ball. The prosocial agent condition involved the initially prosocial puppet, who had opened the box in the habituation phase; the antisocial agent condition involved the initially antisocial puppet, who had closed the box in the habituation phase. All infants saw two events (*Giving* and *Taking*) in this dishabituation phase, one consistent and the other inconsistent with the behavior's valence in the habituation phase. For the consistent event, the valence of the ball event was consistent with the box event; for the inconsistent event, the ball event valence was inconsistent with the box event. For example, for infants in the prosocial condition who saw that the bear had opened the box for the elephant and that the pig had closed the box in the habituation phase, the bear was a prosocial agent. Therefore, they were shown the bear puppet as an intervening agent in the dishabituation phase. For them, the *Giving* event was the consistent event (because the bear had opened the box in the box event *and* gave the ball back to the elephant in the ball events), and the *Taking* event was the inconsistent event (because the bear had opened the box in the box event *but* took the ball away from the elephant in the ball events). Infants' looking times toward consistent and inconsistent events were assessed. Two coders who were blind to the kind of events independently coded infants' looking time for the two events. The two coders' assessments were highly correlated: $r = .91$.

In the final *preference phase,* the infants were presented the bear and pig puppets by an experimenter who did not know the identity (prosocial or antisocial) of each

puppet. The experimenter held one puppet in each hand, initially out of the infant's reach for approximately 10 sec, and then moved them within reach of the infant. In total, the puppets were presented to the infants for 30 sec. If the infant did not show a specific preference (did not choose any puppet, or chose both puppets), puppets were presented until a choice was made, or for a maximum of another 30 sec. The infant's preference was coded by the experimenter as the first puppet the infant intentionally touched. A second independent coder, who was blind to the identity of each puppet, re-coded infants' preferences; inter-coder agreement was 96.4%. Disagreements were resolved by a third independent coder.

The puppet identity of the prosocial character (pig or bear), order of prosocial and antisocial events in the habituation and dishabituation phases, and the side of the prosocial agent in the habituation, dishabituation, and preference phases were counterbalanced.

Mothers' speech about social interactions

Mothers were instructed to watch the video with their children and talk to their children freely while watching it. The video was the same as the one that their children had watched earlier but consisted of only three sets of box events (three *Opening* and three *Closing*) and one set of ball events (a *Giving* and a *Taking*). Mothers' speech while watching the eight events (six box events and two ball events) was transcribed verbatim from video files by native speakers. Following to Fernald and Morikawa (1993), maternal speech was segmented into utterances by native speakers of each language on the basis of pauses and syntactic and prosodic information. All utterances evaluating the agent character's social behavior (e.g., "He opened the box for the elephant, that's nice." "He did a bad thing.") or describing the agent character's prosocial or antisocial traits (e.g., "The bear is nice." "Such a mean piggy.") was used as target coding units for prosocial or antisocial evaluation. Mothers' responses were scored as 1 when the mother made at least one socially evaluative reference for each event, resulting in total scores that ranged from 0 to 8.[1] Two Japanese and three European American mothers' data were missing due to failure to save them. Inter-rater reliability for the coding was .93 (Cohen's kappa). All disagreements were resolved by discussion.

RESULTS

Preliminary analyses involving infants' sex showed that there were no main or interaction effects for sex ($ps > .25$); thus, the data were collapsed across sex for analyses.

[1]It is difficult to simply compare the total utterances of social evaluative speech between Japanese and American mothers as Japanese and English have distinct grammatical structures. In particular, repetition or omission of words was commonly observed in mothers' talk in this study, probably because the repeated presentation of very short events was used. We wanted to see each mother's tendency to use social evaluative expressions constantly while watching others' social behaviors with infants. Therefore, following previous studies that compared maternal speech between Japanese and Canadians using similar types of materials (i.e., short presentations of social stimuli; Lee, Nand, et al., 2017; Masuda et al., in press), we used the current coding scheme.

Social evaluation of infants

Habituation

The number of trial sets in the habituation phase was analyzed by means of a 2 (Culture: Japanese, European American) × 4 (Age: 6-months, 9-months, 12-months, 15–18-months) × 2 (Agent: prosocial, antisocial) ANOVA with all factors as between-subject variables. No main effects or interactions were significant. The number of habituation sets did not differ across culture groups and age groups.

The infants' looking time during the first three and last three sets in the habituation phase (shown in Table 2) was entered into a 2 (Culture) × 4 (Age) × 2 (Agent) × 2 (Habituation Block: first 3, last 3) mixed-model ANOVA with culture, age, and agent as between-subject variables, and habituation block as a within-subject variable. Only the main effect of habituation block was significant, $F(1, 143) = 679.59$, $p < .001$, $\eta_p^2 = 0.83$. The average looking time in the first three sets was longer than that in the last three sets, $t(158) = 27.04$, $p < .001$, Cohen's $d = 2.17$. No other main effects or interactions were significant. Thus, infants in each culture and age group entered the dishabituation phase in similar attentional states.[2]

Looking time in the dishabituation phase

Averages of infants' looking times on the consistent and inconsistent events in the dishabituation phase are shown in Table 3. A 2 (Culture) × 4 (Age) × 2 (Agent: prosocial, antisocial) × 2 (Consistency: consistent, inconsistent) mixed-model ANOVA with culture, age, and agent as between-subject variables, and consistency as a within-subject variable, was performed on infants' looking time. The main effect of age was significant, $F(3, 143) = 5.21$, $p = .002$, $\eta_p^2 = 0.10$. A post hoc test revealed that the average looking time in the dishabituation phase was longer among 15- to 18-month-old infants ($M = 16.17$, $SD = 4.65$) than among 6-month-old infants ($M = 12.90$, $SD = 4.48$) and 9-month-old infants ($M = 13.03$, $SD = 5.08$). The 12-month-old infants ($M = 15.62$, $SD = 5.19$) did not differ from other groups (all pairwise comparisons ps > .05, Tukey's HSD). The Agent × Consistency interaction was also significant, $F(1, 143) = 7.95$, $p = .005$, $\eta_p^2 = 0.05$, such that infants in the antisocial agent condition looked longer at the inconsistent event than the consistent event, $t(73) = 2.90$, $p = .005$, Cohen's $d = -0.36$.[3] However, there was no significant difference between consistent and inconsistent events in the prosocial agent condition, $t(86) = 1.63$, $p = .107$, Cohen's $d = 0.17$. These results indicate that dishabituation to the inconsistent event was shown only for the antisocial agent. The Age × Consistency and the Culture × Consistency interactions were not significant, Fs < 1.00, *n.s.*,

[2]To investigate whether there were differences in infants' attention to two event types, we coded 25% of the data of infants' looking time for prosocial and antisocial events during the first and the last three sets in the habituation phase. The data were entered into a 2 (Event: prosocial, antisocial) × 2 (Habituation block: first 3, last 3) analysis of variance with both factors as within-subject variables. Result showed no main or interaction effect of event type (Fs < 1.30, *n.s.*), suggesting that there was no bias in infants' attention to prosocial and antisocial events in the habituation phase.

[3]However, this difference in looking time between events was not significant once samples were separated into each age group in each culture, all ps > .095. Limited statistical power might account for this lack of significance.

TABLE 2
Infants' Average Looking Time in the Habituation Phase (Max = 44 Sec)

	Culture and age groups							
	Japanese				*European American*			
	6 mo	*9 mo*	*12 mo*	*15–18 mo*	*6 mo*	*9 mo*	*12 mo*	*15–18 mo*
Prosocial agent condition								
Average of first 3 sets	40.75 (5.79)	34.94 (13.41)	36.91 (8.53)	40.15 (5.77)	37.15 (6.15)	28.28 (11.97)	34.49 (11.83)	36.47 (6.88)
Average of last 3 sets	19.23 (7.07)	15.14 (5.35)	17.04 (6.00)	17.92 (5.76)	18.07 (5.93)	15.73 (14.33)	13.07 (7.79)	17.19 (6.57)
Antisocial agent condition								
Average of first 3 sets	36.65 (10.74)	39.38 (7.92)	36.54 (8.57)	38.43 (7.59)	31.22 (15.13)	35.51 (8.45)	33.47 (7.99)	35.29 (8.68)
Average of last 3 sets	17.18 (5.09)	21.65 (8.54)	19.07 (10.43)	17.77 (5.00)	17.05 (9.46)	14.97 (3.74)	17.72 (9.93)	20.95 (5.79)

Note. Looking time is presented in seconds. Standard deviation is in parentheses.
mo = months.

TABLE 3
Infants' Average Looking Time in the Dishabituation Phase (Max = 22 Sec)

	Culture and age groups							
	Japanese				*European American*			
	6 mo	*9 mo*	*12 mo*	*15–18 mo*	*6 mo*	*9 mo*	*12 mo*	*15–18 mo*
Prosocial agent condition								
Consistent event	12.12 (6.26)	12.22 (6.82)	14.70 (4.23)	17.72 (3.30)	14.29 (5.67)	12.68 (9.49)	18.20 (3.63)	17.31 (4.78)
Inconsistent event	11.88 (6.18)	11.23 (7.16)	14.05 (4.95)	17.52 (3.34)	11.06 (4.87)	12.89 (6.38)	20.23 (3.10)	14.70 (6.98)
Antisocial agent condition								
Consistent event	13.80 (2.50)	12.26 (4.87)	16.77 (3.65)	14.83 (5.06)	11.97 (5.63)	12.87 (4.68)	12.27 (5.43)	14.82 (4.31)
Inconsistent event	14.36 (4.07)	16.56 (6.05)	16.65 (6.81)	15.37 (6.59)	14.54 (5.80)	13.34 (6.90)	15.63 (9.48)	17.43 (4.09)

Note. Looking time is presented in seconds. Standard deviation is in parentheses.
mo = months.

indicating that there were no age or cultural differences in dishabituation to the inconsistent event. No other interactions were significant, Fs < 1.00, *n.s.*

Preference

Figure 2 shows infants' preferences toward prosocial or antisocial agents in the preference phase. Thirteen Japanese infants and eight European American infants who chose neither the prosocial nor the antisocial agent or who chose both agents were excluded from analyses. Binomial tests indicated that preference for the prosocial agent over the antisocial agent was observed among Japanese 15- to 18-month-olds (13 of 17 infants, one-tailed p = .025) and European American 15- to 18-month-olds (13 of 18 infants, one-tailed p = .048), but was not observed among 6-month-olds (11 of 23 Japanese infants, one-tailed p = .500; 10 of 19 European American infants, one-tailed p = .500), 9-month-olds (8 of 18 Japanese infants, one-tailed p = .407; 9 of 15 European American infants, one-tailed p = .304), or 12-month-olds (7 of 15 Japanese infants, one-tailed p = .500; 7 of 14 European American infants, one-tailed p = .500). There were no significant differences in preference across the two culture groups for any of the age groups (Fisher's exact probability test: 6-month-olds, p = 1.000; 9-month-olds, p = .491; 12-month-olds, p = 1.000; 15–18-month-olds, p = 1.000, all two-tailed).

Mothers' social explanations

As a preliminary analysis, the total number of utterance mothers made while watching the eight events was compared between two culture groups. Results showed that European American mothers talked more (M = 54.57, SD = 14.26) than Japanese mothers (M = 49.89, SD = 13.22), $t(151)$ = 2.10, p = .037, Cohen's d = 0.34.

Scores on mothers' socially evaluative references were entered into a 2 (Culture) × 4 (Infants' age) ANOVA, showing a main effect of culture, $F(1, 146)$ = 8.19, p = .005, η_p^2 = 0.05. European American mothers made more socially evaluative references

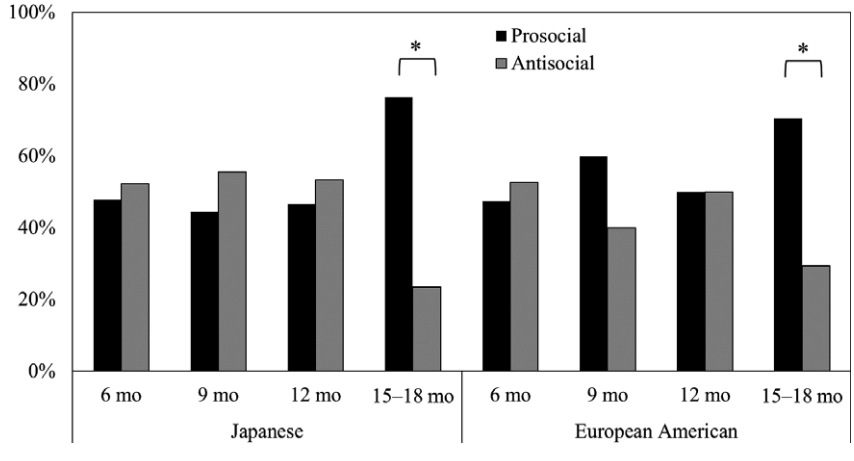

Figure 2 Percentage of infants' preference toward prosocial and antisocial agents, which necessarily add to 100%. mo = months. *p < .05.

(M = 3.20, SD = 3.01) than Japanese mothers (M = 2.07, SD = 2.60). The main effect of infants' age and the culture × infants' age interaction was not significant, Fs < 1.00, *n.s.* Then, we analyzed the correlation between total utterances and social evaluative speech, and found a weak relationship between them (r = .194, p = .016).

Relationship between infants' behavior and mothers' speech

We investigated the relationship between infants' social evaluations and mothers' socially evaluative speech. First, we explored the relationship between mothers' socially evaluative references and infants' looking time on consistent and inconsistent events in the dishabituation phase. We conducted logistic regression analyses with differences in infants' looking times (for inconsistent minus consistent events) as the predicted variable, and culture, age (in months), mothers' total utterances, and the score on mothers' socially evaluative references as predictors. Significance was assessed using a chi-square test (also known as a chi-square difference test). Analyses revealed no significant relationships between looking time differences and any of the predictors or their interactions.

Second, we examined whether infants' preferences for prosocial or antisocial agents were affected by mothers' socially evaluative references. We conducted a binary logistic regression analysis on infants' preferences (prosocial or antisocial agent). Culture, age (in months), mothers' total utterances, and mothers' evaluative references were entered into the model as predictors. Significance was assessed using a chi-square difference test. The analysis revealed that the best-fitting model included age, mothers' total utterances, and mothers' socially evaluative references, without any interactions, $\chi^2(3, 134) = 11.76$, p = .009, Nagelkerke R^2 = .11. The contribution of age to the model was marginally significant, $\beta = 0.79$, Wald = 3.19, p = .074, OR = 1.08, such that infants were more likely to show preferences for the prosocial agent over the antisocial agent as they got older. The contribution of mothers' socially evaluative references was also significant, $\beta = 0.16$, Wald = 4.87, p = .027, OR = 1.17, while the effect of mothers' total utterances was not significant, $\beta = -0.02$, Wald = 1.36, p < .243, OR = 0.98. Results indicate that infants whose mothers made more socially evaluative references while watching others' social interactions were more likely to prefer the prosocial agent to the antisocial agent, beyond the common contributions of culture, age, and mothers' total utterances.

DISCUSSION

We extended previous findings by investigating a broad sample of four infant groups aged 6–18 months from two cultures and the relationship between mothers' infant-directed speech and their infants' social evaluations. Employing a violation of expectations and a preferential reaching paradigm, we examined whether infants would predict other's behavior based on the prior observation of prosocial or antisocial behavior, whether they would show a preference for a prosocial agent over an antisocial agent, and whether these might differ between Japanese and European Americans. Furthermore, we investigated whether the socially evaluative references of mothers were related to the social evaluations of their infants.

The early development of spontaneous social evaluation across two cultures

Overall, infants in our study showed dishabituation when they observed an inconsistent behavior of an antisocial agent, but no such a dishabituation was seen for a prosocial agent. This result indicates that infants in both cultures expected the antisocial agent to behave antisocially across different situations, but had no such expectation for the prosocial agent. In the preferential reaching task, only infants aged 15–18 months showed a preference for the prosocial agent over the antisocial agent among both European Americans and Japanese. The fact that European American and Japanese infants showed similar performance on both tasks suggests that the early development of spontaneous social evaluation is not culture-specific.

Infants showed more sensitivity to an antisocial agent than to a prosocial one, which has been also reported in previous research (Cowell & Decety, 2015; Hamlin & Wynn, 2011). This suggests that negative social information is privileged from an early age. Indeed, a large body of research with adults has demonstrated that attributions made from negative behaviors are likely to be stronger than attributions made from positive behaviors (Fiske & Taylor, 1991; Reeder & Brewer, 1979; Shimizu, 2017; Skowronski & Carlston, 1989). At the neurological level, this negativity bias is clear in adults' late positive ERPs, occurring within 400–900 ms of seeing valenced stimuli (Ito & Cacioppo, 2000; Ito, Larsen, Smith, & Cacioppo, 1998). This ontologically and temporally early sensitivity to negative social information supports the evolutionary claim that this negativity bias serves the adaptive purpose of helping humans to react immediately to avoid harmful situations (e.g., Pratto & John, 1991; Taylor, 1991).

One might think that this negativity bias was evoked by more attention of infants to the antisocial than prosocial events. For example, specific physical characteristics (e.g., containing more motion) of the antisocial behavior in the habituation phase might lead infants to attend more to it and be biased toward the inconsistent event on the dishabituation trials. However, as described in Footnote 2, our preliminary analysis of the effect of event type (prosocial or antisocial) showed no difference in infants' looking time to prosocial and antisocial events in the habituation phase, suggesting that infants' sensitivity for the antisocial agent was not merely linked to an attentional bias to the negative behavior.

In the current study, reaching preference for a prosocial agent over an antisocial one was seen only in children aged 15–18 months, which seems inconsistent with findings by Hamlin and colleagues. They have reported a preference for a prosocial agent during the first year of life (Hamlin, 2014; Hamlin & Wynn, 2011; Hamlin et al., 2007, 2010). How can we explain this difference between their findings and ours? As described in the Introduction, there is an important methodological difference between studies. In our procedure, reaching preference is assessed only after the infants have seen prosocial and antisocial acts by two different agents repeatedly, and then one of them behaving consistently and inconsistently once in a different situation. Therefore, infants in our study saw an inconsistent behavior in a distinct situation: either the "helper" in the trials of the box habituation task then helped once and hindered once in the ball task, or the "hinderer" in the box trials hindered once and helped once in the ball task. In contrast, infants in previous studies were shown just one kind of behavior in

one situation; there were neither multiple events nor inconsistent behaviors. Recent work by Steckler, Woo, and Hamlin (2017) found no evidence for social evaluations among 9-month-old infants when the helper or the hinderer behaved inconsistently once, which is consistent with our results.

It is possible that our infants' reaching preference, which only emerged in the 15- to 18-month-olds, reflects a complex ability to integrate information about agents' multiple acts. Spontaneous social evaluations are about the agent rather than merely the behavior. In real life, we observe others on multiple occasions and sometimes receive inconsistent information, and we usually form social evaluations based on the behavior that is performed most of time. Our design allowed for creating an expectation of prosocial or antisocial behavior in one (box) situation, and then presented evaluatively inconsistent behavior by that same agent in a distinct (ball) situation. Only by changing behaviors and situations can one be certain that the evaluation pertains to the agent and not merely to the behavior. Therefore, the results of our study suggest that this mature and adultlike ability to socially evaluate other agents (not mere behaviors) based on multiple acts, and act on that evaluation, develops around 15 months of age. This developmental period represents a time when infants develop a variety of psychological understandings and when they show altruistic behaviors. Indeed, at 15 months old, infants show an implicit theory of mind (Onishi & Baillargeon, 2005). Although studies have suggested the possibility of an implicit understanding of false beliefs from the first year of life (e.g., Kovács, Téglás, & Endress, 2010; Luo, 2011; Southgate, Chevallier, & Csibra, 2010; Southgate & Vernetti, 2014), the ability to use implicit false beliefs to predict behavior has been reported only among infants aged 17 months and older (e.g., Senju, Southgate, Snape, Leonard, & Csibra, 2011; Southgate, Senju, & Csibra, 2007; Surian & Geraci, 2012). Furthermore, helping behaviors are shown among many infants during the middle or latter half of their second year (Dahl, Campos, & Witherington, 2011; Warneken, 2013; Warneken & Tomasello, 2007). This period in the second year may thus mark the development of the ability to mentalize, with a more mature sociomoral understanding of others occurring at the same time.

As described in the Method, the box and ball events in this study were validated by Japanese and American undergraduates, and modeled from Hamlin and Wynn (2011). They reported that 5-month-olds showed the preference for the prosocial agent over the antisocial agent, indicating that the infants could attribute prosocial and antisocial valence from these events. This seems to suggest that using these sociomoral events for 6- to 18-month-olds in this study was appropriate. Nevertheless, it is possible that the ecological validity of the stimuli was not strong enough for infants. For example, infants might interpret the *Taking event* (antisocial event) as a playful situation because they have experiences where their parent holds their toy and does not give it back for a short while as a tease. The multiple implications of goals from events might weaken the perception of consistent valence across distinct behaviors. Another possibility is that the familiarity of the events may differ across age groups and might be related to age differences in the reaching preference. For example, the ball situation may be more familiar for older infants than younger infants, as older infants have more experience playing or observing such situations and thus find it easier to understand. Future studies should test the validity of diverse types of social events as stimuli for children in early ages.

The effects of socialization on the emergence of social evaluation

The influence of socialization on the development of infants' social evaluation is poorly understood. Our study provides a novel finding regarding the relationship between mothers' socially evaluative speech and their infants' social evaluation. We found that the more often mothers made socially evaluative references to the social interactions that their children observed, the more likely their children were to show a preference for a prosocial agent over an antisocial agent. However, mothers' speech did not predict differences in infants' looking time between consistent and inconsistent events, which suggests that the underlying mechanisms of these two performances differed. Indeed, the results of an additional binary logistic regression analysis indicated that differences in looking time did not predict infants' preference for the prosocial or antisocial agent ($\beta = 0.03$, $p = .36$). So, this preference seems to reflect a complex ability to form social evaluations based on integrated information of others' multiple behaviors. Early verbal socialization may be required only for such a more mature moral understanding (see Killen & Smetana, 2014; Van de Vondervoort & Hamlin, 2016).

Previous findings have suggested that maternal infant-directed speech predicts children's social understanding when they are toddlers or young children (e.g., Meins et al., 2003, 2013; Taumoepeau & Ruffman, 2006). However, the results of the present study indicate that the influence of maternal socialization on social understanding can be seen in infancy. Of course, infants may not have a complete understanding of their mothers' verbal input, but we speculate that mothers' socially evaluative references provide a conceptual scaffold where infants can develop spontaneous evaluations of others. Maternal speech observed in the experimental room should reflect their everyday speech toward their children. Socially evaluative references by adults around infants in everyday conversation may direct, through joint attention, infants' attention to the sociomoral aspects (e.g., helping, hindering) of social interactions, and that may facilitate their spontaneous social evaluation.

However, despite our results, it remains unclear what aspects of maternal speech affect infants' development of social evaluation. It is possible that mothers' social evaluations contain specific prosodic contours (e.g., warmer in tone, higher pitch) and/or grammatical characteristics (e.g., frequent usage of questions) that elicit infants' attention. Additionally, we should be cautious in inferring a causal relationship between maternal speech and children's performance, because this study employed a cross-sectional design. It is possible that the converse is true as well, such that mothers are more likely to use social evaluative expressions while talking to infants who have more mature socio-moral understanding. Further, even with longitudinal designs, it is also possible that the correlation between mothers' speech and infants' performance is not associated with the environmental socialization, but rather with the genetic makeup shared between mothers and infants. Indeed, a recent study that examined toddlers, including twins, suggested that variation in the viewing of social scenes is strongly influenced by genetic factors (Constantino et al., 2017). Clearly, more systematic investigation is needed to explore the mechanism underlying the early developmental process of social evaluation.

Our study further showed that even in their first year, infants are exposed to culturally influenced infant-directed speech regarding social evaluation. European American mothers made more frequent socially evaluative references than Japanese mothers did. This finding is consistent with that of previous studies in adults, which have found that

people in Western cultures are more likely to attribute others' behavior to personal characteristics than are people in Eastern cultures (Fiske et al., 1998; Nisbett et al., 2001; Shimizu et al., 2017). Nevertheless, no cultural differences in infants' social evaluation were observed in our study, nor did we find cultural effects of maternal speech on infants' social evaluation. Probably infants in our study were too young to detect cultural differences. In fact, prior research has reported that significant cultural differences in perception and social cognition are evident when children are 3 years of age or older (Kuwabara & Smith, 2016; Senzaki, Masuda, Takada, & Okada, 2016). It is critical in future work to explore how culturally unique patterns of social evaluations emerge and are socialized including older age groups.

CONCLUSIONS

Given the present results and those from previous studies, it is clear that the human ability to engage in social evaluation emerges early in development. Notably, the results of the present study—which were gleaned from a broad sample of four age groups across two cultures—indicate that early development of social evaluation is not culture-specific. Furthermore, the current findings provide novel evidence of the effect of socialization on the development of social evaluation. The development of sociomoral understanding results from complicated interactions between evolutionary, cognitive, and social factors. Using a longitudinal design, future research could investigate how these factors interact with one another as children develop.

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