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Maternal behaviors mediate the relationship between socioeconomic status and joint attention

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ABSTRACT

Socioeconomic status (SES) is strongly related to parental behaviors and the quality of parent-child interactions. We examined whether through maternal behaviors, SES is linked to joint attention (JA), an important form of parent-child interactions predicting language development. At 12 months, 50 mother-infant dyads were video-recorded during 5-min free play. We coded for maternal behaviors (sensitivity, cognitive stimulation, positive affect, negative affect, control) and JA characteristics (frequency, duration, initiated by maternal following/directing, passive/coordinated, terminated by mother/infant). Mediation analyses showed that higher-SES mothers were more sensitive, less controlling, provided more cognitive stimulation, and displayed more positive affect resulting in JA interactions of higher quality (e.g., initiated by maternal following rather than directing infant's attention) and quantity (i.e., more time spent in JA). These findings contribute to current literature by revealing maternal behaviors as a mediator between SES and mother-infant JA interactions.

Introduction

Socioeconomic status (SES) is a strong predictor of children's cognitive and social development, physical health, and functional and structural brain development (Bradley & Corwyn, 2002; Brito & Noble, 2014; Hackman & Farah, 2009; Hackman, Farah, & Meaney, 2010; Hart & Risley, 1995; Hoff, 2003; Johnson, Riis, & Noble, 2016; Noble, Houston, Kan, & Sowell, 2012; Piccolo et al., 2016; Raizada & Kishiyama, 2010; Tomalski et al., 2013). One of the ways that SES exerts its effects on child development is via proximal factors like parental behaviors. Compared to lower-SES parents, higher-SES parents are likely to show more cognitively stimulating behaviors, positive affect, and sensitivity towards their children and fewer attempts to direct their children's behaviors (e.g., Tamis-LeMonda, Briggs, McClowry, & Snow, 2009). SES is also closely associated with the quality and quantity of parent-child interactions such that higher-SES parents engage in more social interchanges and talk more with their children (Hart & Risley, 1995; Hoff, 2003).

SES differences may also be observed during parent-child interactions when they establish joint attention (JA), in other words, when they attend together to an object, event, or symbol (Bakeman & Adamson, 1984; Markus, Mundy, Morales, Delgado, & Yale, 2000; Seibert, Hogan, & Mundy, 1982; Tomasello & Farrar, 1986). Sharing experiences with a partner while having a mutual focus of attention is thought to optimize the capacity of infants to gain knowledge from social interactive environments (Baldwin, 1995; Bruner, 1981; Mundy et al., 2007). Infants' ability to coordinate and maintain attention with another person to a common point of interest is a precursor of various pivotal facets of social, cognitive, and communicative development such as language (Carpenter, Nagell, Tomasello, Butterworth, & Moore, 1998; Saxon, Colombo, Robinson, & Frick, 2000; Tomasello & Todd, 1983), theory of mind (Mundy, Sigman, & Kasari, 1994), executive functions (Brandes-Aitken et al., 2020), self-regulation (Vaughan van Hecke et al., 2012), and intelligence (Saxon et al., 2000). Despite the predictive role of early joint attention (JA) for later sociocognitive abilities, the factors that may affect the quantity and the quality of JA episodes established by mothers and their infants are largely unknown. In the present paper, we investigate whether SES predicts the formation and maintenance of JA interactions by 12-month-old infants and their mothers via positive (e.g., sensitivity) and negative (e.g., intrusiveness) maternal behaviors.

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Joint attention

JA capacity of infants emerges early in the second half of first year. Even though earlier research suggested that infants start to respond to the JA bids of adults by following their gaze, vocalization, and pointing at around 6 months of age (Butterworth & Cochran, 1980; Scaife & Bruner, 1975), more recent research indicated that this ability emerges at a later age, around 9–10 months (Deák, Triesch, Krasno, de Barbaro, & Robledo, 2013). Infants' ability to follow gaze may depend on the measurement setting where infants follow an adult's gaze more frequently in controlled laboratory settings (Brooks & Meltzoff, 2008; Butterworth & Jarrett, 1991) compared to more cluttered home environments (Deák, Walden, Yale Kaiser, & Lewis, 2008, 2018). As infants reach around 9 months, they can follow the gaze and pointings of adults to the targets in their front or peripheral visual field (Flom, Deák, Phill, & Pick, 2004), and initiate JA with their partners using cues such as gestures and vocalizations (Bakeman & Adamson, 1984; Butterworth & Cochran, 1980; Moore & Dunham, 1995). Around their first birthdays, infants start distributing their attention between objects and their partners (Crais, Douglas, & Campbell, 2004; de Barbaro, Johnson, Forster, & Deák, 2016; Liszkowski, Carpenter, Henning, Striano, & Tomasello, 2004), follow the pointing of adults to the targets behind them (Deák, Flom, & Pick, 2000), and use declarative pointing gestures by which they can call their partners' attention to something interesting (Butterworth & Morissette, 1996; Camaioni, Perucchini, Bellagamba, & Colonnesi, 2004; Carpenter et al., 1998). The nature of infants' JA interactions with their partners also changes with time. For example, the longitudinal study of Bakeman and Adamson (1984) showed that from 6 to 18 months, infants spent more time in coordinated JA (i.e., the child and the partner attend to the same activity, and the child evidences awareness of the partner's involvement by looking at the partner, vocalizing, or turn-taking behaviors), while the time they spent in passive engagements (i.e., the child and the partner attend the same activity but the child does not show awareness of the other person's involvement) did not change over time.

JA interactions in mother-infant dyads are particularly important for the development of children's language and communicative skills. By following 1-year-old children for five months, Tomasello and Todd (1983) demonstrated that children had larger expressive vocabularies if they spent more time in JA with their mothers and if these interactions were initiated by maternal following rather than maternal directing of infants' attention. Similar advantages for longer JA interactions initiated by maternal following were found by Carpenter et al. (1998) in 9- to 15-month-old infants' vocabulary and gesture production. Furthermore, by investigating the predictive role of early JA interactions of mother-infant dyads (at 6 and 8 months) for children's later language and intelligence development (at 17, 24, and 40 months), Saxon et al. (2000) found that infants who engaged in more frequent JA with their mothers had greater vocabulary knowledge and higher intelligence scores at 24 and 40 months, respectively.

Socioeconomic status, parental behaviors, and joint attention

Converging evidence suggests that SES is related to child developmental outcomes and parenting practices (for reviews see Bradley & Corwyn, 2002; Conger & Donnellan, 2007). One possible explanation for the relationship between SES and parental behaviors is through parental goals and values (Hoff, Laursen, Tardif, & Bornstein, 2002). High-SES parents value the autonomy of children, so they display warmth and autonomy support to a greater extent and are less punitive towards their children (Kelley, Sanchez-Hucles, & Walker, 1993; Tamis-LeMonda, Shannon, Cabrera, & Lamb, 2004; Whipple, Bernier, & Mageau, 2011). Low-SES parents, on the other hand, value conformity, tend to endorse harsher discipline practices and be more controlling and restrictive (Harwood, Schoelmerich, Ventura-Cook, Schulze, & Wilson, 1996; Luster, Rhoades, & Haas, 1989). High- and low-SES parents show differences in their beliefs and knowledge about child development as well. Compared to low-SES parents, high-SES parents are more likely to believe that they have a substantial influence on their children's development (Bornstein, Hahn, Suwalsky, & Haynes, 2003; Bornstein, Yu, & Putnick, 2020; Brody, Flor, & Gibson, 1999) and have easier access to recent information about child development (Bronfenbrenner, 1958).

Compared to high-SES parents, low-SES parents tend to experience more stressful living conditions and less advantageous neighborhood characteristics, which may be associated with less sensitive and supportive behaviors observed in low-SES parents (Ceballo & McLoyd, 2002; Conger & Conger, 2002; Conger & Elder Jr, 1994; Hoff et al., 2002; Lipsey & Wilson, 1993). Parental sensitivity can be measured as a macro-level variable such as rating sensitivity based on different parental behaviors during a home visit (e.g., Ainsworth, Bell, & Stayton, 1974; Tamis-LeMonda et al., 2004). Alternatively, sensitivity can also be assessed on a micro-level where parental responses to children are scored in small time segments such as examining whether the parent responds to an infant's bid for attention in a timely manner (e.g., Mason, Kirkpatrick, Schwade, & Goldstein, 2018; Miller, Ables, King, & West, 2009; Miller & Gros-Louis, 2013; Miller & Gros-Louis, 2017). The difference in parental sensitivity across SES groups exists in both micro- (Richman, Miller, & LeVine, 1992) and macro-level assessments (Baydar & Akcinar, 2015; Suor, Sturge-Apple, & Skibo, 2017; Tamis-LeMonda et al., 2004, 2009).

SES may be associated with JA in mother-infant dyads due to several reasons. First, lower SES is usually associated with economic hardship which results in higher stress levels in parents. Parental stress and depression are linked to more negative parental behaviors (Conger & Donnellan, 2007) and may result in lower frequency of interactions such as JA. Second, lower-SES households are in general more crowded and noisy than higher-SES households (Deater-Deckard, Chen, Wang, & Bell, 2012; Lecheile, Spinrad, Xu, Lopez, & Eisenberg, 2020) which may result in fewer opportunities for JA time between mothers and infants. Third, lower-SES parents are usually more controlling and make more attempts to direct their children's behavior (Tamis-LeMonda et al., 2009). This may result in differences in how JA interactions are formed, maintained and terminated in mother-infant dyads from different SES levels (e.g., more maternal rather than infant initiation in lower-SES families). Fourth, SES is related to richer use of parental verbal and nonverbal communication cues such as child-directed speech and gesture (Hoff, 2003; Hoff-Ginsberg, 1991; Huttenlocher, Vasilyeva, Cymerman, & Levine, 2002; Rowe, 2008; Rowe & Goldin-Meadow, 2009). That higher-SES parents provide more verbal and nonverbal input during their interactions with infants may easily attract the attention of infants and result in longer JA interactions. Finally, it is well-established that SES is positively associated with positive parental behaviors like sensitivity (i.e. accurate perceptions and interpretations of children's needs and interests, and providing appropriate and emotionally warm responses to those signals) and cognitive stimulation (i.e. guiding children by providing essential speech and acts, and structuring the play according to the developmental level of the child) (Baker & Brooks-Gunn, 2020; Baydar & Akcinar, 2015; Kalil, Ryan, & Corey, 2012; Richman et al., 1992; Suor et al., 2017; Tamis-LeMonda et al., 2004, 2009). Mothers with higher sensitivity may follow their infants' attentional focus to a greater extent resulting in more JA interactions initiated by maternal following rather than directing of infants' attention. Furthermore, mothers who demonstrate more positive behaviors towards their children may maintain longer JA interactions.

Only three studies compared SES differences in mother-child JA interactions and infants' JA-related behaviors. In a home observation study, Hoff-Ginsberg (1991) reported no SES-related differences in mother-toddler toy play in terms of the percentage of time spent in JA. Similarly, Saxon and Reilly (1999) did not find any SES differences in the frequency and duration of JA interactions between mothers and toddlers. However, compared to lower-SES mothers, higher-SES mothers were less persistent in maintaining JA interactions further after their

children accepted their calls for JA. Finally, Abels and Hutman (2015) used a more controlled setting to investigate SES differences in 12-month-old infants' responding to and initiating JA with an experimenter. Infants from higher-SES families displayed JA initiation actions (i.e., pointing, eye contact) more frequently while infants from lower-SES families followed the experimenter's points more frequently. The authors explained these findings with different socialization goals of the families such that higher-SES families encourage their children to be more independent while lower-SES families socialize their children to be more obedient. Overall, these findings suggest that low- and high-SES mother-child dyads may not differ in the time spent in JA but may differ in how JA interactions are initiated and maintained. An unexplored question is whether SES affects JA interactions via parental behaviors directed towards children such as sensitivity and intrusiveness.

Limited evidence about how parental behaviors are associated with JA interactions suggests that mothers' sensitivity and guiding behaviors are related to the JA interactions they establish with their infants. Londoño and Farkas (2018) showed that more sensitive mothers engaged in shared interactions with their 12- to 14-month-old infants more frequently than less sensitive mothers. Raver and Leadbeater (1995) found that among socioeconomically disadvantaged adolescent mothers, more sensitive ones spent more time in JA with their 12- to 20-month-old infants. Further, Gaffan, Martins, Healy, and Murray (2010) revealed that mothers' level of teaching at 6 months of age, in which they guided and encouraged their infants by instructions and demonstrations, predicted the time the dyads spent in shared attention at 9 months of age.

Current study

The present study is the first to test the mediating role of maternal behaviors between SES and JA interactions of mothers with their infants. To test our hypotheses, 12-month-old infants and their mothers were observed during free play. These interactions were coded for JA and maternal behaviors in terms of sensitivity, positive and negative affect, cognitive stimulation, and controlling behaviors. Compared to low-SES mother-infant dyads, we expected high-SES mother-infant dyads to spend more of their free play time in JA and have longer bouts of JA which are more frequently initiated by maternal following rather than maternal directing of infants' attention. We further expected a mediating role for maternal behaviors between SES and JA. We hypothesized that high-SES mothers would demonstrate more sensitivity leading to longer JA interactions that are more frequently initiated by maternal following and terminated by infants rather than mothers. We also expected high-SES mothers to show more positive affect and cognitive stimulation which may lead to longer JA interactions with a high proportion of coordinated JA where the infant shows explicit awareness of the mother's simultaneous attentional focus. A higher degree of controlling behaviors was expected in low-SES mothers which may result in JA interactions more frequently initiated by maternal direction of infants' attentional focus and terminated more frequently by the mothers instead of infants. Finally, low-SES mothers may demonstrate more negative affect leading to shorter JA interactions.

Method

Participants

The data come from a larger longitudinal study conducted in Turkey investigating infants' communicative, social, and cognitive development from 8 to 18 months by taking measurements at eight time points (i.e. at 8, 9, 10, 11, 12, 13, 14, and 18 months). We used the data of the entire sample from free play sessions at 12 months (M = 12.16, SD = 9.22 days). At 12 months, 47 infants (27 girls) and their mothers participated in the study. Three additional infants were excluded due to developmental delay, growing up in a bilingual home, or being born prematurely. The mean age of the mothers was 31.40 (SD = 5.64) at their first visit when their infants were 8 months of age. Thirty-one (66%) of the infants did not have a sibling, while 10 (21.3%) had one sibling, and 6 (9.8%) had two siblings. Parents received small gifts such as diapers and children's books at each visit.

Materials and procedure

At 8 months, demographic information was collected from the mothers. At 12 months, mothers and infants participated in five-minute free play sessions in the laboratory after they took part in other tasks in an hour-long visit (such as tasks assessing infants' helping, imitation, and gaze behavior). During the free play session, mother-infant dyads sat on the floor on a play rug (see Fig. 1). Mothers were given a basket of age-appropriate toys and instructed to play with their infants as they do at home. The toys were a drum with two drumsticks, a car, a duck, a shape sorter with eleven colorful geometric shapes, and a colorful tower puzzle with seven beakers. Free play sessions were recorded with four cameras in each corner of the room.

Data coding

Socioeconomic status

Based on the SES index of Berzofsky, Smiley-McDonald, Moore, and Krebs (2014), a composite SES score was created for each participant by using the standardized summary metrics of maternal education, mothers' employment status, and household expenditure. Maternal education was coded on a 4-point-scale: 0 = less than high school (n = 14), 1 = high school degree (n = 12), 2 = college degree (n = 17), and 3 = masters or doctorate degree (n = 3). Mothers' employment status was coded as either 0 = unemployed (n = 33) or employed = 1 (n = 14). Instead of the original income variable in Berzofski et al.'s (2014) article, we used household expenditure. Previous studies used household expenditure as an indicator of economic well-being in Turkish samples (Baydar & Akcinar, 2015). Further, as expected, there is a positive correlation between household income and expenditure in families living in Turkey (Alp & Seven, 2019). Household expenditure was coded on a 3-point scale: 0 = between 1200 and 3000 ₺ (n = 24), 1 = between 3000 and 5000 ₺ (n = 13), and 2 = more than 5000 ₺ (n = 10). Maternal education was significantly correlated with household expenses (r_s = 0.55, $p < .001$) and employment status (r_s = 0.59, $p < .001$). Household expenses were also significantly associated with employment status (r_s = 0.31, p = .04).

Maternal behaviors

Maternal behaviors were coded from free play videos based on the Mother-Child Affect, Responsiveness and Engagement Scale (C-CARES, Tamis-LeMonda, 1999; Tamis-LeMonda et al., 2009; see Table 1 for a more detailed explanation of the scale). This scale consists of five subscales where each subscale includes two or three items. *Sensitivity* was coded based on the responsiveness and participation items; *Cognitive Stimulation* was coded based on the structuring and explanatory language items; *Positive Affect* was coded based on the positive affect and positive verbal expressions; *Negative Affect* was coded based on the negative affect and negative verbal expressions; *Control* was coded based on the intrusiveness, inflexibility, and directive language items.

For the coding of maternal behaviors, free play videos were divided into five one-minute samples and each sample was coded for maternal behaviors on a 5-point Likert scale ranging from 1 = “not observed” to 5 = “constantly observed”. For each behavior category, mothers received an average score calculated over five one-minute video samples. Maternal behaviors were coded by a trained coder who was blind to the hypotheses of the study, and a randomly selected 20% of the videos were coded by the first author. Intraclass correlation analyses between the two coders showed high reliability for each of the categories; Cronbach alphas ranged from 0.84 to 0.96. Disagreements were resolved through

Fig. 1. Mother-child interactions in free play setting.

Table 1
The coding scheme for maternal behaviors.

Items	Definitions and Examples
Sensitivity	
Responsiveness	Mother is sensitive to the child's cues (vocalizations, gazes, pointings, play preferences) and provides appropriate responses to these cues (e.g., placing an object in front of the child which is pointed by the child).
Participation	Instead of leaving the child playing alone, mother participates in the child's game by attending to the child's focus and actions.
Cognitive Stimulation	
Explanatory Language	Mother uses a descriptive language in which she mentions the features of objects and how things work by using adjectives and labels (e.g., "See, there are two sticks to play with the drum.").
Structuring	Mother structures the game for the child by showing how to play with toys and placing the objects within the reach of the child.
Positive Affect	
Positive Affect	Mother displays positive emotions by her attitudes, voice tone and facial expressions.
Positive Expressions	Mother uses positive affective words towards the child to praise and encourage the child to play with the toys (e,g., Well done, you did great.).
Negative Affect	
Negative Affect	Mother displays negative emotions and discontent with her voice tone and facial expressions.
Negative Expressions	Mother uses negative affective words by criticizing and discouraging the child (e.g., "I don't like what you're doing").
Controlling	
Intrusiveness	Mother shows controlling behaviors by interrupting child's actions and focus, taking the objects away from the child and bringing new objects within the focus of the child.
Inflexibility	Mother insists on playing with certain objects even if the child is not interested with the toy.
Directive Language	Mother speaks a directive language by using imperatives and pronouns to a high degree. (e.g., "Put that toy here.").

discussion and reaching a consensus by two coders.

Joint attention

The coding scheme was adapted from the studies of Tomasello and Todd (1983), and Bakeman and Adamson (1984). An interaction was coded as JA if both the infant and the mother looked at the same object for at least 3 s. We coded for (1) the duration, and (2) the number of the JA episodes, (3) how JA episodes were initiated and (4) terminated, and (5) whether a JA episode was characterized as passive or coordinated. *Total duration* was defined as the sum of the durations across all JA episodes. *Average duration* was calculated by dividing the total duration to the number of JA episodes.[1] We coded the initiation of the JA episodes as *Mother Directs* if the episode started with the mother's attempt to shift the attention of the infant to a toy or activity. The initiation was coded as *Mother Following* if the mother joined into the infant's ongoing focus of attention. Incidences that infants initiated the JA episodes were very few and were coded as mother following incidences. A JA episode was coded as *Terminated by Infant (mother)* if the infant (mother) looked away from the jointly attended object or activity first for at least 3 s. Lastly, we coded the type of JA between the partners as *Passive* if both partners looked at the same object or activity but the infant showed little awareness of the mother's involvement. A JA episode was coded as *Coordinated* if the infant demonstrated explicit awareness of the mother's involvement through looks to the mother's face, vocalizations, gestures, or turn-taking activities. Mother Directs and Mother Follows, JA Terminated by Infant and JA Terminated by Mother, and Passive and Coordinated categories were mutually exclusive. JA episodes were coded using the ELAN software (Lausberg & Sloetjes, 2009). Half of the coding was done by the first author and the other half was done by an undergraduate student of psychology who was blind to the hypotheses of the study and had not coded the maternal behaviors. Fifteen percent of the videos were randomly selected for calculating interrater reliability. Cronbach alphas ranged from 0.85 to 0.98 indicating high reliability. Disagreements were resolved through discussion and reaching a

[1] If the last joint attention episode was ended by the experimenter, that episode was not included in the calculation of average duration.

consensus by two coders.

Results

Descriptive statistics and correlations

Descriptive information on SES, maternal behaviors, and JA are presented in Table 2. Independent-samples *t*-test analyses showed no significant differences between male and female infants for any of the variables. Table 3 shows the correlations between the study's variables. SES was negatively associated with the percentages of JA episodes that were initiated and terminated by the mothers and it was not related to other JA variables. SES was positively correlated with sensitivity, cognitive stimulation, and positive affect while it was negatively correlated with negative affect and controlling behaviors.

In line with our hypothesis, positive maternal behaviors, i.e. sensitivity, cognitive stimulation, and positive affect were positively related to the total and average duration of JA episodes. Furthermore, mothers who exhibited more negative affect during their interactions with their infants spent less time in JA in total. Mothers' controlling behaviors were not related to the duration of the episodes.

We expected sensitivity to be positively associated with the proportion of JA episodes initiated by maternal following, and controlling behavior to be positively associated with the proportion of JA episodes initiated by maternal directing. Results supported these hypotheses. We found that mothers' sensitive behaviors were positively correlated with the percentage of JA episodes initiated by maternal following while controlling behaviors were positively correlated with the percentage of episodes initiated by maternal directing.

Regarding the termination of the episodes, we expected sensitivity to be negatively associated with the percentage of episodes terminated by the mother; this hypothesis was supported by our findings. The termination of the episodes was not related to any other maternal behaviors.

Finally, we expected positive affect and cognitive stimulation to be positively correlated with the percentage of coordinated episodes. Results only showed a positive association between maternal sensitivity and the proportion of coordinated JA. The frequency of JA episodes was not associated with any of the maternal behaviors.

The mediating role of maternal behaviors between SES and joint attention

Our expectation for the mediating role of maternal behaviors was that higher SES would be related to high-quality JA episodes (e.g., longer; coordinated; initiated by maternal following) via more positive maternal behaviors. Mediation analyses were conducted with SES as the predictor variable, JA characteristics as the outcome variable, and the maternal behaviors as the mediator. We constructed mediation models only for those outcome variables which were significantly associated with maternal behaviors. Note that there was no significant association between SES and some JA variables that were tested in mediation models (i.e., total and average duration of JA episodes, and the percentage of coordinated JA episodes). However, a mediation model can be built in the absence of a significant relationship between the predictor and the dependent variable (Hayes, 2009, 2013; MacKinnon & Fairchild, 2009). Table 4 summarizes the significant (and one marginally significant) models and the outcomes. Simple mediation analyses were conducted with a bootstrap procedure with 5000 resampling and 95% confidence intervals via Process Macro extension of IBM SPSS (Preacher & Hayes, 2008).

Results of four mediation models having the total amount of JA duration as the outcome variable (Models 1 to 4) indicated that among the maternal behaviors, sensitivity (standardized indirect effect coefficient = 0.31, *SE* = 0.10, 95% BCA-CI = 0.12 − 0.50), cognitive stimulation (standardized indirect effect coefficient = 0.16, *SE* = 0.09, 95% BCA-CI = 0.007 − 0.37), positive affect (standardized indirect effect coefficient = 0.21, *SE* = 0.07, 95% BCA-CI = 0.09 − 0.36), and negative affect (standardized indirect effect coefficient = 0.13, *SE* = 0.08, 95% BCA-CI = −0.009 − 0.30; marginal effect[2]) mediated the relationship between SES and the amount of total time the dyads spent in JA interactions. Higher-SES mothers displayed more sensitivity, cognitive stimulation, positive affect, and less negative affect which resulted in longer overall durations of JA interactions with their infants.

When the average JA duration was used as the outcome variable (Model 5), the relationship between SES and average JA duration was only mediated by maternal sensitivity (standardized indirect effect coefficient = 0.23, *SE* = 0.08, 95% BCA-CI = 0.08 − 0.41) indicating that higher-SES mothers were more sensitive towards their infants leading to longer bouts of JA interactions. Maternal cognitive stimulation and positive affect did not mediate the relation between SES and average duration of JA episodes. In terms of the initiation of the JA episodes, mothers' controlling behavior as a mediator had a marginal indirect effect between SES and JA interactions initiated by maternal direction (Model 7) (standardized indirect effect coefficient = −0.11, *SE* = 0.07, 95% BCA-CI = −0.26 − 0.003) while maternal sensitivity was not a significant mediator. Thus, there was a trend of higher-SES mothers being less controlling and as a result following their infants' focus of attention to initiate JA to a greater extent. In terms of the termination of the JA episodes, maternal sensitivity significantly mediated the relationship between SES and JA interactions terminated by mothers (Model 6) (standardized indirect effect coefficient = −0.16, *SE* = 0.06, 95% BCA-CI = −0.29 − 0.05), indicating that higher-SES mothers tended to act more sensitively and terminate JA interactions to a lesser degree. Lastly, maternal sensitivity did not significantly mediate the relationship between SES and the percentage of coordinated JA episodes. Visual depiction of the mediation models is presented in the Supplementary Materials.

Table 2
Descriptive statistics.

Variables	*M*	*SD*	Range
Socioeconomic Status (0–6)	2.15	1.81	0–6
Maternal Behaviors			
Sensitivity (1–5)	2.55	0.52	1.1–3.7
Cognitive Stimulation (1–5)	2.22	0.47	1.1–3.3
Positive Affect (1–5)	2.13	0.57	1.1–3.7
Negative Affect (1–5)	1.65	0.56	1.0–3.2
Control (1–5)	1.91	0.60	1.1–3.7
Joint Attention (JA)			
JA Frequency	6.43	2.26	2–11
JA Total Duration (sec)	191.16	62.75	32.88–296.84
JA Average Duration (sec)	31.16	17.19	10.96–80.67
Mother Directs (%)	67.17	23.87	0–100
Mother Terminates (%)	42.19	24.35	0–100
Coordinated JA (%)	64.94	22.31	20–100

Note. One outlier data point (>M + 3SD) was excluded from the average joint attention duration (148.42 s). Since JA-Mother Directs and JA-Mother Follows, JA-Mother Terminated and JA-Infant Terminated, and Passive and Coordinated categories were mutually exclusive, only one category was reported.

Discussion

In this study, we investigated whether SES is associated with JA interactions in mother-infant dyads via maternal behaviors. This is the first study to show that SES had an indirect effect on mother-infant JA interactions via positive and negative maternal behaviors. Mothers with higher-SES exhibited more sensitive, cognitively stimulating, and

[2] Even though the mediation model for the indirect effect of SES on the JA total duration via maternal negative affect explained a significant amount of variance in the data, the confidence intervals contain zero but the lower limit (i.e. –0.009) is close to zero.

Table 3
Correlations among variables.

Variables	1	2	3	4	5	6	7	8	9	10	11	12
Maternal Behaviors												
1.Sensitivity	–											
2.Cognitive Stimulation	0.45** [0.33–0.81]	–										
3.Positive Affect	0.64** [0.50–0.93]	0.48** [0.27–0.75]	–									
4.Negative Affect	−0.45** [−0.83–0.25]	−0.07 [−0.46–0.13]	−0.38** [−0.70–0.19]	–								
5.Controlling	−0.24 [−0.65–0.05]	−0.21 [−0.25–0.34]	−0.22 [−0.55–0.02]	0.45** [0.34–0.85]	–							
JA Characteristics												
6.JA Frequency	−0.10 [−0.38–0.21]	0.10 [−0.20–0.36]	0.01 [−0.35–0.28]	0.13 [−0.15–0.44]	0.18 [−0.10–0.52]	–						
7.JA Total Duration	0.52** [0.39–0.83]	0.44** [0.28–0.74]	0.51** [0.28–0.77]	−0.34* [−0.70–0.06]	−0.05 [−0.34–0.30]	0.06 [−0.23–0.46]	–					
8.JA Average Duration	0.51** [0.22–0.74]	0.39* [0.06–0.53]	0.39** [0.11–0.58]	−0.28 [−0.55–0.11]	−0.03 [−0.44–0.14]	−0.47** [−0.90–0.25]	0.68** [0.43–0.88]	–				
9.Mother Directs%	−0.37* [.-51–0.11]	0.01 [−0.24–0.40]	−0.12 [.-24–0.31]	0.03 [−0.21–0.31]	0.41** [0.13–0.62]	0.13 [−0.16–0.37]	−0.09 [−0.36–0.31]	−0.16 [−0.51–0.19]	–			
10.Mother Terminates%	−0.46** [−0.70–0.21]	−0.07 [−0.34–0.21]	−0.24 [−0.56–0.04]	0.14 [−09–0.45]	0.10 [−0.27–0.35]	−0.26 [−0.55–0.08]	0.01 [−0.39–0.26]	0.18 [−0.22–0.51]	0.05 [−0.28–0.32]	–		
11.Coordinated JA%	0.34* [0.06–0.57]	0.01 [−0.25–0.24]	0.18 [−0.04–0.41]	−0.23 [−0.54–0.11]	−0.02 [−0.39–0.29]	−0.22 [−0.57–0.07]	0.40** [0.15–0.68]	0.43** [0.12–0.73]	−0.27 [−0.53–0.04]	−0.08 [−0.37–0.26]	–	
Socioeconomic Status												
12.Socioeconomic Status	0.49** [0.26–0.72]	0.33* [0.01–0.53]	0.50** [0.19–0.70]	−0.35* [−0.57–0.23]	−0.34* [−0.60–0.07]	0.14 [−0.17–0.39]	0.26 [−0.03–0.55]	0.18 [−0.20–0.43]	−0.31* [−50–0.01]	−0.31* [−0.63–0.01]	0.11 [−0.24–0.42]	–

Note.*$p < .05$, ** < 0.01 (two-tailed). Spearman rho values were reported. Bootstrapped confidence intervals were reported in brackets. JA = Joint Attention.

Table 4
Results of the significant mediation models.

Model	*β*	*SE*	*p*	R^2	*F*	*p*
Model 1: SES ➜ Sensitivity ➜ Total JA duration (*sec*)				0.40	14.60	<0.001
Intercept	−5.27	37.68	0.89			
SES	−0.05	4.67	0.72			
Sensitivity	0.66	15.89	<0.001			
Model 2: SES ➜ Cognitive stimulation ➜ Total JA duration (sec)				0.31	9.72	<0.001
Intercept	31.99	37.89	0.40			
SES	0.10	4.66	0.45			
Cognitive stimulation	0.52	17.48	<0.001			
Model 3: SES ➜ Positive affect ➜ Total JA duration (sec)				0.27	7.90	0.001
Intercept	72.89	31.44	0.02			
SES	0.05	5.05	0.74			
Positive affect	0.49	15.53	0.001			
Model 4: SES ➜ Negative affect ➜ Total JA duration (sec)				0.15	3.78	0.03
Intercept	238.50	35.81	<0.001			
SES	0.13	5.40	0.39			
Negative affect	−0.31	17.03	0.049			
Model 5: SES ➜ Sensitivity ➜ Average JA duration (sec)				0.20	5.38	0.008
Intercept	−7.24	11.96	0.55			
SES	−0.11	1.49	0.50			
Sensitivity	0.49	5.06	0.003			
Model 6: SES ➜ Sensitivity ➜ JA terminated by mothers%				0.19	5.18	0.009
Intercept	86.45	16.94	<0.001			
SES	−0.16	2.10	0.29			
Sensitivity	−0.34	7.14	0.03			
Model 7: SES ➜ Controlling ➜ Mother directs%				0.13	3.11	0.05
Intercept	48.32	14.16	0.001			
SES	−0.12	2.03	0.43			
Controlling	0.29	6.04	0.06			

positive affect behaviors, and in turn, spent a larger amount of their free play time in JA with their infants. Further, more sensitive behaviors of mothers with higher-SES resulted in longer bouts of JA interactions, which were less frequently initiated by maternal direction and terminated by the mothers. Another novel finding was that mothers who were more controlling towards their infants initiated JA more frequently by directing instead of following their infants' attention. In line with previous studies, we did not observe a direct relationship between SES and the number and duration of JA interactions between mothers and infants (Hoff-Ginsberg, 1991; Saxon & Reilly, 1999). However, we found a direct association between SES and the initiation and termination of JA such that compared to higher-SES dyads, JA interactions were initiated by maternal direction to a greater extent and more frequently terminated by the mothers in lower-SES dyads.

A novel contribution of this study was the finding that SES was indirectly related to JA interactions through maternal behaviors. Our results support and extend previous literature on the mediating role of parental behaviors between SES and child development. Previous studies well documented that through parental behaviors, SES exerts its effects on various aspects of cognitive and social development (Ashiabi & O'Neal, 2015; Bradley & Corwyn, 2002; Demir & Küntay, 2014). For example, studies showed that maternal sensitivity (i.e., degree of mothers' hostility, responsiveness, and autonomy support) and supportiveness (i.e., degree of mothers' cognitive stimulation, and positive regard) mediate the association between family SES and child cognitive and social outcomes (Bøe, Sivertsen, Heiervang, et al., 2014; Mistry, Biesanz, Chien, Howes, & Benner, 2008; Raviv, Kessenich, & Morrison, 2004). It has been theorized that low-SES groups which are more likely to deal with the less advantageous neighborhood characteristics and stressful living conditions display parental negative affect and controlling behaviors which result in adverse child cognitive outcomes (Conger & Conger, 2002; Conger & Elder Jr, 1994; Hoff et al., 2002). Further, better educated parents may have more knowledge about child development and use more effective strategies for their children's social and cognitive development (Bornstein et al., 2003). The present study contributes to those accounts by demonstrating an indirect effect of SES on the quality of mother-infant JA interactions via positive and negative maternal behaviors.

Among the maternal behaviors, sensitivity was the strongest predictor of JA-related behaviors as it was correlated with the duration, initiation (i.e., mother directs/mother following), termination, and type (i.e. coordinated/passive) of JA episodes. These relations support previous findings showing that more sensitive mothers spend more time in JA (Londoño & Farkas, 2018; Raver & Leadbeater, 1995). Since sensitive mothers are able to perceive the needs and interests of their children, and provide appropriate, timely,and contingent responses, they might encourage their children to continue to take part in the ongoing activity leading to longer JA interactions. In line with this interpretation, Mason et al. (2018) found that 5-month-old infants who received high levels of sensitive behaviors from their mothers preferred to look at the objects in the hands of their mothers more frequently compared to infants whose mothers showed a high ratio of directive behaviors.

Mother-infant dyads spent more time in JA if the mothers showed more positive affect and provided more cognitive stimulation. Mothers' positive affect such as praising and complimenting may reinforce children for participating in the shared activity and exploring the objects. Mothers who show high levels of cognitive stimulation can engage their children in age-appropriate learning activities, thus encouraging infants to share attention for longer time periods. On the other hand, children of mothers who display more negative affect by expressing discontent and displeasure may lose interest in shared activities.

Mothers' controlling behaviors were not related to the duration of JA episodes, but controlling behaviors were related to the manner of initiation of JA such that in dyads with more controlling mothers, JA episodes were more frequently initiated by maternal direction. Our results suggest that more controlling mothers initiate JA by directing their infants' attention to an object or activity more often, but when JA is established, they are not different from less controlling mothers in terms of terminating the shared interaction. In dyads with more controlling mothers, mothers were not more likely to terminate JA interactions than dyads with less controlling mothers. Mostly it was the infants who looked away from the shared attention first, probably due to their limited capabilities of sustaining attention (Ruff & Lawson, 1990). An interesting question for future research is whether mothers who differ in their controlling levels act differently towards their children in terms of maintaining children's attention to the shared object or activity. Further, mothers' cognitive stimulation, positive and negative affect were not related to how JA episodes started. These behaviors seem to be mostly about how the mothers manage the mutual engagement, what kind of games they play during the JA episodes, and how they keep the child engaged during play rather than how they initiate or terminate JA episodes.

Among the maternal behaviors, sensitivity was the only one correlated with the proportion of coordinated JA episodes. That coordinated JA was not related to mothers' positive affect and cognitive stimulation behaviors but was only related to maternal sensitivity suggests that infants' ability to establish coordinated JA may in part depend on

caregivers' timely and contingent responses. Parents' timely verbal and nonverbal responses to infants' behaviors may attract infants' attention to parents' responsive behaviors leading to coordinated JA more often. Another explanation for the relationship between sensitivity and coordinated JA may be that infants may be more likely to coordinate their attention between objects and their caregivers when dyads engage in turn-taking games (e.g., beating the drum by taking turns) more often. Bigelow, MacLean, and Proctor (2004) demonstrated that when mothers display sensitive behaviors, children become more likely to play such functional and relational games.

Strengths, limitations, and future studies

This study has remarkable strengths with its detailed coding system. Both maternal behaviors and quantitative and qualitative features of JA episodes were coded in detail. Further, the coding was conducted by different coders, increasing the reliability of the study. Observing the mother-infant interaction in the laboratory with the same toys and in a fixed time duration provided a controlled environment to detect individual differences across the dyads. Further, the context of JA in parent-child interactions in non-WEIRD (WEIRD: White, Educated, Industrialized, Rich, and Democratic) societies has been understudied before (Childers, Vaughan, & Burquest, 2007). As it has been debated in the literature, more studies examining the psychological phenomena in non-WEIRD societies are needed (Henrich, Heine, & Norenzayan, 2010; Muthukrishna et al., 2020). Families in Turkey have different structures, for example, the education levels and employment rates of Turkish mothers tend to be lower than mothers from WEIRD samples (for review see Sen, Yavuz-Muren, & Yagmurlu, 2014). Therefore, this study contributes to the current literature by reporting the relation of SES and maternal behaviors to JA interactions in a non-WEIRD sample.

Although the sample size of the study was somewhat small, the bootstrapping method in which many resamples were generated from the sample data helped us to circumvent the power problem (Preacher & Hayes, 2004). Previous studies also examined the mediator role of different variables in the relationship of maternal and child characteristics to mother-child interactions with small sample sizes (e.g., Hellendoorn et al., 2015; Hoff, 2003; Huttenlocher, Waterfall, Vasilyeva, Vevea, & Hedges, 2010; Taylor, Donovan, Miles, & Leavitt, 2009).

An improvement to the study would be measuring maternal behaviors at an earlier time point than the measurement of JA. Although we found a relation between maternal behaviors and JA, we cannot claim a causal relationship such that certain maternal behaviors lead to certain JA features. It may be that the infants who establish JA more easily with their mothers also elicit more positive maternal behaviors. A cross-lagged design can be more powerful in detecting longitudinal relationships. Further, future studies may investigate the relationship between maternal behaviors and infants' ability to respond to and initiate JA in a controlled setting with an experimenter to explore whether these relationships also hold while interacting with other people (e.g., Early Social Communication Scales by Mundy et al., 2003). JA is a two-person interaction and sometimes mothers may adjust their behaviors to match their children's ability to sustain and reorient attention. Thus, another future line of research would be measuring children's abilities such as following other people's pointing behavior and initiating JA with communicative partners and including these in the models testing the relations between maternal behaviors and JA. In addition, temperamental characteristics of infants may be related to how mothers behave towards their infants and how they maintain the JA interactions. Mothers' personality and mental health may also be related to how mothers interact with their infants. Future research can investigate the effect of infant and maternal characteristics on the relationship between maternal behaviors and JA interactions. In the current study, we observed very few JA initiating behaviors of 12-month-old infants, therefore future research can study the JA initiating behaviors with older age groups. Lastly, differential effects of other verbal (e.g., contents of language used) and nonverbal (e.g., gestures, facial expressions) behaviors can also be studied further.

Conclusion

In sum, this study revealed that mothers with higher SES backgrounds displayed more positive behaviors towards their infants leading to longer and high-quality joint attention interactions. Findings of this study can inform future intervention studies. Our findings suggest that intervention studies targeting caregivers' sensitivity along with other positive behaviors such as cognitive stimulation may increase the frequency and quality of joint attention interactions with their infants. Testing this hypothesis with an intervention study would have theoretical implications in terms of the directionality of the relationship between joint attention and maternal behaviors along with applied implications. Further, our results suggest that targeting parents with lower levels of SES may be more meaningful. Given that parental behaviors act as a mediator between SES and JA, intervention studies targeting low-SES parents in terms of parental behaviors may improve JA interactions between parents and infants and result in more optimal language development patterns.

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Declaration of Competing Interest

None.

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