

# The relationship between maternal sensitivity and play during early childhood with the development of cognitive skills and socio-emotional competencies: Longitudinal evidence from Peru

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## Abstract

Maternal sensitivity and opportunities for play and exploration are key elements of early childhood development. There is limited evidence of its association with skills development during late childhood and adolescence in developing countries. This study uses longitudinal data from the Young Lives study, which has tracked the livelihoods of approximately 2000 Peruvian children since 2002. We used a multivariate linear regression strategy to generate evidence of the role of early maternal sensitivity and play in skills development. We found that both are positively related to cognitive skills and socio-emotional competencies at age 8, with persistence up to age 15.

## KEYWORDS

childhood, cognitive skills, maternal sensitivity, play, socio-emotional competencies

## INTRODUCTION

Maternal sensitivity and opportunities for play and exploration are key elements that are important for early childhood development (Ainsworth et al., 1978; Bowlby, 1969/1982; Sroufe et al., 2005). As Britto et al. (2017) note in a recent issue of *The Lancet* on early childhood, both are elements that form part of ‘nurturing care’. Empirical evidence suggests there is a relationship between maternal sensitivity and play and cognitive and socio-emotional development (see, for instance, Bernier et al., 2021; Grossman et al., 2002, 2013; for a review, see Bordoni, 2018). In part, this relationship is mediated by attachment security (Isabella et al., 1989; Posada et al., 2016). Much of the existing evidence comes from developed countries, however it is in developing countries where children are more at risk (Leer & Lopez-Boo, 2019). It is not obvious that the same benefits will be observed, and sustained, in populations where children are deprived in multiple dimensions of nurturing care (see, for instance, Chang et al., 2002).

This study focuses on Peru, a country classified as upper-middle income according to the World Bank. Evidence to date suggests that investment in early childhood development in this country is far from ideal: According to the 2019 *Demographic and Health Survey*, 40% of boys and girls from 6 to 35 months suffer from anaemia and 12% suffer from chronic malnutrition (INEI, 2020). From the perspective of responsive care, only 46% of girls and boys ages 9–12 months have an adequate interaction with their mother. Since 2012, Peru has a national childcare programme for children aged 0–36 months, *Cuna Más*, however its coverage remains limited. The situation is similar in other Latin American countries (Leer & Lopez-Boo, 2019).

To generate evidence to contribute to understanding the importance of maternal sensitivity and play relevant for the context of developing countries, we used data from the longitudinal study ‘Niños del Milenio’ in Peru, internationally known as Young Lives. In 2002, Young Lives collected data for pro-poor samples from 8000 children between the ages of 6 and 18 months, in Ethiopia, India, Peru and Vietnam (Jones & Huttly, 2018). These boys and girls were tracked and re-visited 4 times (Boyden, 2018a, 2018b; Sánchez et al., 2018; Woldehanna et al., 2018) at ages 5, 8, 12 and 15. The last face-to-face visit took place in 2016. In the Peru study, the first visit, when children aged approximately 1 year, included a series of multiple-choice and open-ended questions that provide information on behaviours related to maternal sensitivity and the role of play with the father and the mother. To the best of our knowledge, this information had not been previously analysed. The Young Lives families in Peru are located in both urban and rural areas and in the three climate regions (coast, mountains and the Amazon rainforest). The sample attrition rate after almost 15 years of tracking is only 8.2%.

The Young Lives children in Peru transited their early childhood when the national poverty and stunting rates were above 50% and 30%, respectively. We used the Young Lives data to test two hypotheses. First, whether there is an association between maternal sensitivity and play with the child’s cognitive skills and socio-emotional competencies at ages 8, 12 and 15 in the context of poor families. Second, whether this association is mediated by observed determinants of maternal sensitivity and by the socioeconomic status of the household. Specifically, we constructed indicators of maternal sensitivity and the prevalence of play with fathers and mothers. We related these results to the boys’ and girls’ test scores in mathematics and vocabulary (Peabody Picture Vocabulary Test) and to the development of socio-emotional competencies that were measured in the Young Lives study (agency and pride, related respectively to the concepts of self-efficacy and self-esteem). To test our hypotheses, we estimated a set of multivariate linear regression models, which allowed us to progressively adjust for characteristics of the child, the household and the mother. These characteristics included, for example, the mother’s level of education, whether she was a teenage mother,

exposure to domestic violence and mental health, all of which might affect maternal sensitivity. We did not intend to measure the causal impact of sensitivity and play, rather we sought to generate evidence that explains if these aspects are correlated to the development of skills in the context of Peru, and which of these factors mediate this relationship. Our results might be of interest for researchers and policy-makers interested in expanding the coverage of parenting interventions in Peru and other countries in Latin America and the Caribbean.

The rest of this article is structured as follows. Section 2 establishes the theoretical framework and includes a brief review of the literature on the role of maternal sensitivity and play in cognitive and socio-emotional development. Sections 3 and 4 present the empirical strategy and the data used. In Sections 5 and 6 the results are presented and discussed. Section 7 presents the conclusions.

## **CONCEPTS AND EVIDENCE: MATERNAL SENSITIVITY AND PLAY DURING EARLY CHILDHOOD**

Maternal sensitivity is considered a relevant construct to understand bonding relationships in child development (Grossmann et al., 2013), especially during the first 3 years (DePasquale & Gunnar, 2020). It is defined as the ability to adequately perceive the infant's signals and messages and interpret them and thus enable the parent to respond promptly, contingently and effectively (Ainsworth et al., 1978, as quoted by Santelices et al., 2012; see also Isabella et al., 1989). It is a dyadic relationship that shows the ability to reduce the child's distress and disengagement (Crittenden, 2005); putting oneself in the place of the infant and providing scaffolding in the zone of proximal development (Bigelow et al., 2010), as well as the timely response to social cues in play contexts and other experiences (Bernard et al., 2013). It is understood that one of the main behavioural signs of maternal sensitivity is learning to interpret crying behaviour and its multiple meanings (Kivijärvi et al., 2004). Parents' sensitive responses are related to the child's social, cognitive and emotional development, managing to regulate their emotions, giving them security (Bordoni, 2018) and favouring their ability to adapt (Bornstein & Putnick, 2012).

The recent literature describes sensitivity as a multidimensional construct. Bernier et al. (2021, p. 238) conceptualises three dimensions of maternal sensitivity: 'Maternal cooperation (accurate interpretation of infant cues and capacity to adjust the interaction correspondingly), positivity (positive attitude toward the infant) and accessibility/availability (consistent attentiveness)'. In this context, following the Page and colleagues' analysis (2010, p. 102) of the work by Ainsworth et al. (1978) and Meins et al. (1998), the following parental behaviours linked to sensitivity are expected to promote social and emotional development: '(1) responding promptly to a cry recognised as signalling distress; (2) comforting the infant when upset; and (3) being available for interaction', while '(4) interpreting the infant's actions as meaningful; and (5) treating the infant as an intentional agent' are considered to promote development of cognitive growth in the infant.

The evidence for the role of maternal sensitivity in child development has a long history, going back to Ainsworth paternal sensitivity scales (Ainsworth, 1969). Sroufe et al. (2005) provide a useful summary of the evidence, while recent studies find that paternal sensitivity is linked to secure children (Nieri, 2017) and maternal sensitivity is associated with cognitive and socio-emotional development (Favez et al., 2012; Tissot et al., 2016; see also Sroufe, 2000 and Collins et al., 2004). Children who grow up with sensitive, empathic and well-regulated significant adults, have a propensity for good cognitive development, high self-esteem, relationships based on trust, communication and proper handling of negative emotions, better adaptation and problem-solving (Kobak

et al., 2006; Sroufe et al., 2005). Most of this evidence comes from Western industrialised countries. Posada et al. (2016) show that the importance of maternal sensitivity for secure attachment also arises in non-Western contexts, however, there is a lack of evidence about its long-term impacts in developing countries, where children are deprived in several dimensions of nurturing care, such as nutrition and early learning. Whether the role of maternal sensitivity will also be prominent in skills development in these contexts is not obvious. For instance, one home visiting early stimulation programme in Jamaica that targeted stunted children found no impacts on school achievement and behaviours at the age of 11–12 (see Chang et al., 2002).

On the other hand, play is fundamental to the development of the child and in particular is important in the interaction with the environment (Winnicott, 1979); and as such it is an important activity to promote cognitive, social, emotional and behavioural skills during the childhood period (Cabrera & Tamis-LeMonda, 2013; Ginsburg et al., 2007) and requires the development of sensitivity responses translated into availability, establishing a meaningful dialogue with recognition and expression of emotions (Winnicott, 1969). Emerging studies suggest that both the mother and the father can contribute to child development and emotional health through play (Amodia-Bidakowska et al., 2020; Gregory et al., 2019; Grossman et al., 2002).

## DATA

To study the role of maternal sensitivity and play in cognitive and socio-emotional development in the context of poverty in Peru, we used data from the longitudinal Young Lives study, which collects data for pro-poor samples in four developing countries: Ethiopia, India, Peru and Vietnam. In each of these countries, data were collected for two cohorts: the *younger cohort* born in 2001–2002, and the *older cohort* born in 1994–1995. For the purposes of this study we used data from the *younger cohort* from Peru, as the relevant data are only available for this country.

This sample has an initial size of 2052 boys and girls. Each child was selected by a two-stage sampling technique. In the first stage, to achieve the aim of over-sampling poor areas 20 districts were randomly selected from the total number of districts in the country, excluding the wealthiest 5%. In the second stage, defined areas in each district were selected at random for data collection. In each district, families who had a child between 6 and 18 months of age were systematically selected and invited to participate in the study until the required 100 families were successfully enrolled. Only one child per household is tracked.

The first round of visits took place in 2002. Subsequently, four visits were made in 2006, 2009, 2013 and 2016, when the children were approximately 5, 8, 12 and 15 years old, respectively. The cumulative sample attrition rate throughout the period is 8.1%, a low rate compared to that reported by similar longitudinal studies in other developing countries (Sánchez & Escobal, 2020). Table 1 shows the main characteristics of the sample observed in 2016. The sample is balanced according to gender, 85% of participants have Spanish as their native language and 75% of them were located in urban areas in 2016.

## Main variables used

The information and procedure used to establish maternal sensitivity and the play indicators are described below. In both cases, we used information as reported by the child's primary caregiver

**TABLE 1** Descriptive statistics of the Young Lives sample

	Average	Standard deviation
<i>Characteristics of the child</i>		
Female (%)	49	0.5
Age (in months)	179	3.7560
Native language is Spanish (%)	85	0.3534
<i>Household characteristics</i>		
Mother's education		
Without formal education (%)	8	0.2652
Complete or Incomplete Primary School Education (%)	37	0.4724
Complete or Incomplete Secondary Education (%)	36	0.4683
Complete or Incomplete Higher Education (%)	19	0.3764
Located in an urban area (%)	75	
Number of observations	1860	–

Note: The data correspond to the Young Lives sample observed in 2016 (Round 5).

when the child was 6–18 months old. In the analytical sample, in 99% of cases the primary caregiver was the mother of the child.

- a. *Maternal sensitivity*: The information was obtained from the caregiver's response to the following multiple-choice question: *When NAME cries and cries and it is not because he/she is cold, hungry, sleepy or ill, what do you do to stop him/her crying?* The question includes 14 alternative answers and an option for 'Other' responses. The interviewers were instructed not to read the alternative answers but to listen to the caregiver and mark the answer accordingly. Based on this information, we classify a set of the responses as follows: (i) 'highly sensitive responses', understood as those that show good maternal sensitivity through an appropriate/responsive response to the child's signals regarding the need for containment and closeness to the main attachment figure. This category includes the following answers: 'calms him/her down', 'carries him/her', 'caresses him/her', 'hugs him/her', 'rocks him/her'; (ii) 'sensitive responses', defined as actions that attempt to calm the child through distraction situations, were reported as: 'play with the child', 'take him/her for a walk', 'give him/her toys'. Based on this classification, we find that, in the Young Lives sample, 45% would have received at least one 'highly sensitive response', 14% at least one 'sensitive response' (see Table 2). Other alternative responses are: 'slaps him/her; shakes him/her; pinches him/her; turns him/her face down; wraps him/her in blankets', 'assaults him/her', 'threatens him/her', 'scolds him/her and 'yells at him'. Only 2% of the sample self-reported to have resorted to at least one of these aggressive responses.
- b. *Play with the parents*: For the play element, the information comes from a data matrix that records the identification code of the household member, the play activity carried out with the child by said household member and the frequency in number of days per month when the activity was carried out. The matrix allows multiple records (more than one activity with the same household member, and more than one household member). Because the information was collected through the use of an open format, we processed and classified the data

**TABLE 2** Prevalence of maternal sensitivity and play in the Young Lives sample

	Average	Standard deviation
<i>Maternal sensitivity</i>		
At least one 'highly sensitive response' (%)	45	0.49
At least one 'sensitive response' (%)	14	0.36
<i>Plays with father and/or mother</i>		
Number of times child engaged in play activities with greater cognitive development (%)	2.12	1.67
Plays at least 15 days per month (%)	93	0.26
Number of observations	2039	–

Note: The data correspond to the Young Lives sample observed in 2016 (Round 1).

manually. We made a distinction between play of 'higher/greater' and 'lower' cognitive development. In the first group we included linguistic, symbolic and construction play, such as: 'he/she tells him stories', 'he/she talks to him/her', 'he/she sings to him/her', 'he/she makes him/her sing'; 'playing house', 'playing pretend kitchen,' 'playing with legos,' 'playing building towers', 'blocks, puzzles.' The second group includes motor skills and physical play, such as: 'makes him/her dance', 'makes him/her jump', 'tickles him/her', 'plays clapping games', 'gives him/her a massage', among others. In this study, we focus on the number of play activities of 'greater' cognitive development with the father and/or the mother. In the first case, we find that, on average, each child has had two instances of play activities of 'greater' cognitive development, with one with a minimum value of zero and a maximum value of 11. Regarding the frequency of play (days per month), 93% have played with their father or mother at least 15 days a month (see Table 2).

The outcome variables considered for the present analysis are:

- a. *Cognitive development*: The child's score in a mathematics test and a vocabulary test are considered at 8, 12 and 15 years of age. The mathematics test was designed by the Young Lives team, while the vocabulary test corresponds to the Peabody Picture Vocabulary Test. Specifically, the Spanish-language version of the test was used. For estimation purposes, the scores in each of the tests are normalised with the mean equal to zero and variance equal to one.
- b. *Socio-emotional development*: We used the agency index and the pride index. Both were designed by the Young Lives team based on existing scales to measure self-efficacy and self-esteem (respectively), adjusted to be administered to children in the context of developing countries. The indices included responses to questions about their daily life at household and at school. Both use a Likert response scale. To calculate each scale, the following procedure is followed: (i) the negative statements are put in reverse order; (ii) all the statements are standardised, with mean and variance equal to zero and one; (iii) the average is calculated for each individual.

All the instruments were piloted, validated and adjusted by the Young Lives team before the beginning of the field work, and administered in rounds 3, 4 and 5, when children aged 8, 12

and 15, respectively. For more details of these instruments, see Cueto et al. (2009), Cueto and León (2012) and Yorke and Ogando (2018). Other Young Lives instruments used for this analysis include the SRQ-20 scale, applied to the child's mother to measure the risk of depression and anxiety/stress, and a series of three questions to establish whether the mother has been a victim of violence domestic by their partner. Both questions were asked in round 1.

## EMPIRICAL STRATEGY

To measure the relationships of interest, we use a multivariate linear regression approach with the following structure:

$$y_{i,y} = \alpha_0 + \alpha_1 msen\_p1_i + \alpha_2 msen\_p2_i + \alpha_3 play1_i + \alpha_4 play2_i + \beta_1 sex_i + \beta_2 age_i \quad (1)$$

$$+ Z_i \Theta \quad (2)$$

$$+ X_i \Gamma + \epsilon_i, \quad (3)$$

where  $y_{i,y}$  is a generic term that represents a cognitive or socio-emotional outcome of child  $i$  at the age of  $y$  years. In this model, the explanatory variables related to maternal sensitivity are:  $msen\_p1_i$ ,  $msen\_p2_i$  (the child received at least one positive 'highly sensitive response' and 'sensitive response', respectively); and, for the concept of play, the variables of interest are  $play1_i$  y  $play2_i$  which measure the number of play activities with 'greater' cognitive development with the father and/or the mother, and if the child plays at least 15 days per month with the father and/or the mother, respectively. Outcome variables are measured at 8, 12 and 15 years.

The analysis is carried out stepwise as indicated in the equation. The first specification (Equation 1) adjusts by age and sex and can be interpreted as the unconditional association. The second specification (Equation 2), includes characteristics of the mother that are known to be correlated with sensitivity. Several studies show that the educational level of the mother (Santelices et al., 2015; Simó & D'Ocon, 2011; Palmer et al., 2013), her marital status (Giraldo-Montoya et al., 2017; Muñoz et al., 2015), age and socioeconomic status (Bornstein et al., 2008; Palmer et al., 2013; Santelices et al., 2015) predict maternal sensitivity. Based on this, the added vector  $Z_i$  include the following variables: whether she had the child when she was 19 years of age or older, whether the permanent partner of the primary caregiver is the biological father of the child, and mother's education in categories (secondary education, higher education). In addition, since for a small fraction of the sample the primary caregiver was not the mother, a binary variable was included that takes the value of 1 if the primary caregiver is the mother of the child, and 0 otherwise. Likewise, the model controls for whether the mother was affected by domestic violence and for symptoms of depression and/or anxiety stress (Beusenbergh et al., 1994), both measured when the child was 1-year-old. A history of intimate partner violence and symptoms of depression and/or anxiety can both be linked to the development of insensitivity (Nieri, 2017), as well as to feelings of emotional abandonment and a loss of trust in and fear of the primary caregiver (Paulus et al., 2018).

The third specification (Equation 3) adds vector  $X_i$ . The purpose of this vector is to include socioeconomic characteristics of the household that are correlated with cognitive skills and socio-emotional competencies in the Young Lives data (Dercon & Krishnan, 2009; Sánchez, 2017). It

is possible that the socioeconomic status of the household mediates maternal sensitivity, given the evidence linking the development of sensitivity to living conditions (Posada et al., 2016). In addition, living conditions might influence the type of play activities available to the child. The following three characteristics are considered: household is in an urban area, household size and the wealth index of the household. The wealth index (Briones, 2017) is an indicator defined in the  $[0, 1]$  range that summarises information about access to basic services (water, electricity, sewage and type of cooking fuel used), housing quality (quality of roof, walls and floor used in the household) and ownership of durable goods (TV, fridge, washing machine, etc). For this analysis, the wealth index is introduced in categories: household is in the bottom (omitted group), middle or top tertile in the distribution of the wealth index. Finally,  $\varepsilon_i$  is the error term. It should be noted that, except for the child's age, all the explanatory variables were measured during the first household visit, when the child aged between 6 and 18 months.

## RESULTS

Table 3 reports the main results of Equation (1). These results are akin to a simple correlation, as they only adjust by sex and age. Looking at outcomes observed at the age of 8 years (column (i)), results show a positive association between the two indicators of maternal sensitivity with vocabulary and math test scores (4 out of 4 coefficients). A similar result is found for the two socio-emotional outcomes, the agency and pride indicators (3 out of 4 coefficient). For 'highly sensitive' ('sensitive') responses, the standardised effect is in the range of 19%–29% (24%–32%) for cognitive skills and 7%–10% (4%–11%) for socio-emotional competencies. As the child ages, the point estimates reduce in magnitude: out of the eight coefficients of interest, in total, 7, 6 and 4 are statistically significant at the age of 8, 12 and 15 years, respectively.

The association of play with skills development is less clear. All the coefficients show the expected sign but are imprecisely estimated. At the age of 8 years, only 3 out of the 8 coefficients are statistically significant: playing at least 15 days a month (with the father and/or the mother) is positively associated with the results of the child in the vocabulary test, whereas the number of play activities (of greater cognitive development) is positively associated with the child level of agency and pride. As the child ages the coefficients reduce in magnitude. Only one of the three coefficients that are statistically significant at the age of 8 remains significant by the age of 15—the association between playing at least 15 days a month with the mother/father and results in the vocabulary test.

Next, we explore results of the extended models. For simplicity, these results are only reported for outcomes observed at the age of 8 years. Column (i) in Tables 4 and 5 report results adjusting for the determinants of maternal sensitivity (Equation 2). As expected, in this case the point estimates related to maternal sensitivity reduce in magnitude. The association between the two indicators of maternal sensitivity and math test scores becomes statistically insignificant. The same happens for agency and pride. However, the association with the vocabulary test remains statistically significant. On the other hand, the associations previously observed between play and child results in the vocabulary test and his/her level of agency and pride remain virtually unchanged.

Finally, column (ii) in Tables 4 and 5 report results that also control for the socioeconomic status of the household (Equation 3). In this case, the association between maternal sensitivity and vocabulary test scores reduces in magnitude and becomes statistically insignificant. Similarly, the association between the frequency of play (at least 15 days per month) and vocabulary test scores also becomes statistically insignificant. However, the association between the number of play activities (of greater cognitive development) with agency and pride remain unchanged.

TABLE 3 Multivariate linear regressions—Adjusting by age and sex

	8 years	12 years	15 years
	(i)	(ii)	(iii)
	coef/se	coef/se	coef/se
<i>Panel A—Dependent variable: vocabulary test (PPVT)</i>			
At least one highly sensitive response	0.287*** (0.090)	0.228*** (0.075)	0.248*** (0.074)
At least one sensitive response	0.318*** (0.079)	0.325*** (0.087)	0.307*** (0.093)
Number of times child engaged in play (with father/mother)	0.021 (0.026)	0.022 (0.025)	0.007 (0.022)
Plays at least 15 days per month (with father/mother)	0.217* (0.117)	0.230* (0.128)	0.322** (0.133)
<i>Panel B—Dependent variable: Math test</i>			
At least one highly sensitive response	0.185** (0.065)	0.150* (0.072)	0.166*** (0.056)
At least one sensitive response	0.244*** (0.075)	0.201** (0.077)	0.110 (0.065)
Number of times child engaged in play (with father/mother)	0.006 (0.022)	0.006 (0.018)	0.016 (0.021)
Plays at least 15 days per month (with father/mother)	0.203 (0.139)	0.220 (0.128)	0.086 (0.104)
<i>Panel C—Dependent variable: Agency</i>			
At least one highly sensitive response	0.102** (0.047)	0.073** (0.029)	0.012 (0.032)
At least one sensitive response	0.043 (0.037)	0.071 (0.050)	0.006 (0.057)
Number of times child engaged in play (with father/mother)	0.024** (0.011)	−0.007 (0.011)	0.003 (0.009)
Plays at least 15 days per month (with father/mother)	0.091 (0.080)	0.061 (0.083)	0.101 (0.087)
<i>Panel D—Dependent variable: Pride</i>			
At least one highly sensitive response	0.074** (0.033)	0.005 (0.036)	0.047 (0.044)
At least one sensitive response	0.112** (0.052)	0.165*** (0.031)	0.102* (0.055)
Number of times child engaged in play (with father/mother)	0.022** (0.011)	−0.007 (0.013)	−0.004 (0.010)
Plays at least 15 days per month (with father/mother)	0.041 (0.060)	0.093 (0.081)	0.022 (0.051)

Note: In each panel, each column reports the results of a multivariate linear regression. For each explanatory variable, the coefficient and the standard error (in parentheses) are reported. Statistical significance is reported at 1% (\*\*\*), 5% \*\* and 10% (\*).

## DISCUSSION

To our knowledge, this is the first study to use data from the Young Lives study to measure the relationship between maternal sensitivity and play with cognitive and socio-emotional development. Maternal sensitivity is proxied by sensitive responses when the child cries—when the child cries, the mother, for example, ‘calms him/her down’, ‘carries him/her’, ‘hugs him/her’, etc—while the role of play is analysed considering play activities of greater cognitive development (telling stories, singing to the child, playing with legos, etc.) and the frequency of play (days per month), in both cases with the mother or the father.

**TABLE 4** Multivariate linear regressions for cognitive outcomes—Adjusting by age, sex, determinants of maternal sensitivity and household socio-economic status

	<b>Panel A—Dependent variable: Vocabulary test</b>		<b>Panel B—Dependent variable: Math test</b>	
	<b>(i)</b>	<b>(ii)</b>	<b>(i)</b>	<b>(ii)</b>
	<b>coef/se</b>	<b>coef/se</b>	<b>coef/se</b>	<b>coef/se</b>
At least one highly sensitive response	0.138* (0.074)	0.082 (0.060)	0.062 (0.051)	0.017 (0.048)
At least one sensitive response	0.127** (0.054)	0.065 (0.052)	0.083 (0.059)	0.044 (0.056)
Number of times child engaged in play (with father/mother)	0.007 (0.018)	0.001 (0.013)	−0.007 (0.017)	−0.011 (0.017)
Plays at least 15 days per month (with father/mother)	0.188* (0.091)	0.099 (0.075)	0.174 (0.117)	0.109 (0.111)
Child is female	−0.064 (0.048)	−0.045 (0.043)	−0.125** (0.048)	−0.110** (0.045)
Age in months at the time of the interview	0.068 (0.052)	0.066 (0.048)	0.095** (0.041)	0.091** (0.041)
Mother is primary caregiver	−0.023 (0.143)	−0.123 (0.135)	0.063 (0.123)	−0.045 (0.154)
Mother had child when she was over 19 years old	0.076 (0.067)	0.001 (0.069)	−0.006 (0.054)	−0.061 (0.053)
Mother has secondary education	0.742*** (0.093)	0.352*** (0.064)	0.610*** (0.086)	0.305*** (0.063)
Mother has higher education	1.092*** (0.108)	0.595*** (0.090)	0.893*** (0.087)	0.485*** (0.082)
Mother's permanent partner is the biological father	0.086 (0.075)	0.029 (0.057)	0.048 (0.060)	−0.001 (0.064)
Caregiver's index of exposure to violence	−0.030 (0.042)	−0.050 (0.039)	−0.080** (0.034)	−0.096** (0.036)
Mother's no. of symptoms of depression and/or anxiety	0.027 (0.028)	0.023 (0.021)	−0.018 (0.020)	−0.021 (0.016)
In urban area		0.474*** (0.084)		0.301** (0.105)
Household size		−0.012 (0.010)		−0.020 (0.012)
Household in middle tertile of wealth		0.252*** (0.050)		0.193*** (0.067)
Household in top tertile of wealth		0.561*** (0.066)		0.512*** (0.083)
Number of observations	1689	1689	1729	1729
Adjusted R <sup>2</sup>	0.222	0.333	0.150	0.218

*Note:* Each column reports the results of a multivariate linear regression. For each explanatory variable, the coefficient and the standard error (in parentheses) are reported. Statistical significance is reported at 1% (\*\*\*), 5% \*\* and 10% (\*).

Our main results (Table 3) show substantial evidence of the existence of an association between maternal sensitivity with the child vocabulary and math test scores, and with the child level of agency and pride by the age of 8 years in Peru. These results are consistent with Ainsworth

**TABLE 5** Multivariate linear regressions for socio-emotional outcomes—Adjusting by age, sex, determinants of maternal sensitivity and household socioeconomic status

	<b>Panel A—Dependent variable: Agency</b>		<b>Panel B—Dependent variable: Pride</b>	
	<b>(i)</b>	<b>(ii)</b>	<b>(i)</b>	<b>(ii)</b>
	<b>coef/se</b>	<b>coef/se</b>	<b>coef/se</b>	<b>coef/se</b>
At least one highly sensitive response	0.068 (0.044)	0.048 (0.042)	0.034 (0.032)	0.018 (0.031)
At least one sensitive response	−0.003 (0.034)	−0.021 (0.034)	0.051 (0.049)	0.041 (0.047)
Number of times child engaged in play (with father/mother)	0.021* (0.011)	0.022** (0.009)	0.018* (0.010)	0.022** (0.008)
Plays at least 15 days per month (with father/mother)	0.084 (0.076)	0.052 (0.080)	0.017 (0.055)	−0.010 (0.054)
Child is female	0.032 (0.027)	0.038 (0.028)	−0.034 (0.031)	−0.029 (0.029)
Age in months at the time of the interview	0.036 (0.038)	0.032 (0.036)	0.001 (0.026)	−0.003 (0.026)
Mother is primary caregiver	0.019 (0.158)	−0.025 (0.159)	−0.102 (0.120)	−0.144 (0.115)
Mother had child when she was over 19 years old	0.041 (0.038)	0.026 (0.037)	0.087 (0.051)	0.077 (0.049)
Mother has secondary education	0.167*** (0.046)	0.052 (0.033)	0.225*** (0.063)	0.128* (0.062)
Mother has higher education	0.251*** (0.047)	0.116** (0.046)	0.252*** (0.072)	0.127* (0.071)
Mother's permanent partner is the biological father	−0.022 (0.048)	−0.047 (0.052)	−0.049 (0.040)	−0.081* (0.040)
Caregiver's index of exposure to violence	−0.054** (0.021)	−0.063** (0.025)	0.023 (0.032)	0.014 (0.034)
Mother's no. of symptoms of depression and/or anxiety	0.009 (0.020)	0.008 (0.019)	−0.041** (0.019)	−0.040** (0.019)
In urban area		0.196*** (0.061)		0.153** (0.070)
Household size		−0.011 (0.007)		−0.025*** (0.008)
Household in middle tertile of wealth		0.060 (0.055)		0.010 (0.052)
Household in top tertile of wealth		0.095 (0.065)		0.082 (0.048)
Number of observations	1760	1760	1760	1760
Adjusted $R^2$	0.024	0.043	0.033	0.049

*Note:* Each column reports the results of a multivariate linear regression. For each explanatory variable, the coefficient and the standard error (in parentheses) are reported. Statistical significance is reported at 1% (\*\*\*), 5% \*\* and 10% (\*).

sensitivity theory and with Bowlby's attachment theory, the latter due to the notion that attachment security is fostered by maternal sensitivity (Isabella et al., 1989). Our findings also show that some of these associations persist at the age of 12 and 15 years: having received at least one early sensitive response is associated with an increase in pride and vocabulary development by the age of 15. These results are aligned with findings from other longitudinal studies (Grossman

et al., 2002; Hirsh-Pasek & Burchinal, 2006; Paulus et al., 2018). However, our study provides unique longitudinal evidence in the context of Peru, a developing country where children are at-risk in multiple dimensions, during the early childhood and in subsequent periods of childhood and adolescence.

Our estimates also show that having more play activities of greater cognitive development with the mother and/or the father is associated with an improvement in socio-emotional development during childhood, although this result does not last in the long term—greater socio-emotional development is observed at 8 years, but not at 12 or 15 years. Likewise, a higher number of days playing with the mother/father—in any type of game—has a positive relationship with the development of vocabulary throughout childhood and adolescence, at ages 8, 12 and 15. Play enables the development of multiple aspects and contributes to psychological development in a highly significant way (Winnicott, 1980). Our estimates in particular capture the interaction between play and attachment figures: the playful space allows us to observe and facilitate the capacity for reflection in adults who play a significant role in the child's life, which then is expected to generate effects on the development of the child's secure attachment (Posada et al., 2016).

When we move to the specification that adjusts for the determinants of maternal sensitivity (Equation 2), as expected several of the coefficients related to the maternal sensitivity indicators reduce in magnitude and lose statistical significance. Only the association with vocabulary development remains statistically significant. For this finding to be consistent with the notion that the selected maternal characteristics drive maternal sensitivity, these characteristics should also predict cognitive and socio-emotional development. Indeed, from a closer inspection to the estimates of Equation (2) (see column (i) in Tables 4 and 5), a higher level of education of the mother is positively related to the child's cognitive test results in math and vocabulary, and exposure to violence is negatively related to the child's math test scores. As for socio-emotional competencies, the education of the mother predicts the child's level of agency and pride. Likewise, exposure to violence is negatively associated with agency, and an increase in the number of symptoms of depression and/or anxiety/stress is negatively associated with pride, which is consistent with the evidence of recent studies that have analysed data from this Peruvian cohort (Bedoya et al., 2020; Bendini & Dinarte, 2020). In contrast, when moving to Equation (2), the coefficients related to the role of play remain virtually unchanged. This is not necessarily surprising because our definition of play includes activities with the father, thus is not necessarily mediated by maternal sensitivity.

In the final specification that also adjusts by the socioeconomic status of the household (Equation 3), none of the coefficients linking maternal sensitivity to cognitive and socio-emotional outcomes at the age of 8 years remain as statistically significant. Compared with the previous specification, the main difference is the loss of statistical significance of the association with vocabulary development. This result suggests that the socioeconomic status of the family also mediates maternal sensitivity, although an alternative explanation is that they are both highly correlated.

The association between play and vocabulary development also becomes statistically insignificant, which is expected given that family and language development depends on the family and sociocultural context. However, the results linking the number of play activities with socio-emotional competencies (agency and pride) remain as statistically significant in this specification, which suggests a role for play in the development of soft skills even among families with limited resources. In summary, our results highlight the importance of maternal sensitivity and play as important elements for the development of cognitive skills and socio-emotional

competencies. Our key results are observed at the age of 8 years, but some of the associations persist up to the age of 15 years. A potential limitation of our findings is the self-reported nature of our indicators of maternal sensitivity and play.

The proportion of households benefited by parenting programmes for early childhood development in the Latin American region is small (Leer & Lopez-Boo, 2019). From a policy perspective, our results validate the existence of these programmes. At the same time, the fact that maternal sensitivity is found to be mediated by the caregiver's level of education, exposure to intimate partner violence, symptoms of mental health problems and household poverty. Suggest not only that it is important to increase the scope of these programmes to help as many children at risk as possible, but also that programmes need to be multi-dimensional, targeting several aspects of the family that have an impact on nurturing care. In Peru, the 'Cuna Más' childcare programme has a home-based modality with the aim of promoting more and better-quality adult-child interaction and learning through play for rural families. This modality has been found to have a positive impact on child development, with an increase in the frequency and variety of play activities as one of the mediating factors (Araujo et al., 2016; Guerrero & Demarini, 2016). Our results suggest that Cuna Más, and similar programmes in the Latin American region could have long-lasting impacts, but also that improving other dimensions of families' well-being—through other early childhood and social programmes—can help to sustain these impacts.

## CONCLUSIONS

There is limited evidence about the role of maternal sensitivity and play for promoting skills development in developing countries, where children face deprivations in multiple dimensions of nurturing care. This is the first study to use information from the longitudinal Young Lives study to quantify the relationship between maternal sensitivity and play with cognitive and socio-emotional development during childhood and adolescence. This represents a contribution to the early childhood development literature for developing countries. The information about maternal sensitivity and play activities was self-reported by the mother when the child aged 6–18 months in 2002. These Peruvian families were re-visited at ages 8, 12 and 15 (in 2009, 2013 and 2016). We found that early sensitive responses by the mother are positively associated with child test scores in vocabulary and math, and to a child level of agency and pride at the age of 8 years. Likewise, the number of play activities with the mother and/or the father is positively associated to a child level of agency and pride, while the frequency of play with the mother and/or the father is linked to a child test scores in vocabulary. For some of these indicators, the association persist up to the age of 15 years. These results highlight the importance of investing in programs that promote early child development, especially those with the potential of improving the quality of the mother-child interaction, but paying attention to other dimensions of family well-being, as suggested by the mediation analysis.

## DATA AVAILABILITY STATEMENT

The data used for this analysis come from the five waves of data collection of the Young Lives Study. The data are publicly available in the UK Data Service at <http://doi.org/10.5255/UKDA-SN-5307-3>, reference number 5307 (Round 1), <http://doi.org/10.5255/UKDA-SN-6852-3>, reference number 6852 (Round 2), <http://doi.org/10.5255/UKDA-SN-6853-3>, reference number 6853 (Round 3), <http://doi.org/10.5255/UKDA-SN-7931-2>, reference number 7931 (Round 4) and <http://doi.org/10.5255/UKDA-SN-8357-1>, reference number 8357 (Round 5).

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