Positive Parenting and Sociodemographic Factors Related to the Development of Chilean Children Born to Adolescent Mothers

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Posted Date: 5 October 2023

doi: 10.20944/preprints202310.0237.v1

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Article

Positive Parenting and Sociodemographic Factors Related to the Development of Chilean Children Born to Adolescent Mothers

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Abstract: The current study aimed to examine the relationship between demographic variables within the family context and parenting behaviors among adolescent mothers (including affection, responsiveness, encouragement, and teaching). These factors were correlated with communication, problem-solving abilities, and personal-social development in typically developing infants. The study included a sample of 79 Chilean adolescent mother-child dyads with children aged 10 to 24 months. Communication, problem-solving, and personal-social development were assessed using the Ages and Stages Questionnaire-3, along with a demographic information questionnaire. Parenting behaviors (affection, responsiveness, encouragement, and teaching) were observed using the Spanish version of Parenting Interactions with Children: Checklist of Observations Linked to Outcomes. The findings indicated that employed mothers and those who had not dropped out of school had children with better problem-solving skills. Additionally, children residing with their fathers and female children exhibited superior performance in communication, problem-solving, and personal-social development. Maternal responsiveness was associated with communication and problem-solving, while maternal encouragement was linked to improved problem-solving skills. Maternal teaching was connected to communication, problem-solving, and personal-social development. The study emphasized the significance of parenting and sociodemographic factors among adolescent mothers in influencing their children's development.

Keywords: adolescent mothers; positive parenting; child development; family sociodemographic factors

1. Introduction

The relationship between positive parenting and child development has received significant attention in recent years [1–4]. Parenting is a wide-ranging concept involving different aspects of childrearing, including support for children's needs, parental styles, provision of food and care, teaching and developmental guidance, and affectionate communication [5] Following Roggman et al. [6], in this paper, 'parenting' refers to the characteristics of high-quality parent–child dyadic interactions that occur face-to-face and promote child development. The literature suggests that a home environment characterized by positive interactions between parents and children significantly impacts typically developing children [7–9].

Parenting and child development have also been studied in high-risk families, specifically in families from socially and economically vulnerable contexts [10–12]. Existing research has demonstrated that low economic income negatively interferes in the family context due to less stimulating home learning environments for their children [13], directly affecting the maternal role of younger mothers [14]. In fact, according to the World Health Organization [15], adolescent motherhood is more prevalent among women with lower incomes. Latin America has the second-highest adolescent birth rate globally, with a higher prevalence in lower-income countries [16].

 doi:10.20944/preprints202310.0237.v1

A recent study has found that Latin adolescent mothers' characteristics related to their economic and educational level, knowledge of child development, and co-parenting conflict are associated with their children's development, with cognitive stimulation and the emotional support given to their children being significant factors [17]. Given the socioeconomic challenges faced by adolescent mothers in Latin America, [18] emphasized the importance of incorporating an examination of co-parenting relationships, particularly involving the fathers of children born to adolescent mothers, and the impact of dropping out of school on adolescent parenting experiences.

In Chile, although there has been a decrease in adolescent pregnancies over the last decade in comparison to other countries in Latin America [19], pregnancies still occur among adolescents from economically and socially vulnerable backgrounds [20]. The Biobío region, known for having some of the highest poverty rates in Chile [21], also reports a higher number of adolescent mothers who have been exposed to circumstances requiring judicial determinations for the violation of their rights compared to the national average [22].

Despite the relevance of investigating adolescent motherhood, most of the studies that have analyzed the relationship between parenthood and child development have been carried out with adult mothers [23–26] (. Meanwhile, few studies have explored the relationship between parenting in adolescent mothers, family sociodemographic factors, and child development. Thus, positive interactions between mother and child can be a real challenge for adolescent mothers, with their social and family context being particularly relevant.

1.1. Chilean adolescent mothers' sociodemographic context and children's developmental outcomes

A family context characterized by high social and economic risk significantly influences child development since it has been shown that mothers with higher income and educational levels reduce delays in children's cognitive and linguistic development [27]. In contrast, children living in poverty are at a higher risk of encountering significant developmental delays, which could be primarily due to the adverse effects of reduced cognitive skill stimulation and harmful parenting practices on children's brain development [28].

Previous research suggests that children born to adolescent mothers tend to exhibit slower cognitive, linguistic, and social development compared to those born to older mothers, possibly due to the highly vulnerable context in which they are raised [29–32]. Specifically, these children often present lower levels of language development, which may be linked to reduced verbal stimulation from their mothers [33]. Moreover, the cognitive development of such children can be negatively impacted by low socioeconomic status, as poverty can interfere with adequate childrearing and stimulation [34].

In Chile, a correlation is observed between higher economic income, educational level, and older maternal age with higher maternal competencies [35]. It is well known that adolescent mothers are more likely to drop out of school than women who are not mothers or delay motherhood [36]. In this context, the impact of adolescent motherhood in Chile translates to the interruption of their studies, a reduced likelihood of pursuing higher education, and a higher probability of future unemployment, ultimately perpetuating the cycle of poverty [37].

The consequence of being unemployed for a mother who became pregnant during adolescence is an important issue. In a study by Reynolds et al. [38], Chilean children whose mothers were more involved in the workforce during their early years demonstrated enhanced cognitive, linguistic, and socio-emotional assessment performance. This association may be attributed to mothers' employment, which is associated with a more favorable learning environment as the family may be better able to invest in stimulating learning resources and participate in educational activities that promote their children's development [39].

The employment and educational status and the high-risk and vulnerable context in which adolescent mothers are situated highlight the need for parenting support to optimize their children's development [40] . In a study conducted by Luttges et al. [41], it was found that Chilean adolescent mothers require orientation with parenting strategies, as various authors have noted that mothers who have children at a young age often lack the necessary maternal skills to face adversity [42,43]. In

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fact, within the context of Chilean adolescent mothers, it has been demonstrated that support in the care of her baby from the extended family of the adolescent contributes to the mother's greater satisfaction with her child [44].

Indeed, child development may be less affected if grandparents provide greater protection against the adverse effects of fatherlessness [45]. Previous literature has found that support in caring for children born to adolescent mothers prompts them to be more affectionate with their babies [46]. Therefore, it is necessary to delve into the impact on child development when adolescent mothers receive support in caring for their babies and when these mothers are affectionate during their interactions with their children.

While social support for adolescent mothers is essential, research suggests that the absence of fathers can emerge as one of the primary challenges young mothers face and can significantly impact their children's development [47]. In the Chilean context, it has been observed that adolescent fathers who do not cohabit with the mother of their children may contribute to an unstable relationship characterized by a low level of commitment, potentially resulting in relationship breakdowns and subsequent loss of contact and bonding between fathers and their children [48].

The role of fathers in the early stages of child development has significant effects on the child's neurobiological development, emotional and behavioral regulation systems, and experiences in children's mental models of themselves and others [49] (Fitzgerald & Bocknek, 2013). Specifically, research indicates that father–child contact among children of adolescent mothers is associated with improved academic performance, enhanced reading skills, and fewer behavioral problems in later years [47].

In addition, Chile offers preschool centers designed for adolescent mothers' children. They are free of charge and intend to increase mothers' support in the care of their children [50]. Their primary goal is to assist young mothers and fathers in ensuring their children receive the necessary care and stimulation, all while enabling adolescents to continue their education, because early motherhood often leads to high school dropout rates among young women. In Chile, concerted efforts have been made to enhance the quality of early childhood education to provide children from impoverished environments with the same opportunities as those from higher-income families [51]. Therefore, analyzing the effects on child development of receiving support in caring for children born to adolescent mothers at home when they do not attend preschool centers is relevant.

Although it has been shown that parenting depends on various sociodemographic variables, such as parent's age, employment, and educational level [52] (), it is crucial to investigate how these factors influence the development of children of adolescent mothers.

1.2. Positive parenting in adolescent mothers and children's developmental outcomes

Studies increasingly recognize the value of parenting quality on child developmental outcomes [53–55]. However, the quality of parenting in adolescent mothers has been characterized by having a level of negative involvement, which leads them to have less positive interaction and a more withdrawn behavior with their children [56] since the context in which families are situated can contribute to or affect the emotional state of mothers when they interact with their children [57].

Hence, it is crucial to underscore the significance of positive parenting in adolescent mothers and its impact on their children's developmental outcomes within a natural context. Various studies have consistently shown that positive parent–child interactions significantly affect children's language skills, cognitive abilities, and socioemotional development [7,58,59]. More specifically, positive interactions between parents and children have been associated with the expansion of vocabulary and early literacy [60,61], as they play a vital role in fostering expressive language development [62]. Additionally, positive parenting has been linked to proficient executive functioning, academic achievement, memory, and problem-solving skills [63,64]. Furthermore, positive parenting practices in Latino mothers have predicted higher levels of child social self-efficacy [65]. Consequently, parenting practices cover various behaviors in domains such as affection, warmth, responsiveness, encouragement, and cognitive stimulation or teaching, all of which are closely associated with children's developmental outcomes [6,66,67].

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On the one hand, emotional warmth, which refers to the expression of positive evaluation of the child [6], is associated with fewer problem behaviors in infants [68] and higher social skills and communication abilities in early childhood [69] and predicts lower levels of child externalizing problems [70] and higher levels of executive function in preschool and post-kindergarten [71], which is associated with cognitive development.

On the other hand, responsiveness is the maternal skill to detect a child's attention, interest, or emotional state, responding appropriately to their needs. This ability promotes higher pre-academic abilities, such as in reading comprehension, applied maths problems, and receptive vocabulary [72] and predicts higher cognitive development in infants [73] related to more significant memory and, in turn, with better social development in terms of self-regulation [74].

Indeed, scientific evidence has consistently shown that socioeconomic risk among adolescent mothers can negatively impact their ability to exhibit emotional warmth and responsiveness, adversely affecting their children's cognitive development [34]. Furthermore, affection and responsiveness in adolescent mothers are also associated with infant security [75].

Encouragement, understood as promoting autonomy in children, is linked to higher independence, security, and language, cognitive, and socioemotional development [76]. However, children show higher separation anxiety levels when maternal behavior is characterized by extreme intrusiveness or is very protective [77]. Children born of adolescent mothers may present lower levels of expressive and receptive language than children of older mothers, attributed to the high intrusiveness, rather than encouragement, and low verbal stimulation provided by young mothers [33].

In this sense, cognitive stimulation or teaching related to promoting the child's participation in parents–child joint activities and conversation is associated with better cognitive function skills [78], receptive and expressive communication [54], and prosocial behavior [79]. Thus, the provision of low verbal stimulation by adolescent mothers can negatively affect their child's development.

It should be noted that the quality of interactions with children may vary depending on the child's gender. For example, a systematic review found a significant difference between sons and daughters concerning autonomy-supportive strategies, even though these differences by gender have been found to be minimal in recent years [80]. Nevertheless, a more recent systematic review showed differences in parenting and the child's gender concerning vocalization, socializing strategies, play, and the provision of different toys to their sons and daughters, which were associated with some differences in child development across the children's gender [81]).

Moreover, it has been demonstrated that mothers are more affectionate with girls [82] and when their distress levels are lower [83]. Lower maternal distress is associated with the implications of the biological father's coresidence and when they are more involved as caregivers [84]. In this sense, it is essential to understand how the presence of the father and mother's affection can influence children's development and the possible gender differences.

Given the difficulties and parental characteristics experienced by Chilean adolescent mothers, it is imperative to delve into this issue. Such investigation can provide valuable insights that enable the implementation of intervention practices to enhance the quality of interaction between adolescent mothers and their children [85,86].

Based on the evidence reviewed above, the current study is exploratory, aiming to: a) explore the relation between family-related demographic variables and parental factors (e.g., mother who has dropped out of school, employment status, support in the care of a child, child's gender, fathers/grandparents living with their child, and children attending preschool), and language, cognitive, and personal-social development in typically developing young children of Chilean adolescent mothers; and b) to explore the relation between parenting, defined in terms of affection, responsiveness, encouragement, and teaching and cognitive, linguistic and personal-social development in typically developing children of Chilean adolescent mothers at early ages.

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2. Materials and Methods

2.1. Participants

The current study was conducted in seven health centers, one hospital, four preschool learning centers, and one residential home for adolescent mothers (belonging to the National Children's Service) in Biobío, Chile. Power analyses were run in advance to determine the required sample size for the present study. In this regard, analyses based on Fisher's transformation for the correlation test and assuming moderate-sized correlations (r=.3, α=.05, and 1-β=.80) yielded a required sample size of 84 individuals. Additionally, we ran power analyses for linear regressions by assuming models with at least four predictors and moderate effects (k=4, f2=.15 -equivalent to R2=.18-, α=.05, and 1-β=0.80), for which the minimum required sample size was 80 individuals.

The final sample included 79 dyads of mothers and children who met the eligibility criteria (low-income mothers who became pregnant at 19 years old or younger, average household income less than or equal to 678.49 USD per month for mid-low income and 391.16 USD per month for low-income, according to the criteria of the Chilean Association of Market Researchers 2019 [87] and children of typical development. Within this group of mothers, 62% had completed high school, 29% had completed primary school, and fewer than half had not completed primary school (9%, n=7); 14% had dropped out of school due to maternity.

Adolescent mothers aged between 15 and 21 years (M = 19.1, SD = 1.7) and children aged between 10 and 24 months (M = 15.5, SD = 4.2) were visited at their homes. They provided voluntary, informed consent for their participation and use of data related to their family's sociodemographic, parenting, and child developmental characteristics when aged older than 18 years old; in the case of mothers younger than 18 years old, their legal guardians signed an informed consent. The characteristics of the children and their mothers that were relevant to the study are presented in Table 1.

Table 1. Sociodemographic characteristics of adolescent mothers and their children.

Childcare support	**N**	**%**
Childcare support provided	62	78.5
Childcare support not provided	17	21.5
Mother's employment		
Employed	15	19.0
Unemployed	64	81.0
Dropped out school		
Yes	11	13.9
No	68	86.1
Child gender		
Male	42	53.2
Female	37	46.8
Preschool center		
Attends	28	35.4
Does not attend	51	64.6
Father co-habiting with mother and his child		
Yes	23	29.1
No	56	70.9
Grandparents co-habiting with mother and the child		
Mother, father, and children	6	7.6
Mother, grandparents, and children	56	70.9
Mother, grandparents, fathers, and children	17	21.5

2.2. Procedure

Data procedures were collected via questionnaires and observations. Firstly, the coordinators of the health centers, hospitals, preschool learning centers, and residential homes for adolescent mothers provided a database with telephone numbers and addresses to contact the families directly. Families who agreed to participate were visited at home and informed about the study. A sociodemographic questionnaire was read and explained to adolescent mothers, clarifying the possible answers. Subsequently, mothers were asked to engage in a video-recorded 10-minute play

session with their infants at home, with the following instruction translated into Spanish: "Interact and play with your children as you typically do." Mother–child dyads were observed during 10 minutes of free play using toys provided in three bags that included books, toys for pretend play, and age-appropriate manipulative toys, respectively. The "Three Bag task" provides a structured space with flexibility for the mother to guide the interaction and to use the toys as they wish while playing with their children [88]. PICCOLO [6]was then used to score parent–child interactions in these 10-minute video recordings. Finally, the Ages and Stages questionnaire-3 [89]was administered to check whether the child performed the behavior indicated in the items of the areas of communication, problem-solving, and personal-social with the following instruction: "We will read each question carefully and check whether your baby does the activity, does the activity sometimes or not yet." Interviewers and mothers completed the ASQ-3 in around 10–15 minutes. According to Small et al. [90], in low-income countries in Latin America, this instrument is usually read by a trained evaluator who helps parents record and interpret their child's response when they are evaluated. Mothers completed ASQ-3, but all items were read and verified whether the child did the activity indicated in the questionnaire by a member of the research team due to difficulties in reading presented by the adolescent mothers.

2.3. Measures

An *ad-hoc sociodemographic* questionnaire was used to record the mother's age, educational level, employment status, and whether she was receiving support or help in the care of her child from the child's grandparents when the mother was studying or working at home and in parenting tasks such as feeding, toileting, and putting the baby down to sleep. The same questionnaire was used to record the child's age, gender, relatives who resided with them, and whether they attended a preschool learning center.

The *Parenting Interactions with Children: Checklist of Observations Linked to Outcomes (PICCOLO,* [6]) is an observational tool assessing interactions between parents and children aged 10 to 47 months. It includes 29 observable parental behaviors that reflect parent interaction behaviors, which are scored according to their frequency as 0 (absent, no behavior observed), 1 (barely, minor, or emerging behavior), and 2 (clear, definitive, strong, and frequent behavior). These are grouped into four domains: (a) Affection (7 items), which involves physical and verbal expression of affection, positive emotions, positive evaluation, and positive regard; (b) Responsiveness (7 items), which includes reacting sensitively to a child's cues and expression of needs or interests and reacting positively to the child's behavior; (c) Encouragement (7 items), which considers parents' support of children's efforts, exploration, independence, play, choices, creativity, and initiative; and (d) Teaching (8 items), which includes cognitive stimulation, explanations, conversation, joint attention, and shared play. The instrument generates a score for each domain between 0 to 14 (0 to 16 for the teaching domain) and a total score between 0 and 58 (adding all the items). The original PICCOLO reliability is good; the analysis of Cronbach Alpha for the total instrument was .91 (.78 for affection, .75 for responsiveness, .77 for encouragement, and .80 for teaching), and the instrument had good results for construct and predictive validity [6]. In this study, the Chilean adaptation of PICCOLO [91] was applied, and the reliability (Cronbach Alpha) for the total instrument was 88 (.76 for affection, .85 for responsiveness, .75 for encouragement, and .65 for teaching). For this sample comprised of Chilean adolescent mothers (n = 79), the reliability (Cronbach α) for the total instrument was .87 (.64 for affection, .70 for responsiveness, .69 for encouragement, and .62 for teaching). Inter-rater reliability for the current study was calculated from 20% of observations, yielding an inter-rater agreement estimate of 0.85 for total scores used in the current analyses. The training of the raters involved the following steps: the second author, whom the authors of the original PICCOLO trained, trained the first author for this study, who read about the content and purpose of the measure (during an approximately 3-h session) during a university course attended by the first author that the second author dictated. In this course, the first author scored the Spanish version of the PICCOLO when she watched four video recordings (3 h). The first author was considered to have satisfactorily completed her training when the percentage of agreement between evaluators was equal to or higher than 80%.

 doi:10.20944/preprints202310.0237.v1

Both authors viewed and discussed 20 of the 79 video recordings for this study and coded them to establish reliability.

The *Spanish version of the Ages and Stages Questionnaire Third Edition (ASQ-3)*, developed by Squires et al. [89], is a caregiver-report tool to assess children's developmental progress from birth to 60 months. This questionnaire includes six items that pertain to the areas of communication (both comprehensive and expressive language), problem-solving (which includes cognitive skills in terms of learning and play), and personal-social development (related to the child's self-help abilities and social interactions). For each item, respondents select one of three possible responses coded as "10" (yes), "5" (sometimes), or "0" (not yet), based on whether the child could perform a specific task. The overall score is derived by summing these responses, with higher scores indicating higher levels of development in children. To ensure consistency and avoid variations in cutoff scores based on age ranges defined in ASQ-3, the developmental scores of children in this sample were transformed into Z scores using a standard metric. The ASQ is recognized as a valid and reliable instrument for assessing child development, with a reported Cronbach's alpha coefficient of .94 for overall reliability [92]. It should be noted that ASQ-3 was validated in Chile by Armijo et al. [93]and considered an effective screening tool. In the present sample, reliability was confirmed with a Cronbach's alpha coefficient of .73.

2.4. Data analysis

Data were analyzed in several stages. Firstly the bivariate association between parenting behaviors, socio-demographic factors (i.e., whether the mother had dropped out of school, her employment status and whether she received support or help in the care of her child, child's gender, whether fathers resided with their child, and whether children attended preschool), and the ASQ-3 scores was quantified and tested by means of correlation tests in the case of interval scales and using parametric tests based on comparisons of means in the case of categorical predictors. In order to complement the statistical analysis, effect sizes were computed using Cohen's d, eta-squared, and product-moment correlations. In this regard, these analyses were useful to determine initial sets of predictors to be included in the predictive models for all ASQ-3 scores. More specifically, a significance (p) lower than .05 was used to specify sets of predictors to be used for all responses employed in the current study.

Linear regression models were estimated in order to predict ASQ-3 scores using as exogenous variables all relevant variables concerning parenting behaviors as well as socio-demographic factors employed as potential predictors in the modeling procedure. In this regard, the routine was based upon a feasible solutions algorithm [94], an intensive computing method that allows researchers to find an optimal solution amongst multiple possible solutions (i.e., candidate models). These multiple solutions correspond to different subsets of predictors including second-order interaction terms. Specifically, the intensive routine was as follows: 1) In the first step of every iteration evaluated, models were specified to include those predictors that proved to be useful in the bivariate analyses along with a random subset of the remaining predictors with which second-order interactions will be assessed; 2) in the next step, the complexity of the model was trimmed taking into account its predictive capacity; 3) steps 1 and 2 were iterated k times, saving the model obtained in each iteration; 4) the model that yielded the highest number of occasions, and thus having the highest predictive capacity, was kept as the fittest one; 5) in the final step of the modeling routine, some of the terms kept in the fittest model found in step 3 were removed, depending on the goodness-of-fit index. One thousand different initial random subsets of predictors were studied for each response (k=1,000), allowing us to evaluate the models' space when searching for an optimal solution while avoiding local solutions. Adjusted R-squared was employed as a fit index during the iterations and the complexity of the final solution obtained by means of the intensive procedure was reduced whenever possible by using Akaike's Information Criterion (AIC).

All statistical models were assessed in order to improve their specification by adding non-linear terms (i.e., polynomials) as well as detecting possible issues concerning multicollinearity (by inspecting Variance Inflation Factors, VIFs, and considering VIF < 5 as an indicator of the absence of

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multicolinearity problems). Finally, raw and standardized effects were estimated for interpretation using the original metrics of the scales used and as adimensional effects, thus allowing comparisons betweeen predictors in terms of their relative importance.

All statistical analyses were carried out using the R environment (version 4.1; R Core Team, 2021). The intensive modeling routine was implemented using the rFSA package [95].

3. Results

3.1. Sociodemographic factors and children's developmental outcomes

The relationship between each factor included in the *sociodemographic questionnaire* (parenting domains regarding affection, responsiveness, encouragement, and teaching) and children's developmental outcomes (ASQ-3 Z scores) was analyzed. The results showed that mothers were more responsive when their children were girls (t (77) = -2.19; p = .02; d = 0.49) and when fathers resided with their children (t (77) = 2.0; p = .02; d = 0.49). Moreover, mothers' encouragement scores were higher when mothers did not drop out of school (t (77) = -2.05; p = .02; d = 0.67) and when fathers resided with their child (t (77) = 1.86; p = .03; d = 0.45). Finally, teaching domain scores were higher when mothers were employed (t (77) = 2.73; p = .02; d = 0.62), when their children were girls (t (77) = 1.82; p = .04; d = 0.41) and when the father resided with their child (t (77) = 1.70; p = .047; d = 0.42). Specifically, teaching domain scores were higher when fathers and grandparents resided with the children [F (2,29.5) = 3.42; p = 0.038; η 2 = 0.08].

Regarding the relationship between children's development and sociodemographic factors, the results showed a relationship between mothers dropping out of school (t (77) = -2.32; p = .023 d = 0.76), employment status (t (77) = 2.07; p = .042; d =.60) and children's problem-solving scores. In this regard, children with currently employed mothers who had not dropped out of school showed significantly higher scores in problem-solving development. Additionally, there was a significant association between the fact of fathers residing with their children and scores corresponding to communication (t (77 = 2.77; p = .01; d =0.69), problem-solving (t (77) = 2.54; p = .013; d = 0.63), and personal-social (t (77) = 2.61; p = .011; d = 0.65) development. Specifically, children residing with their fathers scored significantly higher in the abovementioned dimensions.

Likewise, girls performed significantly better than boys in communication (t (77) = -2.22; p = .029; d = 0.51), problem-solving (t (77) = -2.21; p = .03; d = 0.50), and personal-social (t (77) = -2.65; p = .01; d = 0.60) scales.

Table 2. Descriptive summary of ASQ-3 Z and PICCOLO scores by sociodemographic factors.

	Communication	Problem-solving	Personal-social	Affection	Responsiveness	Encouragement	Teaching
	M±*SD* (Min-Max)	*M*±*SD* (Min-Max)	*M*±*SD* (Min-Max)	*M*±*SD* (Min-Max)	*M*±*SD* (Min-Max)	*M*±*SD* (Min-Max)	*M*±*SD* (Min-Max)
Mother`s level of education							
Dropped out of school (n= 11)	0.03±.97 (-1.86−1.19)	-0.6±0.88 (-1.88−1.23)	0.23±1.01 (-1.51−1.66)	8.82±2.23 (4.0−12.0)	9.64± 2.88 (3.0 −13.0)	7.27±2.97 (1.0 −11.0)	8.82±3.74 (2.0 −14.0)
Not dropped out of school (n= 68)	-0.01±0.96 (-2.06−2.09)	0.1±0.94 (-2.34−1.7)	-0.04±0.95 (-2.13−2.07)	10.09±2.53 (3.0−14.0)	10.09±2.50 (2.0−14.0)	9.03± 2.59 (2.0− 14.0)	8.56± 2.92 (0−14.0)
Statistical test (Effect size)	*t*= 0.12 d= 0.04	*t*= -2.32* d= 0.76	*t*= 0.84 d= 0.28	*t*= -1.57 d=0.51	*t*=-0.55 d=0.18	*t*=-2.05* d=0.67	*t*= 0.26 d=0.09
Mother's employment status							
Employee (n=15)	-0.01±0.79 (-1.27−2-09)	0.45±0.81 (-0.83−1.38)	-0.05±0.8 (-1.51−1.13)	10.40±2,13 (7.0−13.0)	10.87± 1,685 (7.0 −13.0)	9.73±1,944 (7.0 −14.0)	10.07 ±2,086 (5.0 −13.0)
Not an employee (n=64)	0 ±0.99 (-2.06−2-06)	-0.11±0.96 (-2.34−1.7)	0.01±0.99 (-2.13−2.07)	9.80 ±2.60 (3.0−14.0)	9.83 ±2.67 (2.0−14.0)	8.56 ± 2.81 (1.0− 14.0)	8.25± 3.12 (0−14.0)
Statistical test (Effect size)	*t*=-0.04 d= 0.01	*t* = 2.07 * d =0.60	*t*=-0.23 d= 0.07	*t*= 0.84 d=0.24	*t*= 1.44 d=0.41	*t*= 1.53 d=0.44	*t*= 2.73* d=0.62

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Support in the care of child							
Receiving support in the care of child (n= 62)	0.08±0.94 (-2.06–2.06)	0.07±0.96 (-1.93–1.7)	0±0.98 (-2.13–2.07)	9,94±2.40 (4.0–14.0)	10,18± 2.28 (3.0 –14.0)	8,85± 2.64 (1.0 –14.0)	8,65±2.81 (2.0 –14.0)
Not receiving support in the care of child (n= 17)	-0.3±0.97 (-1.98–2.06)	-0.27±0.89 (-2.34–1.04)	-0.01±0.87 (-1.51–1.66)	9.82±2.96 (3.0–14.0)	9.47±3.34 (2.0–13.0)	8.53± 2.98 (2.0– 12.0)	8.41± 3.81 (0–14.0)
Statistical test (Effect size)	t= 1.47 d= 0.41	t= 1.31 d =0.37	t=0.06 d= 0.02	t=0.16 d=0.04	t=1.02 d=0.28	t=0.44 d=0.12	t=0.28 d=0.08
Child gender							
Girl (n=37)	0.25±0.83 (-1.13–2.09)	0.25±0.86 (-1.93–1.7)	0.29±1.01 (-1.66–2.07)	10,05 ±2.33 (3.0–14.0)	10,68 ± 2.22 (2.0 –14.0)	9,30 ±2.33 (4.0 –14.0)	9,24±2.55 (2.0 –14.0)
Boy (n=42)	-0.22±1.01 (-2.06–1.5)	-0.22±0.99 (-2.34–1.7)	-0.26±0.83 (-2.13–1.18)	9.79±2.68 (4.0–14.0)	9.45 ±2.68 (3.0–13.0)	8.33± 2.94 (1.0– 14.0)	8.02± 3.31 (0–14.0)
Statistical test (Effect size)	*t* = -2.22 * d = 0.51	*t* = -2.21* d = 0.50	*t* = -2.65** d = 0.60	t=-0.47 d=0.11	t=-2.19* d=0.49	t=-1.60 d=0.36	t=-1.82* d=0.41
Preschool center							
Had attended preschool (n=28)	-0.1±1.07 (-2.06–2.06)	0.17±0.96 (-1.93–1.38)	-0.13±0.95 (-2.13–1.91)	10.04±2.55 (5.0–14.0)	10.07± 2.36 (5.0 –13.0)	9.0±2.66 (3.0 –14.0)	8.79±2.59 (3.0 –14.0)
Had not attended preschool (n=51)	0.05±0.89(-1.98–2.09)	-0.09±0.95 (-2.34–1.7)	0.07±0.96 (-1.7–2.07)	9.84±2.52 (3.0–14.0)	10.0±2.65 (2.0–14.0)	8.67± 2.74 (1.0– 14.0)	8.49± 2.26 (0–14.0)
Statistical test (Effect size)	t=-0.65 d = 0.16	t=1.18 d = 0.28	t=-0.91 d = 0.22	t=0.32 d=0.08	t=0.12 d=0.03	t=0.52 d=0.12	t=0.41 d=0.10
Father							
Residing with his child (n=24)	0.43±0.93 (-1.86–2.06)	0.4±0.7 (-0.83–1.7)	0.41±0.82 (-1.12–1.59)	10.13±2.68 (3.0–14.0)	10.88± 2.54 (2.0 –14.0)	9.63±2.30 (4.0 –12.0)	9.46±3.16 (2.0 –14.0)
Not residing with his child (n=55)	-0.19±0.91 (-2.06–2.09)	-0.17±1 (-2.34–1.38)	-0.18±0.96 (-2.13–2.07)	9.82±2.46 (4.0–14.0)	9.65±2.47 (3.0–14.0)	8.42± 2.79 (1.0– 14.0)	8.22± 2.91 (0–13.0)
Statistical test (Effect size)	*t* = 2.77** d =0.69	*t* = 2.54** d = 0.63	*t* = 2.61** d = 0.65	t=0.50 d=0.12	t=2.0* d=0.49	t=1.86* d=0.45	t=1.70* d=0.42
Grandparents							
Mother, father, and children (n=6)	0.13±0.93 (-1.13–1.23)	0.40±0.55 (-0.24–1.04)	0.22±0.89 (-0.91–1.51)	10.0±3.69 (3.0–14.0)	9.50±4.14 (2.0–13.0)	9.83±2.93 (4.0–12.0)	7.83±4.31 (2.0–14.0)
Mother, grandparents, and children (n=56)	-0.15±0.93 (-2.06–2.09)	-0.16±0.98 (-2.34–1.38)	-0.11±0.99 (-2.13–2.07)	9.75±2.53 (4.0–14.0)	9.77±2.05 (3.0–13.0)	8.41±2.83 (1.00–14.0)	8.18±3.0 (0–13.0)
Mother, grandparents, father, and children (n=17)	0.43±0.95 (-1.87–2.06)	0.39±0.87 (-1.53–1.70)	0.29±0.81 (-1.12–1.59)	10.41±2.03 (7.0–13.0)	11.06±1.75 (8.0–14.0)	9.65±1.90 (5.0–12.0)	10.24±2.49 (3.0–14.0)
Statistical test (Effect size)	*F* = 2.54 η^2 = 0.06	*F* = 2.85 η^2 = 0.07	*F* = 1.31 η^2 = 0.03	*F* = 0.45 η^2 = 0.01	*F* = 1.87 η^2 = 0.05	*F* = 1.90 η^2 = 0.05	*F* = 3.42 η^2 = 0.08

Notes: *p < .05 **p < .01.

3.2. Parenting domains and children's developmental outcomes

Observed average levels for the PICCOLO's domains were 9.91 (SD=2.51; Min=3, Max=14) for affection, 10.03 (SD=2.54; Min=2, Max=14) for responsiveness, 8.78 (SD= 2.70; Min=1, Max=14) for encouragement, and 8.59 (SD=3.02; Min=0, Max=14) for teaching.

Statistically significant Pearson's correlation coefficients were found between children's development and parenting. Firstly, communication development was associated with the mother's responsiveness and teaching. Likewise, problem-solving was related to the mother's responsiveness, encouragement, and teaching. Finally, personal-social development was significantly associated with the mother's teaching (see Figure 1). Supplemental material shows a correlation plot.

Table 3. Pearson's correlations between ASQ-3 Z scores and PICCOLO domain scores.

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	2	3	4	5	6	7
1 Affection	.57**	.74**	.33**	.00	.10	.06
2 Responsiveness		.62**	.60**	.34**	.26*	.10
3 Encouragement			.54**	.18	.24*	.19
4 Teaching				.27*	.35**	.24*
5 Communication					.36**	.35**
6 Problem solving						.37*
7 Personal-social						

Notes.: *p < .05 **p < .01.

3.3. Predictive models for infants' ASQ-3 developmental scores

The results indicate that higher levels in all developmental areas of the ASQ-3, that is, communication (β = -0.23, p = .03; 95% CI = [-0.95; -0.06]), problem-solving (β = -0.21, p = .04; 95% CI = [-0.89;-0.03]), and personal-social (β = -0.22, p = .04; 95% CI = [-0.92;-0.03]) were predicted by having the father residing with their children. In turn, being a girl predicted a higher level of communication (β = 0.23, p = .03; 95% CI = [0.04;0.85]), problem-solving (β = 0.20, p = .05; 95% CI = [0.00;0.79]), and personal-social (β = 1.24, p = .01; 95% CI = [0.17;1.01]) development.

Both for communication and problem-solving development, there were interactions with the support received by the mother for childcare. Specifically, communication scores were higher when the mothers received childcare support but only when the children were not attending preschool (unstandardized marginal B = 0.41 and 95% CI = [0.12;0.70]), and the interaction between mothers' affection and mothers receiving support in the care of their children (β = -0.71, p = .06; 95% CI = [-0.82;0.13]) predicted higher scores in problem-solving development. The interaction between the mother's affection and the child's gender (β = 1.24, p = .01; 95% CI = [0.17;1.01]) showed higher personal-social scores.

It should be noted that mothers' teaching scores (β = 0.32, p = .01; 95% CI = [0.09;0.54]) and mothers dropping out of school (β = 0.25, p = .02; 95% CI = [0.13;1.30]) were significantly associated with child problem-solving development only, but not with the other developmental areas.

Table 4 summarizes the regression model obtained based on a feasible solutions algorithm using ASQ-3's communication, problem-solving, and personal-social development scores (n = 79) as the response. Categorical factors include the category to be compared to the reference category within parentheses.

Table 4. Regression model on children's developmental score.

Child development: Communication					
Variable	**Estimate**	**SE**	**Standardized Beta**	**t**	**p**
Intercept	-0.77	0.47		-1.63	.11
Mother's responsiveness	0.07	0.04	0.18	1.70	.09
Gender (Female)	0.43	0.19	0.23	2.20	.03
Father residing with his child (No)	-0.48	0.21	-0.23	-2.28	.03
Receiving childcare support (Yes)	0.57	0.45	0.25	1.25	.21
Child attending preschool (Yes)	0.53	0.22	0.27	2.46	.02
Child attending preschool x Childcaresupport provided	-1.42	0.53	-0.55	-2.68	.01
Adj. R^2 = .26					
Child development: Problem-solving					
Variable	**Estimate**	**SE**	**Standardized Beta**	**t**	**p**
Intercept	-1.10	0.63		-1.74	.09
Mother's teaching	0.10	0.04	0.32	2.82	.01
Mother dropped-out of school (No)	0.68	0.28	0.25	2.45	.02
Mother employed (No)	-0.33	0.24	-0.13	-1.35	.18
Gender (Female)	0.38	0.19	0.20	1.98	.05
Father residing with his child (No)	-0.44	0.21	-0.21	-2.15	.04
Mother's affection	0.01	0.05	0.03	0.27	.79

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Receiving childcare support (Yes)	1.25	0.86	0.54	1.44	.15
Mother's affection x childcare support provided	-0.16	0.08	-0.71	-1.88	.06
Adj. R^2 = .27					
Child development: Personal-Social	**Estimate**	**SE**	**Standardized Beta**	**t**	**p**
Variable					
Intercept	0.56	0.55		1.02	.31
Mother's teaching	0.06	0.04	0.19	1.69	.09
Gender (Female)	-1.79	0.82	-0.94	-2.19	.03
Father residing with his child (No)	-0.45	0.21	-0.22	-2.11	.04
Mother's affection	-0.10	0.05	-0.26	-1.87	.07
Mother's affection x child's gender	0.22	0.08	1.24	2.83	.01
Adj. R^2 = .20					

Notes.*p < .05 **p < .01.

4. Discussion

In the current study, we aimed to determine the relationship between some familial sociodemographic factors (e.g., mother who had dropped out of school, employment status, support in the care of child, child's gender, fathers/grandparents living with their child, and children attending preschool) and parenting characteristics such as affection, responsiveness, encouragement, and teaching [6]of Chilean adolescent mothers, concerning communication, problem-solving, and personal-social developmental outcomes in typically developing children. To better understand our results, we will discuss how sociodemographic variables and adolescent motherhood are related to child development below.

4.1. Sociodemographic factors and children's developmental outcomes

Comparative analyses showed significant differences between child development based on certain sociodemographic variables. Our results showed that children with employed mothers and mothers who had not dropped out of school had higher problem-solving developmental scores. Regarding the association of maternal employment and child cognitive development, as mentioned in the introduction, it has been shown that the children of working Chilean mothers demonstrate more robust cognitive performance since maternal employment contributes to their parenting skills, leading to a higher level of child development [38,39].The association between employment and parenting skills was also observed in this study since it was found that employed mothers had higher scores in the teaching domain. In turn, the teaching domain was significantly associated with child cognitive development in this sample. This result contributes to the current literature that discusses the reconciliation between work and child care [96], in which it has been shown that the mother's employment does not interfere with their children's daily activities [97]. In fact, according to the findings of Huston & Rosenkrantz Aronson [98], mothers who worked for longer provided their children with higher-quality home environments and interaction. This issue will be addressed in future research that will examine the association between maternal employment and parenting as factors influencing children's developmental outcomes.

Regarding the difference in problem-solving development between children of mothers who had dropped out of school and those who had not, it is well known that socioeconomic status factors have a significant association with cognitive development, making maternal education an important variable [99]. In the case of the sample in this study, the low education that adolescent mothers usually receive could be associated with disadvantaged social circumstances that put their children's cognitive development at risk [32]. It has been found that the educational level of mothers who, regardless of income, the educational level of the mother was found to be a strong predictor of their child's cognitive development [100] (Schady, 2011) and that higher educational levels in mothers who became pregnant during adolescence predicted better achievement of children in mathematics at the start of school [101]. Therefore, the relationship between adolescent mothers' continuity of education and their children's cognitive development is interesting since mothers who do not drop out of school can make a difference in their children's cognitive development even when they belong to a low-

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income family. However, future studies of larger samples that include different levels of socioeconomic status are required to deepen our understanding of the influence of school dropout by adolescent mothers on their children's cognitive development.

We also found that children who resided with their fathers achieved significantly higher scores in communication, problem-solving, and personal-social development. Children living with both parents may receive more financial investment and spend more time with their fathers, which, in turn, would enhance child development [102]. Furthermore, the father's presence can help in the child's development due to fathers engaging in activities that contribute to their children's learning and providing emotional support and guidance to them; indeed, the effectiveness of parenting depends on the quantity of time parents spend with their children and the quality of the relationship they establish with them [103]. This evidence could explain why children who lived with their fathers achieved higher scores in developmental outcomes in our sample. Our results are similar to another study carried out on children of adolescent mothers, which found that those children who were in contact with their father during the first eight years of life had higher levels of social-emotional functioning and reading than those who were not in contact with their father [47].

Another aspect of our results to consider is that mothers showed higher responsiveness, encouragement, and teaching scores when fathers cohabited. These maternal factors were related to their children's development. In this context, the association between the coresidence between mothers and fathers could be a protective factor for maternal well-being [104], contributing to the quality of dyadic interaction in their children's development. More specifically, the absence of the father is an aspect that directly influences stress in socioeconomically disadvantaged Chilean mothers [105]. In adolescent mothers, the father's presence helps to reduce maternal depression [106]. In turn, a low level of maternal mental health in adolescent mothers has been related to developmental problems in their children [30]. Nevertheless, this factor was not considered in our study, but it is a relevant issue that could be considered in future studies on adolescent mothers.

Another sociodemographic variable associated with the children's developmental outcomes was the child's gender. Specifically, girls scored higher than boys in communication, problem-solving, and personal-social development. Our results are concordant with studies that have shown that girls were ahead of boys in early communicative gestures, productive vocabulary, and combining words [107]and showed stronger social interaction during the preschool stage, because the forms of social and structured play appear earlier in girls than in boys, even though these differences vary over time [108]. Also, in more recent research on children aged from 4 to 7 years, girls showed higher cognitive ability to perform mental tasks faster than boys [109]. So, it is reasonable to assume that biological components that explain functional and morphological differences in the brain between boys and girls [110] lead to a higher level of performance in girls in all areas assessed.

It should be noted that the quality of interactions between parents and their children could vary according to their gender and, in turn, be associated with their developmental outcomes. Adolescent mothers in our sample showed higher levels of responsiveness and teaching when interacting with girls than boys. Our findings are similar to previous research by Butler & Shalit-Naggar [111], who observed that mothers tend to exhibit higher levels of responsiveness towards girls than boys. Leaper [112]also reported that mothers show increased responsiveness and engage in more conversations with their daughters than their sons. It is widely recognized that explanations and interactive conversations during play significantly contribute to a child's development [113,114]. Therefore, both the biological factors that indicate that girls mature before boys and the parental characteristics of adolescent mothers when interacting with their children may explain why girls had higher scores in developmental outcomes than boys.

4.2. Parenting and child development

Parenting behaviors, as measured by the PICCOLO, have been studied in diverse ethnic groups [115,116]. Recent literature has documented the association between parenting and child development, both in families with developmental delay disabilities[26,117,118] and those with typically developing children [119–121]. Compared with other studies in which parenting was

 doi:10.20944/preprints202310.0237.v1

assessed with PICCOLO in adult mothers of typically developing children [120] and children with disabilities [26], the responsiveness domain showed the highest mean score, followed by affection, the encouragement domain and finally the teaching domain. Thus, it is possible to infer that dyadic interaction between Chilean adolescent mothers and adult mothers with their children does not vary so much regarding the frequency of parental behavior during free play nor the association between the parenting domains and their children's development.

Interestingly, the parenting domain scores in the current study sample were lower than in all previously mentioned studies. However, compared with the original study of parenting assessed using the PICCOLO in a low-income sample from the United States that included European Americans, African Americans, and Latino American families [115], in our sample, the means of the affection and encouragement domains were lower, responsiveness was similar, and teaching was higher. Also, compared with a Turkish sample [116], all domains were lower, except teaching.

Given the low economic and educational status of the mothers who participated in our study, it is curious that the mean score for the adolescent mothers' teaching domain was higher than in the other studies mentioned. Despite this, a study conducted with Chilean mothers aged from 15 to 44 years old found higher means in all domains than in our sample [35] . It would be interesting for future studies to compare these parenting domains between Chilean adolescent and adult mothers to determine whether there are significant differences. This comparison would be necessary because previous evidence has found differences in the support adult mothers receive compared to adolescent mothers [122]. In this context, adolescent mothers tend to be more depressive, feel less efficacy in their maternal role, and receive lower social support than adult mothers, which could affect their parenting [123].

The results of our study confirm the association between early parenting behaviors and the cognitive, linguistic, and social development of adolescent mothers' children and are similar to the results of research that has found a close relationship between adult mothers' parenting and child development [124,125]. Specifically, our results show that responsiveness was associated with communication and problem-solving development. This was consistent with the findings of several previous studies that have analyzed parenting interactions with children with typical development [58,61,72,73,126]. It should be noted that this finding could make a valuable contribution to the existing literature because previous research has found that maternal responsiveness in adolescent mothers acted as a mediator between socioeconomic risk and cognitive development [34].

In this study, we also found that children whose mothers displayed more encouraging behaviors during mother–child interactions showed higher scores in problem-solving development. Our results are consistent with studies that found that children of mothers who support their children's autonomy (which is associated with the encouragement domain) achieved higher levels of executive function, that is related to the children's skills to solve problems [127].

Furthermore, our findings also establish that adolescent mothers' teaching is associated with communication, problem-solving, and personal-social development. A considerable amount of research has documented the association between teaching or cognitive stimulation and children's cognitive, linguistic, and social development [125,128,129], although few studies have analyzed this in adolescent mothers. However, previous studies of adolescent mothers have shown that having a poor language-learning home environment was related to lower language development in children [130].

This view is consistent with the study by Shephard et al. [131], which established that due to factors such as living in impoverished environments and mental health problems, children born to adolescent mothers represent a population at high risk for impaired child development. However, although this study involved low-income adolescent mothers, risk variables such as maltreatment, abuse, or neglect, which are frequent factors in these vulnerable dyads [132], were not analyzed. Thus, future studies of adolescent mothers must analyze the association between their context and parenting competencies.

Given that adolescent motherhood is concentrated in low socioeconomic groups in Chile [133]and, that, in this country, there is a gap between low-income and high-income child

development [134], it is relevant that our findings indicate that positive parenting in terms of responsiveness, encouragement, and teaching contributes to cognitive, linguistic and socio-individual development. The significance of these results lies in the fact that the home environment and parenting competencies significantly influence children's development [135]. From this perspective, it would be interesting for intervention programs that work with low-income adolescent mothers to strengthen parental skills to prevent cognitive and linguistic problems in children of very young mothers since children born of adolescent mothers are more prone to risk for poorer developmental outcomes [136].

In this study, the mother's affection was not significantly related to their children's cognitive, linguistic, or personal-social development. Although affection may play an essential role in children's development, it has been demonstrated that maternal warmth moderates the impact of maternal intrusiveness on child anxiety and separation anxiety [137], being more associated with closeness and confidence between mother and child. A study comparing adolescent and adult mothers interacting with their children found that adolescent mothers spent more time in negative engagement with their children than adult mothers, which was associated with insecure attachment [56]. Thus, maternal affection is more associated with secure attachment than children's cognitive and linguistic development [138]. This may explain why the adolescent mother's affection was not associated with any of the evaluated areas of child development.

4.3. Predictive models for child's development

Regarding the association of sociodemographic and parental factors with children's development, higher scores in communication development could be explained by higher maternal responsiveness, being a girl, having the father residing with their children, and the mother receiving childcare support but only when children did not attend preschool. Previous research on the quality of parent–child interactions (including both mothers and fathers) has concluded that affection is higher when parents interact with their daughters than with their sons [82,139,140]. Moreover, fathers were more attentively engaged with their daughters and used more analytical language than their sons [141]. It is well known that parents' responsiveness promotes expanded word learning in children's early years [142]. This presumption could partially explain why fathers residing with their children, the mother's responsiveness and the children's gender play an essential role in communication development.

However, to determine whether this result is due to the evidence presented, it would be necessary to analyze the quality of dyadic interaction between parents and their children. The importance of inquiring about the complement of parenting competencies of fathers and mothers is that it would explain higher scores in communication development in girls than in boys. However, this was not done in the current study. As we mentioned in the introduction, mothers who reside with the fathers of their children could suffer lower levels of distress [84], which, in turn, is associated with positive parenting [83]. Maternal health was not assessed in this research. Therefore, it is a subject that should be considered in future studies examining factors related to parenting in adolescent mothers.

Regarding the support that adolescent mothers receive in childcare, preschool centers contribute to reducing the gap between children from lower and higher-income families, promoting linguistic and mathematical development by reducing problem behaviors due to the rapid brain development they experience during the first years of life [143]. Nevertheless, in the Chilean context, it has been shown that child development in children aged from 6 months to 3 years who attend preschool centers and those who stay at home is similar. Therefore, the younger the child, the more significant family variables are for child development than going to preschool [144]. In this sense, it is reasonable for adolescent mothers who receive childcare support in their own homes to have better-performing children if they do not require preschool centers to support them with the care of their children. However, future studies need to analyze this interaction between the support that adolescent mothers receive in childcare and their children's attendance at preschool centers in later years because previous literature has indicated that children who attend educational centers from an early age have

 doi:10.20944/preprints202310.0237.v1

a higher academic performance in the long term [145]. Thus, it is possible that the association between attendance at a preschool center by children born of low-income adolescent mothers and children's development will not be evident immediately. However, it could be significant when children are older.

The problem-solving development score was higher for girls with higher mothers' teaching scores, mothers who had not dropped out of school, and fathers residing with their children. Scientific evidence shows that the mothers' educational level contributes to the cognitive development of their children, which would also be influenced by a cognitively stimulating home environment [135]. Our findings are consistent with recent research as mentioned above. Furthermore, when fathers engage positively in activities with their children, teaching activities may promote learning and development [146]. In future studies, it will be necessary to determine what kind of activities fathers of adolescent mothers' children perform and whether these predict better development of children's problem-solving skills.

Finally, the children's social-personal development score was higher when fathers resided with them and in daughters of those mothers with higher levels of affection. Our findings are consistent with a study that found that the fathers' coresidence with the adolescent mother's children during the first three years of life was related to lower externalization problems in children [84]. Also, the evidence has shown that maternal affection/warmth is related to stronger regulation and prosocial behavior in their children [147,148] and that it is higher in daughters than in sons [149]. Although our sample did not show a direct correlation between a mother's affection and children's development or the difference between boys and girls, our findings show that mothers show more affection towards girls when the fathers reside with them from an early age. More studies are required to analyze whether this phenomenon occurs in samples of adult and adolescent mothers and fathers.

4.4. Limitations and future directions for research

The present study supports the literature on adolescent mothers' parenting of the typically developing child. However, this research has several limitations that should be taken into account. First, the study sample size might appear to be small since it only included 79 participants. Nevertheless, post-hoc power analyses for this sample size indicate that given a predictive capacity of R2=.20 in models with five predictors and α =.05, a statistical power greater than .95 is still obtained. In this regard, the sample size did allow us to reach conclusions concerning the effects adequately enough. Nevertheless, it is not possible to generalize these results since the sampling was intentional and its representativeness might thus be affected.

Additionally, it is necessary to remember that the presence of correlations does not imply causality. Specifically, in this descriptive and cross-sectional study, the term "predict" does not mean direct causality but instead estimates child development scores based on scores of sociodemographic variables and parental variables, that is, the predictor variables. It should be noted that the fact that it was not a longitudinal study may be a limitation from the point of view that the quality of interaction may change depending on the age of the child [150], the age of the mother, and her level of education [35].

Another limitation to consider is that the tool we used to measure child development was a caregiver report rather than a behavioral observation measurement instrument, as applied in other research with typically developing children [151,152]. However, the ASQ-3 is a recommended and qualified screening tool for investigating children's development (Squires et al., 2009), and UNICEF has recommended it for developing countries [153].

In addition, some internal consistency indices associated with PICCOLO subscales were low, as also found in a study carried out by Rivero et al. [154] with a sample that included children with typical development. In this sense, although it might affect the psychometric properties of some of the tools, it is not just a particular issue of the current study. Despite this, PICCOLO has been applied to children in large samples in the United States in diverse ethnic groups [115] (Roggman et al., 2013b), Turkey[116] (Bayoğlu et al., 2013) and Spain [66]. Therefore, these studies have demonstrated

this instrument's strong reliability and predictive validity for low-income families with diverse cultural backgrounds.

Finally, the study did not consider the quality of parental interaction between fathers and adolescent mothers' children. Our findings indicated that the levels of development of the children who lived with their fathers were higher in all the areas evaluated (communication, problem-solving, and personal-social). From this point of view, our results could have been more robust if we had analyzed the relationship between the parental dimensions of the fathers measured by PICCOLO and their children's development, complementing this with the parental behaviors of the adolescent mothers, as has been done in other studies with adult parents [8,155]. However, not all adolescent mothers were cohabiting with the father of their children. As mentioned in the introduction, in the Chilean context, several adolescent fathers indicated that they did not live with their children [41] . Further analyses of adolescent mothers, fathers, and their children are needed to determine the consistency of our findings.

5. Conclusions

The current study confirmed that sociodemographic and parenting factors of adolescent mothers could explain children's developmental outcomes. The above findings will contribute to determining how the presence of the father and adolescent mothers' responsiveness and teaching influence their children's communication, problem-solving, and personal-social development. It should be noted that adolescent mothers constitute a risk group in terms of social and economic factors and a low educational level. Thus, promoting adolescent mothers' knowledge about stages of child development is an issue that should be considered when planning interventions to enhance parenting and children's development in Chilean national programs. These findings highlight the importance of providing adolescent mothers with social support and guidance during motherhood to continue their studies, offering them information on entering and training in the workplace, and providing support and resources that optimize child development.

Author Contributions: Conceptualization, L.L.-M. and R.V.; methodology, L.L.-M. and D.L.; software, D.L.; formal analysis, L.L.-M. and D.L.; investigation, L.L.-M. and R.V.; data curation, L.L.-M. and D.L.; writing—original draft preparation, L.L.-M., and R.V; writing—review and editing, L.L.-M., R.V, and R.G-R.; visualization, L.L.-M. R.V, and R.G-R.; supervision, L.L.-M. and R.V.; project administration, R.V.; funding acquisition, R.V. All authors have read and agreed to the published version of the manuscript.

Funding: Please add: This research was funded by Agencia Nacional de Investigación y Desarrollo (ANID) through a doctoral fellowship granted to Laura Léniz-Maturana [grant number: 72190318]. And The APC was funded by University of Barcelona and Universidad Católica de la Santísima Concepción.

Institutional Review Board Statement: The study was conducted in accordance with the Declaration of Helsinki and approved by the Ethics Committee of the Health Service of Concepción (protocol code 19-03-05, 30 May 2019) and the Health Service of Biobío (protocol code 82, 26 April 2019) for studies involving humans.

Informed Consent Statement: Written informed consent and assent have been obtained from the participants to publish this paper.

Data Availability Statement: Data are available upon request of the corresponding author.

Acknowledgments: We would like to thank all families for their participation in this study and the workers at family health centers, day care learning centers, the residential home and the hospital for their support during the course of the project. Moreover, we appreciate the financial aid from the University of Barcelona and Universidad Católica de la Santísima Concepción for publishing in open Access.

Conflicts of Interest: The authors declare no conflict of interest.

References

1. Boyce LK, Seedall RB, Innocenti MS, Roggman LA, Cook GA, Hagman AM, et al. Influence of a parent-child interaction focused bookmaking approach on maternal parenting self-efficacy. *Infant Young Child*. **2017**, *20*, 76-93.
2. Roggman LA, Cook GA, Innocenti MS, Jump Norman V, Boyce LK, Christiansen K, et al. Home visit quality variations in two Early Head Start programs in relation to parenting and child vocabulary outcomes. *Infant Ment. Health J*. **2016**, 37, 193– 747 207.
3. Seay A, Freysteinson WM, McFarlane J. Positive parenting. *In Nurs. Forum*. **2014**, *49*, 200-208.
4. Vilaseca R, Rivero, M, Ferrer F, Bersabé RM. Parenting behaviors of mothers and fathers of young children with intellectual disability evaluated in a natural context. *PLoS One*. **2020**, *15*, e0240320
5. Eraso J, Bravo Y, Delgado M. Creencias, actitudes y prácticas sobre crianza en madres cabeza de familia en Popayán: un estudio cualitativo. *Pediatría*. **2006**, *41*, 23-40
6. Roggman, L.A.; Cook, G.A.; Innocenti, M.S.; Jump-Norman, V. *Parenting Interactions with Children: Checklist of Observations Linked to Outcomes: PICCOLO User's Guide*; Paul, H. Brookes Publishing Co., Inc.: Baltimore, ML, USA, **2013**, 92p.
7. Blair C, Raver CC, Berry DJ. Two approaches to estimating the effect of parenting on the development of executive function in early childhood. *Dev. Psychol*. **2014**, *50*, 554-565
8. Cabrera NJ, Fagan J, Wight V, Schadler C. Influence of mother, father, and child risk on parenting and children's cognitive and social behaviors. *Child Dev*. **2011**, *82*, 1985–2005.
9. Karabekiroglu K, Uslu R, Kapci-Seyitoglu EG, Özbaran B, Öztop DB, Özel-Özcan Ö, et al. A nationwide study of social–emotional problems in young children in Turkey. *Infant Behav Dev.* **2013**, *36*,162–170.
10. Guttentag CL. Using Live Coaching and Video Feedback to Teach Responsive Parenting Skills: Experience from the PALS Project. *J. Appl. Res. Child*. **2014,** *5*, 1-29.
11. Landry SH, Zucker TA, Williams JM, Merz EC, Guttentag CL, Taylor HB. Improving school readiness of high-risk preschoolers: Combining high quality instructional strategies with responsive training for teachers and parents. *Early Child. Res. Q*. **2017,** *40*, 38-51.
12. Traube DE, Hsiao HY, Rau A, Hunt-O'Brien D, Lu L, Islam N. Advancing home based parenting programs through the use of telehealth technology. *J Child Fam Stud*. **2020**, *29*, 44-53.
13. Baggett K, Davis B, Feil E, Sheeber L, Landry S, Leve C, Johnson U. (2017). A randomized controlled trial examination of a remote parenting intervention: Engagement and effects on parenting behavior and child abuse potential. *Child maltreatment*, **2017**, *22*, 315-323.
14. Uzun AK, Orhon FS, Baskan S, Ulukol B. A comparison between adolescent mothers and adult mothers in terms of maternal and infant outcomes at follow-ups. *J. Matern. -Fetal Neonatal Med*, **2013**, *26*, 454-458
15. World Health Organization (WHO). Adolescent pregnancy. [Internet]. **2022** [Retrieved 2023 September 24]. Available from: https://www.who.int/es/news-room/fact-sheets/detail/adolescent-pregnancy
16. United Nations Population Fund (UNFPA). [Internet]. Consecuencias socioeconómicas del embarazo en la adolescencia en seis países de América Latina. Implementación de la Metodología Milena en Argentina, Colombia, Ecuador, Guatemala, México y Paraguay. Fondo de Población de las Naciones Unidas - Oficina Regional. **2020**. [Retrieved 2023 September 24] Available from: https://lac.unfpa.org/sites/default/files/pub-pdf/unfpa_consecuencias_en_6_paises_espanol_1.pdf
17. Jahromi LB, Bravo DY, Umaña-Taylor AJ, Updegraff KA, Hinman JA. Mexican-Origin Adolescent Mothers' Beliefs and Practices Concerning Children's School Readiness. *Early Educ Dev*, **2023**, *34*, 128-151.
18. Perez-Brena NJ, Toews ML, Feinberg ME, Anders KM. Adapting a Coparenting-Focused Prevention Program for Latinx Adolescent Parents in a School Context. *Fam. Process*, **2022**, *61*, 91-107.
19. INE-Instituto Nacional de Estadística. Vital Statistics Yearbook. Department of Health Statistics and Information. Santiago: **2018**[Retrieved 2023 September 24] Available from https://www.ine.gob.cl/docs/default-source/nacimientos-matrimonios-y-defunciones/publicaciones-y-anuarios/anuarios-de-estad%C3%ADsticas-vitales/anuario-de-estad%C3%ADsticas-vitales-2018.pdf?sfvrsn=10e4ed27_5
20. Rodríguez Vignoli J, San Juan Bernuy V. *Maternidad, fecundidad y paridez en la adolescencia y la juventud: continuidad y cambio en América Latina.* CEPAL, **2020** [Retrieved 2023 September 24] Available from https://repositorio.cepal.org/server/api/core/bitstreams/cea50c2d-b82e-4d80-9e38-294e4fb44a57/content
21. Ministerio de Desarrollo Social y Familia. *Encuesta Casen 2020 en Pandemia*. **2020.** [Retrieved 2023 September 24] Available from http://observatorio.ministeriodesarrollosocial.gob.cl/encuesta-casen-en-pandemia-2020
22. Junta Nacional de Auxilio Escolar y Becas (Junaeb). Caracterización Socio-Educativa del Registro de Estudiantes en Condición de Paternidad, Maternidad y/o Embarazo 2019. Región del Biobío. **2019**. [Retrieved 2023 September 24] Available from**:** https://www.junaeb.cl/wp-content/uploads/2018/12/Informe-NacionalRegistro-de-Estudiantes-padres-madres-y-embarazadas-2019.pdf
23. Ayar G, Yalçın SS, Bayoğlu B. Do the Children of Mothers with Optimum PICCOLO Scores Have Better Denver II Test Results? *Turk Pediatri Ars*. **2021**, *56*, 423-428.

24. Dexter CA, Stacks AM. A preliminary investigation of the relationship between parenting, parent-child shared reading practices, and child development in low-income families. *J. Res. Child. Educ.* **2014**, *28*, 394-410.
25. Rivero M, Vilaseca R, Cantero MJ, Valls-Vidal C, Leiva D. Relations between positive parenting behavior during play and child language development at early ages. *Children*. **2023**, *10*, 505.
26. Vilaseca R, Rivero M, Bersabé RM, Cantero MJ, Navarro-Pardo, E, Valls-Vidal C, Ferrer F. Demographic and parental factors associated with developmental outcomes in children with intellectual disabilities. *Front. Psychol.* **2019,** *10*, 872.
27. Donald KA, Wedderburn CJ, Barnett W, Nhapi RT, Rehman AM, Stadler JA, et al. Risk and protective factors for child development: An observational South African birth cohort. *PLoS Med*. **2019**,*16*, e1002920.
28. Johnson SB, Riis JL, Noble KG. State of the art review: poverty and the developing brain. *Pediatrics*. **2016**, *137*, e20153075
29. Hofferth SL, Reid L. Early childbearing and children's achievement and behavior over time. *Perspect. Sex. Reprod. Health.* **2002**,41-49.
30. Huang CY, Costeines J, Kaufman JS, Ayala C. Parenting stress, social support, and depression for ethnic minority adolescent mothers: Impact on child development. *J Child Fam Stud*. **2014**, *23*, 255-262.
31. Levine JA, Pollack H, Comfort ME.Academic and behavioral outcomes among the children of young mothers. *J Marriage Fam*. **2001**, *63*, 355-369.
32. Morinis J, Carson C, Quigley MA. Effect of teenage motherhood on cognitive outcomes in children: a population-based cohort study. *Arch Dis Child*. **2013**, *98*, 959-964.
33. Keown LJ, Woodward LJ, Field J. (2001). Language development of pre-school children born to teenage mothers. *Infant Child Dev*. **2001**, *10*, 129-145.
34. Firk C, Konrad K, Herpertz-Dahlmann B, Scharke W, Dahmen B. Cognitive development in children of adolescent mothers: The impact of socioeconomic risk and maternal sensitivity. *Infant Behav. Dev*. **2018**, 50, 238-246.
35. Farkas C, Álvarez C, del Pilar Cuellar M, Avello E, Gómez DM, Pereira P. Mothers' competence profiles and their relation to language and socioemotional 758 development in Chilean children at 12 and 30 months. *Infant Behav. Dev.* **2020**, 59: 101443.
36. Letourneau NL, Stewart MJ, Barnfather AK. Adolescent mothers: Support needs, resources, and support-education interventions. *J Adolesc Health*. **2004**, *35*, 509-525.
37. Berthelon M, Kruger DI. Does adolescent motherhood affect education and labor market outcomes of mothers? A study on young adult women in Chile during 1990–2013. *Int. J. Public Health*. **2017**, *62*, 293-303.
38. Reynolds SA, Fernald LC, Behrman JR. Mothers' labor market choices and child development outcomes in Chile. *SSM - Popul*. **2017**, *3*, 756-766.
39. Rodriguez ET, Tamis-LeMonda CS. Trajectories of the home learning environment across the first 5 years: Associations with children's vocabulary and literacy skills at prekindergarten. *Child Dev.* **2011**, *82*, 1058-1075.
40. Kumar M, Huang K. Impact of being an adolescent mother on subsequent maternal health, parenting, and child development in Kenyan low-income and high adversity informal settlement context. *PLoS One*. **2021**. *16*, e0248836.
41. Luttges C, Leal I, Huepe G, González D, González E, Molina, T. Pregnant again? Perspectives of adolescent and young mothers who and do not experience a repeat pregnancy in adolescence. *Int. J. Qual. Stud. Health Well-being.* **2021**, *16*, 1898317.
42. Erfina E, Widyawati W, McKenna L, Reisenhofer S, Ismail D. Adolescent mothers' experiences of the transition to motherhood: an integrative review. *Int. J. Nurs. Sci.* **2019**, *6*,221–228
43. Mangeli M, Rayyani M, Cheraghi MA, Tirgari, B. Exploring the challenges of adolescent mothers from their life experiences in the transition to motherhood: a qualitative study. *J Family Reprod Health*. **2017**, *11*, 165-173.
44. Álamo N, Krause, M, Pérez, J, Aracena, M. Impacto de la salud psicosocial de la madre adolescente en la relación con el niño/ay su desarrollo. *Rev. Argentina de Clin. Psicol.* **2017**, *26*, 332-346
45. Parkes A, Chambers S, Buston K. Nonresident Fathers' and Grandparents' Early Years Support and Middle Childhood Socio- Emotional Adjustment. *J Marriage Fam***. 2021**, 83, 358-374.
46. Lee HY, Edwards RC, Hans SL. Young first-time mothers' parenting of infants: the role of depression and social support. *Matern Child Health J*, **2020,** *24*, 575-586.
47. Howard KS, Lefever J EB, Borkowski JG, Whitman TL. Fathers' influence in the lives of children with adolescent mothers. *J Fam Psychol*. **2006.***20*, 468-476.
48. Molina-Gutiérrez R. El padre adolescente, su relación parental y de pareja. *Última década.* **2011**, *19*, 89-110.
49. Fitzgerald HE, Bocknek EL. Fathers, children, and the risk-resilience continuum. *Handbook of father involvement: Multidisciplinary perspectives*, **2013**, 168-185.

50. Ministerio de Educación. *Salas cuna: para que estudie contigo.* Junta Nacional de Jardines Infantiles: Santiago.**2016.** [Retrieved 2023 September 24] Available from https://www.junji.gob.cl/salas-cuna-para-que-estudie-contigo-pec/
51. Concha-Díaz M, Bakieva M, Meliá JMJ. Sistemas de atención a la educación infantil en América Latina y El Caribe (AL y C). *Publ. Fac. Educ. Humanid. Campus Melilla*. **2019**, *49*,113-136.
52. Van Holland De Graaf J, Hoogenboom M, De Roos S, Bucx F. Socio-demographic correlates of fathers' and mothers' parenting behaviors. *J Child Fam Stud.* **2018**, *27*, 2315-2327.
53. Knauer HA, Ozer EJ, Dow WH, Fernald LC. Parenting quality at two developmental periods in early childhood and their association with child development. *Early Child. Res. Q.* **2019,** *47*: 396-404.
54. Nunes Cauduro G, de Mendonça Filho EJ, Pandolfo Silveira N, Ruschel Bandeira D. Direct and indirect effects of socio-economic status on child development: is developmental parenting a relevant mediator? *Early Child Dev. Care*. **2019**, 191, 1715-1728.
55. Wu X, Cheng G, Tang C, Xie Q, He S, Li R, et al. The Effect of Parenting Quality on Child Development at 36–48 Months in China's Urban Area: Evidence from a Birth Cohort Study. *Int. J. Environ. Res. Public Health*. **2020**, 17, 89-62.
56. Crugnola CR, Ierardi E, Gazzotti S, Albizzati A. Motherhood in adolescent mothers: Maternal attachment, mother–infant styles of interaction and emotion regulation at three months. *Infant Behavior and Development*, **2014**, *37*, 44-56.
57. Green, B. L., Furrer, C., & McAllister, C. How do relationships support parenting? Effects of attachment style and social support on parenting behavior in an at-risk population. *Am. J. Community Psychol*. **2007**, *40*, 96-108.
58. Madigan S, Prime H, Graham SA, Rodrigues M, Anderson N, Khoury J, et al. Parenting behavior and child language: a meta-analysis. *Pediatrics.* **2019,** *144*, e20183556.
59. Weisleder A, Cates CB, Dreyer BP, Berkule Johnson S, Huberman HS, Seery AM, et al. Promotion of positive parenting and prevention of socioemotional disparities. *Pediatrics.* **2017**, *137*, e20153239.
60. Landry SH, Smith KE. The influence of Parenting on Emerging literacy skills. *Handbook of early literacy research.* **2007,** *2*, 135-148.
61. Vallotton CD, Mastergeorge A, Foster T, Decker KB, Ayoub C. Parenting supports for early vocabulary development: Specific effects of sensitivity and stimulation through infancy. *Infancy.* **2017.** *22*, 78-107.
62. Hirsh-Pasek K, Adamson LB, Bakeman R, Owen MT, Golinkoff RM, Pace A, et al. The contribution of early communication quality to low-income children's language success. *Psychol. Sci*. **2015.** *26*, 1071-1083.
63. Bindman SW, Pomerantz EM, Roisman GI. Do children's executive functions account for associations between early autonomy-supportive parenting and achievement through high school? J. *Educ. Psychol*. **2015**, *107,* 756- 797
64. Farah MJ, Betancourt L, Shera DM, Savage JH, Giannetta JM, Brodsky NL, et al. Environmental stimulation, parental nurturance and cognitive development in humans. *Dev. Sci*. **2008.** *11*, 793-801.
65. Leidy MS, Guerra NG, Toro RI. Positive parenting, family cohesion, and child social competence among immigrant Latino families. *J Fam Psychol.* **2010**, *24*, 252-260.
66. Vilaseca R, Rivero M, Bersabé RM, Navarro-Pardo E, Cantero MJ, Ferrer F, et al. Spanish validation of the PICCOLO (parenting interactions with children: checklist of observations linked to outcomes). *Front. Psycho*l. **2019**. *10*: 680.
67. Vilaseca R, Rivero M, Bersabé R, Navarro-Pardo E, Cantero MJ, Ferrer F, Valls-Vidal CP. Interacciones Parentales Con los/las niños/as. *Lista de Ítems de Observación Vinculados al Desarrollo. Publicacions de la Universitat de València: Valencia, Spain*, **2021**, 1-93.
68. Zhang Y, Edwards RC, Hans SL. Parenting Profiles of Young Low-income African American and Latina Mothers and Infant Socioemotional Development. *Parenting.* **2020.** *20*, 28-52.
69. Girard LC, Doyle O, Tremblay RE. Maternal warmth and toddler development: support for transactional models in disadvantaged families. *Eur. Child Adolesc. Psychiatry*. **2017.** *26*, 497-507.
70. Reuben JD, Shaw DS, Neiderhiser JM, Natsuaki MN, Reiss D, Leve LD. Warm parenting and effortful control in toddlerhood: Independent and interactive predictors of school-age externalizing behavior. *J. Abnorm. Child Psychol.* **2016**.*44*, 1083-1096.
71. Kraybill JH, Bell MA. Infancy predictors of preschool and post- kindergarten executive function. *Dev. Psychobiol*. **2013.** *55*, 530-538.
72. Wade M, Jenkins JM, Venkadasalam VP, Binnoon-Erez N, Ganea PA. The role of maternal responsiveness and linguistic input in pre-academic skill development: A longitudinal analysis of pathways. *Cogn. Dev.* **2018.** 45: 125- 140.
73. Mermelshtine R, Barnes J. Maternal responsive–didactic caregiving in play interactions with 10- month-olds and cognitive development at 18 months. *Infant Child Dev.* **2016** *25*, 296-316
74. Bernier A, Carlson SM, Whipple N. From external regulation to self-regulation: early parenting precursors of young children's executive functioning. *Child Dev*. **2010**, 81: 326–339

75. Tarabulsy GM, Bernier A, Provost MA, Maranda J, Larose S, Moss E, et al. Another look inside the gap: ecological contributions to the transmission of attachment in a sample of adolescent mother-infant dyads. *Dev. Psychol*. **2005**. *41*, 212-224.
76. Graziano PA, Calkins SD, Keane SP. Sustained attention development during the toddlerhood to preschool period: Associations with toddlers' emotion regulation strategies and maternal behaviour. *Infant Child Dev*. 2011. 20(6): 389–408.
77. Kiel EJ, Premo JE, Buss KA. Maternal encouragement to approach novelty: A curvilinear relation to change in anxiety for inhibited toddlers. *J. Abnorm. Child Psychol.* **2016:** *44*, 433-444.
78. Yue A, Shi Y, Luo R, Wang B, Weber A, Medina A, et al. Stimulation and early 835 child development in China: caregiving at arm's length. J. *Dev. Behav. Pediatr.* **2019.** 40, 458-467.
79. Murray L, De Pascalis L, Tomlinson M, Vally Z, Dadomo H, MacLachlan B. Randomized controlled trial of a book- sharing intervention in a deprived South African community: effects on carer–infant interactions, and their relation to infant cognitive and socioemotional outcome. *J Child Psychol Psychiatry*. **2016.** *57*, 1370-1379.
80. Endendijk JJ, Groeneveld MG, Bakermans-Kranenburg MJ, Mesman J. Gender differentiated parenting revisited: Meta-analysis reveals very few differences in parental control of boys and girls. *PLoS One*. **2016.** *11*, e0159193.
81. Morawska A. The effects of gendered parenting on child development outcomes: A systematic review. *Clin. Child Fam. Psychol. Rev.* **2020.** *23*,553-576.
82. Lovas GS. Gender and patterns of emotional availability in mother-toddler and father-toddler dyads. *Infant Ment. Health J.* **2005.** *26*, 327-353
83. Chen BB. The relationship between Chinese mothers' parenting stress and sibling relationships: A moderated mediation model of maternal warmth and co-parenting. *Early Child Dev. Care*. **2020**, *190*, 1350-1358.
84. Martin A, Brazil A, Brooks-Gunn J. The socioemotional outcomes of young children of teenage mothers by paternal coresidence. *J. Fam. Issues*. **2013.** *34*, 1217-1237
85. Fatori D, Argeu A, Brentani H, Chiesa A, Fracolli L, Matijasevich A, et al. Maternal parenting electronic diary in the context of a home visit intervention for adolescent mothers in an urban deprived area of São Paulo, Brazil: Randomized controlled trial. *JMIR mHealth and uHealth*, **2020**. *8*, e13686.
86. Leonard NR, Casarjian B, Fletcher RR, Prata C, Sherpa D, Kelemen A, et al. Theoretically-based emotion regulation strategies using a mobile app and wearable sensor among homeless adolescent mothers: acceptability and feasibility study. *JMIR Pediatr. Parent*. **2018**, *1*, e9037
87. Asociación Investigadores de Mercado (Association of Market Researchers). AIM Clasificación Grupos Socioeconómicos y Manual de Aplicación, **2019.** Santiago, Chile. [Retrieved 2023 September 24] Available from https://aimchile.cl/wp-content/uploads/2022/03/Actualizacio% CC%81n-y-Manual-GSE-AIM-2019-1.pdf
88. Fuligni AS, Brooks-Gunn J. Mother-child interactions in Early Head Start: Age 853 and ethnic differences in low-income dyads. *Parent Sci Pract.* **2013**, *13*, 1-26.
89. Squires J, Bricker DD, Twombly E Ages & stages questionnaires. *Baltimore, MD, USA: Paul H. Brookes*. **2009**, 182-257.
90. Small JW, Hix-Small H, Vargas-Baron E, Marks KP. Comparative use of the Ages and Stages Questionnaires in low-and middle-income countries. *Dev. Med. Child Neurol*. **2019**, *61*, 431–443.
91. Farkas C, Muzard A, Gallardo AM, Strasser K, Badilla G, Santelices MP. PICCOLO's cross-cultural adaptation process implemented in Chile. In Proceedings of the 15th World Congress of the World Association of Infant Mental Health (WAIMTH), Prague, Czech Republic **2016 May**.
92. Singh A, Squires J, Yeh CJ, Heo KH, Bian H. (2016). Validity and reliability of the developmental assessment screening scale. *J Family Med Prim Care*. **2016**, *5*, 124.
93. Armijo I, Schonhaut L, Cordero M. Validation of the Chilean version of the Ages and Stages Questionnaire (ASQ-CL) in Community Health Settings. *Early Hum. Dev.* **2015**, *91*, 671–676.
94. Lambert J, Gong L, Elliott CF, Thompson K, Stromberg A. rFSA: an R package for finding best subsets and interactions. *The R.J j.* **2018,** *10*, 295-308.
95. Lambert J, Gong L, Elliott C. rFSA: Feasible Solution Algorithm for Finding Best Subsets and Interactions. *R package version 0.9.6.* **2020** [Retrieved 2023 September 24] Available from https://CRAN.R-project.org/package=rFSA
96. Raley S, Bianchi SM, Wang W. When do fathers care? Mothers' economic contribution and fathers' involvement in child care. *Am. J. Sociol*. **2012**, *117*, 1422-59.
97. Roeters A, Van Der Lippe T, Kluwer ES. Parental work demands and the frequency of child-related routine and interactive activities. *J Marriage Fam*. **2009**, *71*, 1193-1204.
98. Huston AC, Rosenkrantz Aronson S. Mothers' time with infant and time in employment as predictors of mother–child relationships and children's early development. *Child Dev*. **2005**, *76*, 467-482.

99. González L, Cortés-Sancho, R, Murcia M, Ballester F, Rebagliato M, Rodríguez-Bernal CL. The role of parental social class, education and unemployment on child cognitive development. *Gac Sanit*. **2020,** *34*, 51-60.
100. Schady N. Parents' education, mothers' vocabulary, and cognitive development in early childhood: Longitudinal evidence from Ecuador. *Am. J. Public Health***. 2011**,*101*, 2299-2307.
101. Tang S, Davis- Kean PE, Chen M, Sexton HR. Adolescent pregnancy's intergenerational effects: does an adolescent mother's education have consequences for her children's achievement? *J. Res. Adolesc*. **2016,** *26*, 180-193.
102. Ryan RM. Marital birth and early child outcomes: The moderating influence of marriage propensity. *Child Dev*.**2012**, *83*, 1085-1101.
103. Cabrera NJ. Father involvement, father-child relationship, and attachment in the early years. *Attach Hum Dev.* **2020**, *22*, 134-138.
104. Coleman PK, Karraker KH. Maternal self-efficacy beliefs, competence in parenting, and toddlers' behavior and developmental status. *Infant Ment. Health J.* **2003,** *24*, 126-148.
105. Farkas C, Valdés N. (2010). Maternal stress and perceptions of self-efficacy in socioeconomically disadvantaged mothers: An explicative model. *Infant Ment. Health J.* **2010**, *33*, 654-662.
106. Fagan J, Lee Y. Perceptions and satisfaction with father involvement and adolescent mothers' postpartum depressive symptoms. *J Youth Adolesc.* **2010**, *39*, 1109-1121.
107. Eriksson M, Marschik PB, Tulviste T, Almgren M, Pérez Pereira M, Wehberg S, et al. Differences between girls and boys in emerging language skills: Evidence from 10 language communities. *Br. J. Dev. Psychol*. **2012**, *30*, 326-343.
108. Barbu S, Cabanes G, Le Maner-Idrissi G. Boys and girls on the playground: sex differences in social development are not stable across early childhood. *PLoS One*. **2011,** *6*, e1640
109. Walter F, Daseking M, Pauls F. Sex Differences in Intelligence in Children Aged 2:6–7:7: Analysis of the Factor Structure and Measurement Invariance of the German Wechsler Primary and Preschool Scale of Intelligence–Fourth Edition. *J Psychoeduc Assess.* **2021**, *39*, 395-421.
110. OECD. Understanding the Brain: The Birth of a Learning Science. OECD Publishing: Paris. **2007**. 169-202
111. Butler, R., Shalit-Naggar, R. Gender and patterns of concerned responsiveness in representations of the mother–daughter and mother–son relationship. *Child Dev.* **2008**. *79*, 836-851.
112. Leaper C. Parenting girls and boys. In M. H. Bornstein (Ed.), *Handbook of parenting: Children and parenting*. *Mahwah, NJ: Erlbaum*. **2002**, 189–225.
113. Rowe ML. A longitudinal investigation of the role of quantity and quality of child-directed speech in vocabulary development. *Child Dev*. **2012**, *83*, 1762-1774.
114. Yont KM, Snow CE, Vernon-Feagans L. The role of context in mother–child interactions: An analysis of communicative intents expressed during toy play and book reading with 12-month-olds. *J. Pragmat.* .**2003**, *35*, 435-454.
115. Roggman LA, Cook GA, Innocenti MS, Jump Norman V, Christiansen K. Parenting interactions with children: Checklist of observations linked to outcomes (PICCOLO) in diverse ethnic groups. *Infant Ment. Health J.* **2013,** *34*,290- 306.
116. Bayoğlu B, Unal Ö, Elibol F, Karabulut E, Innocenti MS. Turkish validation of the PICCOLO (Parenting interactions with children: checklist of observations linked to outcomes). *Infant Ment. Health J.* **2013**, *34*,330-338.
117. Crowell JA, Keluskar J, Gorecki A. Parenting behavior and the development of children with autism spectrum disorder. *Compr. Psychiatry*. **2019,** *90*: 21-29.
118. Montirosso R, Rosa E, Giorda R, Fazzi E, Orcesi S, Cavallini A, Provenzi L. Early Parenting Intervention–Biobehavioral Outcomes in infants with 908 Neurodevelopmental Disabilities (EPI-BOND): study protocol for an Italian multicentre randomised controlled trial. *BMJ open*. **2020,** *10*, e035249.
119. Prime H, Wade M, Gonzalez A. The link between maternal and child verbal 911 abilities: An indirect effect through maternal responsiveness. *Dev. Sci*. **2020,** *23*, e12907.
120. Rivero M, Vilaseca R, Cantero MJ, Bersabé RM, Valls-Vidal C. Relations between parenting assessed with PICCOLO and child's developmental outcomes. *Infant Ment. Health J.* **2018,** *39*, 441.
121. Tamis- LeMonda CS, O' Brien M, Rojas R, Bakeman R, Adamson LB, Tresch M, et al. Culture, parenting, and language: respeto in Latine mother–child interactions. *Soc Dev.***2020.** *29*, 689-712.
122. Lewin A, Mitchell SJ, Ronzio CR. Developmental differences in parenting behavior: Comparing adolescent, emerging adult, and adult mothers. **2013,** *Merrill-Palmer Q. 59*, 23-49.
123. Sangsawang N, Sangsawang B. Postpartum depression, social support and maternal self-efficacy between adolescent and adult mothers during the COVID-19 pandemic: A comparative cross-sectional study. *J. Adv. Nurs*. **2023**, *79*, 113-124.
124. Bornstein MH, Putnick DL, Suwalsky JT. Parenting cognitions → parenting practices → child adjustment? the standard model. *Dev. Psychopathol.* **2018.** *30*, 399-416.

125. Rowe ML, Leech KA, Cabrera N. Going beyond input quantity: Wh-Questions matter for toodlers' language and cognitive development. *Cogn. Sci*. **2017**, *41*, 162-179
126. McFadden KE, Tamis- Lemonda, CS. Maternal responsiveness, intrusiveness, and negativity during play with infants: Contextual associations and infant cognitive status in a low- income sample. *Infant Ment. Health J.***2013,** *34*, 80-92.
127. Matte-Gagne C, Bernier A. Prospective relations between maternal autonomy support and child executive functioning: Investigating the mediating role of child language ability. *J. Exp. Child Psychol.* **2011,** *110*, 611–625
128. Barreto FB, Sánchez de Miguel M, Ibarluzea J, Andiarena A, Arranz E. Family context and cognitive development in early childhood: a longitudinal study. *Intelligence*. **2017***.65*, 11–22.
129. Chazan-Cohen R, Raikes H, Brooks-Gunn J, Ayoub C, Pan BA, Kisker EE, et al. Low-income children's school readiness: Parent contributions over the first five years. *Early Educ Dev.* **2009,** *20*, 958-977
130. Oxford M, Spieker S. Preschool language development among children of adolescent mothers. *J. Appl. Dev. Psychol.* **2006,** *27*, 165-182
131. Shephard E, Fatori D, Mauro LR, de Medeiros Filho MV, Hoexter MQ, Chiesa AM, et al. Effects of maternal psychopathology and education level on neurocognitive development in infants of adolescent mothers living in poverty in Brazil. *Biological Psychiatry: Cognitive Neuroscience and Neuroimaging*. **2019**, *4*, 925-934.
132. Khoury JE, Dimitrov L, Enlow MB, Haltigan JD, Bronfman E, Lyons-Ruth K.. Patterns of maternal childhood maltreatment and disrupted interaction between mothers and their 4-month-old infants. *Child maltreatment*. **2022**, *27*, 366-377.
133. Ministerio de Desarrollo Social y Familia. (2019). Salud sexual y reproductiva juvenil: en qué está y hacia dónde vamos. *Revista RT del INJUV*. **2019,** *8*, 1-20. [Retrieved 2023 September 24] Available from https://www.injuv.gob.cl/sites/default/files/rt_29_web.pdf
134. Bedregal P, Hernández V, Mingo MV, Castañón C, Valenzuela P, Moore R et al. Desigualdades en desarrollo infantil temprano entre prestadores públicos y privados de salud y factores asociados en la Región Metropolitana de Chile. *Rev.chil. pediatr.* **2016**. *87*, 351-358.
135. Davis-Kean PE. The influence of parent education and family income on child achievement: the indirect role of parental expectations and the home environment. *J. Fam. Psychol*. **2005***19*, 294-304.
136. Smith H, Ashby B. Looking Into the Future for Children of Young Mothers. *Pediatrics*. **2022,** *150*, e2022058142.
137. Raudino A, Murray L, Turner C, Tsampala E, Lis A, De Pascalis L, et al. Child anxiety and parenting in England and Italy: The moderating role of maternal warmth. *J Child Psychol Psychiatry*. **2013**, *54*,1318-1326.
138. Kochanska G. Emotional development in children with different attachment 948 histories: the first three years. *Child Dev*. **2001**, 72: 474–490.
139. Barnett MA, Deng M, Mills-Koonce WR, Willoughby M, Cox M. Interdependence of parenting of mothers and fathers of infants. *J Fam Psychol*. **2008**, *22*, 561-573.
140. Tamis-LeMonda CS, Shannon JD, Cabrera NJ, Lamb ME. Fathers and mothers at play with their 2- and 3-year olds: Contributions to language and cognitive development. *Child Dev.* **2004,** *75*, 1806-1820.
141. Mascaro JS, Rentscher KE, Hackett PD, Mehl MR, Rilling JK. Child gender influences paternal behavior, language, and brain function. *Behav. Neurosci*. **2017,** *131*, 262–273
142. Tamis-LeMonda CS, Kuchirko Y, Song L. Why is infant language learning facilitated by parental responsiveness? *Curr. Dir. Psychol. Sci*. **2014,** *23*, 121- 126.
143. Yoshikawa H, Weiland C, Brooks-Gunn J. When does preschool matter? *Future Child*.**2016,** *26*, 21-35.
144. Seguel X, Edwards M, Hurtado M, Bañados J, Covarrubias M, Wormald A, et al. ¿Qué efecto tiene asistir a sala cuna y jardín infantil desde los tres meses hasta los cuatro años de edad?: Estudio longitudinal en la junta nacional de jardines infantiles. *Psykhe.* **2012,** *21*, 87-104.
145. Cortázar A. Long-term effects of public early childhood education on academic achievement in Chile. *Early Child. Res. Q*. **2015,** *32*, 13-22.
146. Cabrera NJ, Shannon JD, Tamis- LeMonda. Fathers' influence on their children's cognitive and emotional development: From toddlers to pre-K. *Appl. Dev. Sci.* **2007**, *11*, 208-213.
147. Daniel E, Madigan S, Jenkins J. Paternal and maternal warmth and the development of prosociality among preschoolers. *J Fam Psychol*. **2016,** *30*, 114-124.
148. Von Suchodoletz A, Trommsdorff G, Heikamp T. Linking maternal warmth and responsiveness to children's self- regulation. *Soc Dev.* **2011,** *20*, 486-503.
149. Mandara J, Murray CB, Telesford JM, Varner FA, Richman SB. Observed gender differences in African American mother- child relationships and child behavior. *Fam. Relat*. **2012**, *61*, 129-141
150. Crnic K, Arbona AP, Baker B, Blacher J. Mothers and fathers together: Contrasts in parenting across preschool to early school age in children with developmental delays. *Int Rev Res Ment Retard.* **2009,** *37*, 3-30
151. Gueron-Sela N, Camerota M, Willoughby MT, Vernon-Feagans L, Cox MJ. Maternal depressive symptoms, mother-child interactions, and children's executive function. *Dev. Psychol*. **2018**, *54*, 71- 116.

152. Heymann P, Heflin BH, Baralt M, Bagner DM. Infant-directed language following a brief behavioral parenting intervention: The importance of language quality. *Infant Behav. Dev.* **2020**, *58*: 101419.
153. Korfmacher, J.; Chawla, N. Toolkit of Recommended Curricula and Assessments for Early Childhood Home Visiting; UNICEF: Geneva, Switzerland, **2013**.
154. Rivero M, Vilaseca R, Cantero MJ, Navarro-Pardo E, Ferrer F, Valls-Vidal C, Bersabé RM. Parenting of Spanish mothers and fathers playing with their children at home. *Plos one*. **2022**, *17*, e0266762.
155. Belsky J, Jaffee SR, Sligo J, Woodward L, Silva PA. Intergenerational transmission of warm-sensitive-stimulating parenting: A prospective study of mothers and fathers of 3-year-olds. *Child Dev*. **2005**, *76*, 384-396.