Family Environment and Preschoolers' Sleep: The Complementary Role of Both Parents

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1. Introduction

Sleep problems are associated with various cognitive, behavioral, and emotional regulation difficulties in children [1]. Given that children's sleep patterns develop within the family environment, and that poor relationships between family members can lead to child sleep difficulties, a better understanding of the influence of family factors on sleep in childhood is needed [2]. A recent review of the literature highlighted several conceptual issues that need to be addressed by future studies, including a greater consideration of the role of fathers and the investigation of more complex family models to identify pathways and interaction effects that may exert an influence on children's sleep [3]. To date, most studies have focused on community and clinical samples, limiting our knowledge of sleep correlates among children of at-risk yet non-clinical populations. In particular, children living in poverty, who are exposed to cumulative risk factors, are one vulnerable population for which more research is warranted [4]. With the objective of furthering knowledge on the relationship between child sleep disturbances and quality of the family context in at-risk populations, the present study examined the associations between several family factors (i.e., coparenting, quality of parent-child interactions, and parental anxiety) and child sleep in a low-income sample, using a moderated mediation model.

1.1 Parent-child interactions and child sleep

Sleep problems in childhood are manifold but mainly include behaviors interfering with falling asleep at bedtime, difficulties getting back to sleep after night awakenings, short sleep duration, and poor sleep quality [3]. According to the transactional model of sleep [5], the most direct path linking family ecology to child sleep is through parental behavior. Therefore, one would expect the quality of parent-child interactions to be related to children's sleep. Preschool age is a sensitive developmental stage during which children develop greater perspective-taking

and communication abilities. This contributes to redefine the parent-child relationship into a goal-corrected partnership involving negotiation of mutual plans and conflict resolution through compromise [6]. During the same developmental period, epidemiological studies show a steady decrease in nighttime awakenings and a significant increase in difficulty falling asleep between 2.5 and 5 years of age [7,8]. A longitudinal study has found a linear decrease of sleep duration and an increase of sleep efficiency between 2 and 4 years of age [9]. Thus, both sleep and parent-child interactions undergo significant changes in the preschool period but studies testing their inter-relations rarely target this developmental stage.

While most studies testing the association between parent-child interactions and child sleep have focused on mother-child interactions, those assessing both mother-child and father-child interactions are sparse and have provided mixed results. In some studies, mothers' and fathers' behavior were both associated with child sleep. For example, Bordeleau and colleagues [10] found that greater quality of mother-toddler interactions at 12 and 15 months predicted child sleep consolidation (as perceived by mothers) at 3-4 years of age. They also observed that a higher quality of father-toddler interactions at 18 months significantly predicted a higher percentage of night-time sleep, even after controlling for quality of mother-child interactions in the model, suggesting that both parents contributed to preschoolers' sleep quality. In other studies with older children (aged 8-10 years), only lower quality of mother-child interactions, not father-child interactions, was significantly and positively related to child sleep problems. Specifically, lower maternal sensitivity and more conflictual mother-child interactions were associated with greater mother-reported sleep problems in middle childhood [11]. Another study found a negative association between daytime sleepiness and attachment security to mothers, but not to fathers [12]. Finally, other studies have found significant associations between poor father-

child interactions, not mother-child interactions, and sleep problems in children. In particular, fathers', but not mothers', lower sensitivity during a feeding interaction differentiated toddlers (aged 1-3 years) with sleep problems from those without [13]. In addition, in a sample of adopted preschool children, higher levels of hostile parenting in fathers, but not in mothers, were significantly associated with more subjectively parent-reported sleep problems [14].

One explanation for these apparently contradictory findings is the possibility that previously uncontrolled factors, such as parental well-being and coparenting, could influence or moderate the association between the quality of parent-child interactions and child sleep.

1.2 Parental well-being and child sleep

Beyond quality of the parent-child relationship, children may be chronically stressed when living in a household with parents who suffer from mental health problems, and, in turn, experience deficits in regulation strategies [15]. In line with this, maternal anxiety has been found to be a particularly significant predictor of sleep problems among infants and toddlers [16,17]. Studies, however, have not consistently found differences in quality of mother-child interactions according to mothers' anxiety, in contrast to those examining maternal depression [18]. Instead, maternal anxiety may constitute a risk factor that exacerbates difficulty in the parent-child relationship when mothers are exposed to stressful conditions. One context that may be challenging for anxious mothers is child bedtime, due to child resistance to bedtime routines and parent-child separation. The combination of both factors, that is, poor quality of parent-child interactions and parental anxiety, may represent a dual risk for children, triggering or exacerbating child sleep problems. Consistent with this idea, Sadeh and colleagues [5] suggested that mothers' anxiety combined with inadequate parenting behavior around bedtime may

interfere with child sleep. More empirical studies are, however, needed to investigate the moderating role of maternal and paternal anxiety.

1.3 Coparenting and child sleep

Evidence suggests that the marital relationship has an incidence on children's sleep. To date, research has linked the marital subsystem (marital conflict and satisfaction) to child sleep quality [19-21]. However, previous studies have rarely taken into consideration parents' agreement or conflicts around discipline and child-rearing practices, a phenomenon captured by the concept of coparenting and which may be especially salient for child sleep given it concerns the child directly. Two studies have assessed the association between coparenting and child sleep. The first study found that mothers who had experienced more negative coparenting when the child was aged 1 and 6 months were more likely to have shared their bed with their infant during infancy [22]. The second study found a significant relation between experiences of poor coparental cooperation assessed by mothers and fathers and child sleep problems at 2.8 years old [23]. However, these studies have not tested whether the influence of coparenting on child sleep is indirect through its intermediate effect on the parent-child relationship. As suggested by Peltz and colleagues [23], higher abilities in parents to work together allow for a better task division during bedtime routine and prevent any one parent from becoming overburdened and frustrated, which, in turn, could positively influence child sleep. As such, the influence of coparenting on child sleep may likely be mediated by the interplay between quality of parent-child interactions and parents' anxiety (see section 1.2). This model has yet to be empirically supported.

1.4 Poverty and its impact on family functioning and child sleep

Economic hardship is associated with an array of precarious living conditions including limited material resources, food insecurity, difficulty finding safe and affordable housing, and

fewer opportunities for social and leisure activities. In addition, low-income families are more likely to be strained multiple risk factors including low parental education, social isolation, and stressful life events [24]. The adverse effects of financial strain (and other cumulating risk factors) induce constant pressure on families who then struggle to maintain healthy family functioning and promote their children's development. The stress caused by economic hardship increases marital conflict and dissatisfaction and contributes to mental health issues, all of which are likely to interfere with high quality parenting which, in turn, disrupts child functioning [25].

Low family income has been related to shorter sleep duration and poorer sleep quality in children [26,27] and more recent studies have assessed potential mechanisms explaining this association. It has been found that parents with lower levels of income and education are less likely to provide their preschool children with regular bedtimes and bedtime routines [28]. Disruptive environments (e.g., noisy bedroom or neighborhood) as well as perceived stress (e.g., worries about family or friends) also represent mechanisms linking lower income-to-needs ratio to school-age children's sleep disturbances [29]. Researchers that tested the moderating role of socioeconomic status (SES), have observed a stronger link between family functioning and children's sleep among children from lower SES families [30]. Given these results, it appears important to investigate the associations between child sleep and characteristics of family functioning in low-income households, so as to decipher how these associations operate in the context of limited financial and material resources.

1.5 Current study

The current study assessed family factors, namely coparenting, parent-child relationships and parents' anxiety, in an at-risk, low-income environment, in association with sleep among preschoolers, a developmental period that has received relatively little attention from the

research community. Addressing this topic from a family perspective, we considered both parents' perceptions of their coparenting and of their child's sleep and we gathered observational data on the quality of both the mother-child and father-child relationships.

In particular, we tested in a sample of low-income families whether the quality of parent-child interactions mediated the association between coparenting and child sleep, and if this association was moderated by parents' anxiety. We expected that greater coparenting difficulties would be related to more dysfunctional parent-child interactions, which, in turn, would be associated with poorer sleep (quality and duration) in children. We also expected these associations to be exacerbated by parents' anxiety.

2. Method

2.1 Participants

Participants in this study were 81 two-parent families receiving social security benefits and living in metropolitan, urban, and rural areas in the Province of Québec, Canada. Children were on average 4.25 years of age (*SD* = 0.71, range from 3 to 5 years) and 48% were boys. Mothers were between 21 and 46 years old (*M* = 32.51; *SD* = 5.96) and fathers were between 23 and 51 years old (*M* = 37.38; *SD* = 6.33). The majority of the sample was Caucasian. About a third of the children (36%) were first-born children. Nine percent of families had an annual income (in Canadian dollars) under $8,000, 38% earned between $8,000 and $14,999, 36% earned between $15,000 and $21,999, and 17% earned more than $22,000. In Québec, the poverty threshold was $27,844 at the time of the data collection [31] confirming the low-income status of the current sample.

2.2 Measures and procedure

Potential participating families were identified from lists of families receiving social security benefits in the Province of Québec to participate in a large project on child adaptation. Information on the research project was sent to families by mail and a week later a research assistant contacted them by phone. Inclusion criteria were: 1) Child aged between 3 and 5 years; 2) both parents (or parental figures) living in the same household; 3) at least one parent receiving social security benefits; 4) absence of known severe organic developmental disorders in children. After parents agreed to participate in the study, a home visit of about 1.5h was carried out to complete parent-child and individual tasks and fill out questionnaires. If parents did not have enough time to complete all the questionnaires, arrangements were taken with the family to retrieve them later. The research protocol was approved by our institution's (blinded for the review process) research ethics committee.

2.2.1 Coparenting

The Family Experiences Questionnaire (FEQ) [32] was administered to assess each parent's perception of their coparenting experience. The questionnaire includes items that are coded using a 4-point scale (1 = strongly disagree to 4 = strongly agree). For the purpose of the study, items related to four different subscales were retained: positive problem solving (e.g., My spouse and I often talk together about what is best for our children), shared responsibility (e.g., My spouse helps out with parenting whenever possible), denigrating spouse (e.g., My spouse does not trust my abilities as a parent), and conflicts around discipline (e.g., My spouse and I do not agree on when to punish and how to punish). The instrument has demonstrated adequate construct validity [33,34]. Cronbach's alphas ranged between .80 and .91 for mothers' and fathers' subscales. A principal components factor analysis including the four subscales yielded a single factor explaining 76% of the variance for mothers and 68% for fathers. Accordingly,

scores were standardized and aggregated into two coparenting variables, one for each parent. Because the intercorrelation between mothers' and fathers' scores was high ($r = .67$, $p < .001$), they were averaged to create a single coparenting variable where higher scores indicate more positive coparenting experiences.

2.2.2 Quality of parent-child interactions

Mother-child and father-child interactions were evaluated from an 8-minute videotaped free play sequence. Each parent-child dyad was invited to play with a specific set of toys while the other parent was in a separate room completing a questionnaire. The order of mother-child and father-child interactions was counterbalanced to avoid any order effect.

The quality of parent-child interaction was coded from the videotaped interactions using the *Parent-Child Interaction Scale for the Preschool and School Periods* [35]. An overall rating (from *high quality* [i.e., harmonious, reciprocal] to *poor quality* [i.e., indifferent or conflictual]) and eight 7-point subscales (Coordination, Communication, Partner Roles, Emotional Expression, Responsivity/Sensitivity, Tension, Mood, and Enjoyment) were used to capture global aspects of parent-child interactive quality, with higher scores (4-7) considered more optimal and scores from 1 to 3 representing a dysfunctional interactive pattern.

The scales have been shown to distinguish the parent-child interactive patterns of 3- to 7-year-old children with different attachment classifications and have shown concurrent and longitudinal associations with behavior problem ratings, school performance, and home behavior with normative [36,37] and at-risk samples [38]. Mother-child and father-child interactions were coded by independent coders (two for each family) who were blind to other family information. Interrater reliability (intraclass correlations) calculated on 30% of sample cases ranged from .62 to .86 for scale ratings. Because a principal components factor analysis of the interaction scales

yielded a single factor explaining 83% and 81% of the variance (for mother-child and father-child interactions, respectively), separate mean scores representing reciprocated, balanced, and open communication (at the high end) were computed and used in data analyses for mother-child and father-child interactions. Quality of mother-child and father-child interactions were not significantly related, $r = .16$, $p = .151$.

2.2.3 Parental anxiety

Mothers and fathers completed the 53-item Brief Symptom Inventory (BSI) [39], a self-report measure focusing on symptoms related to psychological distress and psychiatric disorders observed in the last week. The instrument generates nine symptoms scales and three global indices of distress. The BSI has been widely used and its validity and reliability are well-documented [39,40]. For the purpose of this study, only the anxiety scale was retained in the analyses. Internal consistency was acceptable for mothers and fathers, Cronbach's $\alpha = .77$ and .79, respectively. Raw scores were transformed into T scores and, consistent with the BSI manual, those greater than or equal to a T score of 63 were considered in the clinical range. In the current sample, 17% of mothers and 20% of fathers were affected by anxiety in the clinical range. The correspondence between mothers' and fathers' clinical anxiety scores was significant, $\chi^2(1) = 21.17$, $p < .001$.

2.2.4 Preschoolers' sleep

Mothers were asked to report how many hours their child usually slept, both during the day and night, excluding nighttime awakenings. Daytime and nighttime sleep duration were summed to create an index of total 24h-sleep time. Other studies have used the same procedure for assessing preschoolers' sleep duration, and found it to be negatively associated with behavior

problems [41,42]. Maternal reports of children's sleep duration show adequate validity and test–retest reliability [43] and have been associated with actigraphy and sleep diary measures [44].

Mothers and fathers also completed the Child Behavior Checklist for Ages 1.5-5 (CBCL/1.5-5) [45], which consists of 100 items scored on a 3-point scale (not true, somewhat or sometimes true, very true or often true). The CBCL generates scores on different subscales including a Sleep problems subscale that was used in the current study. The subscale includes seven items (e.g., bed resistance, frequent awakenings) that were reported to correlate with different objective measures of older children's and adolescents' sleep [46] and with 2 year-old children's sleep diary data [47]. The CBCL/1.5-5 has excellent psychometric properties, with high internal consistency and strong one-year test–retest reliability [45,48,49]. Adequate Cronbach's alpha scores for mothers' and fathers' evaluation of sleep problems were found in the current study (.78 and .80, respectively). The intercorrelation between parents' scores was high ($r = .88$, $p < .001$); accordingly, a composite score was created to reflect both parents' perception of their child's sleep problems.

3. Results

3.1 Missing Data

To maximize the sample size, we included cases with missing values in the analyses by estimating missing data. Of the complete sample, 17 parents did not return questionnaires. An analysis of the existing dataset with Little's Missing Completely at Random (MCAR) Test indicated that data were missing completely at random, χ^2 (280) = 289.78, $p = .331$. Missing data were therefore replaced by means of Expectation Maximization [50,51]. Analyses conducted with and without missing data revealed similar results. Reported results are those with data imputation.

3.2 Preliminary Analyses

Data analysis were performed using SPSS (version 24.0.0.0; SPSS Windows; Chicago, IL, USA). Table 1 presents the means and intercorrelations between study variables. Scores were normally distributed. Sleep duration and problems were moderately related, where more sleep time was associated with less sleep problems. Higher levels of positive coparenting were significantly associated with greater quality of mother-child and father-child interactions, and less sleep problems. Higher levels of positive coparenting was also marginally related to greater sleep duration. Higher quality of father-child interaction was associated with less sleep problems. Shorter sleep duration, more sleep problems, and lower quality of father-child interactions were found when either parent was anxious (the result for sleep duration and fathers' anxiety was marginal). Families with an anxious father also had more negative coparenting.

Analyses were then undertaken to identify possible covariates related to the dependent variables, that is, parent reports of sleep duration and problems. *T*-tests and analyses of variance (ANOVAs) revealed no significant differences in sleep as a function of child gender or family income (*t*s between -0.02 and .18, *ns* and *Fs* between 2.90 and 0.86, *ns*). Correlations revealed no significant associations between sleep variables and child or parental age or birth order (*r*s between -.16 and .12, *ns*). Therefore, no covariates were included in subsequent analyses.

3.3 Moderated mediation models with mother-child interactions

In order to examine if quality of the mother-child relationship mediated the association between coparenting and child sleep, and to test whether the effect of the mediator was moderated by mothers' anxiety, bootstrap analyses were performed using the PROCESS macro for SPSS [52] based on 10,000 bootstrapped resampling. This method is preferable over other methods, as multiple resampling of the data builds an approximation of the sampling distribution

for indirect effects, which are unlikely to be normally distributed in relatively small samples [53]. Moreover, this method allows for the inclusion of mediators and moderators while limiting Type 1 errors [54]. Using PROCESS to test a moderated mediation model, Hayes and his colleagues showed that a sample of 60 participants provided satisfactory statistical power [54]. The number of participants in the current study is therefore large enough to test the research questions.

3.3.1 Sleep duration

Results revealed an overall significant model explaining 20% of child sleep duration, $F(4, 76) = 4.83$, $p = .002$. Table 2 presents the statistics for each variable included in the model. Mothers' anxiety and the interaction term (quality of mother-child interactions X mothers' anxiety) were both significant predictors.

The test of highest order unconditional interaction revealed a significant moderating effect of mothers' anxiety on the association between mother-child interactions and sleep duration, $F(1, 76) = 4.29$, $p = .042$. Post-hoc analyses revealed that the effect of quality of mother-child interaction on sleep duration was non-significant when mothers are not anxious ($B = -0.08$, $t = -0.50$, $p = .615$, 95% CI = -0.41, 0.24). However, a significant positive association between quality of mother-child interaction and sleep duration was found in dyads of anxious mothers ($B = 0.66$, $t = 2.06$, $p = .043$, 95% CI = 0.02, 1.30). Hence, when mothers were anxious, greater sleep duration was associated with higher levels of mother-child interactive quality.

The direct effect of coparenting on sleep duration was non significant ($B = 0.26$, $t = 1.40$, $p = .17$, 95% CI = -0.11, 0.64). The indirect effect was non-significant for dyads with non-anxious mothers ($ab = -0.03$, $SE = 0.06$, 95% CI = -0.16, 0.06) and significant for dyads with anxious mothers ($ab = 0.22$, $SE = 0.15$, 95% CI = 0.01, 0.58). The index of moderated mediation

was significant (index = 0.25, *SE* = 0.17, 95% CI = 0.01, 0.65). Thus, mother-child interactive quality mediated the association between coparenting and sleep duration only among anxious mothers.

3.3.2 Sleep problems

Results revealed an overall significant model explaining 28% of child sleep problems, $F(4, 76) = 7.48$, $p < .001$. Table 2 presents the statistics for each variable included in the model. Coparenting, maternal anxiety and their interaction term (quality of mother-child interactions X mother anxiety) were related to sleep problems.

The test of highest order unconditional interaction revealed a significant moderating effect of mothers' anxiety on the association between mother-child interactions and sleep problems. Posthoc analyses revealed that the effect of quality of mother-child interaction on sleep problems was non-significant when mothers were not anxious (*B* = 0.38, *t* = 1.04, *p* = .301, 95% CI = -0.34, 1.08). However, a significant negative association between quality of mother-child interactions and sleep problems was found in dyads of anxious mothers (*B* = -1.44, *t* = -2.07, *p* = .042, 95% CI = -2.82, -0.06).

The direct effect of coparenting on sleep problems was significant (*B* = -1.44, *t* = -3.53, *p* < .001, 95% CI = -2.26, -0.63) while the indirect effect of coparenting on sleep problems through quality of mother-child interactions was non-significant for both the non-anxious and anxious mother conditions (*ab* = 0.12, *SE* = 0.11, 95% CI = -0.08, 0.35 and *ab* = -0.48, *SE* = 0.48, 95% CI = -1.71, 0.10, respectively). The index of moderated mediation was non-significant (index = -0.60, *SE* = 0.50, 95% CI = -1.87, 0.02).

3.4 Moderated mediation models with father-child interactions

In order to examine if quality of the father-child relationship mediated the association between coparenting and child sleep, and to test whether the effect of the mediator was moderated by paternal anxiety, bootstrap analyses of the sampling distribution were performed in the same way as previously presented.

3.4.1 Sleep duration

Results revealed an overall non-significant model for child sleep duration, $F(4, 76) = 1.19$, $p = .323$. Table 3 presents the statistics for each variable included in the model resulting in no significant association with sleep duration. The test of highest order unconditional interaction was non-significant ($F = .03$, $p = .867$) and the direct and indirect effects of coparenting on sleep duration were also non-significant. No moderated mediation was found (index = 0.03, *SE* = 0.18, 95% CI = -0.29, 0.45).

3.4.2 Sleep problems

Results revealed an overall significant model explaining 29% of child sleep problems, $F(4, 76) = 7.93$, $p < .001$. Table 3 presents the statistics for each variable included in the model. Coparenting and father-child interactive quality were both significant predictors. The test of highest order unconditional interaction revealed no moderating effect of paternal anxiety on the association between father-child interactions and sleep problems, $F(1, 76) = .79$, $p = .378$.

The direct effect of coparenting on sleep problems was significant ($B = -0.95$, $t = -2.28$, $p = .025$, 95% CI = -1.79, -0.12). A significant indirect effect of coparenting on sleep problems through quality of father-child interactions was found for both the non-anxious and anxious father conditions (*ab* = -0.42, *SE* = 0.21, 95% CI = -0.89, -0.07 and *ab* = -0.68, *SE* = 0.37, 95% CI = -1.49, -0.06, respectively). The index of moderated mediation was non-significant (index = -0.27, *SE* = 0.31, 95% CI = -0.98, 0.25). Thus, the mediating role of father-child interactions in

the association between coparenting and sleep problems did not vary according to fathers' anxiety.

4. Discussion

This study examined the association between coparenting, quality of parent-child interactions, parental anxiety, and child sleep in a low-income sample using a moderated mediation model. Economic hardship induces considerable pressure on families and has been associated with parental psychopathology, interparental conflict, and harsh parenting that, in turn, influence children's well-being [56]. The study of family factors related to child sleep in low-SES families allows for a better understanding of the risk and protective factors that come into play when family resources are limited. The results of the current study contribute to this understanding by showing different pathways and interaction effects that predicted two child sleep regulation processes (duration and problems), and in which both mothers or fathers were considered. By highlighting mechanisms tying family functioning to child sleep in a vulnerable population, these findings have clinical and policy implications.

4.1 Sleep duration

Results showed that preschoolers' sleep duration was related to their mothers' functioning. Specifically, a significant moderated mediation model, in which coparenting predicted children's sleep duration through its effect on the quality of mother-child interactions was found, but only for dyads in which mothers were clinically anxious. This result suggests the presence of a double jeopardy effect: when children experience poor quality of interactions with an anxious mother, they get less sleep over a 24-hour period. Maternal psychopathology combined with contextual risk factors in the family environment, including low income and poor parenting quality, impairs child functions such as sleep [28]. Such risk factors have specifically

been associated with decreased use of bedtime routines [57]. However, in the current study, poor quality of interactions in the absence of maternal anxiety was unrelated to shorter sleep duration. Quality of the mother-child relationship therefore seems to be particularly important when mothers have limited psychological resources. Thus, the ability of certain anxious mothers to remain sensitive to their child's needs could represent a protective factor that fosters a sense of security and allows children to benefit from adequate sleep duration.

Moreover, within dyads including an anxious mother, the effect of coparenting on sleep duration was indirect, occurring through mother-child interactions. Anxious mothers who agree with their partner on how to raise their children and who feel supported are certainly less overloaded with household management – especially when material resources are limited –, which may promote more positive mother-child interactions and, in turn, greater sleep duration in their children. This is consistent with results from the Family Foundations intervention model revealing that a short-term intervention on coparenting during pregnancy enhances coparenting quality, parent-child relationships, and children's sleep habits and regulation strategies at six months and three years of age [58,59]. The results of the current study highlight one mechanism tying shared parenting to child sleep in disadvantaged families and suggest that spousal support may be particularly important for mothers who suffer from mental health issues.

Contrary to the results with mothers, fathers' levels of anxiety and interactive quality with their children were unrelated to child sleep duration. Given that bedtime routines are more frequently managed by mothers [23,60], it may be that mothers' rather than fathers' parenting abilities are more likely to relate to bedtime routines and consequently, to sleep itself. Other studies have found children's sleep duration to be related to mothers' but not to fathers' sleep [61]. Keller and El-Sheikh [12], however, reported different results, where security of attachment

to father but not to mother was related to child sleep duration. Child age in the latter study spanned over a 2-year period and children were quite older than those in the current sample (8.7-10.7 years vs. 4.25 years respectively), which may explain result discrepancies given that fathers become more involved in children's lives as they grow older [62].

Worth mentioning are studies that have found a bidirectional association between family functioning and child sleep [23,63], yielding an alternative interpretation to study results. Children who are sleep deprived, be it due to a chaotic home environment (e.g., noisy, overcrowded), an absence of consistent bedtime routine or other individual or family issues, could exhibit more difficult behaviors during daytime. These behaviors could affect quality of the parent-child relationship, exacerbate maternal anxiety, and take a toll on the marital relationship by undermining coparenting abilities. Longitudinal studies will be needed to better understand the reciprocal relations between family environment and child sleep.

4.2 Sleep problems

Results showed a significant moderating effect of maternal anxiety in the association between quality of mother-child interactions and child sleep problems, where poorer quality of mother-child interactions was related to more sleep problems but only in dyads of anxious mothers. Maternal anxiety has been shown to relate to disrupted parent-child interactions and to negative child outcomes including sleep problems [59]. Children of anxious mothers are likely to be exposed to maternal mood disturbances, cognitive bias towards threats, and maternal overinvolvement when distressed [16,64]. When these maternal struggles are combined with intrusive, dysregulated, and negative mother-child interactions, it creates an environment of uncertainty and insecurity that may increase behaviors such as trouble sleeping, bedtime resistance, refusing to sleep alone, or nightmares, for instance.

Coparenting was directly related to sleep problems and the quality of mother-child interactions did not mediate this association. Others have also found coparenting to be directly related to child sleep with a reciprocal effect between coparenting and sleep but only with mothers [23]. Coparenting potentially affects children's sleep-related behaviors and, according to Peltz and colleagues' results [23], child difficult behaviors may also influence how parents support each other in their parenting role. The association between coparenting and children's sleep problems was significantly mediated by quality of father-child interactions. This result, along with those of others [10,12,13], underlines the important role that fathers play in children's sleep habits. Fathers who developed good coparenting strategies with their spouse are more likely to interact positively with their child and provide supportive care that translates into less sleep problems. Inversely, competitive and demeaning coparenting strategies are associated with more distant or hostile father-child interactions, which are related to more sleep problems. Given coparenting and child sleep problems scores were derived from both parents' reports, the mediating role found for father-child but not mother-child interactions appears unlikely to reflect a methodological artefact. Instead, this finding draws attention to the potentially critical role played by fathers in the family dynamics influencing child sleep, at least in low-income families.

Fathers' anxiety was not associated with child sleep and it did not modulate the association between quality of father-child interactions and child sleep problems. A meta-analysis has shown that, contrary to maternal anxiety, paternal anxiety is not related to children's internalizing problems [65]. The results of the current study showed that fathers' anxiety was related to quality of father-child interactions whereas mothers' anxiety was not associated with mother-child interactive quality. Taken together, these results suggest that child adaptation may be more directly linked to maternal anxiety than to fathers' anxiety, which influence could be

indirect through daily father-child interactions. In this sense, the joint experience of fathers' anxiety and poor quality of father-child interactions would not create a double jeopardy effect. Clearly, paternal anxiety has not received much attention in the literature and more studies are needed to better understand its role in child adaptation.

Again, the reciprocal relation between family environment and child sleep should be considered. Sleep problems such as bedtime resistance, difficulty falling asleep, and frequent awakenings could certainly affect parents' well-being and quality of the parent-child relationship, especially when economic hardship already burdens parents.

4.3 Study limits and strengths

Assessing sleep with parental reports is an established methodology, however it is not equivalent to objective sleep measures. Another pattern of results could be obtained with objective sleep measures, such as actigraphy. Although child sleep duration may vary across consecutive nights, mothers were asked to report how many hours their child usually slept. Therefore, the assessment considered the most common sleep duration for the child. Subjective measures of sleep, despite being less precise, can be useful to reflect parents' perception of their children's sleep, and likely to be related to how they behave with their children. Reliance on parental report of child sleep also raises the issue of perception bias. The inclusion of both parents' perspective to the sleep problem variable may however have minimized this shortcoming. In addition, the use of an objective evaluation of parent-child interactions by independent observers ensures that rater bias did not inflate its association with child sleep or coparenting. Because of the cross-sectional nature of our data, the directionality of the findings is subject to debate. As mentioned above, it will be important for future studies to follow children

over a period of time in order to test the potential bidirectional effects between child sleep and family functioning using multiple measures of each.

Despite these limitations, the current study untangled some of the issues found in the literature by examining the associations between child sleep and family variables of coparenting quality, parental mental health, and parent-child interactions in a low-income sample. The results support the importance of considering the interplay between different factors of the family ecology and suggest that these factors have different levels of association with child sleep. For instance, greater associations were found between child sleep and variables of parent-child interactions and parental anxiety than with coparenting, which is coherent with a transactional perspective [5]. In line with other studies, the current results suggest that both parents play a different but complementary role in children's sleep. Likewise, different pathways and interactions were found in relation to sleep duration and problems, emphasizing the complexity of the links between family factors and sleep processes. Overall, this study helps to clarify some of the associations between parental characteristics and preschoolers' sleep within a sample of low-income families.

4.4 Clinical and policy implications

The findings of this study have important implications for prevention and intervention. The results underscore the need to adopt a broader ecological approach to child sleep problems with low-income families. In addition to considering parents' psychological functioning, clinicians should assess different family systems such as the marital and parent-child relationships and evaluate how these systems interact to predict child sleep. Both parents should be included in intervention programs as mothers and fathers both provide a significant and complementary role in influencing child sleep quality and duration.

Children living in low-income families are more likely to experience various types of delays and disruptions, and sleep is one of them. Despite economic hardship, when parents maintain a good communication and work as a team to raise their child, they are more likely to engage in positive interactions with their child, which in turn, is associated with less sleep problems. Such good marital and parent-child relationship patterns, which may act as protective factors against the negative effects of poverty, are to be promoted in prevention and intervention programs to foster children's sense of family security despite economic adversity. Programs that have effectively enhanced child sleep by targeting coparenting abilities and the parent-child relationship [e.g., 58,59] should be made accessible to families, especially those experiencing multiple risk factors.

Still, being aware of or participating to programs that provide relevant information to parents about child sleep may not be sufficient. Taken alone, such programs might not reach their target. Parents' decisions and choices about the way they raise their children, as well as their capacity to provide a safe and organized environment often depend on the economic and societal factors that go beyond their individual control [25]. Limited economic resources often result in living in a disadvantaged neighbourhood and overcrowded housing where it becomes a challenge for parents to provide a quiet, well-tempered and dark room where the child can sleep peacefully. Policies should therefore provide opportunities for low-income families to get appropriate financial and material resources as well as medical and social services all of which will contribute to limit economic disparities. Global actions that equally consider proximal factors (i.e., quality of parent-child interactions, parents' well-being and coparenting abilities) and distal factors (i.e., financial and material resources, support network) should provide the most effective results in promoting child sleep.

Conflict of interests

The authors have no conflict of interests to report.

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Table 1.

Descriptive Statistics and Intercorrelations among Continuous Study Variables

Variables	1.	2.	3.	4.	5.	6.	*M*	(*SD*)
1. Sleep duration in a 24h period (in hours)	–						10.95	1.35
2. Sleep problems (CBCL)	-.46***	–					3.85	3.08
3. Coparenting[a]	.20[†]	-.38***	–				0	0.77
4. Mother-child interactions	.05	-.06	.26*	–			4.06	0.98
5. Father-child interactions	.07	-.47***	.32**	.16	–		4.16	0.94
6. Mother anxiety[b]	-.37**	.34**	-.15	.11	-.25*	–	.17	0.38
7. Father anxiety[b]	-.19[†]	.24*	-.31**	.07	-.29**	.51***	.20	.40

[a] Standardized score with a mean of 0 and a standard deviation of 1. [b] Clinical dichotomous score.

[†] $p < .10$; * $p < .05$; ** $p < .01$; *** $p < .001$.

Table 2.

Variables Included in the Model with Maternal Variables Predicting Child Sleep Variables

	Child sleep duration			Child sleep problems		
Variables	Point estimate	*t*-test	95% CI	Point of estimate	t-test	95% CI
Coparenting	0.26	1.40	-0.11 – 0.64	-1.44	-3.53**	-2.26 – -0.63
Mother-child interactions	-0.08	-0.50	-0.41 – 0.25	0.37	1.04	-0.34 – 1.08
Mother anxiety	-4.40	-2.82**	-7.50 – -1.29	10.01	2.97**	3.29 – 16.73
Interaction term	0.74	2.07*	0.03 – 1.46	-1.81	-2.33*	-3.36 – -0.27

Note. Interaction term = Quality of mother-child interactions X mother anxiety.

* $p < .05$; ** $p < .01$

Table 3.

Variables Included in the Model with Paternal Variables Predicting Child Sleep Variables

	Child sleep duration			Child sleep problems		
Variables	Point estimate	*t*-test	95% CI	Point of estimate	t-test	95% CI
Coparenting	0.27	1.29	-0.15 – 0.70	-0.95	-2.28*	-1.79 – -0.12
Father-child interactions	-0.05	-0.26	-0.44 – 0.34	-1.08	-2.79**	-1.85 – -0.31
Father anxiety	-0.76	-0.49	-3.84 – 2.31	3.04	1.00	-3.03 – 9.11
Interaction term	0.07	0.17	-0.72 – 0.85	-0.69	-0.89	-2.23 – 0.85

Note. Interaction term = Quality of father-child interactions X father anxiety.

* $p < .05$; ** $p < .01$

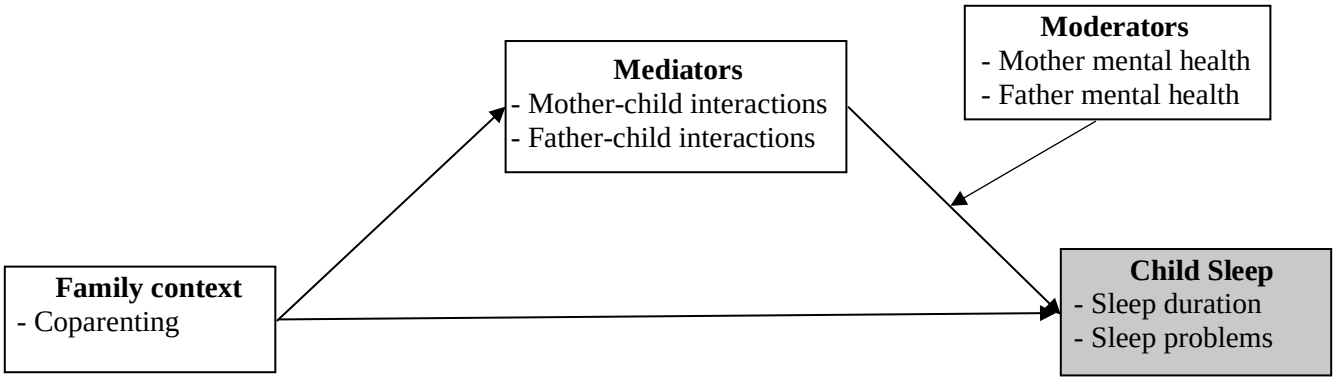

Figure 1. A conditional process model of family ecology and sleep in preschoolers