

# Association between Maternal Personality Traits and Children's Sleep Disturbance: A Population-based Cohort Study in Republic of Korea

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**Objective:** Sleep affects the development and severity of psychiatric symptoms in children, and maternal personality traits may influence children's sleep. We aimed to confirm the longitudinal effect of maternal personality traits on children's sleep disturbance using cohort data from the Panel Study on Korean Children.

**Methods:** Maternal personality traits were assessed using the Personality Assessment Inventory in 2009, and the sleep disturbance of children was assessed using parent survey data from 2010 to 2014 (2nd–6th waves). Among the 11 clinical scales of the Personality Assessment Inventory, the 5 scales that showed the most significant correlations were analyzed. Presence or absence of child sleep disturbance was evaluated with a chi-square test, and the effect of the Personality Assessment Inventory was assessed by a binary logistic regression analysis with child sleep disturbance as the dependent variable.

**Results:** Of the 171 mother-child dyads, 92 were classified into the sleep disturbance group and 79 were classified into the normal sleep group. Maternal somatic concerns showed a significant relationship with children's sleep disturbance at years 2 and 3. Maternal borderline features demonstrated a significant relationship with children's sleep disturbance from years 2 to 5. The binary logistic regression analysis revealed a significant association between high borderline features and children's sleep disturbance at years 2 and 3.

**Conclusion:** High maternal borderline features evaluated at child age 1 were related to sleep disturbance in early childhood. In assessing a children's sleep problems, it may be important to examine mothers' dysfunctional personality traits.

**KEY WORDS:** Child; Mother; Personality; Sleep; Cohort studies.

## INTRODUCTION

Research on the effects of maternal mental health on children is vast and well established. According to recent studies, the prevalence of maternal mental illness is approximately 21.9–38.8%, and currently its importance is emphasized more than in the past [1,2]. Maternal mental health is shaped by genetic as well as a major environmental factors, which in turn determine parenting behav-

ior and have a tremendous influence on children and their environments [3]. Maternal depression is reported to be strongly associated with child behavior, executive functioning, and sleep problems [4-6].

In comparison to maternal mental health, researchers have had less interest in the effects of maternal personality traits on child mental health [7]. However, a mother's dysfunctional personality traits may have a clear and consistent effect on children [7]. Mothers with borderline personality disorder are at high risk for comorbid mental illnesses, such as depression and substance use, and have significant difficulties in parenting due to problems in emotional control and interpersonal relationships [8,9]. In addition, depression and borderline personality disorders in parents have a strong effect on psychopatho-

**Received:** April 10, 2023 / **Revised:** July 4, 2023

**Accepted:** July 14, 2023 / **Published online:** August 18, 2023

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logical conditions in children, such as depression and substance use [10]. In a recently conducted population-based longitudinal cohort study, children of mothers with dysfunctional personality traits showed high risks for anxiety, depression, and self-harm at the age of 18 years [11].

In children, sleep is important for cognition, emotion, and physical health, and disrupted sleep is a major factor affecting the development and severity of psychiatric symptoms [12,13]. Previous studies suggested that maternal personality traits may influence child sleep, although the effect of maternal dysfunctional personality traits on child sleep is not well known [14,15]. However, some studies have reported dysregulation in mother-child interactions due to maternal personality traits, and a link between dyadic interaction and child sleep at night was found [16,17]. Hence, the effect of maternal dysfunctional personality traits on child sleep should be investigated further. Intervention for sleep problems in children is significant not only for their mental health but also in the prevention of maternal stress and mood disorders linked to child sleep disturbance [18].

Thus, we hypothesized that maternal dysfunctional personality traits might be associated with child sleep disturbances. This study investigated the longitudinal effect of maternal personality traits on child sleep using cohort data from the Panel Study on Korean Children (PSKC).

## METHODS

### Study Population

This study analyzed the 2008–2014 data from the PSKC performed by the Korea Institute of Child Care and Education. The PSKC data were collected for follow-up of children born in healthcare institutions in 2008 from birth throughout the developmental stages. The cohort was designed with a 2-phase plan in which healthcare institutions were sampled nationwide and infants born in these healthcare institutions were screened during the panel recruitment period. Specifically, in the 1st phase, 30 healthcare institutions that were classified by region and had 500 or more births in 2006 were sampled. In the 2nd phase, researchers visited the 30 healthcare institutions between April and July 2008 to obtain the mothers' written consent to participate in the study. Finally, 2,150 households were selected from the PSKC.

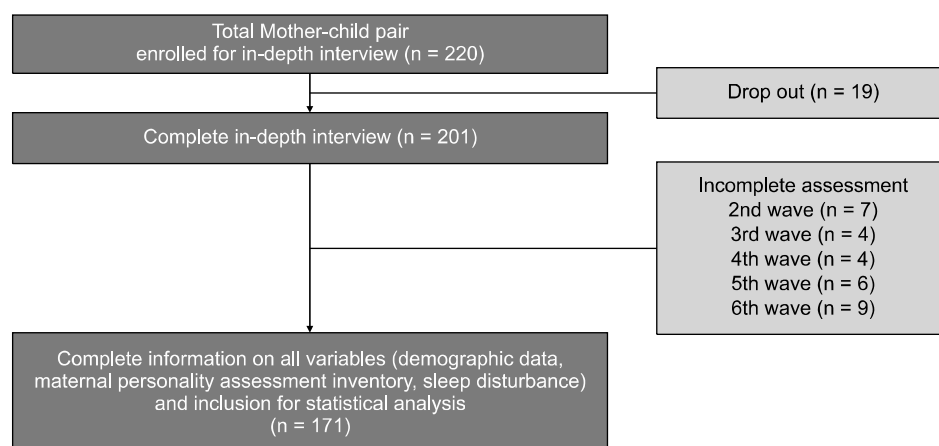
Among the 2,150 households, in-depth interviews were planned for 200 individuals, which accounts for one-tenth of the total. Initially, a total of 220 individuals were allocated, taking into consideration the anticipated dropout rate and the regional distribution of the final sample in the first year. Subjects for the in-depth interviews were recruited through voluntary applications from participants who completed the household visit survey in the second year, and no exclusion criteria were applied. In 2009, 220 individuals who participated in the interview signed up through the PSKC homepage for an in-depth interview. During this interview, the Personality Assessment Inventory (PAI), which is the clinical scale utilized in this study, was administered to the mothers. Nineteen of the 220 households were excluded from this study because of missing data. Additional households from the remaining 201 were excluded because data regarding child sleep disturbance between 2010 and 2014 were incomplete. Finally, 171 households were included as the study participants.

This study was approved by the Institutional Review Board (IRB; IRB number 116271-2021-25). Figure 1 presents the timings at which the PAI and child sleep disturbances were assessed.

### Measurement

#### Personality Assessment Inventory (PAI)

In 2009, maternal personality traits were assessed using the PAI. The PAI is a self-report questionnaire that consists of 344 items evaluated on a 4-point Likert scale across the following 22 subscales: 4 validity scales (inconsistency, infrequency, negative impression, positive impression), 11 clinical scales (somatic concerns, anxiety, anxiety-related disorder, depression, mania, paranoia, schizophrenia, borderline features, antisocial features, alcohol problems, drug problems), 5 therapeutic consideration scales (aggression, suicide ideation, stress, nonsupport, treatment rejection), and 2 interpersonal scales (dominance, warmth). In South Korea, the PAI was standardized in 2001. In the Korean version of the PAI, the median value of internal consistency is 0.77, with all clinical scales showing an internal consistency over 0.7, except for the Drug Problems scale, thus confirming validity [19]. In this study, 11 clinical scales of the 22 subscales of the standardized Korean version of the PAI were analyzed.



**Fig. 1.** Flow chart for Personality Assessment Inventory and child sleep disturbance assessment.

### Sleep disturbance

An annual survey of child development was administered to the sampled households. To investigate the child's sleep problem, a question regarding the presence or absence of sleep disturbance was used from the 2nd wave through the 6th wave of the PSKC. Parents were instructed to select 1 of the following 2 alternatives: "your baby wakes up in the middle of the night," and "your baby sleeps through the night."

### Statistical analyses

Study participants were classified into either the sleep disturbance group or the normal sleep group, and demographic data were analyzed for each group. Participants in whom sleep disturbance was reported at least once in the 2nd through 6th waves were classified into the sleep disturbance group, whereas the normal sleep group included participants in whom sleep disturbance was not reported during any of the waves. An independent-sample *t* test was performed to test between-group differences in mothers' age, and a chi-square test was performed to test between-group differences in mothers' marital status, education level, income level, and children's sex.

Next, Pearson correlational analysis was performed to test the significance of correlations between PAI scale scores in the 2nd through 6th waves in the sleep disturbance and normal sleep groups, and based on the results, 5 of 11 clinical scales that showed the largest, most significant correlations with other scales were selected (somatic concerns [SOM], mania [MAN], borderline features [BOR], antisocial features [ANT], and alcohol problems [ALC] scales). Scores on each of the 5 clinical scales

were categorized as low (bottom 75 percent) or high (top 25 percent), and the chi-square test was performed to test for the presence or absence of child sleep disturbance in each of the 2nd through 6th waves. Finally, to examine the effect of the PAI on child sleep disturbance, binary logistic regression analysis was performed with the presence or absence of child sleep disturbance as the dependent variable. Statistical significance was set at a *p* value of less than 0.05. All statistical analyses were conducted using SPSS (Statistical Package for the Social Sciences) 26.0 (IBM Co.).

## RESULTS

### Participants Characteristics

The sociodemographic characteristics of mothers and children in the 1st wave (2009), that is, the wave when the PAI was administered, are presented in Table 1. Of the 171 households, 92 were classified into the sleep disturbance group (children who experienced sleep disturbance at least once between the 2nd and 6th waves) and 79 into the normal sleep group (children who never experienced sleep disturbance in the waves). There were no significant differences observed between the two groups in terms of maternal age, parental marital status, maternal education level, household income, and the sex of the child.

### Association between Maternal Personality Trait and Sleep Disturbances in Children from 2010 to 2014 (2nd – 6th Wave)

Table 2 shows cross-tab results of the 5 PAI clinical

**Table 1.** Sociodemographic characteristics of participants

Characteristics	Sleep disturbance (2nd–6th wave) <sup>a</sup> (n = 92)	Normal sleep (2nd–6th wave) <sup>b</sup> (n = 79)	$\chi^2$	<i>p</i> value
Maternal characteristics at 2nd wave				
Age (yr)	32.36 ± 3.86	32.46 ± 3.16		0.859
Marital status			1.171	0.279
Spouse present	92 (100)	79 (100)		
First marriage	92 (100)	78 (98.7)		
Remarriage	0 (0)	1 (1.3)		
Spouse absent	0 (0)	0 (0)		
Maternal education			0.787	0.675
High school	16 (17.4)	10 (12.7)		
Junior college/university	67 (72.8)	60 (75.9)		
Graduate school	9 (9.8)	9 (11.4)		
Income level			0.036	0.849
Basic livelihood recipient	0 (0)	0 (0)		
Second-income class	3 (3.3)	3 (3.8)		
No state subsidy	89 (96.7)	76 (96.2)		
Child characteristics				
Sex			0.334	0.563
Boy	46 (50)	43 (54.4)		
Girl	46 (50)	36 (45.6)		

Values are presented as mean ± standard deviation or number (%).

$\chi^2$ , chi-square test.

<sup>a</sup>Sleep disturbance group (2nd–6th wave): children who experienced sleep disturbance at least once between the 2nd and 6th waves. <sup>b</sup>Normal sleep group: children who never experienced sleep disturbance in the waves.

scales (SOM, MAN, BOR, ANT, and ALC) according to the presence or absence of child sleep disturbance in each of the 2nd through 6th waves.

Regarding SOM, in the 2nd wave, 43 (32.58%) and 20 (51.28%) children were in the low and high SOM groups, respectively ( $p = 0.033$ ). In the 3rd wave, 12 (9.09%) and 10 (25.64%) children were in the low and high SOM groups, respectively ( $p = 0.007$ ). The between-group differences were not significant in the 4th ( $p = 0.141$ ), 5th ( $p = 0.361$ ), or 6th ( $p = 0.293$ ) waves.

In the 2nd wave, 40 (30.08%) children in the low BOR group experienced sleep disturbance, and the corresponding number in the high BOR group was 23 (60.53%) ( $p = 0.001$ ). In the 3rd wave, 12 (9.02%) patients in the low BOR group and 10 (26.32%) in the high BOR group experienced sleep disturbances ( $p = 0.005$ ). In the 4th wave, 14 (10.53%) and 9 (23.68%) participants in the low and high BOR groups, respectively, experienced sleep disturbance ( $p = 0.036$ ), and in the 5th wave, the corresponding numbers were 19 (14.29%) and 12 (31.58%) in the low and high BOR groups, respectively ( $p = 0.015$ ). In the 6th wave, the between-group difference was not statistically significant ( $p = 0.099$ ).

In the case of the MAN, ANT, and ALC scales, there were no significant correlations with the presence or absence of child sleep disturbances across all waves.

### Maternal Personality Trait Affecting Sleep Disturbances in Children

Table 3 presents the results of a series of binary regression analyses of the association between the PAI clinical scale and child sleep disturbance in each wave. It was found that in the 2nd and 3rd waves, high BOR in mothers was significantly associated with sleep disturbance in children (2nd wave: odds ratio [OR], 3.807,  $p = 0.003$ , 3rd wave: OR, 3.175,  $p = 0.034$ ), and that high SOM and high BOR were significantly associated with at least 1 occasion of child sleep disturbance in the 2nd through the 6th waves (SOM high: OR, 2.968,  $p = 0.018$ , BOR high: OR, 4.110,  $p = 0.004$ ). No significant association with child sleep disturbance was found for any of the other PAI clinical scales.

## DISCUSSION

This longitudinal study examined the effect of maternal

**Table 2.** Chi-square test between the PAI clinical scale and children who had sleep disturbances from 2010 to 2014 (2nd–6th wave)

Sleep disturbance	SOM			MAN			BOR			ANT			ALC	
	Low	High	$\chi^2$	Low	High	$\chi^2$	Low	High	$\chi^2$	Low	High	$\chi^2$	Low	High
2nd wave	Y	43 (32.58)	20 (51.28)	49 (36.57)	14 (37.84)	40 (30.08)	23 (60.53)	46 (34.85)	17 (43.59)	52 (38.24)	11 (31.43)		52 (38.24)	11 (31.43)
	N	89 (67.42)	19 (48.72)	85 (63.43)	23 (62.16)	93 (69.92)	15 (39.47)	86 (65.15)	22 (56.41)	84 (61.76)	24 (68.57)		84 (61.76)	24 (68.57)
				0.020		11.778		0.989		0.554			0.554	
				0.887		0.001**		0.320		0.457			0.457	
3rd wave	Y	12 (9.09)	10 (25.64)	18 (13.43)	4 (10.81)	12 (9.02)	10 (26.32)	14 (10.61)	8 (20.51)	15 (11.03)	7 (20.00)		15 (11.03)	7 (20.00)
	N	120 (90.91)	29 (74.36)	116 (86.57)	33 (89.19)	121 (90.98)	28 (73.68)	118 (89.39)	31 (79.49)	121 (88.97)	28 (80.00)		121 (88.97)	28 (80.00)
				0.178		7.885		2.636		1.998			1.998	
				0.673		0.005**		0.104		0.157			0.157	
4th wave	Y	15 (11.36)	8 (20.51)	17 (12.69)	6 (16.22)	14 (10.53)	9 (23.68)	18 (13.64)	5 (12.82)	20 (14.71)	3 (8.57)		20 (14.71)	3 (8.57)
	N	117 (88.64)	31 (79.49)	117 (87.31)	31 (83.78)	119 (89.47)	29 (76.32)	114 (86.36)	34 (87.18)	116 (85.29)	32 (91.43)		116 (85.29)	32 (91.43)
				0.310		4.396		0.017		0.900			0.900	
				0.577		0.036*		0.896		0.343			0.343	
5th wave	Y	22 (16.67)	9 (23.08)	22 (16.42)	9 (24.32)	19 (14.29)	12 (31.58)	20 (15.15)	11 (28.21)	24 (17.65)	7 (20.00)		24 (17.65)	7 (20.00)
	N	110 (83.33)	30 (76.92)	112 (83.58)	28 (75.68)	114 (85.71)	26 (68.42)	112 (84.85)	28 (71.79)	112 (82.35)	28 (80.00)		112 (82.35)	28 (80.00)
				1.221		5.955		3.456		0.104			0.104	
				0.269		0.015*		0.063		0.747			0.747	
6th wave	Y	18 (13.64)	8 (20.51)	20 (14.93)	6 (16.22)	17 (12.78)	9 (23.68)	17 (12.88)	9 (23.08)	21 (15.44)	5 (14.29)		21 (15.44)	5 (14.29)
	N	114 (86.36)	31 (79.49)	114 (85.07)	31 (83.78)	116 (87.22)	29 (76.32)	115 (87.12)	30 (76.92)	115 (84.56)	30 (85.71)		115 (84.56)	30 (85.71)
				0.037		2.725		2.428		0.029			0.029	
				0.847		0.099		0.119		0.865			0.865	

Values are presented as number (%).

ALC, alcohol problems; ANT, antisocial features; BOR, borderline features; MAN, mania; PAI, Personality Assessment Inventory; SOM, somatic concerns; Low, lower 75% of the PAI scale; High, top 25% of the PAI scale.

\* $p < 0.05$ ; \*\* $p < 0.01$ .

**Table 3.** Binary logistic regression between the high PAI clinical scale group and children with sleep disturbance

Sleep disturbance	OR	95% CI	<i>p</i> value
2nd wave			
SOM high	1.938	0.857–4.383	0.112
MAN high	0.741	0.314–1.745	0.492
BOR high	3.807	1.593–9.100	0.003**
ANT high	1.013	0.424–2.420	0.976
ALC high	0.478	0.191–1.200	0.116
3rd wave			
SOM high	2.524	0.913–6.972	0.074
MAN high	0.409	0.113–1.476	0.172
BOR high	3.175	1.094–9.212	0.034*
ANT high	1.204	0.401–3.616	0.741
ALC high	1.448	0.476–4.406	0.514
4th wave			
SOM high	1.825	0.642–5.183	0.259
MAN high	1.106	0.366–3.342	0.858
BOR high	2.907	0.947–8.921	0.062
ANT high	0.649	0.193–2.187	0.486
ALC high	0.402	0.103–1.575	0.191
5th wave			
SOM high	1.083	0.416–2.823	0.870
MAN high	1.245	0.483–3.209	0.651
BOR high	2.213	0.852–5.748	0.103
ANT high	1.681	0.649–4.353	0.284
ALC high	0.796	0.284–2.227	0.663
6th wave			
SOM high	1.387	0.507–3.792	0.524
MAN high	0.879	0.303–2.552	0.813
BOR high	1.727	0.610–4.889	0.304
ANT high	1.802	0.644–5.037	0.262
ALC high	0.631	0.198–2.010	0.436
Number of waves of sleep disturbance $\geq$ 1			
SOM high	2.968	1.205–7.314	0.018*
MAN high	1.092	0.473–2.521	0.837
BOR high	4.110	1.586–10.648	0.004**
ANT high	0.606	0.248–1.481	0.272
ALC high	0.414	0.168–1.019	0.055

ALC, alcohol problems; ANT, antisocial features; BOR, borderline features; MAN, mania; PAI, Personality Assessment Inventory; SOM, somatic concerns; OR, odds ratio; CI, confidence interval; High, top 25% of the PAI scale.

\* $p < 0.05$ ; \*\* $p < 0.01$ .

personality on children's sleep using cohort data from South Korea. The results indicated the mothers' borderline features, assessed at the child's age of 1 year, influenced child sleep disturbance in the 2nd and 3rd waves and that mothers' borderline features and somatic concerns were associated with at least 1 occasion of child sleep disturbance in the 2nd through the 6th waves.

According to a previous study that investigated the link between maternal borderline personality disorder and child mental health problems, maternal borderline personality affects the quality of mothers' facial expressions

toward their children and the level of contact in mother-child dyads, making mothers less sensitive in responding to their children during interaction [9]. Since maternal sensitivity influences the feeling of security and sleep in children, mothers' insensitivity due to borderline features may affect the sleep quality of their children [16,20]. Additionally, mothers with borderline personality disorder have shown impairment in affective communication with their infants [9,21]. The current study finding regarding the effect of mothers' borderline personality features on their preschoolers' sleep is consistent with a pre-

vious study finding that preschoolers' nighttime sleep was influenced by the quality of parent-child interaction [16].

Mothers with borderline features feel more stressed as parents, show insensitivity toward their children, and sometimes neglect them [22]. High parenting stress and negative mood in mothers are linked to child sleep problems, and maternal depression and anxiety influence sleep duration in pediatric patients [23,24]. The finding that parenting stress in mothers due to borderline features affects their mental health and, consequently, can affect sleep duration in their children supports the current study finding regarding the effect of maternal borderline features on sleep disturbance in pediatric patients. A genetic component of borderline personality disorder was identified in previous studies, suggesting that sleep quality may be compromised in children with borderline features inherited from their mothers, because borderline personality itself has to do with the quality of sleep [25,26].

It is unclear whether mothers' somatic concerns directly influence their children's sleep. A previous study reported that symptoms such as somatic concerns are closely linked to depressive and anxiety disorders [27]. Additionally, somatic concerns may be a prodromal symptom of depression [28]. Maternal depressive symptoms associated with somatic concerns are predicted to influence child sleep; however, additional research should be performed to confirm this link [24].

The correlation between maternal personality traits and child sleep disturbance was not significant in the 4th and later waves. One hypothesis that may explain this null finding is child growth. Sleep patterns change as a newborn develops, and the change in sleep pattern, including the ratio of rapid eye movement (REM) to non-REM sleep, continues to occur in adulthood [29]. At birth, the ratio of REM and non-REM sleep is approximately 1:1, and with increasing age, REM sleep decreases while deep sleep increases [30]. In contrast, in individuals with depressive disorder, REM sleep increases while slow-wave sleep decreases, resulting in sleep disturbances [30,31]. Sleep pattern change across child development may partially explain why the pattern of sleep disturbance differed from the 4th wave in comparison to the earlier waves.

In children, sleep disorder symptoms vary with age. In this study, 63 out of 171 (36.8%) reported sleep disturbance in the 2nd wave. In the 3rd wave, the number of individuals reporting sleep disturbance decreased to 22 out

of 171 (12.9%). Subsequently, the prevalence of sleep disturbance remained consistent across subsequent waves. In the 4th wave, 23 individuals (13.5%) reported experiencing sleep disturbance, followed by 31 individuals (18.1%) in the 5th wave, and 26 out of 171 individuals (15.2%) in the 6th wave. Aside from sleep disturbances (i.e., waking up in the middle of the night), preschoolers may take a long time to fall asleep. Additionally, they may suck their thumbs or require their parents to rock them to sleep [32]. According to the Diagnostic and Statistical Manual of Mental Disorders, 5th edition, insomnia is defined as difficulty in falling asleep, maintaining sleep, or falling asleep after waking up in the middle of the night; children with insomnia may need help from their parents in sleep initiation and re-initiation. Future studies should be conducted to examine the association between maternal personality traits and child sleep disorder symptoms other than sleep disturbance.

The finding that children experiencing sleep problems are highly likely to experience behavioral problems suggests that child behavior problems may influence mothers' stress levels and mood, consequently affecting mother-child interaction [33,34]. Accordingly, bidirectional associations between sleep disturbance and variables such as a child behavior problems, maternal stress, and maternal depression should be investigated in the future.

The current study has the following strengths: first, this was a prospective cohort study, therefore, the study data were reliable; second, it was a longitudinal study in which the link between maternal personality traits and child sleep was investigated, and longitudinal studies are rarely performed in this research field; and third, since child sleep is manifested in various patterns, to assess sleep quality, the study utilized easily verifiable information, such as sleep disturbance, which increases the reliability of the study findings.

However, this study also has several limitations. First, major factors known to be strongly associated with child sleep quality, such as mother's depression and anxiety, were not included in the study [24]. Second, the variable for sleep disturbance used in the study measured only a single aspect of sleep disorders; thus, it is difficult to consider that this variable completely captured the effect of maternal personality traits on child sleep. One additional limitation is that sleep disturbance was assessed using a single item only. A precise evaluation of sleep disturbance

necessitates the utilization of extensive questionnaires, sleep diaries, and specialized technologies (such as actigraphy and polysomnography) that should be administered by a trained clinician. In addition, although the study examined the effect of maternal personality traits on child sleep, it would be necessary to consider the fathers' influence on children's sleep problems and mother-child interactions in actual parenting practices. Indeed, the importance of the fathers' role was mentioned in a study that found a paternal influence on child sleep disturbance [35]. Furthermore, the scope of this study encompassed the final sample of 205 individuals who consented to participate in the comprehensive in-depth interviews and fulfilled the evaluation requirements during the subsequent year, out of the initial cohort of 2,150 individuals. Consequently, there exists a potential for selection bias, impeding the generalizability of the findings to the entire population. Finally this study was based on parent-reported surveys. The response to the item regarding child sleep disturbance was based on parents' subjective evaluations, and it may be insufficient for assessing child sleep. As discussed above, mothers with a borderline personality disorder may not be fully sensitive in responding to their children's behavior during sleep, and, likely, reports by such mothers did not completely reflect the status of their children's sleep [22].

In this 6-year cohort study on the effect of maternal personality traits on child sleep, causality between mothers' borderline features and child sleep disturbance was found. In assessing a child's sleep problems, it is critical to examine the mother's dysfunctional personality traits and parenting behavior. Additional research should be conducted to gain a deeper understanding of maternal personality traits and sleep problems in children.

#### ■ Funding

This study was supported by a clinical research grant (No. 2022-01) from the National Center for Mental Health, Republic of Korea.

#### ■ Acknowledgments

The findings and conclusions presented in this study are solely the responsibility of the authors and do not necessarily reflect the views of the funding agency.

#### ■ Conflicts of Interest

No potential conflict of interest relevant to this article was reported.

#### ■ Author Contributions

Conceptualization: Yunhye Oh. Data curation: Ki Hyeon Kwak. Formal analysis: Ki Hyeon Kwak. Investigation: Ki Hyeon Kwak. Methodology: Yunhye Oh. Project administration: Yunhye Oh. Supervision: Yunhye Oh. Validation: Yunhye Oh. Visualization: Ki Hyeon Kwak. Writing – original draft: Ki Hyeon Kwak. Writing – review & editing: Yunhye Oh, Ki Hyeon Kwak.

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