

SCIENTIFIC INVESTIGATIONS

Sleep Characteristics and Temperament in Preterm Children at Two Years of Age

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Study Objectives: We aimed to compare 2-year-old children born preterm with children born full term regarding: (1) sleep characteristics, (2) temperament, and (3) relations between sleep pattern and habits and temperament.

Methods: The study included 51 preterm children with normal cognitive, language, and motor development (mean = 20.94 months, standard deviation [SD] = 4.08) and 57 full-term children (mean = 21.19, SD = 4.32). To assess sleep-related difficulties and habits and child temperament, mothers completed the following questionnaires: the (1) Sleep Disturbance Scale for Children—adapted (SDSC); (2) Brief Infant Sleep Questionnaire (BISQ); and (3) Italian Temperament Questionnaires—version 12-36 months (QUIT).

Results: Preterm children needed less support to fall asleep and fell asleep more often alone in their own bed compared to those born at full term; however, preterm children showed more frequent sleep difficulties, such as restlessness and breathing problems during the night. In addition, preterm children had lower scores in the temperamental dimension of attention and higher scores in negative emotionality than full-term children. Finally, sleep problems were correlated with higher motor activity, lower social orientation and attention, and increased negative emotionality; a shorter nocturnal sleep duration was related to higher motor activity and lower inhibition to novelty whereas an earlier rise time was associated with lower attention and social orientation.

Conclusions: Preterm children showed sleep pattern problems and disturbance, predominance of attention problems, and negative emotionality related to sleep disruption.

Keywords: preterm children, sleep, temperament

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INTRODUCTION

Children born preterm are at increased risk for neurodevelopmental problems in various areas, such as language, motor skills, behavior, and self-regulation.^{1,2} Some studies have indicated that preterm children may also have sleep disturbances such as shorter daytime rest and nighttime sleep duration, as well as decreased sleep quality in the first and second year of life,^{3,4} showing that sleep is significantly less restful than that of full-term children. Also later in life, at 3 years of age, sleep disturbances have been described in preterm children, although a reduction of sleep problems was reported at 5 years.⁵ Furthermore, it has been observed that children with very low birth weight are at risk for reduced sleep efficiency at 8 years and advanced sleep onset times in adulthood.^{6,7} Preterm children may also present sleep-disordered breathing more frequently than full-term children during middle childhood.⁸ All these sleep disturbances have been associated with subsequent developmental disturbances, suggesting that adequate sleep is a fundamental requisite for an optimal infant development. Several researchers showed that sleep is particularly important during the early development phases. Sleep deprivation could determine cellular damage,⁹ hippocampal oxidative stress,^{10,11} and suppression of neurogenesis.¹² It may also influence brain areas such as frontal lobes involved in motivation, goal direction, and attentional abilities.¹³ Therefore, in the developing brain, sleep deprivation during critical periods may result in

BRIEF SUMMARY

Current Knowledge/Study Rationale: Preterm birth is a risk factor for many areas of neurological and psychological development. Little is known about sleep quality and habits of preterm children beyond the neonatal period and research findings, to date, have been inconclusive. Very few studies have analyzed the relationship between sleep patterns and temperament in preterm children compared to children born full term.

Study Impact: Our findings show that preterm children with no deficit in cognitive, language, and motor areas, in the second year of life, have relatively more frequent sleep difficulties during the night and different sleep habits compared to full-term children. The temperament of preterm children seems to be characterized by a lower level of attention and more negative emotionality compared to full-term children. We observed a link between sleep pattern and temperament in preterm children and found that sleep problems were related to increased negative emotionality and decreased attention.

morbid and potentially irreversible changes in neural organization of these brain structures.¹⁴

Conversely, other studies have found that preterm children do not differ in their sleep features, such as sleep duration, bed sharing, night waking or time of sleep onset, from full-term children.^{3,15} Researchers have attempted to identify the etiology of sleep difficulties in preterm children in terms of exposure to early neonatal stressors, such as nonphysiological nutrition, hypoxia, repeated painful experiences, abnormal light, and noise.^{16–18}

The persistent attitude of parents of preterm children in the perception of their children as fragile and vulnerable and their reaction to the child's waking could be an important factor in the development of sleep problems.¹⁹ In fact, preterm infants are generally less able to provide clear distress signals, are more easily stressed, and may not show the same rich variety of interactional capacities seen in those born at term.²⁰ Such difficulties may contribute to less adequate parenting, which may play a role in sleep development.²¹ Moreover, lack of constant physical bonding and challenging breastfeeding in preterm children may also contribute to higher stress response, less organized sleep, and difficult maternal–infant interactions.^{22–24} Finally, melatonin rhythmicity may develop more slowly in preterm than in full-term children.^{17,25}

It is known that sleep in children is likely to be influenced not only by environmental and biological factors but also by individual characteristics such as child temperament.²⁶ Temperament has been variously defined^{27–29}; for the current study, we used the temperamental model developed by Thomas and Chess, which focuses on the goodness of fit between child and environment. The model includes different cognitive, emotional, and relational processes such as attention, negative and positive emotionality, motor control activity, social orientation, and inhibition to novelty.²⁸

Overall, recent studies have reported that during the first months of life, preterm children may manifest a higher degree of negative reactivity,^{30,31} a limited capacity to modulate arousal, and lower thresholds to negative emotionality.³² In addition, preterm children may present a greater use of distancing during dyadic play compared to their full-term counterparts, indicating a lower capacity for self-regulation even in routine interactions.³³ There is also evidence that a history of painful procedures in the neonatal intensive care unit (NICU) is associated with poor sustained attention and with a higher basal level of cortisol during the first years of life.^{18,34} Neonatal pain has also been linked to the internalization of behavioral problems in preterm children at 18 months of age³⁵ and a higher reactivity to pain was related to negative affectivity temperament in toddlerhood among preterm children.³⁶

It is known that a difficult child temperament, such as being irritable, fussy, or hypersensitive, may interfere with sleep consolidation in the first months of life and is associated with sleep problems in general during childhood. Moreover, parental behavior in response to awakenings is highly related to the child's sleep rhythmicity and with the endurance of sleep problems.^{37,38} Longitudinal studies have confirmed a positive association between difficult temperament profile and sleep problems over the first 2 years of life.³⁹

However, to the best of our knowledge only 1 study has analyzed the association between temperament and sleep in preterm children.⁴⁰ In this study, 21 preterm children were assessed at 3 time points: during the neonatal period, during toddlerhood, and during the preschool age period. During toddlerhood, low birth weight and low scores in sociability were significant predictors of sleep problems. Nevertheless, the study lacked a control group and sleep was assessed only considering a global measure of sleep problems using the Child Behavior Checklist (CBCL).

Therefore, because very few studies have been carried out in order to evaluate the relation between sleep quality and habits and temperament in preterm children, the aims of this study were to investigate: (1) the characteristics of sleep (in terms of sleep-related difficulties and habits), (2) the temperamental dimensions, and (3) the relations between sleep pattern and temperament in a group of preterm children.

METHODS

Participants

The current study is part of a larger investigation on the neurodevelopment of preterm children. The study group is composed of 51 preterm children recruited from the NICU of a public hospital in Rome, Italy (Umberto I General Hospital). The sample was composed of 5 extremely preterm children (< 28 weeks of gestational age), 17 very preterm children (28 to < 32 weeks gestational age), and 29 moderate to late preterm children (32 to < 37 weeks gestational age). Data collected from the hospital medical charts revealed that among them, 2 (4%) had sepsis, 4 (7.9%) had intraventricular hemorrhage grade I-II, 4 (7.9%) had intraventricular hemorrhage grade III-IV, 1 (2%) had periventricular leukomalacia, and 11 (21.6%) had neonatal respiratory distress syndrome (RDS). The length of stay in the NICU ranged from 9 to 88 days (mean = 36.21, standard deviation [SD] = 21.12).

As a part of their follow-up evaluation, during the first year of life, children were assessed for cognitive, language, and motor development by the Bayley Scales of Infant and Toddler Development-Third Edition (BSID-III).⁴¹ In the current study, we included only preterm children who did not have a delay in cognitive, language, and motor areas, defined as a BSID-III scaled score in each scale of less than 2 SD relative to the mean.

The control group consists of 57 healthy full-term children recruited from 3 daycare centers in the same geographic area as the preterm group. For both groups, children with a genetic syndrome, major congenital anomalies, and neurosensory or motor disabilities, as well as mothers who did not possess an adequate Italian language level, were excluded from the study.

This study was approved by the Ethics Committee of the Department of Developmental and Social Psychology, Sapienza, University of Rome.

Procedure

Mothers of preterm children were approached by doctors or psychologists in the course of the second year of life of their children during one of their hospital follow-up visits and solicited for participation in the study. For each daycare center, the director of the center contacted the mothers of the control group to explain the aims of the study. A written parental consent was obtained from all participants before inclusion in the study. Two research assistants trained in child assessment explained the questionnaires on temperament and sleep to each parent, administered the questionnaires, and remained available for any clarification during completion. The completion of the questionnaires was checked as soon as parents returned them.

Table 1—Demographic characteristics of preterm and control groups.

	Preterm Group (n = 51)			Control Group (n = 57)			F	P	Partial η^2
	Mean	SD	Range	Mean	SD	Range			
Infant age (months)	20.94	4.08	13–29	21.19	4.32	13–29	0.096	NS	.01
Birth gestational age	31.06	2.47	23–35	39.26	1.60	37–43	428.801	< .001	.80
Birth weight (g)	1600.82	501.19	710–2710	3187.09	573.69	1180–4850	228.302	< .001	.69
Maternal age	35.61	5.39	24–45	34.54	5.33	25–45	1.062	NS	.01
	n	%		n	%		χ^2	P	
Type of feeding							22.241	< .001	
Breast fed	8	15.7		33	57.9				
Bottle fed	16	31.3		9	15.8				
Mixed	26	51.0		12	21.1				
Missing	1	2.0		3	5.2				
Maternal education							0.565	NS	
University degree or beyond	21	41.2		24	42.1				
High school degree	21	41.2		25	43.9				
Less than high school degree	9	17.6		7	12.3				
Missing	0	0.0		1	1.7				

SD = standard deviation.

Measures

Assessment of infant sleep

To assess the infant sleep-related difficulties and habits, all mothers completed the following measures:

1. The Sleep Disturbance Scale for Children—adapted (SDSC).⁴² A revised version of the SDSC questionnaire was used and adapted for use with toddlers in order to identify the presence of sleep disturbances. From the original scale, we selected 12 items (removing 14 items deemed to be inappropriate for age). An exploratory factor analysis on the 12 items yielded 2 correlated factors named (a) bedtime difficulties (composed of 3 items, eg, a child's difficulty or refusal to fall asleep) with factor loadings ranging from 0.40 to 0.93 and a good internal consistency ($\alpha = .72$) and (b) sleep difficulties (composed of 9 items, eg, nocturnal movement, restlessness during the night, or breathing problems) with factor loadings ranging from 0.37 to 0.68 and a good internal consistency ($\alpha = .76$). Responses were given on a 3-point Likert scale with higher values reflecting a greater difficulty with bedtime and sleep.
2. Brief Infant Sleep Questionnaire (BISQ).⁴³ The BISQ aims to evaluate sleep pattern and habits and it is composed of questions related to the following areas: (a) bedtime, (b) rise time, (c) nocturnal sleep duration, (d) daytime sleep duration, (e) number of nighttime awakenings, (f) nocturnal wakefulness, (g) latency to falling asleep during the night (or settling time), (h) method of falling asleep, and (i) location of sleep.

Assessment of infant temperament

To evaluate the infant temperament, we used the Italian Temperament Questionnaires—version 12-36 months (QUIT).⁴⁴

The questionnaire is composed of 56 items rated on a 6-point Likert scale (1 = almost never to 6 = almost always) describing infant behavior in 3 different contexts: (1) child interaction with others, (2) child during play, and (3) child during an activity or a task. In total, 6 temperamental dimensions were assessed: (1) Social Orientation (9 items; infant interest and attention towards others); (2) Inhibition to Novelty (12 items; infant emotional reactivity toward contextual stimuli); (3) Motor Activity (11 items; infant physical activity); (4) Positive Emotionality (10 items; infant expression of positive emotions); (5) Negative Emotionality (6 items; infant expression of negative emotions); and (6) Attention (8 items; infant ability to keep the focus of his/her attention). The scores of each dimension were averaged to create Social Orientation, Inhibition to Novelty, Motor Activity, Positive Emotionality, Negative Emotionality, and Attention rates for each infant. Overall, each dimension of the QUIT showed an acceptable internal consistency.^{44,45}

Statistical Analysis

Analyses of variance were conducted to analyze differences in sleep difficulties, sleep habits, and temperamental dimensions between preterm and control groups. Then, we ran a series of chi square tests (χ^2) and Fisher exact tests to compare preterm and control groups for their method of falling asleep, location of sleep, and settling time. Finally, Pearson correlations were performed in preterm children to examine the associations among temperamental dimensions, sleep difficulties, and sleep habits.

RESULTS

Demographic characteristics (ie, infant mean age, birth gestational age, and birth weight) and the type of feeding for the preterm and control groups are displayed in **Table 1**. **Table 1** also

Table 2—Sleep difficulties and habits for preterm and control groups.

	Preterm Group			Control Group			F	P	Partial η^2
	Mean	SD	Range	Mean	SD	Range			
Bed time difficulties (SDSC)	0.63	0.55	0.00–2.00	0.64	0.55	0.00–2.00	0.009	NS	.01
Sleep difficulties (SDSC)	0.41	0.37	0.00–1.67	0.27	0.29	0.00–1.11	4.630	< .05	.04
Bedtime (BISQ) (hh.mm)	21.57	0.64	21.00–24.00	21.73	0.74	19.30–24.00	1.400	NS	.01
Rise time (BISQ) (hh.mm)	7.75	0.81	5.30–9.30	7.68	0.74	5.30–9.00	0.219	NS	.01
Nocturnal sleep duration (BISQ) (hh.mm)	9.59	1.22	5.00–13.00	9.33	1.26	6.00–13.00	1.137	NS	.01
Daytime sleep duration (BISQ) (hh.mm)	1.90	0.56	1.00–4.00	2.15	0.73	1.00–4.00	3.749	NS	.03
No. nighttime awakenings (BISQ)	1.22	0.58	1–3	1.33	1.11	0–6	0.463	NS	.01
Nocturnal wakefulness (BISQ) (min)	11.65	20.46	2–120	7.33	13.70	0–60	1.689	NS	.02

BISQ = Brief Infant Sleep Questionnaire, SD = standard deviation, SDSC = Sleep Disturbance Scale for Children.

Table 3—Prevalence of method of falling asleep, location of sleep, and settling time for preterm and control groups.

	Preterm Group n (%)	Control Group n (%)	χ^2	P
Method of Falling Asleep				
Feeding	1 (2.0)	4 (7.0)		NS*
Hold in arms	2 (3.9)	11 (19.3)	6.011	< .01
In parent bed	8 (15.7)	24 (42.1)	9.010	< .01
Alone in own bed	25 (49.0)	17 (29.8)	4.173	< .05
Rocked	8 (15.7)	8 (14.0)	0.058	NS
Location of Sleep				
Parents bed	4 (7.8)	19 (33.3)	10.434	< .01
Crib in the parents' room	20 (39.2)	14 (24.6)	2.680	NS
Own room with siblings	16 (31.4)	12 (21.1)	1.493	NS
Own room alone	8 (15.7)	11 (19.3)	0.242	NS
Settling Time				
≤ 30 min	36 (85.7)	51 (91.1)		NS*
> 30 min	6 (14.3)	5 (8.9)		NS*

* = calculated by Fisher exact test.

shows the maternal age and education for both groups. Preterm children had a gestational age and weight at birth lower than that of full-term children. In addition, we found that preterm children were less frequently breastfed than full-term children. No differences have been found for maternal education and maternal age.

Preterm children displayed more medical sleep problems (eg, nocturnal movement, restlessness during the night and breathing problems, as assessed by the SDSC questionnaire) than the control group (**Table 2**) whereas behavioral sleep problems as assessed by the BISQ were less frequent. Indeed, preterm children needed less support to fall asleep (hold in arms or in parent bed), fell asleep more often alone in their own bed, and slept less often in the parent bed than the full-term children. No other significant differences were found (**Table 3**).

Regarding temperament, the preterm group reported lower scores in attention and higher scores in negative emotionality than the control group (**Table 4**).

Significant and positive correlations in preterm children were found between bedtime difficulties and both motor activity and negative emotionality and between nocturnal sleep

duration and inhibition to novelty. Negative correlations were observed between sleep difficulties and social orientation, positive emotionality, and attention; between the rise time and both social orientation and attention dimensions; and between nocturnal sleep duration and motor activity (**Table 5**).

DISCUSSION

Our findings show that preterm children have a relatively high degree of medical sleep problems during the night and a lower degree of behavioral sleep problems, such as lower need of support from parents to fall asleep, compared to full-term children, whereas no differences were found between the 2 groups on sleep patterns such as bedtime, rise time, and nocturnal and daytime sleep durations.

These results are similar to those of previous studies on sleep in preterm children, although many controversial findings have been previously published in the literature. Some authors found a poorer sleep quality (in terms of restful sleep during the night) in preterm versus full-term children, at approximately 20 months of corrected age⁴ and an increase in the number of night awakenings and in the time spent with mouth breathing.⁴⁶ However, other studies were in agreement with our findings, showing that preterm children exhibited fewer and shorter night awakenings at age 3 months and settled more quickly once awakened at 5 months of age than full-term children and no differences have been found in sleeping behavior at age 20 months and at preschool age.^{5,47} Furthermore, our results are also in agreement with other studies showing no differences on bedtime, rise time, nocturnal and daytime sleep durations, bed sharing, nighttime waking, bedtime resistance, and sleep onset difficulties.^{15,48}

In our study, we only included preterm children with no deficit in cognitive, language, and motor areas, to ensure a sample as homogeneous as possible. Our criteria excluded the majority of preterm infants who had a complicated NICU course and who could present with different, and probably more severe, sleep problems often linked to the presence of a severe neurological damage.⁴⁹

Despite the fact that no differences in bedtime, rise time, or sleep duration have been found in preterm versus full-term

Table 4—Temperamental dimensions for preterm and control groups.

	Preterm Group			Control Group			<i>F</i>	<i>P</i>	Partial η^2
	Mean	SD	Range	Mean	SD	Range			
Social orientation	4.22	0.56	3.11–5.33	4.16	0.62	2.78–5.67	0.204	NS	.01
Inhibition to novelty	2.79	0.69	1.17–3.75	2.56	0.68	1.42–4.50	2.884	NS	.03
Motor activity	3.30	0.62	2.45–5.73	3.45	0.57	2.18–4.64	1.807	NS	.02
Positive emotionality	4.53	0.73	3.00–6.00	4.63	0.67	3.00–5.75	0.519	NS	.01
Negative emotionality	3.35	0.93	1.00–5.17	2.90	0.77	1.00–4.50	7.467	< .01	.07
Attention	3.93	0.78	2.63–5.25	4.28	0.68	2.25–5.71	6.311	< .01	.06

SD = standard deviation.

Table 5—Correlations between the temperamental dimensions and infant sleep difficulties and habits for preterm group.

	Social Orientation	Inhibition to Novelty	Motor Activity	Positive Emotionality	Negative Emotionality	Attention
Bedtime difficulties (SDSC)	-.04	-.10	.29*	-.23	.38**	.17
Sleep difficulties (SDSC)	-.28*	.02	.19	-.27*	.10	-.32*
Bedtime (BISQ)	.11	-.11	.21	-.09	-.10	-.26
Rise time (BISQ)	-.28*	.24	-.12	-.15	-.01	-.32*
Nocturnal sleep duration (BISQ)	-.21	.39**	-.33*	-.01	.01	.01
Daytime sleep duration (BISQ)	-.01	-.19	.21	.01	-.07	.17
No. nighttime awakenings (BISQ)	-.07	-.26	.15	-.03	.06	-.04
Nocturnal wakefulness (BISQ)	-.06	.03	-.11	-.10	.08	.12

* = $P < .05$. ** = $P < .01$. BISQ = Brief Infant Sleep Questionnaire, SDSC = Sleep Disturbance Scale for Children.

children, the sleep problems described by the parents of preterm children (restlessness, breathing problems during sleep) could have resulted in sleep disruption, which has been associated with alteration of daytime behavior, attention, and learning difficulties during childhood and adolescence as reported in the literature.^{50,51}

Regarding temperamental characteristics, we showed that preterm children had lower levels of attention and more negative emotionality (eg, crying, stranger wariness) than full-term children. These results are consistent with previous studies demonstrating that children born preterm are at risk of attention and learning problems⁴⁰ as well as emotional difficulties.⁵² Accordingly, a review conducted on attention development during the first 4 years of age confirmed a decrease of sustained attention and visual orientation of attention in preterm children compared to their counterparts born at full term.⁵³ Furthermore, some authors found that preterm children at 2 months corrected age expressed more negative affect during repeated exposure to the modified still-face procedure than the full-term children, confirming, thus, the preterm children's difficulty in regulating their distress.³⁰ Similarly, another study found that very preterm children expressed more negative emotions, in terms of fear and frustration, than full-term children in tasks assessing emotional abilities.⁵⁴ The negative affectivity may represent a significant predictor of both internalizing and externalizing behaviors, as suggested by some authors with a sample of children aged from 18 to 36 months who were born preterm.⁵⁵

It is noteworthy that our results support an association between sleep quality and child temperamental characteristics. Correlational analyses showed that sleep difficulties were associated with increased motor activity, lower social orientation

and attention, and more negative emotionality. Furthermore, a shorter nocturnal sleep duration was related to increased motor activity and lower inhibition to novelty, whereas an earlier rise time was associated with lower attention and social orientation.

An increase in motor activity is often reported by parents of children with sleep problems and may also be related to difficulties in attention and social interactions.⁵⁶ It is possible that sleep difficulties in preterm children interfere with brain maturation that, in turn, may compromise the children's cognitive and regulatory abilities.⁵⁶ Previous studies also underlined the parents' role in helping children to regulate sleep and executive functions.⁵⁷ Parents may have more difficulties in being external regulators for preterm children given their child's vulnerability to a range of cognitive, attentional, and behavioral problems.

Therefore, our findings also confirm a link between sleep-related difficulties and temperament in children born preterm. Most of the previous studies focused their attention on full-term children, demonstrating that sleep may be related to infant individual characteristics as well as environmental factors.²⁶ A previous study found that a longer nocturnal sleep duration was related to infant approachability at 3, 6, and 11.5 months.⁵⁸ Other authors have shown associations between infant negative temperament (in terms of distress to limitations and fear), the difficulty in putting infants to sleep, sleep problems, and longer wakefulness in the night during the first year of life.⁵⁹

To the best of our knowledge, only one study analyzed the link between temperament and sleep in preterm children and reported an association between sleep problems and low sociability during toddlerhood.⁴⁰ Although the authors considered a global measure of sleep problems derived from the CBCL, we

found similar results confirming an association between sleep problems and difficulty in children's social orientation. In contrast, children's optimal sleep may be related to their adaptive functioning during the day in terms of social engagement and peer acceptance.⁶⁰

Based on a transactional model of infant sleep, temperamental characteristics might directly interfere with sleep consolidation or may influence the parents' behavioral response to their children, thereby affecting their sleep.⁶¹ Infant sleep develops in dynamic and complex transactions between infant temperament and parent emotional quality. Therefore, it is important to examine both sleep and temperament and their interrelationships in order to provide a correct approach for infant sleep problems.⁶¹

Although the current study is one of the first on the relationship between different aspects of sleep (eg, duration, location of sleep) and temperament in preterm children, some limitations of this research should be considered when interpreting results. First, the cross-sectional nature of our data prevents us from analyzing possible direct relationships between infant sleep and temperament in preterm children. It is possible that infant sleep may influence the expression of temperament in terms of motor activity and less attention during the day or that infant temperamental characteristics may play a role in influencing infant sleep.⁶² Therefore, future studies that might analyze these associations longitudinally may help us to better understand the link between infant sleep and temperament, as well as their associations with socioemotional adjustment over time.

Furthermore, we only considered parental ratings on sleep and temperamental characteristics with no other objective sleep measures (such as actigraphy or polysomnography) or different informants (eg, teachers versus parents). The inclusion of different objective informants may be useful to better understand the effect of sleep quality on children's social behaviors in different contexts. Finally, it would be interesting to replicate the results of the current study in other cultural samples to improve our knowledge on the association between preterm children temperament and sleep in different samples/cultures.

In conclusion, we found a link between sleep and temperament in preterm children, demonstrating that sleep problems are related to more negative emotionality and lower attention. Therefore, it is important that pediatricians screen sleep more rigorously in preterm children, especially with respect to sleep-related breathing disorders and sleep-related movement disorders.

Interventions on the quality of the infant-caregiver relationship as well as environmental modification or behavioral treatment might be useful to improve sleep quality of preterm children and hopefully modify the negative temperamental characteristics of preterm children during early childhood.⁶³

ABBREVIATIONS

BISQ, Brief Infant Sleep Questionnaire

BSID-III, Bayley Scales of Infant and Toddler Development-Third Edition

CBCL, Childhood Behavior Checklist

NICU, neonatal intensive care unit

QUIT, Italian Temperament Questionnaires

SD, standard deviation

SDSC, Sleep Disturbance Scale for Children

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