Sleep in the Family Context: Opportunities for Sleep Health Promotion

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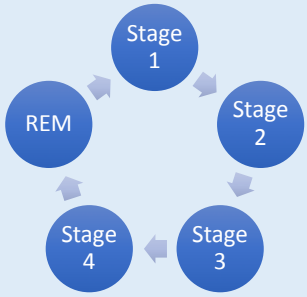
Healthy Sleep

- Sleep characteristics:
  - Total sleep time (TST)
  - Number of awakenings
  - Wake after sleep onset (WASO)
  - Sleep efficiency (SE)
  - Sleep onset latency (SOL)



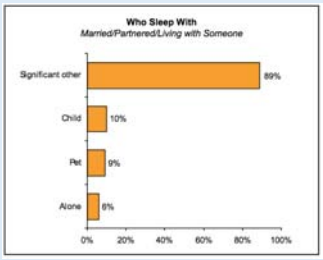
Talk Outline

1) Sleep during pregnancy
2) Sleep challenges after birth
3) Infant sleep and health
4) Family interactions
5) Interventions

Sleep in Couples

Couples and Sleep

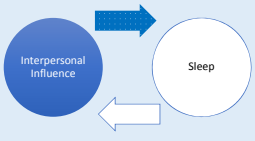
- Objective consequences in bed sharing, but subjective benefits[1]
- Bidirectional influence with relationship characteristics[2]



Pankhurst & Horne, 1994[1]
Troxel, 2010[2]

NSF Poll, 2005

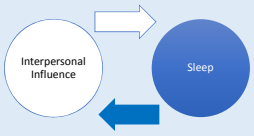
Effects of Partner Influence on Sleep



- Conflict is stressful, which can lead to rumination and increased sympathetic activation[1,2]
- Partners serve as social zeitgebers, providing cues for sleep. Conflict can disrupt bedtime rituals[3]
- Partners can buffer stress[4]

Troxel 20101
Kiecolt-Glaser et al., 19982
Larson et al., 19913
Caccioppo et al., 20024

Effects of Sleep on Interpersonal Factors



- Poor sleep leads to irritability[1]
- Associated with decreases in problem solving, empathy, friendliness, emotion regulation, and positive mood[2,3]
- Fatigue can elicit social isolation[4]

Selvi et al., 2007[1]
Hou et al., 2007[2]
Goel et al., 2009[3]
Caccioppo et al., 2002[4]

Transition to Pregnancy

Sleep During Pregnancy

- Maternal sleep changes as early as the first trimester
  - Lower sleep efficiency, more awakenings[1]
- Total sleep time decreases through pregnancy[2]

Table II Differences in labor duration by total sleep time and wake after sleep onset (n = 131)

	n	Labor duration* (mean ± SD)
WASO		
15%+	41	26.0 ± 11.7†
10%-14.9%	32	18.3 ± 12.8
<10%	58	18.3 ± 14.6
TST		
<6 h	19	29.0 ± 12.5†
6-6.9 h	38	20.5 ± 11.3
7+ h	74	17.7 ± 15.6

*Adjusted for infant birth weight.
† significantly longer labor than the other 2 groups.

Lee, Zaffke, & McEnany, 2000[1]
Lee & Gay, 2004[2]

Table III Differences in cesarean rates by wake after sleep onset (n = 131)

	n	Cesarean rate	Odds Ratio*	95% CI	P value
WASO					
15%+	41	39.0%	5.19	1.77-15.18	.003†
10%-14.9%	32	18.8%	1.90	0.55-6.63	.312
<10%	58	10.3%	ref		
TST					
<6 h	19	36.8%	4.54	1.36-15.21	.014†
6-6.9 h	38	34.2%	3.67	1.33-10.18	.012†
7+ h	74	10.8%	ref		
GSDS sleep quality					
Poor sleep 5+ d/wk	48	31.3%	5.33	1.40-20.36	.014†
Poor sleep 3-4 d/wk	39	25.6%	4.21	1.05-16.93	.043†
Poor sleep 0-2 d/wk	44	6.8%	ref		

*Adjusted for infant birth weight.
† $P < .01$.
† $P < .05$.

OSA During Pregnancy

- Pregnant women at increased risk for OSA due to anatomic and physiologic changes[1]
- Risk for adverse birth outcomes
  - Low birthweight[2]
  - Pre-term birth[3]
  - Small for gestational age[4]
  - Cesarean section[5]
  - Lower Apgar scores[6]
  - Preeclampsia[1]

Venkata & Venkatehlah, 2009[1]
Sahin, Koken, & Coaar 2008[2]
Kapsimalis & Kryger, 2009[3]
Roush & Bell, 2004[4]
Louis et al., 2010[5]
Champagne et al., 2010[6]
Chen et al., 2012

Variable	Women with obstructive sleep apnea (n = 791) n	%	Women in the comparison group (n = 3955) n	%	P value
LBW	68	8.6	165	4.2	< .001
OR (95% CI)*	2.16 (1.61–2.90)†		1.00		
Adjusted OR (95% CI)‡	1.76 (1.28–2.40)†		1.00		
Preterm birth	96	12.1	215	5.4	< .001
OR (95% CI)*	2.40 (1.86–3.10)†		1.00		
Adjusted OR (95% CI)‡	2.31 (1.77–3.01)†		1.00		
SGA	145	18.3	535	13.5	< .001
OR (95% CI)*	1.44 (1.17–1.76)†		1.00		
Adjusted OR (95% CI)‡	1.34 (1.09–1.66)†		1.00		
CS	399	50.4	1475	37.3	< .001
OR (95% CI)*	1.73 (1.48–2.02)†		1.00		
Adjusted OR (95% CI)‡	1.74 (1.48–2.04)†		1.00		
Low Apgar score at 5 min	10	1.3	5	0.1	< .001
OR (95% CI)*	10.11 (3.45–29.67)†		1.00		
Adjusted OR (95% CI)‡	---		1.00		
Preeclampsia/eclampsia	11	1.4	18	0.5	.002
OR (95% CI)*	3.08 (1.45–6.55)†		1.00		
Adjusted OR (95% CI)‡	1.60 (2.16–11.26)†		1.00		
Gestational diabetes	37	4.7	130	3.3	.053
OR (95% CI)*	1.45 (0.99–2.11)		1.00		
Adjusted OR (95% CI)‡	1.63 (1.07–2.48)†		1.00		
Gestational hypertension	53	6.7	85	2.2	< .001
OR (95% CI)*	3.32 (2.33–4.74)†		1.00		
Adjusted OR (95% CI)‡	3.18 (2.14–4.73)†		1.00		

Sleep Challenges After Birth

Parental Postpartum Sleep

- Both parents experience diminished sleep quality following birth
- Mothers tend to have more sleep fragmentation[1], while father's TST is impaired[2]
- Sleep characteristics improve over the first year postpartum[3]

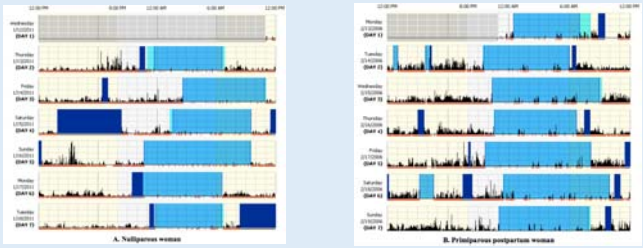
	Time	Mothers	Fathers	Significant Differences
TST-night (mins)	3rd trimester	424.3 ± 62.7	419.0 ± 52.9	$F(1, 57) = 12.6^{**}$ (T)
	Postpartum	385.1 ± 76.8	403.2 ± 64.5	$F(1, 57) = 4.8^{*}$ (TxP)
WASO (%)	3rd trimester	12.4 ± 7.2	9.3 ± 5.2	$F(1, 57) = 124.5^{***}$ (T)
	Postpartum	28.2 ± 8.6	17.4 ± 8.4	$F(1, 57) = 73.2^{***}$ (P)
				$F(1, 57) = 23.5^{***}$ (TxP)
TST-day (mins)	3rd trimester	38.0 ± 53.7	18.6 ± 29.4	$F(1, 53) = 9.1^{**}$ (T)
	Postpartum	68.8 ± 64.5	13.5 ± 29.7	$F(1, 53) = 34.6^{***}$ (P)
				$F(1, 53) = 10.7^{**}$ (TxP)
TST-total (mins)	3rd trimester	471.0 ± 91.6	441.9 ± 59.3	$F(1, 53) = 10.5^{**}$ (P)
	Postpartum	457.9 ± 96.6	424.2 ± 89.0	
GSDS score	3rd trimester	43.9 ± 14.9	28.3 ± 17.3	$F(1, 65) = 65.4^{***}$ (T)
	Postpartum	55.5 ± 15.4	42.8 ± 14.1	$F(1, 65) = 50.3^{***}$ (P)
Morning fatigue	3rd trimester	3.7 ± 1.8	3.6 ± 1.6	$F(1, 70) = 37.9^{***}$ (T)
	Postpartum	4.9 ± 2.0	4.4 ± 1.9	
Evening fatigue	3rd trimester	5.8 ± 1.7	5.7 ± 1.6	$F(1, 70) = 18.8^{***}$ (T)
	Postpartum	6.8 ± 1.8	6.1 ± 1.6	

NOTE: TST = total sleep time, WASO = wake after sleep onset, GSDS = General Sleep Disturbance Scale. (T) = main effect of time, (P) = main effect of parent, (TxP) = interaction effect of time and parent.

Gay, Lee, & Lee, 2004

Insana, Stacom, & Montgomery-Downs, 2010[1]
Condone, Boyce, & Corkindale, 2004[2]
Hunter. Rychnovsky, & Yount, 2009[3]

Sleep Characteristics: Fragmentation



Montgomery-Downs, Stremler, & Insana, 2013

Sleep Architecture

- Early in postpartum period, decreased SWS and REM sleep[1]
- Mothers extremely efficient at making up for lost SWS and REM sleep (REM rebound)
  - Effect stronger for multiparous women

Karacan et al., 1969[1]

Sleep Characteristic	Pregnancy 35–36 weeks (n = 29)	Postpartum 3–4 weeks (n = 29)
Total sleep time (min)	415 ± 64.5	379 ± 78.5*
Sleep efficiency (%)	89 ± 5.8	81 ± 7.7†
Sleep onset latency to stage 2 (min)	13 ± 11.1	11 ± 10.7
REM onset latency (min)	87 ± 42.9	69 ± 27.4*
Awake time (% sleep)	11 ± 5.8	19 ± 7.7†
Stage 1 (% sleep)	4 ± 1.2	4 ± 2.4
Stage 2 (% sleep)	56 ± 5.7	44 ± 7.1†
Stage 3 + 4 (% sleep)	8 ± 3.8	12 ± 5.1†
REM (% sleep)	21 ± 5.1	21 ± 4.3

REM = rapid eye movement.
Data presented as mean ± standard deviation.
* t = 2.0, P < .05 significant decrease from third trimester.
† t = 4.2, P ≤ .001 significant change from third trimester.

Lee et al.,2000

Poor Sleep and Health

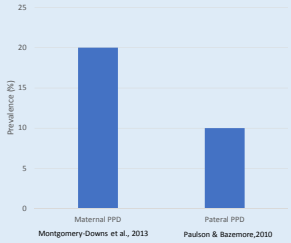
- Sleep deprivation and fragmentation associated with decreased executive attention, memory, and motor function[1]
- Acute consequences of disturbed sleep
  - Increased stress reactivity[2]
  - Cognitive functiong[3]
  - Immune supression[4]
- If sleep problems persists this increases risk for chronic illness
  - Cardiovascular disease[5]
  - Type II diabetes[6]
  - Obesity[7]
  - Mortality[8]

Durmer & Dinges, 2005[1]
Leproult et al., 1997[2]
Lim & Dinges 2010[3]
Bryant, Trinder, & Curtis, 2004[4]
Sabanayagam & Shankar, 2010[5]
Spiegel et al., 2005[6]
Watanabe et al., 2010[7]
Cappuccio et al., 2010[8]

Postpartum Depression

- Both parents experience postpartum depression in the first year following birth
- Infant outcomes associated with parental PPD
  - Poor cognitive, behavioral, emotional, and social development[1]

Bell et al., 1994[1]



Montgomery-Downs et al., 2013
Paulson & Bazemore,2010

Sleep and Postpartum Depression

- Sleep and fatigue
  - Maternal sleep[1] and fatigue[2] associated with PPD
  - Causal pathway hard to examine, but some research suggest sleep predicts depressive symptoms[3]

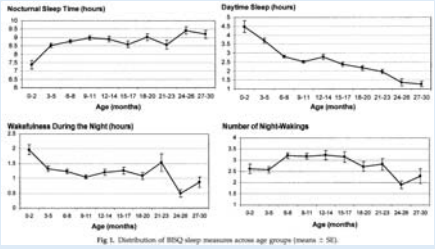
Swain et al., 1997[1]
Gardner, 1991[2]
Lee, Zaffke, & McEnany, 2000[3]
Posmonteir et al., 2008

Step		R^2	F	ΔR^2	ΔF	Final Model B	SE B	β
1	Sociodemographic variables	.14	2.18*					
	Maternal age					−0.04	0.16	−.02
	Race (Caucasian)					1.30	1.42	.07
	Household income					0.00	0.72	.00
	Maternal education					−0.18	0.52	−.03
	Delivery type (Cesarean)[1]					2.26	1.61	.11
	Gender of infant (Female)[1]					1.66	1.34	.09
	Feeding type (Formula)[1]					1.35	1.39	.07
	Relationship satisfaction					−0.11	0.05	−.15*
2	Prenatal CES-D Score	.24	3.65**	.10	13.31***	0.27	0.11	.19*
3	Infant temperament	.25	3.00**	.01	0.32			
	Maternal Ratings					0.10	0.60	.01
	Paternal ratings					0.50	0.55	.07
4	Objective sleep	.41	4.86***	.16	9.04***			
	Night sleep≥6 hrs					−0.86	1.87	−.04
	Wake 12 AM–6 AM≥2 hrs					10.55	2.31	.37***
	Daytime sleep≥1 hr					−3.94	1.70	−.18*
5	Subjective sleep	.55	7.71***	.13	28.38***			
	GSDS total score					0.22	0.04	.41***

Infant Sleep

Infant Sleep Patterns

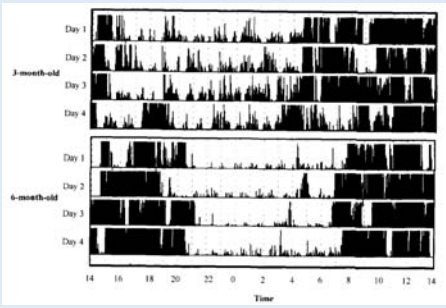
Polyphasic sleep pattern that consolidates over time



Sadeh, 2004

Infant Sleep

24-hour sleep reports of infants at 3 and 6 months old



Sadeh, 1995

Infant Sleep and Health

- Sleep may play important role for the physical development of an infant's first 6 months of life
- Sleep associated with weight, length, body size, infant BMI

Tikotzky et al., 2010

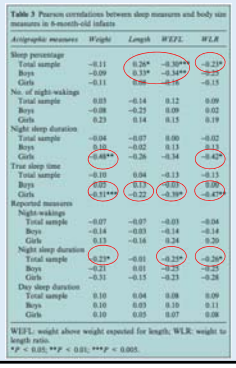


Table 3 Pearson correlations between sleep measures and body size measures in 6-month-old infants

Actigraphic measures	Weight	Length	WFL	WLR
Sleep percentage				
Total sample	−0.11	0.26*	−0.30**	−0.23*
Boys	−0.09	0.35*	−0.34**	−0.25
Girls	−0.11	0.16	−0.15	−0.15
No. of night-wakings				
Total sample	0.03	−0.14	0.12	0.09
Boys	−0.08	−0.25	0.09	0.02
Girls	0.23	0.14	0.15	0.19
Night sleep duration				
Total sample	−0.04	−0.07	0.00	−0.02
Boys	0.10	−0.02	0.13	0.12
Girls	−0.48**	−0.26	−0.34	−0.42*
True sleep time				
Total sample	−0.10	0.04	−0.13	−0.13
Boys	0.07	0.17	−0.03	0.00
Girls	−0.51***	−0.22	−0.38*	−0.47**
Reported measures				
Night-wakings				
Total sample	−0.07	−0.07	−0.03	−0.04
Boys	−0.14	−0.03	−0.14	−0.14
Girls	0.13	−0.16	0.24	0.29
Night sleep duration				
Total sample	0.25*	−0.01	−0.25*	−0.26*
Boys	−0.21	0.01	−0.23	−0.25
Girls	−0.31	−0.15	−0.23	−0.28
Day sleep duration				
Total sample	0.10	0.04	0.08	0.09
Boys	0.10	0.03	0.10	0.11
Girls	0.10	0.05	0.07	0.08

WFL: weight above weight expected for length; WLR: weight to length ratio.
*P < 0.05; **P < 0.01; ***P < 0.005.

Infant Sleep and Cognitive Development

Infant objective sleep associated with infant cognitive achievement in the first year of life (Scher, 2005)

Table 1 Descriptive statistics, reliability estimates and Pearson correlation coefficients between sleep–wake measures and Bayley (MDI/PDI) scores

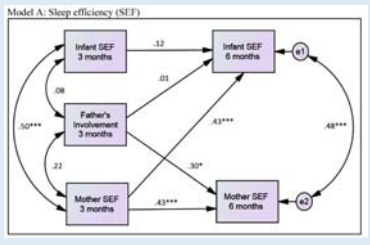
	Sleep reports		Actigraph measures				
	Schedule	Nightwaking	SOT	DUR	ACT	SEF	WAKE
Mean	1.33	1.77	21:02	573	18	95	1.5
S.D.	0.68	1.02	58	46	6.2	2.9	1.2
α	0.61	0.60	0.75	0.36	0.83	0.78	0.88
MDI	0.09	−0.08	−0.02	−0.09	−0.30*	0.30*	−0.37**
PDI	−0.08	−0.07	0.11	0.08	0.11	0.05	−0.09

α values for the reports represent internal consistency, for the actigraphs–stability across three nights. Key for abbreviations: SOT–sleep onset time; DUR–duration of the entire sleep period; ACT–percentage of activity per minute of sleep; SEF–sleep efficiency; WAKE–number of awakenings >5 min.
* $p<0.05$.
** $p<0.01$.

Sleep Within Families

Infant and Maternal Sleep

- Mothers who are awake more throughout the night may use more soothing behavior, thus reinforcing more infant awakenings
- Maternal SE at 3 months predicts infant sleep at 6 months[1]
- Stress about infant sleep can have a cyclical effect[2]
  - Associated with poorer maternal and infant sleep[2]



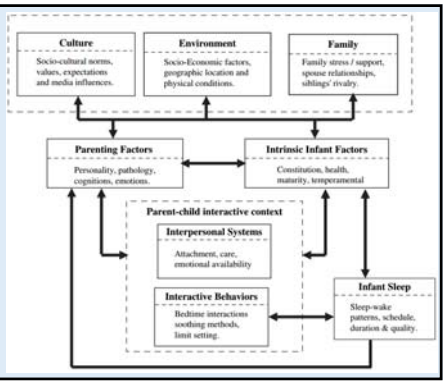
Sinai & Tikotzky, 2012[1]
Thomas & Foreman, 2005[2]

A Quick Word on Co-sleeping

- Many research organizations (AAP, NICHD) do not recommend infant/parent bed sharing, yet it is still a very common practice
  - Every night: 10% of children aged 2 weeks to 2 years[1]
  - At least part of the night: 5-16%[1]
- While we know bed sharing is risk factor for SIDS, its effects on parental sleep are not yet studied
- Other aspects of sleep hygiene, such as smoking, couch sleeping, and room ventilation are other risk factors for SIDS[2,3]

NSF Poll[1]
Doering et al., 2013[2]
Coleman-Phox et al., 2008

Transactional Model of Infant Sleep



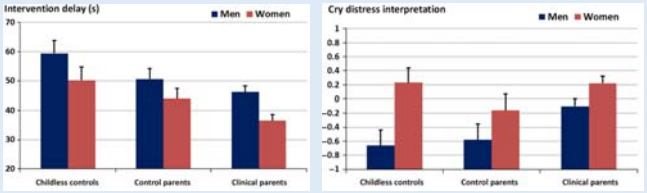
Sadeh, Tikotzky, & Scher (2010)

Cry Tolerance

- Infant crying demonstrates a sense of distress or need, eliciting both neurologocial[1] and behavioral[2] responses by the parents
- There are gender differences in brain responses to infant crying[3]
- Parental response has important implications for infant sleep quality and sleep consolidation over time[4]

Sander, Frome, & Scheich, 2007[1]
Zeifman & St. James-Roberts, 2017[2]
De Pisapoa et al., 2013[3]
Sadeh et al., 2010[4]

Gender Differences in Cry Tolerance



Sadeh et al., 2016

Improving Sleep in Families

- Most interventions target infant sleep
  - Prevention/promotion[1,2]
  - RCT's[3,4]
- Few studies target maternal sleep, and no studies target paternal or family level sleep
  - Maternal self-reported sleep does improve after targeting infant sleep[3]
- Two studies have targeted infant and maternal sleep
  - Stemler et al., 2006
  - Stemler et al., 2013

Pinilla & Birch, 1993[1]
Symon et al., 2005[2]
Hiscock & Wake, 2002[3]
Mindell et al., 2009[4]
Stemler et al., 2006[5], 2013[6]

A Behavioral-Educational Intervention to Promote Maternal and Infant Sleep: A Pilot Randomized, Controlled Trial

Robyn Stremler, RN, PhD[1,2]; Ellen Hodnett, RN, PhD[1]; Kathryn Lee, RN, PhD[1]; Shauna MacMillan, RN, BScN[2]; Catriona Mill, RN, MHSc[2]; Lisa Orgcangco, RN, BScN[2]; Andrew Willan, PhD[2]

- 6 week intervention focusing on sleep promotion
- Experimental group: 45 minute meeting discussing maternal sleep hygiene, relaxation techniques, and information on infant sleep cues, bedtime strategies, soothing, and night-day entrainment. Weekly phone calls.
- Control group: 10 minute meeting with brief explanations of maternal sleep hygiene and infant sleep. Phone calls at weeks 3 and 5.

Box 1 Topics covered by sleep intervention group

Infant sleep structure and sleep promotion strategies

- Every baby is different and you will learn to recognise your baby's patterns
- Newborns have cycles of sleep with brief awakenings
- Not all babies need to be rocked or fed to help them go to sleep
- Strategies to let baby sleep/settle on own
- Crying might indicate fatigue; crying is communication
- Infants are active in their sleep
- Turn down the baby monitor
- Swaddle if the baby startles itself awake
- When to wake the baby to feed versus allowing to sleep
- How to prevent baby falling asleep at the breast

Differentiating between night and day

- Bright lights can disrupt night time sleep; expose baby to some daytime light
- Limit social interaction and play at night
- Begin a short bedtime routine

Sleep hygiene for mothers

- Make sleep a priority
- Your bedroom should be cool, quiet, dark and reserved for sleep/intimacy
- Try relaxing activities before bed
- Don't discuss major issues/worries before bed
- Exercise regularly, ideally outdoors
- Limit caffeine; avoid alcohol, nicotine, heavy meals

Support around parenting and sleep

- Be realistic about what needs to be done; accept/ask for help from others
- Learning how to care for your new baby can be overwhelming
- Relaxation strategies might help you sleep
- It is difficult to have interrupted sleep when learning to be a new parent
- Limit visitors in the first few weeks

Box 2 Training programme for sleep intervention nurses

Content to be understood

- Basic neurobiology of sleep and circadian rhythms
- Normal sleep patterns for infants and postpartum women
- Development of infant sleep
- Role of sleep in health and disease
- Consequences of sleep deprivation
- Randomised controlled trials of infant sleep promotion
- Each strategy recommended in the trial and its evidence base

Skills to be achieved

- Relaxation strategies
- Interactive discussion strategies
- Facilitation of participatory learning
- Provision of problem solving by phone

Maternal Outcomes

Only nocturnal sleep duration was better in intervention group

24-hour sleep was not better in intervention group

Table 2—Comparison of Maternal Outcomes Between Treatment Groups at 6 Weeks

	Sleep Intervention Group n = 15		Control Group n = 15		Between treatment-group difference	p Value
GSDS score	37.0	(28.7, 45.2)	43.9	(35.9, 51.9)	-6.9	(-21.1, 3.3)	.15
GSDS score > 42	6	(40%)	8	(53%)	$\chi^2 = 0.34$		.46
EPDS score	4.4	(2.9, 5.9)	5.9	(4.0, 7.9)	-1.5	(-3.9, 0.8)	.19
EPDS score > 12	0	(0%)	0	(0%)	$\chi^2 = 0$		1.00
STAI	27.1	(23.0, 31.1)	29.1	(24.5, 33.6)	-2.0	(-7.8, 3.8)	.49
STAI score 40-59	2	(13%)	2	(13%)	$\chi^2 = 0$		1.00
Nocturnal sleep, min	433	(402, 463)	370*	(332, 420)	57	(6, 107)	.03
Longest nocturnal sleep period, min	186	(157, 215)	158*	(127, 189)	28	(-12, 68)	.17
Nocturnal awakenings, no	11.2	(8.5, 13.9)	12.7*	(9.9, 16.5)	-1.5	(-5.9, 2.9)	.49
WASO, min	126	(96, 157)	116*	(88, 144)	11	(-29, 50)	.59
Daytime sleep, min	68	(27, 109)	78	(59, 118)	-10	(-65, 44)	.69
Longest daytime sleep period, min	27	(5, 48)	42	(10, 75)	-15	(-52, 21)	.39
24-h sleep, min	497	(438, 556)	462	(404, 520)	35	(-44, 114)	.38
Fatigue-morning, 100mm	36.5	(27.1, 45.9)	48.4	(36.5, 60.4)	-11.9	(-26.3, 2.4)	.10
Fatigue-evening, 100mm	57.5	(49.1, 66.0)	62.1	(53.9, 69.0)	-4.7	(-15.1, 5.7)	.36
Rated own sleep as problem	5	(33%)	11	(73%)	$\chi^2 = 4.82$		.03
Rated infant sleep as problem	9	(60%)	9	(60%)	$\chi^2 = 1.20$		.27
Exclusive breastfeeding	8	(53%)	10	(67%)	$\chi^2 = 0.56$		.46
Bed sharing with infant at some point during night	5	(33%)	7	(47%)	$\chi^2 = 0.56$		.46

Values are means (95% CI) or number (%), unless otherwise indicated. GSDS refers to General Sleep Disturbance Scale (score range, 0-147; a score >42 indicates poor sleeper), EPDS, Edinburgh Postnatal Depression Scale (score range 0-30; score > 12 indicates at risk for postpartum depression), STAI, State-Trait Anxiety Inventory state subscale (score range, 20-80; a score of 40-59 indicates moderate anxiety; a score ≥ 60, severe anxiety). *n = 14.

Infant Outcomes

Longest nocturnal sleep duration and nocturnal awakenings were better in intervention group

Table 3—Comparison of Infant Outcomes Between Treatment Groups at 6 Weeks

	Sleep Intervention Group n = 15		Control Group n = 15		Between treatment-group difference		p Value
Nocturnal sleep, min	468	(445, 491)	448	(418, 478)	20	(-16, 56)	26
Longest nocturnal sleep period, min	217	(189, 245)	171	(138, 204)	46	(5, 88)	03
Nocturnal awakenings, no.	7.9	(5.5, 10.2)	12.3	(10.1, 14.6)	-4.4	(-7.6, -1.4)	006
Daytime sleep, min	231	(197, 265)	276	(238, 314)	-45	(-93, 4)	07
Longest daytime sleep period, min	76	(58, 94)	100	(69, 131)	-24	(-58, 11)	17
24-h sleep, min	697	(656, 739)	728	(675, 782)	-31	(-96, 33)	33

Values are means (95% CI) unless otherwise indicated.

Effect of behavioural-educational intervention on sleep for primiparous women and their infants in early postpartum: multisite randomised controlled trial

OPEN ACCESS

Robyn Stremler *assistant professor and adjunct scientist*[1,2], Ellen Hodnett *professor*[1], Laura Kenton *trial coordinator*[1], Kathryn Lee *professor*[3], Shelly Weiss *staff neurologist and assistant professor*[2,4], Julie Weston *senior trial coordinator*[1], Andrew Willan *senior scientist and professor*[2,5]

- 6 week intervention focusing on sleep promotion
- Experimental group: 45 minute meeting discussing maternal sleep hygiene, relaxation techniques, and information on infant sleep cues, bedtime strategies, soothing, and night-day entrainment
- Control group: 10 minute meeting with brief explanations of maternal sleep hygiene and infant sleep

Study Results

No significant differences between intervention and control

Lack of findings may be due to:

- High SES sample
- Failure to address sleep at family level

	Sleep intervention*	Usual care†
Nocturnal sleep (minutes):		
6 weeks	397 (362-428)	387 (359-424)
12 weeks	440 (402-469)	431 (396-468)
Longest stretch of nocturnal sleep (minutes):		
6 weeks	144 (114-174)	136 (114-167)
12 weeks	153 (125-208)	155 (122-192)
No of night awakenings:		
6 weeks	8.8 (6.8-11.5)	9.3 (6.9-11.3)
12 weeks	9.3 (5.5-12.0)	9.0 (6.7-12.0)
Daytime sleep (minutes):		
6 weeks	34 (15-70)	45 (24-72)
12 weeks	32 (6.7-67)	35 (15-64)

*n=109 at 6 weeks and 103 at 12 weeks.
†n=103 at 6 weeks and 102 at 12 weeks.

Mother Outcomes

Mean (SD)	Sleep intervention*	Usual care†
Nocturnal sleep (minutes):		
6 weeks	472 (60)	458 (51)
12 weeks	531 (53)	521 (56)
Longest stretch of nocturnal sleep (minutes):		
6 weeks	180 (56)	169 (45)
12 weeks	229 (84)	240 (87)
No of night awakenings:		
6 weeks	11.8 (3.6)	11.2 (3.4)
12 weeks	9.0 (3.3)	9.0 (4.1)
Daytime sleep (minutes):		
6 weeks	186 (86)	184 (89)
12 weeks	180 (81)	191 (90)
Longest stretch of daytime sleep (minutes)		
6 weeks	67 (33)	64 (27)
12 weeks	68 (33)	73 (35)

Infant Outcomes

Expanding Intervention Research

- Studies are promising, but need to consider family context
  - Targeting infant sleep is effective, but targeting all levels of the family may prove even more beneficial
- Different family members may have different needs
  - Mothers have more fragmentation
    - Napping may be very beneficial, and mothers do not take advantage of naps during infant daytime sleep
  - Fathers suffer more from sleep deprivation, but may depend on work status and parenting role

High Risk Populations

- Rural families
- Primaparous mothers[2]
- Breast feeding mothers[3]
- Mothers with no maternity leave[4]
- Low socioeconomic status

Lee et al., 2000
Tikotzy et al., 2010[3]
Sinai & Tikotzky, 2012[4]
Doering et al., 2013[5]

Research Questions

- What are the multidimensional influences that the infant, mother, and father have on each other?
- What is the role of the dad's sleep and parenting during this time?
- How does parental sleep fit into the Transactional Model of Infant Sleep?
- How strong are the moderating variables in these relationships, and are there any other important factors?
- How effective are sleep interventions that target all family members?
- Do high risk populations benefit more from interventions, and should their interventions be tailored differently?

THANK YOU!

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