Mindfulness and Behavioral Approaches to Improving Sleep and Promoting Mental Health During Pregnancy & Early Parenting

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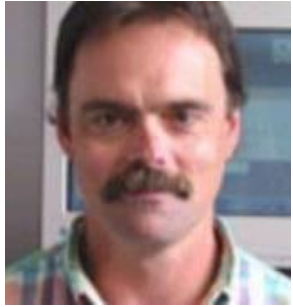
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Patient Care • March 10, 2022

Prenatal Mindfulness Program Improves Stress Response in Infants

UCSF Study Adds Support for Two-Generation Treatment Approach

By Jess Berthold

Infants whose mothers participated in a mindfulness-based program during pregnancy had healthier stress responses at 6 months old, a new UC San Francisco study found.

This is the first known study to show that a prenatal social intervention may improve health outcomes in offspring, as measured by autonomic nervous system responses, said Amanda Noroña-Zhou, PhD, first author of the study in *Psychosomatic Medicine*.

Unique **Challenges** for Improving Mental Health

- Often excluded from clinical trials

- Concerns about pharmacological treatments

- Stigma is a barrier to seeking help

- Competing demands on time and energy

Perinatal* Depression is Common

During pregnancy or the postpartum period

Le Strat et al., 2011, J of Affective Disorders; Woody et al., 2017, J of Affective Disorders

Perinatal Depression is Consequential

For Mothers and Their Families

- Increased risk of adverse birth outcomes,[1,2] such as preterm birth[3]
- Increased risk of suicide[4]
- Impairments in parenting[5]
- Increased risk of internalizing (e.g., depression) and externalizing e.g., ADHD) disorders in children[5,6]

For Society[7]

- $4.7 billion in productivity losses
- $2.9 billion in maternal health expenditures
- $3.3 billion in preterm births
- $2.6 billion in child behavioral and developmental disorder costs

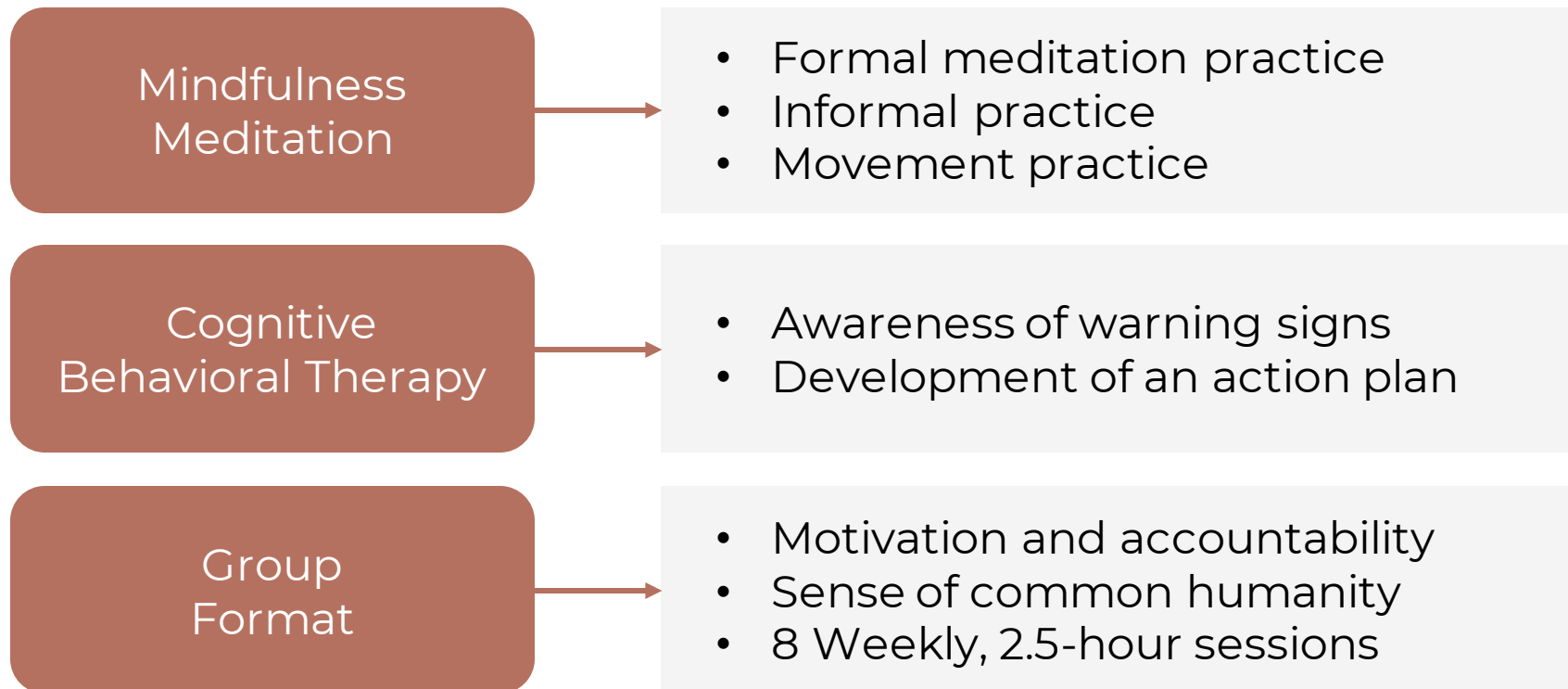[1]Accortt et al., 2015, Matern Child Health; [2]Grote et al., 2010, Archives of General Psychiatry; [3]Felder et al., 2017, Journal of Consulting and Clinical Psychology; [4]Khalifeh et al., 2016, Lancet; [5]Stein et al., 2014, Lancet; [6]Goodman et al., 2014, Clinical Child and Family Psychology Review; [7]Luca et al., 2019, IssueBRIEF

Can We Prevent Perinatal Depression?

Mindfulness-based Cognitive Therapy (MBCT)

MBCT was designed to target the automatic thought patterns (e.g., rumination) that precipitate relapse among people with histories of depression

Mindfulness Meditation
- Formal meditation practice
- Informal practice
- Movement practice

Cognitive Behavioral Therapy
- Awareness of warning signs
- Development of an action plan

Group Format
- Motivation and accountability
- Sense of common humanity
- 8 Weekly, 2.5-hour sessions

Segal et al., 2013

MBCT Efficacy

C MBCT vs antidepressants

Study	Hazard Ratio (95% CI)	Weight, %
Kuyken et al,[13] 2008	0.66 (0.40-1.08)	23.4
Segal et al,[18] 2010	0.80 (0.35-1.82)	8.6
Huijbers et al,[19] 2015	0.80 (0.36-1.78)	9.1
Kuyken et al,[21] 2015	0.81 (0.59-1.11)	58.9
Overall ($I^2 = 0.0\%$, $P = .92$)	0.77 (0.60-0.98)	100

Hazard Ratio (95% CI)

Kuyken et al., 2016, JAMA Psychiatry
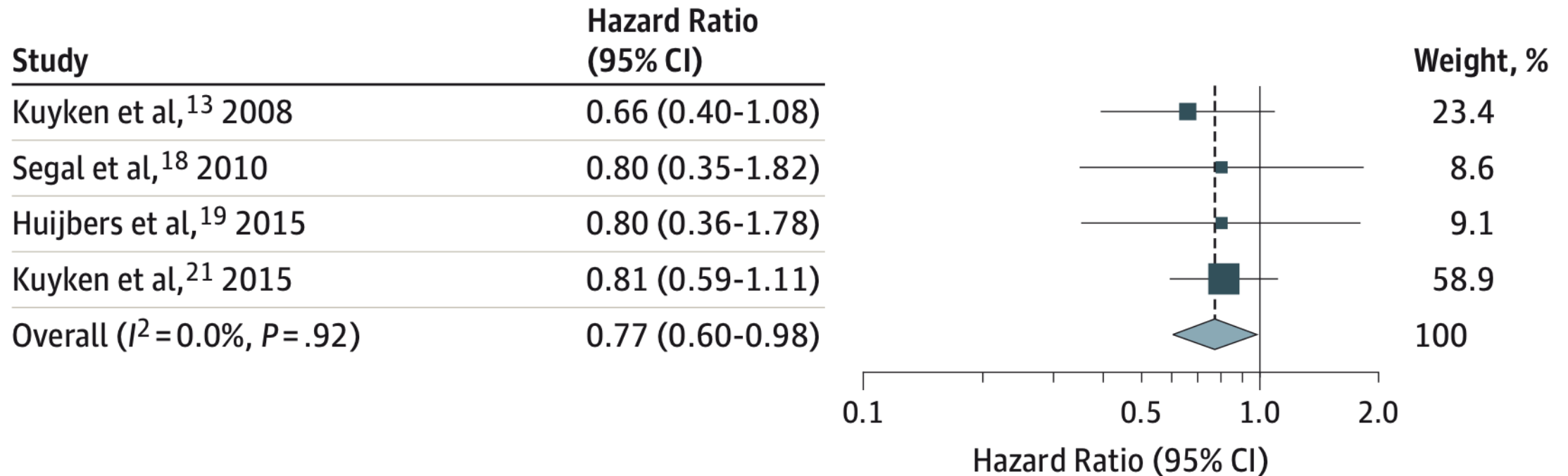
Overview of MBCT Projects

Staying Well	Mindful Mood Balance (MMB)	MMB for Moms	Optimizing MBCT Maintenance (OMM)
Adapted MBCT for pregnant women	Adapted MBCT to be delivered digitally	Pilot tested MMB in pregnant women	Pilot testing booster classes to extend the benefits of MBCT

Staying Well Study

- Adapted MBCT for perinatal women[1]
  - Brief informal practices
  - Loving-kindness meditation
  - Psychoeducation
  - Enhancing social support

- Pilot tested[2]
  - 86 pregnant women randomized to MBCT or treatment as usual (TAU)
  - Followed through 6 months postpartum
  - 50% of TAU participants became depressed
  - 18% of MBCT participants became depressed

Sona Dimidjian
University of Colorado Boulder

Sherryl Goodman
Emory University

[1]*Dimidjian, Goodman, Felder et al., 2014, Archives of Women's Mental Health;* [2]*Dimidjian, Goodman, Felder et al., 2015, Journal of Consulting and Clinical Psychology*

Mindful Mood Balance (MMB)

- Adapted MBCT for digital delivery[1,2,3]
  - Experiential learning
  - Video-based vicarious learning

- Conducted an efficacy trial[4]
  - Participants randomized to MMB (n=230) had greater reductions in depressive symptoms, higher rates of remission, lower rates of relapse compared with participants randomized to usual depression care (n=230)

Sona Dimidjian
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[1]*Felder et al., 2014, Permanente Journal;* [2]*Boggs, Beck, Felder et al., Journal of Medical Internet Research;* [3]*Dimidjian, Beck, Felder et al., 2014, Behaviour Research and Therapy;* [4]*Segal,… Felder, & Levy, 2020, JAMA Psychiatry.*

Mindful Mood Balance for Moms

- Pilot tested MMB for pregnant women

- First to examine a digital program to prevent depression in perinatal women

- Feasibility testing, single group, multi-site trial (n=37)

- Encouraging preliminary findings
  - Entered with minimal to mild depressive symptoms, did not significantly worsen

94%
Helped me take action on early warning signs

77%
Gave me an increased sense of control over depression

82%
Helped me relate differently to negative thoughts and emotions

Felder et al., 2017, Cognitive and Behavioral Practice

Optimizing MBCT Maintenance (OMM)

- Half of participants randomized to MBCT relapsed by 26 months[1]

- Focus group feedback[2]

  "Things did not stick necessarily, so if you got a major stressor, it was not an instinct yet. It was not part of your marrow of how to react…It was easy to go back to the old way of reacting to things."

  "Having some kind of support or some kind of consistency is the only way, for me at least, for it to work."

- Conducting intervention refinement and feasibility testing

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[1]*Shallcross et al., 2019, Behavior Therapy;* [2]*Siwik et al., 2023, Global Advances in Integrative Medicine and Health*

Are There Less-Stigmatized In-roads for Promoting Mental Health?

The Problems of Prenatal Insomnia

1. **Difficulty falling or staying asleep, despite adequate opportunity, resulting in significant distress or impairment**

2. **Risk factor for depression in non-perinatal[1] and perinatal people[2-4]**

3. **Common**
   - 38% of pregnant people have elevated insomnia symptoms[5]

[1]Baglioni et al., 2011, Journal of Affective Disorders; [2]Kalmbach et al., 2021, SLEEP; [3]Pietikäinen et al., 2019, Archives of Women's Mental Health; [4]Tomfohr et al., 2015, SLEEP; [5]Sedov et al., 2021, Behavioral Sleep Medicine; [6]Felder et al., 2019, Behavioral Sleep Medicine

Insomnia Diagnosis and Preterm Birth

	None	Insomnia	OR (95% CI)	p Value
	n (%)	n (%)		
Sample:	2,172	672		
Gestation at Birth				
< 34 weeks	63 (2.9)	31 (4.6)	**1.7 (1.1, 2.6)**	**0.026**
Preterm Premature Rupture of Membranes	14 (0.6)	17 (2.5)	**4.1 (2.0, 8.3)**	**<.001**
Spontaneous	35 (1.6)	11 (1.6)	1.1 (0.5, 2.1)	0.879
Indicated	14 (0.6)	3 (0.5)	0.7 (0.2, 2.5)	0.605
Any < 37 weeks	237 (10.9)	95 (14.1)	**1.3 (1.0, 1.7)**	**0.023**
Preterm Premature Rupture of Membranes	45 (2.1)	30 (4.5)	**2.2 (1.4, 3.5)**	**<.001**
Spontaneous	130 (6.0)	47 (7.0)	1.2 (0.9, 1.7)	0.276
Indicated	53 (2.4)	14 (2.1)	0.9 (0.5, 1.6)	0.690
≥ 37 weeks	1,935 (89.1)	577 (85.9)	Reference	

Felder et al., 2017, Obstetrics & Gynecology

> It's frustrating that preterm birth is so poorly understood and that most risk factors from stress to insomnia (both of which are probably connected) are ignored by doctors. I had terrible insomnia during my pregnancy and my OB suggested taking Benadryl but was not concerned because as the article points out, "poor sleep is common during pregnancy." I went into spontaneous preterm labor at about 28 weeks. My son passed away when he was one week old. I had what doctors told me was a healthy pregnancy, and my son was healthy except that he was born too soon.

Is There Anything That Pregnant People Can Do to Improve Sleep??

Prenatal Sleep Disturbances

1

**Insomnia
(During Pregnancy)**

2

**Pregnancy-specific
Poor Sleep Quality**

Insomnia (During Pregnancy)

Precipitating Factors
(stress, role transitions, hormonal changes)

Acute Sleep Disturbance

Cognitive Behavioral Therapy

Counterproductive Efforts to Cope

Dysfunctional Beliefs About sleep

Insomnia

Cognitive Behavioral Therapy for Insomnia (CBT-I)

Treatment Component	Goal
Stimulus Control	Strengthen association between bed and sleep
Time in Bed Restriction	Consolidate sleep by increasing sleep drive
Cognitive Therapy	Identify and modify dysfunctional beliefs about sleep
Relaxation	Reduce cognitive and physiological arousal
Sleep Hygiene	Promote higher quality sleep by changing environmental, physiological, and behavioral factors

Evidence for CBT-I

- Effective for non-perinatal populations when offered in-person[1] or digitally[2]

- American College of Physicians recommends as the first line treatment[3]

- Preferred by pregnant people, relative to pharmacotherapy or acupuncture[4]

- Is digital CBT-I effective during pregnancy?

  - *Research on Expecting moms and Sleep Therapy (REST) Study*

- Clinical equipoise

[1]Trauer et al., 2015, Annals of Internal Medicine; [2]Seyfert et al., 2016, PLoS One; [3]Qaseem et al., 2016; [4]Sedov et al., 2017, JOGNN

REST Study Hypotheses

- Participants randomized to digital CBT-I will have improved **insomnia symptoms** relative to participants randomized to TAU

  – <u>Insomnia Remission</u>: Insomnia Severity Index (ISI) < 8

- Participants randomized to digital CBT-I will have improved **depressive symptoms** relative to participants randomized to TAU[1,2]

  – <u>Probable Depression</u>: Edinburgh Postnatal Depression Scale (EPDS) ≥ 13

[1]Christensen et al., 2016, Lancet Psychiatry; [2]Ye et al., 2015, PLOS ONE

REST Study Participants

- Recruited primarily via social media and UCSF electronic health record, November 2016-May 2018

Inclusion	Exclusion
• 18+ years of age	• Probable major depression
• ≤ 28 weeks pregnant	• Self-reported bipolar disorder or history of psychosis
• Insomnia disorder or elevated insomnia symptom severity	• Active suicidality
• Regular internet access	• Employment in night shift work

REST Study Design

Screening Consent and Survey

↓

Study Consent and Sleep Diaries

↓

Orientation

↓

Baseline Measures

↓

Randomization

Digital CBT-I

TAU

Follow-up Surveys
- 10 weeks post-randomization
- 18 weeks post-randomization
- 36 weeks gestation
- 3 months postpartum
- 6 months postpartum
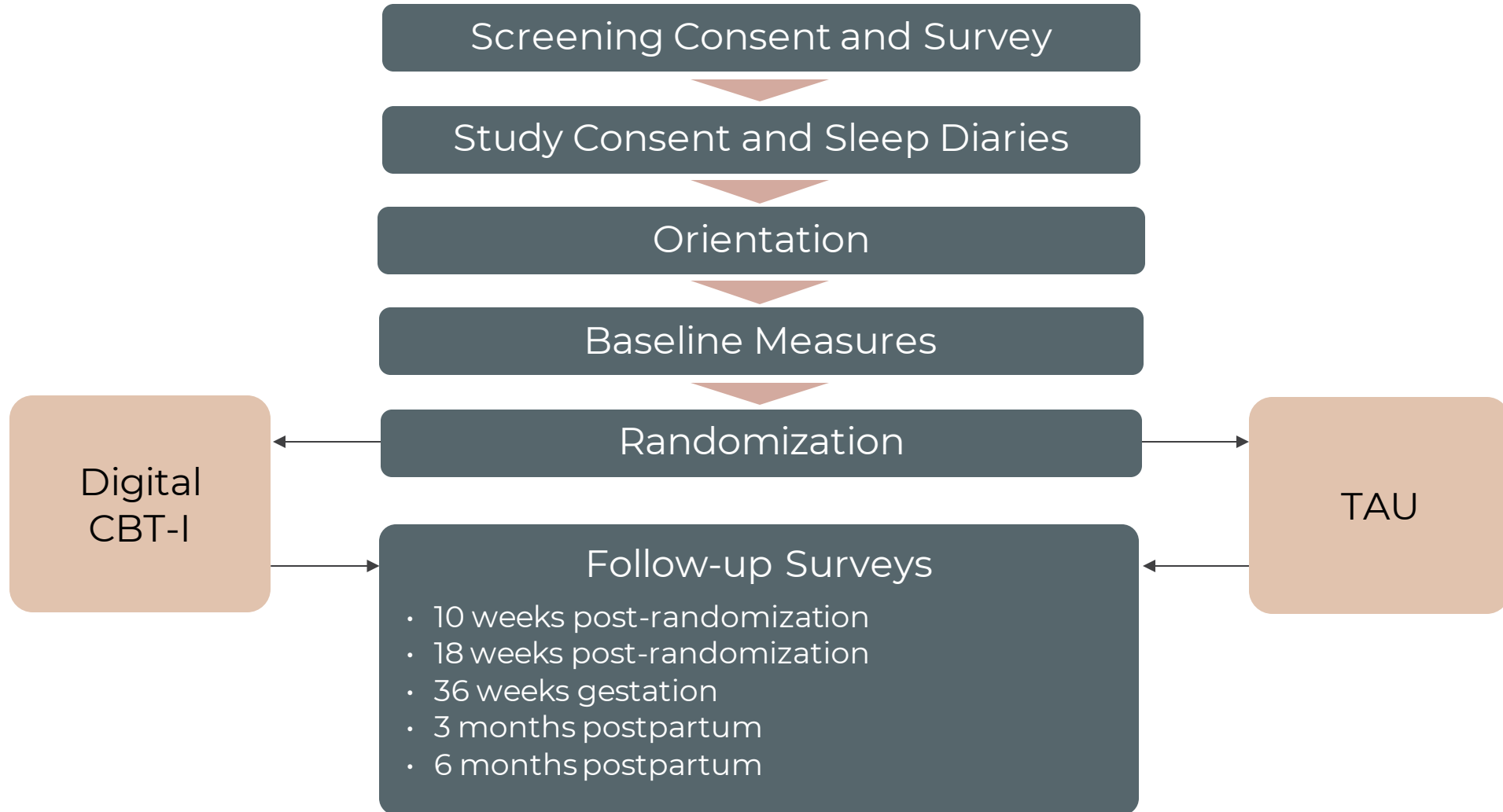
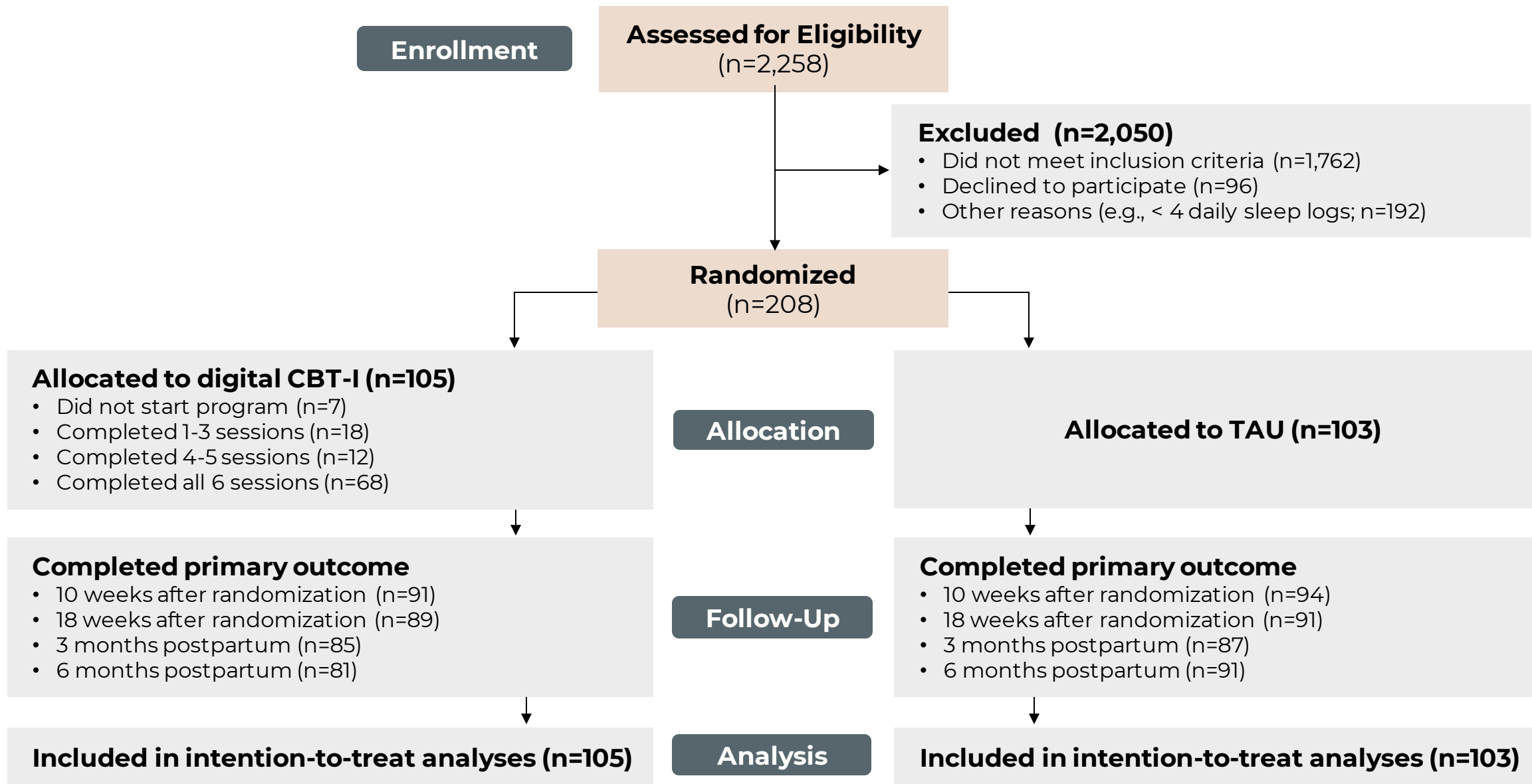*Felder et al., 2020, JAMA Psychiatry; Felder et al., 2022, SLEEP*

Digital CBT-I

- Sleepio (Big Health, Ltd)[1]

- Intervention content
  - Sleep hygiene, stimulus control, sleep restriction, relaxation, cognitive therapy

- Duration
  - Six weekly 20-minute sessions

- Delivery format
  - Fully online, 24/7 access
  - Delivered by animated therapist

- Support and motivation
  - Reinforcement contingent on progress
  - Online community of users and sleep experts

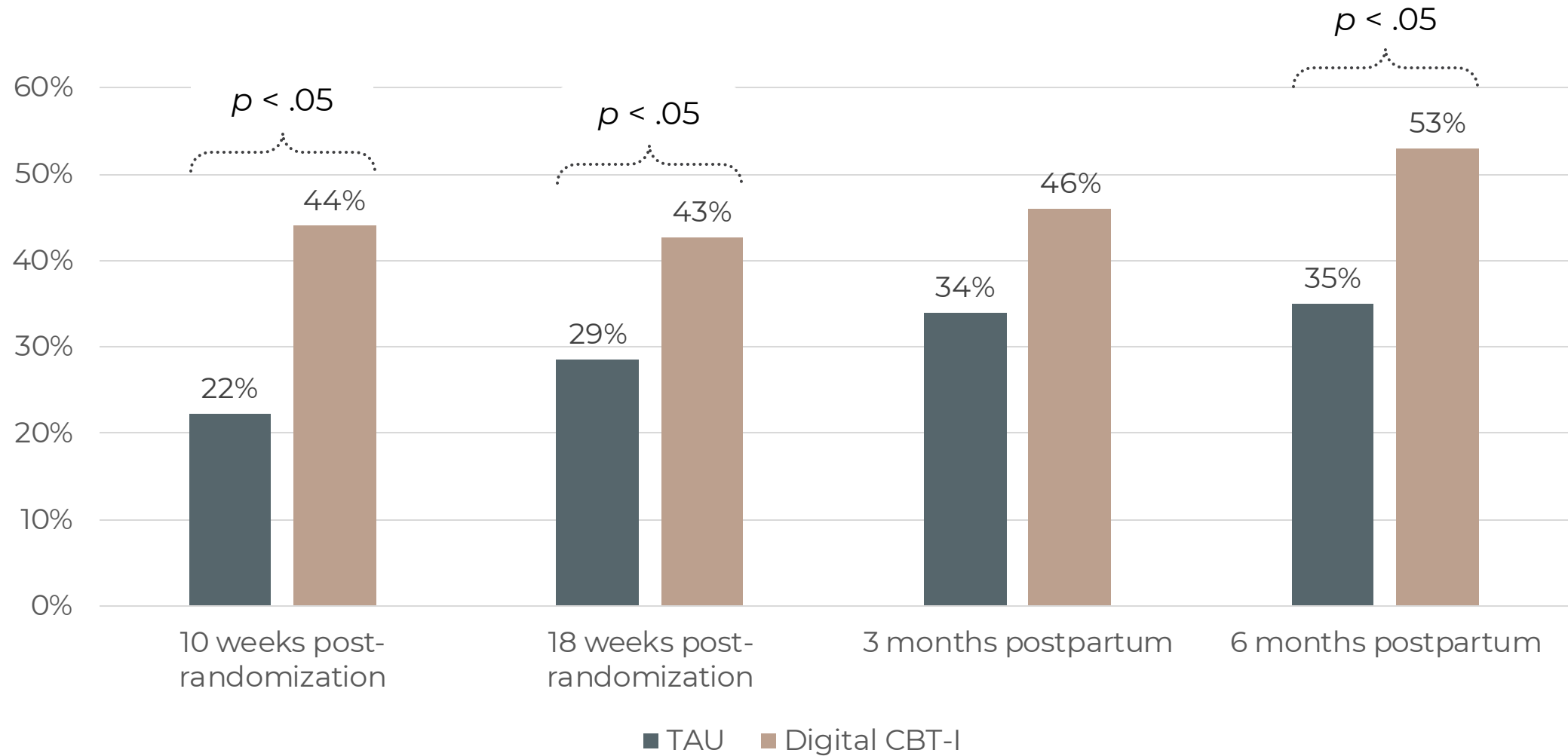[1]*Espie et al., 2012, SLEEP*

Treatment as Usual (TAU)

- No limits placed on receiving non-study treatment

- Received digital CBT-I upon study completion

Enrollment

Assessed for Eligibility (n=2,258)

Excluded (n=2,050)
- Did not meet inclusion criteria (n=1,762)
- Declined to participate (n=96)
- Other reasons (e.g., < 4 daily sleep logs; n=192)

Randomized (n=208)

Allocation

Allocated to digital CBT-I (n=105)
- Did not start program (n=7)
- Completed 1-3 sessions (n=18)
- Completed 4-5 sessions (n=12)
- Completed all 6 sessions (n=68)

Allocated to TAU (n=103)

Follow-Up

Completed primary outcome
- 10 weeks after randomization (n=91)
- 18 weeks after randomization (n=89)
- 3 months postpartum (n=85)
- 6 months postpartum (n=81)

Completed primary outcome
- 10 weeks after randomization (n=94)
- 18 weeks after randomization (n=91)
- 3 months postpartum (n=87)
- 6 months postpartum (n=91)

Analysis

Included in intention-to-treat analyses (n=105)

Included in intention-to-treat analyses (n=103)

Felder et al., 2020, JAMA Psychiatry

REST Study Baseline Characteristics

| Characteristics	TAU N (%) or M (SD)	Digital CBT-I N (%) or M (SD)
Age (years)	33.2 (4.0)	33.9 (3.38)
White race	65 (63.1%)	73 (69.5%)
Hispanic ethnicity	10 (9.7%)	5 (4.8%)
College graduate	88 (85.4%)	92 (87.6%)
Married or cohabitating	96 (93.2%)	100 (95.2%)
Gestational age at screening (weeks)	18.1 (6.3)	17.1 (6.4)
Pregnant for the first time*	66 (64.1%)	46 (43.8%)

Felder et al., 2020, JAMA Psychiatry

Insomnia Remission (ISI < 8)

Chart showing insomnia remission rates comparing TAU and Digital CBT-I:

Timepoint	TAU	Digital CBT-I	Significance
10 weeks post-randomization	22%	44%	p < .05
18 weeks post-randomization	29%	43%	p < .05
3 months postpartum	34%	46%	
6 months postpartum	35%	53%	p < .05

Felder et al., JAMA Psychiatry, 2020; Felder et al., SLEEP, 2021

Probable Depression (EPDS ≥ 13)
Full Sample (n=208)

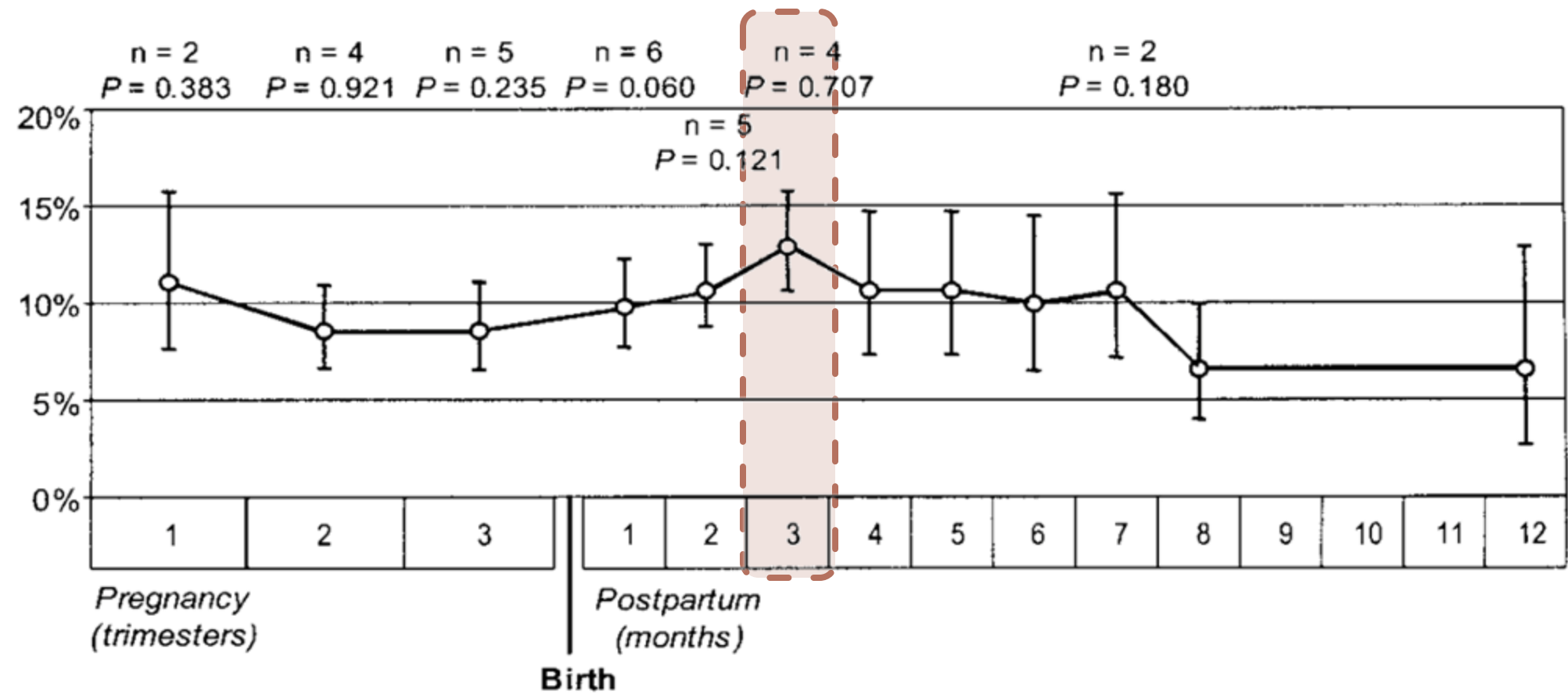*Felder et al., 2021, SLEEP*
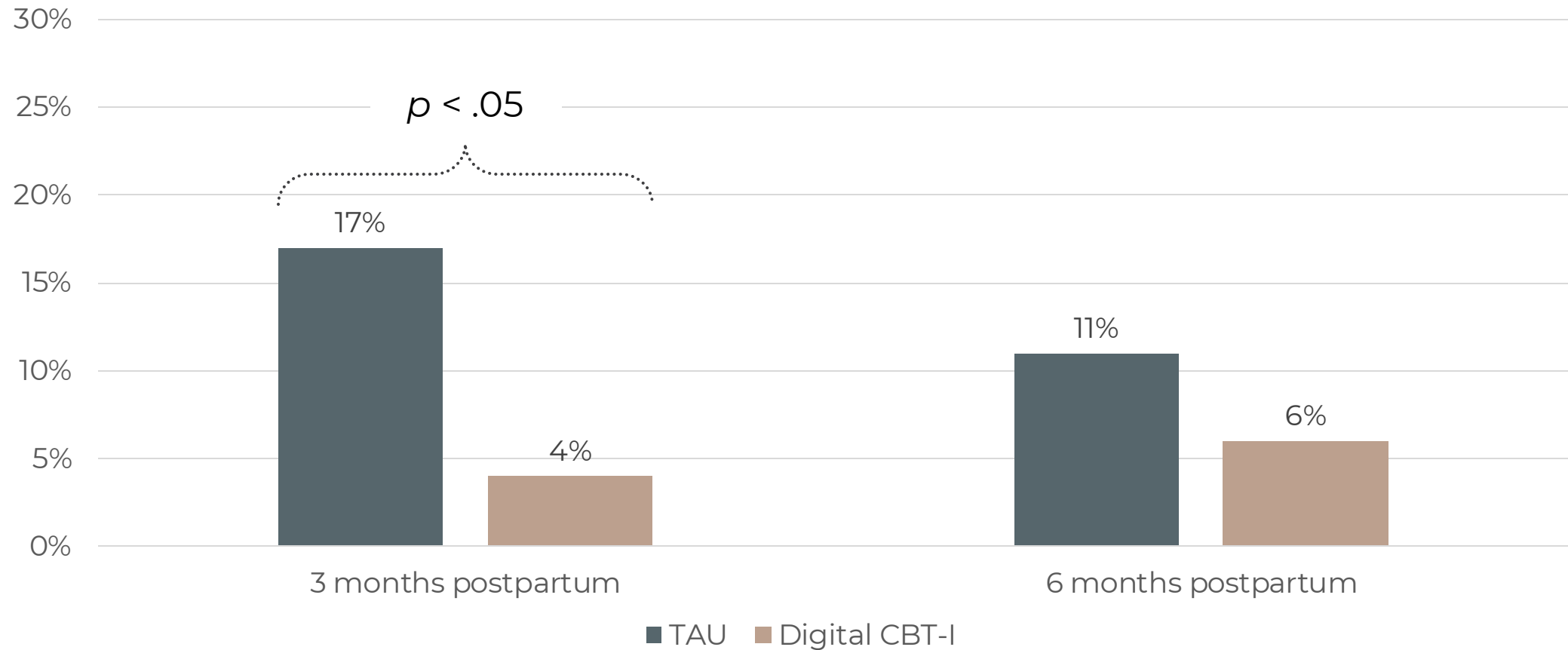
Probable Depression (EPDS ≥ 13)
Subsample with minimal depressive symptoms at baseline (n=143)

Felder et al., 2021, SLEEP
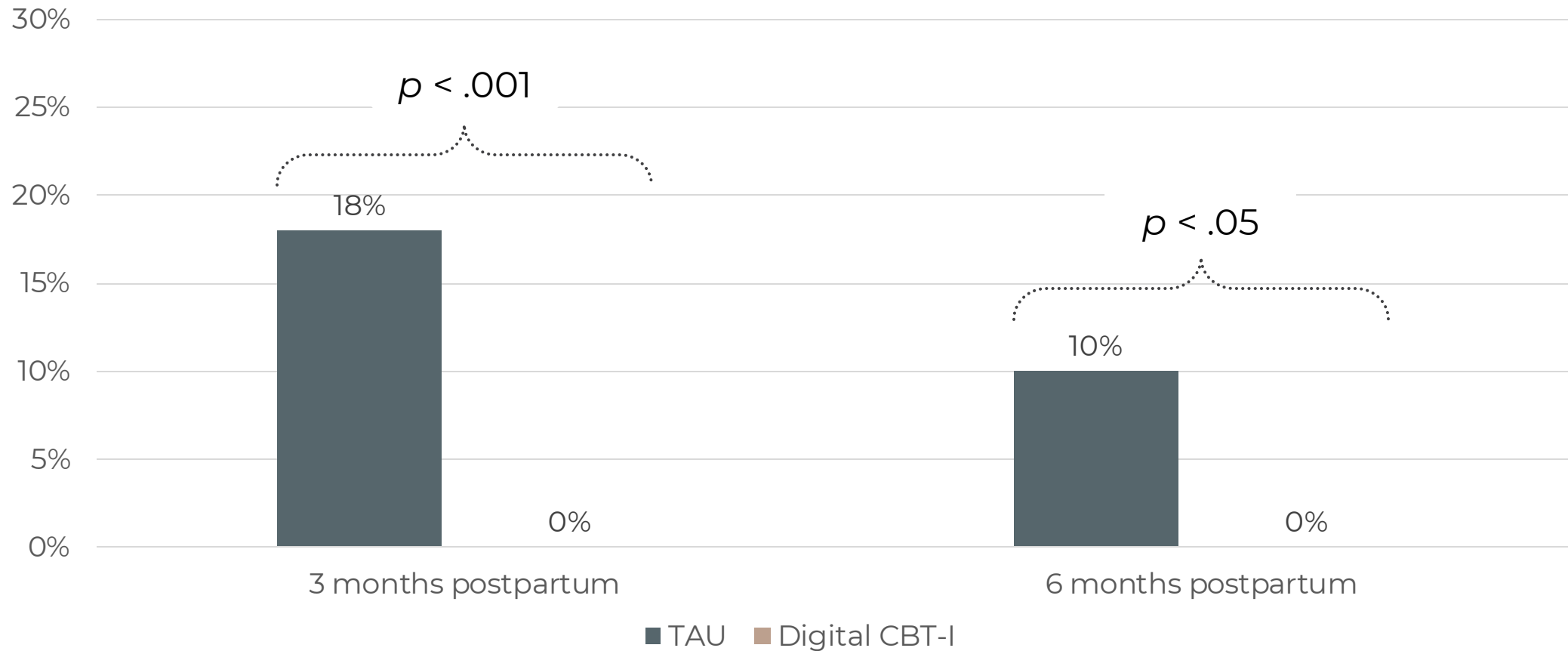
Prevalence of Minor and Major Depression During Pregnancy and Postpartum
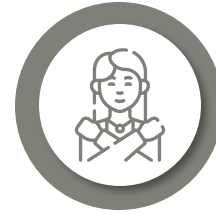
PRISM STUDY

PERINATAL RESEARCH ON IMPROVING SLEEP & MENTAL HEALTH

- Confirmatory efficacy trial to provide definitive evidence

- Will randomize 498 pregnant people with insomnia to digital CBT-I or digital SHE

- Will follow participants through 12 months postpartum

- Primary outcome is depression incidence

Prescribing Sleep to Prevent Postpartum Depression

(Celia Jacobs for The Washington Post)

Focus on Self-Care Over Self-Sacrifice
Change the message from "A good mother sacrifices for her family" to "Meeting a mother's needs allows her to better care for her family."

Consolidate Sleep
One chunk of 4-5 hours uninterrupted sleep plus another 2-3 hours is better than being woken all night every 2 hours.

Expand the Workforce
Infant night feedings are a job for more than 1 person. Recruit help if possible.
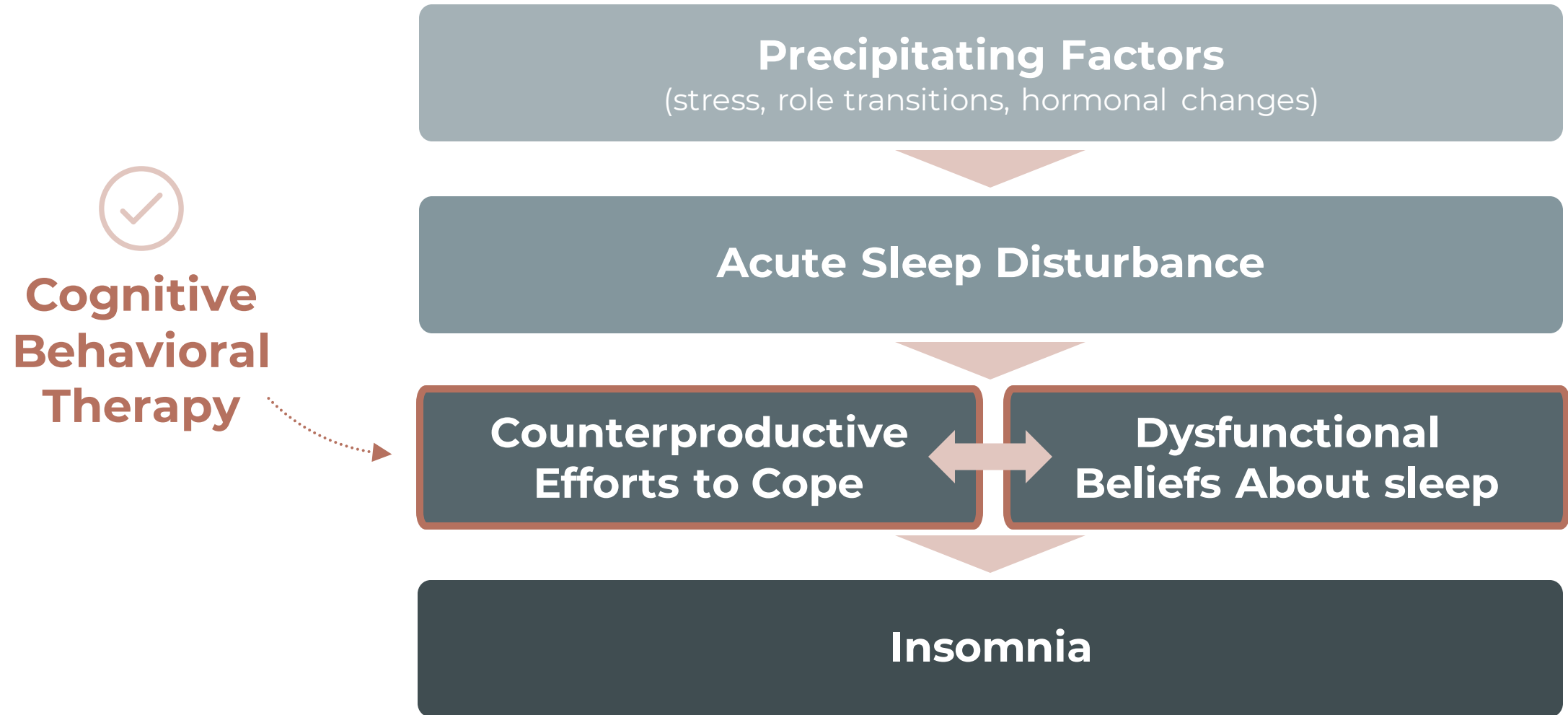
Flex the Breast
Breastfeeding women can pump during the day and have others bottle feed at night. If needed, formula is compatible with breastfeeding.

Leistikow et al., 2022, Biological Psychiatry

Future Questions

Does an insomnia intervention delivered to mothers during pregnancy improve the social-emotional outcomes for their offspring?

Insomnia (During Pregnancy)

Precipitating Factors
(stress, role transitions, hormonal changes)

Acute Sleep Disturbance

Cognitive Behavioral Therapy

Counterproductive Efforts to Cope

Dysfunctional Beliefs About sleep
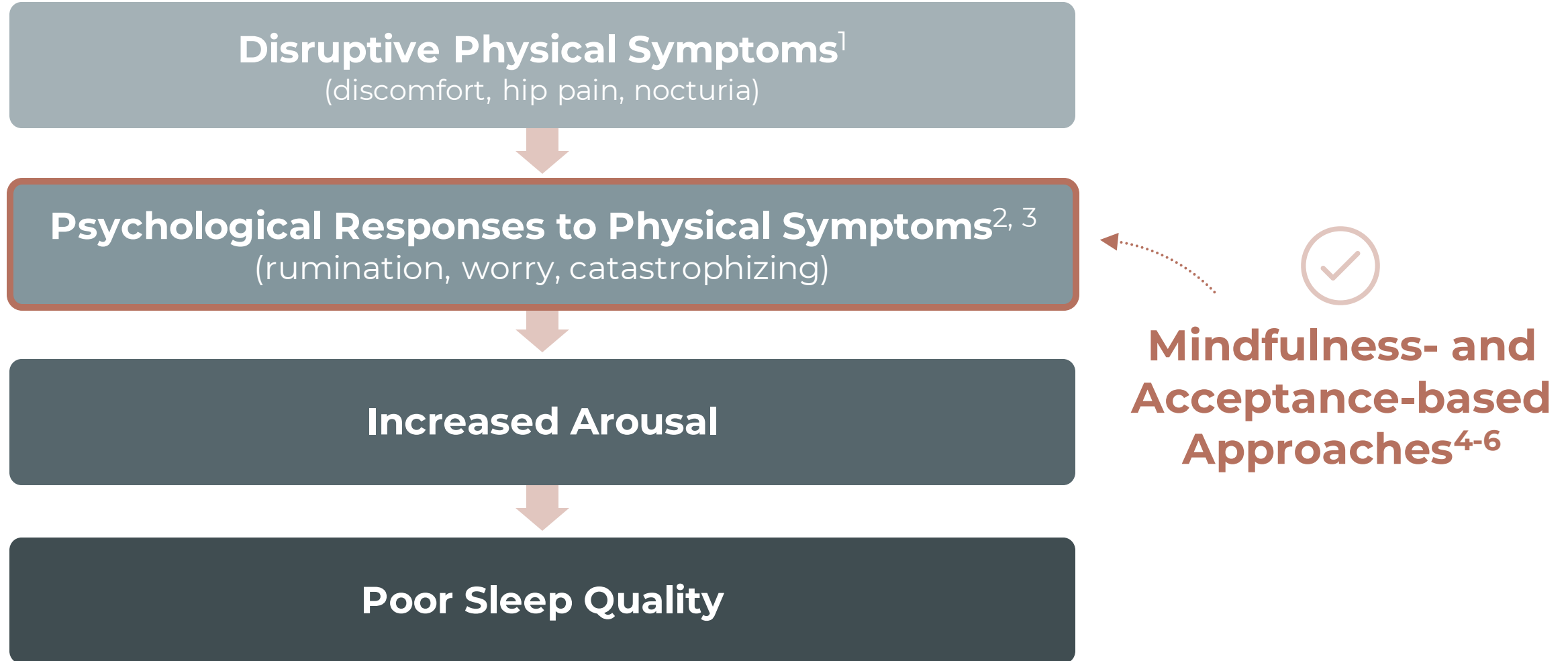
Insomnia

Limitations of CBT-I

- Many CBT-I participants did not experience remission in insomnia symptoms (58%)
  - Higher rate of insomnia non-remission than in non-perinatal populations (27-46%)[1,2]

- In exit surveys, participants attributed their residual symptoms to the fact that CBT-I did not address the pregnancy-specific factors that affect sleep

> *"I was mostly disappointed in realizing that my lack of sleep was pregnancy related, and the techniques [CBT-I] provided [didn't] change anything, because I still dealt with being uncomfortable, having to use the restroom, etc."*

> *"I found that as I had more trouble sleeping, virtually all of it was related to pregnancy symptoms, like back pain late in my second trimester, the need for more pillows, not being able to sleep on my back as usual, having to go to the bathroom 3-4 times a night..."*

> *"I would have liked for it to be more geared toward pregnant women tips for better sleep. [CBT-I] was for the general public, and many points were not relevant to me because I don't often wake up stressed, I wake up uncomfortable."*

Cheng et al., 2019, Psychol Med; Ritterband et al., 2009, Archives of General Psychiatry

Pregnancy-Specific Poor Sleep Quality

Disruptive Physical Symptoms[1]
(discomfort, hip pain, nocturia)

↓

Psychological Responses to Physical Symptoms[2,3]
(rumination, worry, catastrophizing)

↓

Increased Arousal

↓

Poor Sleep Quality

Mindfulness- and Acceptance-based Approaches[4-6]

[1]*Mindell et al., 2015, Sleep Medicine;* [2]*McCracken et al., 2011, Pain Medicine;* [3]*Smith et al., 2001, Journal of Behavior Medicine;* [4]*Kabat-Zinn, 1982, General Hospital Psychiatry;* [5]*Bawa et al., 2015, British Journal of General Practice;* [6]*Ong et al., 2014, Sleep*

RISE Study

- Aimed to study to feasibility and acceptability of a mindfulness-based program for improving sleep quality during pregnancy

- Enrolled pregnant people with poor sleep quality (PSQI > 5)

- Participants were randomized to mindfulness-based stress reduction + prenatal sleep classes (MBSR+PS) or to treatment as usual (TAU)

- MBSR

  – Aims to relieve suffering and promote well-being

  – Formal and informal mindfulness practices

  – 8 weekly 2.5 hour sessions + daylong retreat + 45 minutes/day home practice

Kabat-Zinn, 1990, Full Catastrophe Living

Basis for Selecting Mindfulness-Based Stress Reduction (MBSR)

Our data showing that responses to physical symptoms contribute to poor sleep quality

Associations Between Responses to Nightly Physical Symptoms and Sleep Quality

Psychological Response	Estimate	SE	p value
I felt annoyed or bothered by my physical symptoms.	-0.17	0.05	0.003
I felt like it was hard to think about anything other than my physical symptoms.	-0.15	0.05	0.004
I thought negative thoughts about myself or my body.	-0.41	0.15	0.015
I was kind to myself.	0.2	0.08	0.019
I paid attention to my physical symptoms without trying to change them.	0.12	0.06	0.046

Basis for Selecting Mindfulness-Based Stress Reduction (MBSR)

Our data showing that responses to physical symptoms contribute to poor sleep quality

Others' data showing that MBSR improves responses to physical symptoms and sleep[1-3]

Our qualitative data showing that pregnant people are interested in mindfulness tools for sleep[4]

[1]Kabat-Zinn, 1982, General Hospital Psychiatry; [2]Bawa et al., 2015, British Journal of General Practice; [3]Ong et al., 2014, Sleep; [4]Felder et al., 2022, Global Advances in Health and Medicine

Basis for Developing Prenatal Sleep Classes

Pregnant people want relevant sleep education[1]

Pregnant people with poor sleep quality demonstrate maladaptive sleep behaviors

Pregnant people want tools for coping with sleep disturbances[1]

Provide education about sleep during pregnancy, postpartum, and infancy

Target using behavioral techniques, from a mindfulness- and acceptance-based lens

Teach brief strategies for coping with pregnancy-related physical symptoms

[1]*Felder et al., 2022, Global Advances in Health and Medicine*

RISE Participants

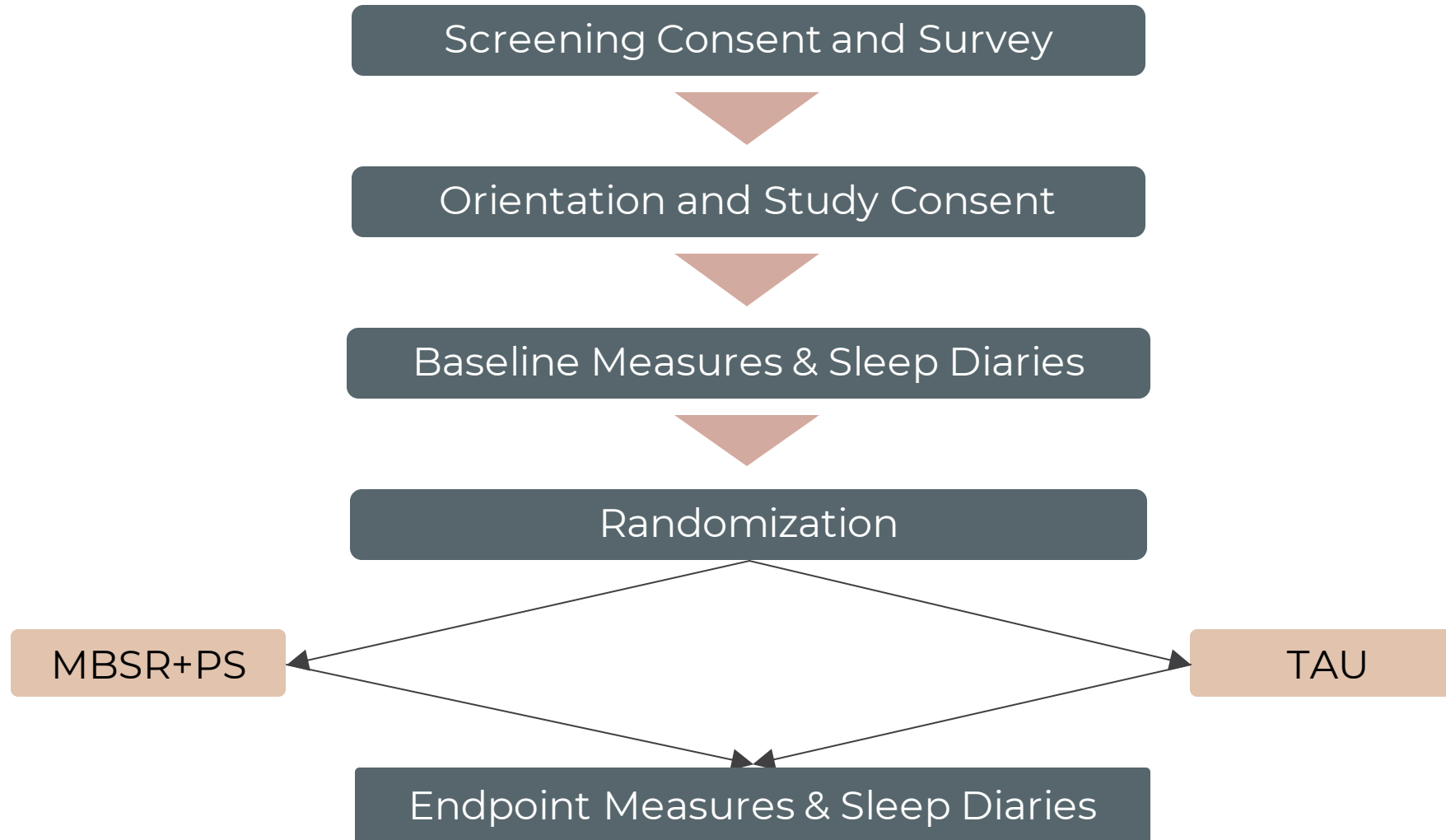- Recruited primarily via Facebook ads, September 2021-April 2022

Inclusion	Exclusion
- 18+ years of age - 8-28 weeks pregnant - Poor sleep quality (Pittsburgh Sleep Quality Index > 5) - Regular internet access	- Self-reported sleep disorder not likely to improve with MBSR+PS - Shift work or night-time caregiving responsibilities - Psychological, medical, or other issues that necessitate priority treatment - Current regular mindfulness practice

RISE Study Design

Screening Consent and Survey

Orientation and Study Consent

Baseline Measures & Sleep Diaries

Randomization

MBSR+PS

TAU

Endpoint Measures & Sleep Diaries

Intervention Delivery

- Mindfulness-Based Stress Reduction (MBSR)

  – Delivered via Zoom

  – Publicly available through the Osher Center

  – In heterogenous groups

  – 8 weekly 2.5-hour classes, half-day retreat

- Prenatal Sleep (PS) Classes

  – Delivered via Zoom

  – In homogenous groups of pregnant people with poor sleep quality

  – 8 weekly 30-minute classes

Components of Pain

Sensory — The actual physical sensation of pain
(e.g., is it sharp, dull, pulsating, electric?)

Cognitive — How you think about the pain
(e.g., "This is never going to stop!")
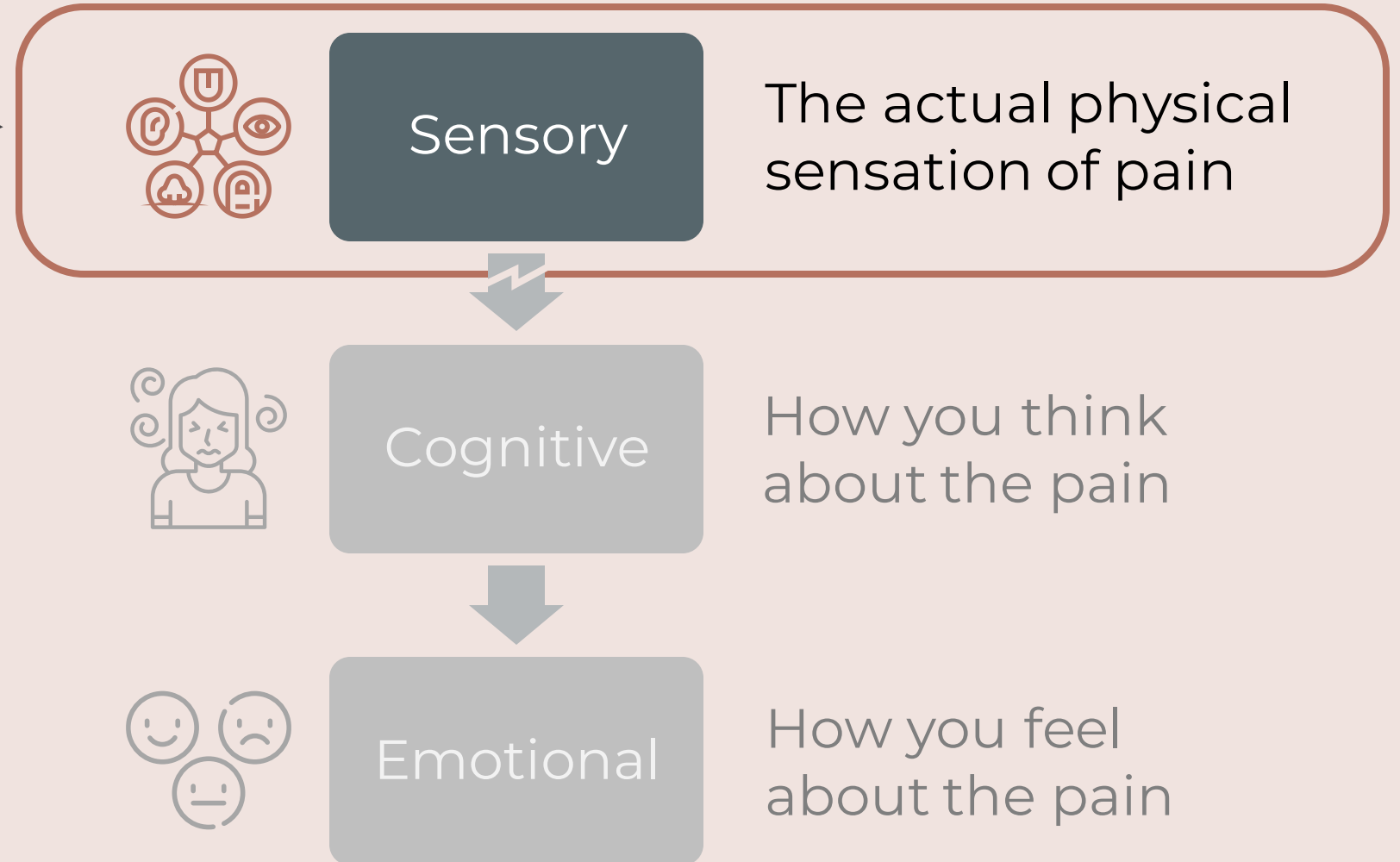
Emotional — How you feel about the pain
(e.g., "I'm afraid of it.")

How Does this Relate to Sleep During Pregnancy?

- Sleep during pregnancy is often disrupted by normal pregnancy discomforts (e.g., hip pain, needing to urinate).

- We can't eliminate pregnancy discomforts BUT we can change how we *respond* to these symptoms.

- Responding with curiosity, compassion, or acceptance may help you sleep better.

Mindfulness involves focusing on the physical sensations, and uncoupling the cognitive and emotional parts

Sensory	The actual physical sensation of pain
Cognitive	How you think about the pain
Emotional	How you feel about the pain

Our previous research showed that:

Pregnant people who responded to physical discomfort by feeling annoyed or bothered slept **WORSE**

Sensory

The actual physical sensation of pain

Cognitive

How you think about the pain

Emotional

How you feel about the pain

What are some ways you respond to discomfort or pain that make your sleep **worse**?

What are some ways you respond to discomfort or pain that make your sleep **better**?

Counting Breaths

Silently and gently count to yourself:

One on the inhalation

Two on the exhalation

Three on the inhalation

Four on the exhalation

and so on...

Holding Image of Baby in Mind's Eye

Experiment with allowing an image of your baby to arise in your mind's eye.

Associating the Bed with Sleep

- We want to associate the bed with sleep, not with anxiety or wakefulness

- Only go to bed when sleepy

- If you are unable to sleep, stop striving for sleep. Practice accepting that you are not currently in a state compatible with sleep.

- Do something enjoyable or pleasant. When you notice sensations of sleepiness, return to bed.
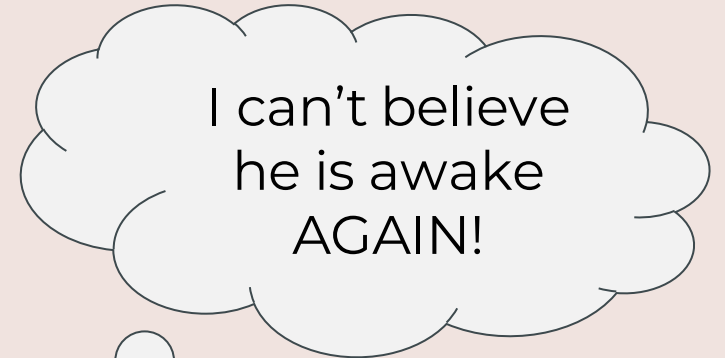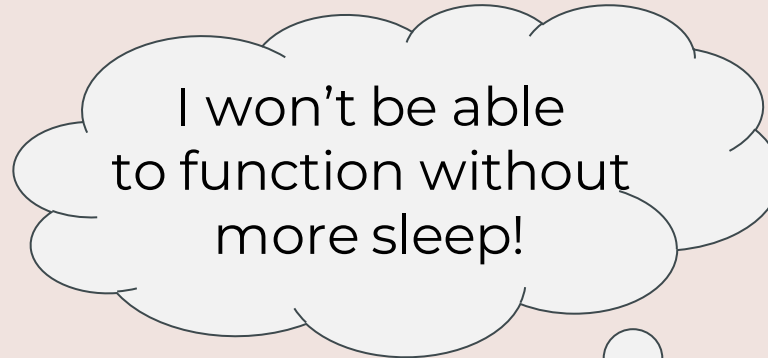
RISE Participant Flow

Assessed for eligibility
(N = 715)

- Excluded on screener (n = 348)
- Did not respond to scheduling attempts (n = 272)
- Declined to participate (n = 33)
- Other reasons (e.g., unable to attend MBSR, sleep improved, etc.; n = 10)

Randomized
(N = 52; .1%)

Allocated to TAU
(N=26; 50%)

Allocated to MBSR+PS
(N=26; 50%)

Completed endpoint
(N=24; 92%)

Completed endpoint
(N=24; 92%)
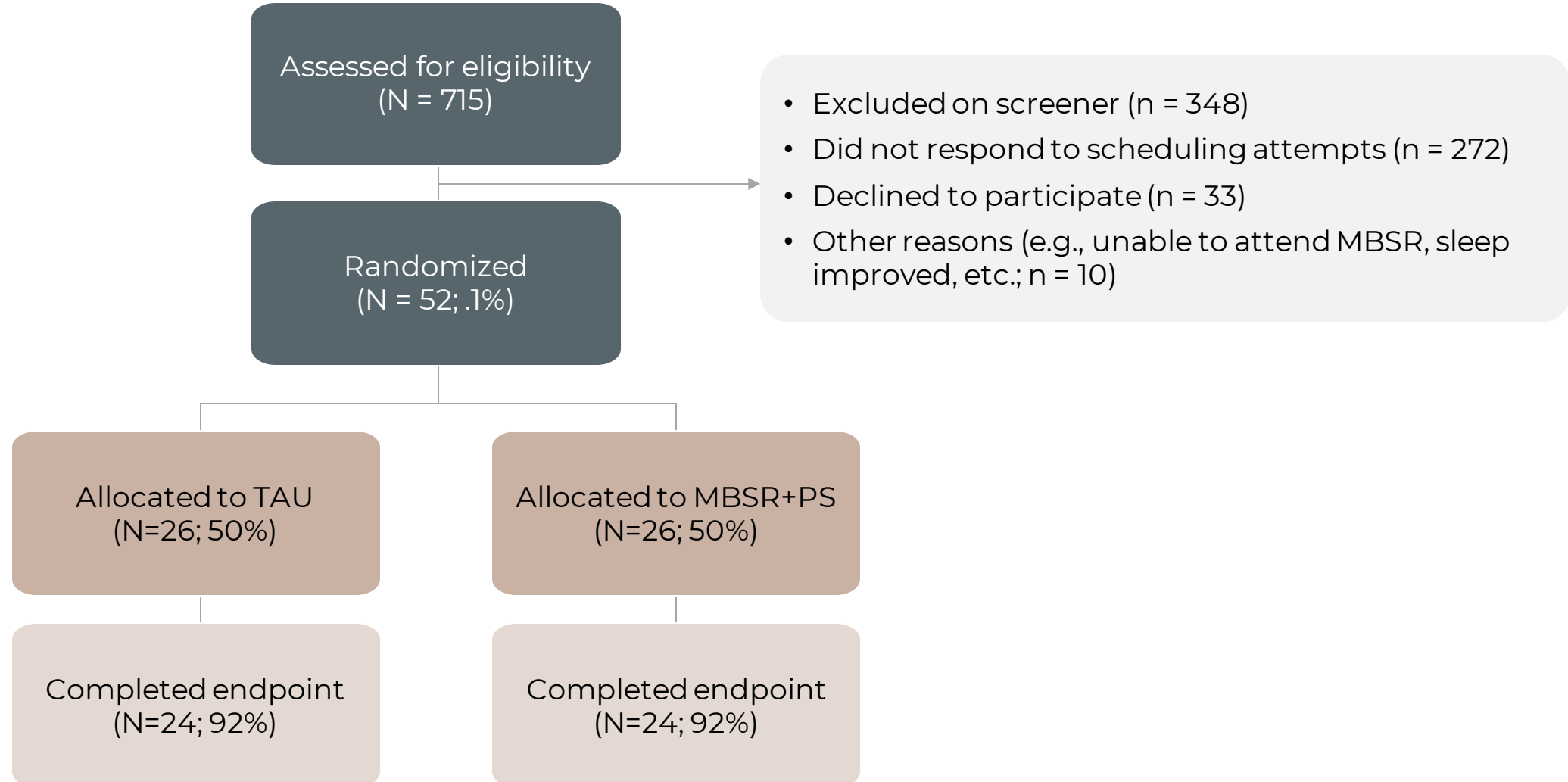
RISE Demographics

	M (SD) or N (%)
Gestational age (weeks)	15.1 (4.9)
Age (years)	32.58 (5.24)
Female gender	52 (100%)
Race/ethnicity	
African-American or Black	7 (13.5%)
Asian or Pacific Islander	9 (17.3%)
White	29 (55.8%)
Latin, Latin American, or Hispanic	5 (9.6%)
Bi- or multi-racial/ethnic	2 (3.8%)
Sexual orientation	
Straight	48 (92.3%)
Gay/lesbian	1 (1.9%)
Bisexual	3 (5.8%)
Relationship status	
Married or living with a partner	50 (96.2%)
Significantly involved with a partner but not living together	2 (3.8%)

	M (SD) or N (%)
Education	
College graduate	23 (44.2%)
Professional or graduate degree	25 (48.1%)
Some college, junior college, or vocational school	4 (7.7%)
Employment status	
Full-time job	36 (69.2%)
Homemaker	5 (9.6%)
Part-time job	10 (19.2%)
Unable to work, on disability, or leave of absence	1 (1.9%)
Household income	
Under $25k	2 (3.8%)
$25-49k	4 (7.7%)
$50-99k	10 (19.2%)
$100-199k	14 (26.9%)
$200k or higher	21 (40.4%)
Don't know	1 (1.9%)

RISE Surpassed Acceptability Targets

Endpoints	Target	RISE Data
Willingness to be randomized	≥**80**% of eligible participants willing to be randomized	**96**% were willing to be randomized
Treatment initiation	≥**85**% attend at least one session of MBSR and PS	**88**% attended at least one session of MBSR and PS
Satisfaction	Client Satisfaction Questionnaire (CSQ-8) ≥ **24**	CSQ-8 scores mean = **28.04**, SD=3.6
Reasons for attrition from MBSR+PS	Assessed qualitatively	3 withdrew <u>prior to treatment initiation</u> due to: • Personal reasons (n=1), • Sleep improved (n=1), • Scheduling conflicts (n=1)

RISE Surpassed Feasibility Targets

Endpoints	Target	RISE Data
Yield of eligible participants	Defined as # Eligible / # Assessed for Eligibility	Of 713 who completed the screening survey, 367 were eligible (**52**%).
Number randomized	N=**50** by June 30, 2022	N = **52** by April 6, 2022.
Retention rate	≥**80**% of randomized participants to complete endpoint measures	**92**% completed endpoint measures (48/52)

Changes in Proposed Mechanisms Were in Predicted Directions

	TAU	MBSR+PS		
	Mean Change (SD)	**Mean Change (SD)**	**p**	**SMD**
I felt like I could handle the pain or discomfort.	**0.02 (0.47)**	**0.73 (0.43)**	**0.001**	**1.583**
I reassured myself that my symptoms were normal.	**-0.36 (0.60)**	**0.79 (1.14)**	**0.005**	**1.248**
I felt annoyed or bothered by my physical symptoms.	**0.14 (0.70)**	**-0.78 (0.99)**	**0.016**	**1.071**
I was kind to myself.	**-0.04 (0.65)**	**0.68 (1.01)**	**0.05**	**0.85**
I accepted the fact that I was having pain or discomfort.	**-0.06 (0.84)**	**0.70 (0.95)**	**0.056**	**0.843**
I realized that others experience this type of pain or discomfort, too.	**-0.10 (0.58)**	**0.68 (1.31)**	**0.066**	**0.774**
I tried to think of something other than my physical symptoms.	-0.18 (0.92)	-0.48 (0.61)	0.376	0.391
I felt like it was hard to think about anything other than my physical symptoms.	0.32 (0.84)	0.04 (0.83)	0.44	0.331
I worried about my physical symptoms.	-0.13 (0.57)	-0.29 (0.47)	0.481	0.305
I paid attention to my physical symptoms without trying to change them.	0.03 (0.64)	0.24 (0.79)	0.502	0.283
I wondered whether there was something seriously wrong.	-0.11 (0.41)	-0.19 (0.38)	0.649	0.195
I ignored or avoided thinking about my physical symptoms.	-0.28 (0.62)	-0.33 (0.69)	0.878	0.065
I immediately tried to make my physical symptoms go away.	-0.07 (0.66)	-0.04 (0.69)	0.91	0.048
I thought negative thoughts about myself or my body.	-0.10 (0.63)	-0.12 (0.46)	0.964	0.019

Preliminary Suggestion of Clinical Benefit

PRELIMINARY DATA

	TAU	MBSR+PS		
	Mean Change (SD)	**Mean Change (SD)**	**p**	**SMD**
Sleep quality (PSQI)	**-1.59 (2.06)**	**-3.23 (2.59)**	**.06**	**.71**
Insomnia severity (ISI)	**-5.00 (4.03)**	**-7.38 (3.82)**	**.11**	**.61**
Diary metrics				
Sleep refreshing	**-0.09 (0.36)**	**0.51 (0.51)**	**0.001**	**1.344**
Sleep efficiency	**0.02 (0.06)**	**0.11 (0.10)**	**0.004**	**1.124**
Sleep quality	**-0.01 (0.32)**	**0.40 (0.52)**	**0.013**	**0.949**
Wake after sleep onset	**-1.26 (15.48)**	**-26.52 (37.58)**	**0.018**	**0.879**
Calculated total sleep time	-0.01 (0.62)	0.19 (0.55)	0.359	0.346
Number of awakenings	-0.14 (0.48)	-0.08 (1.20)	0.842	0.07
Sleep onset latency	-7.96 (17.91)	-8.64 (13.63)	0.91	0.043

> "
>
> Even though I am still woken up by my symptoms, my relationship to those symptoms has changed. I have been taught many ways to cope with those awakenings. While my sleep is not perfect, I do think without the education and tools I received as a result of this study I would be having a far worse time with my sleep. Some nights I'm experiencing disrupted sleep where I'm actually able to feel well rested the next day due to these techniques I have been taught through MBSR+PS.

Future Questions

What is the efficacy of MBSR+PS
for improving prenatal sleep?

Conclusions

- Sleep is a pillar of health

- The consequences of poor sleep during pregnancy are too great to ignore

- CBT-I is effective for *prenatal insomnia*; may prevent depression

- A mindfulness-based plus behavioral intervention shows promise for *pregnancy-specific sleep quality*

- Emphasis of mindfulness-based programs on **promoting** versus **restoring** mental health make them particularly well-suited for this critical lifecycle phase
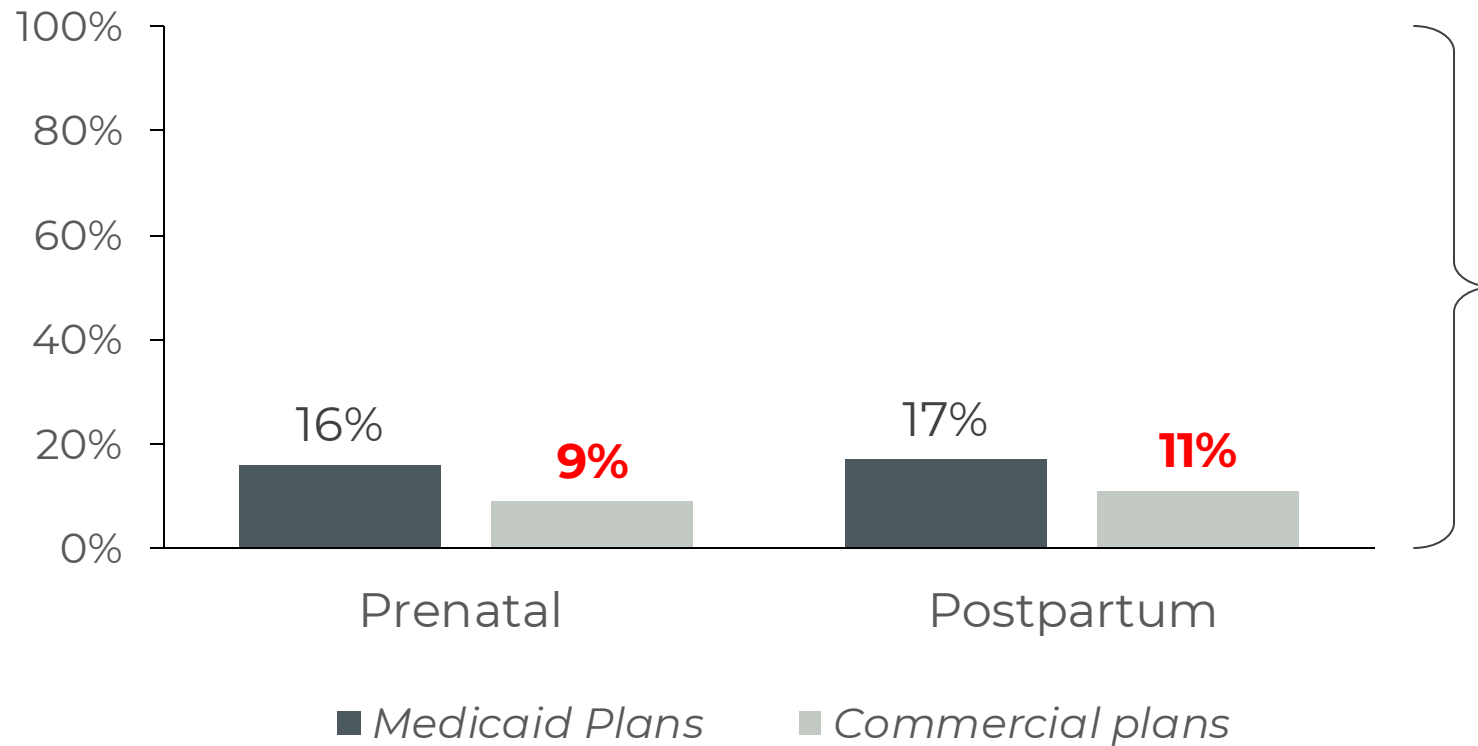

Image by Grace Farris

Thank You!

Jennifer Felder, PhD

jennifer.felder@ucsf.edu

Perinatal Depression is Under-detected

2021 Perinatal Depression Screening Rates

Only ***half*** of those who screened positive received follow-up

National Committee for Quality Assurance, Healthcare Effectiveness Data and Information Set

Prevalence of Perinatal Depression and Gestational Diabetes

Gregory et al., 2022, National Vital Statistics Report

U.S. Preventive Services Task Force Recommendation

Population

Pregnant and postpartum persons

Recommendation

Provide or refer persons at increased risk of perinatal depression to counseling interventions

Grade

B

USPSTF, 2019, JAMA

Insomnia Diagnosis and Infant Outcomes

Whole Population

	Insomnia During Pregnancy	No Sleep Disorder During Pregnancy	RR (95% CI)
	n (%)	n (%)	
Sample:	3,213	2,952,660	
Complications			
1 Minute Apgar < 7	312 (9.7)	144,497 (4.9)	**2.0 (1.8, 2.2)**
Infant NICU Stay on Birth Admission	388 (12.1)	161,148 (5.5)	**2.2 (2.0, 2.4)**
Respiratory Distress Syndrome	128 (4.0)	41,580 (1.4)	**2.8 (2.4, 3.4)**
Hypoglycemia	131 (4.1)	52,392 (1.8)	**2.3 (1.9, 2.7)**
Utilization			
Long Birth Stay	563 (17.5)	322,848 (10.9)	**1.6 (1.5, 1.7)**
ER Visit	1,231 (38.3)	982,317 (33.3)	**1.2 (1.1, 1.2)**
Hospital Admission	323 (10.1)	280,659 (9.5)	1.1 (0.9, 1.2)

Felder et al., 2022, Sleep Health

Insomnia Diagnosis and Infant Outcomes

Matched Sample

	Insomnia During Pregnancy	No Sleep Disorder During Pregnancy	OR (95% CI)
	n (%)	n (%)	
Sample:	2,212	2,212	
Complications			
1 Minute Apgar < 7	158 (7.1)	146 (6.6)	1.1 (0.9, 1.4)
Infant NICU Stay on Birth Admission	144 (6.5)	138 (6.2)	1.0 (0.8, 1.3)
Respiratory Distress Syndrome	34 (1.5)	28 (1.3)	1.2 (0.7, 2.0)
Hypoglycemia	61 (2.8)	52 (2.4)	1.2 (0.8, 1.7)
Utilization			
Long Birth Stay	254 (11.5)	242 (10.9)	1.1 (0.9, 1.3)
ER Visit	822 (37.2)	715 (32.3)	**1.2 (1.1, 1.4)**
Hospital Admission	208 (9.4)	202 (9.1)	1.0 (0.8, 1.3)

Felder et al., 2022, Sleep Health

ASLEEP Study

1. 50 Pregnant people

2. Daily diaries about sleep for 2 weeks

3. Aimed to evaluate whether psychological responses to nightly physical symptoms affected sleep quality, over and above discomfort and pain

Daily Diary Measure
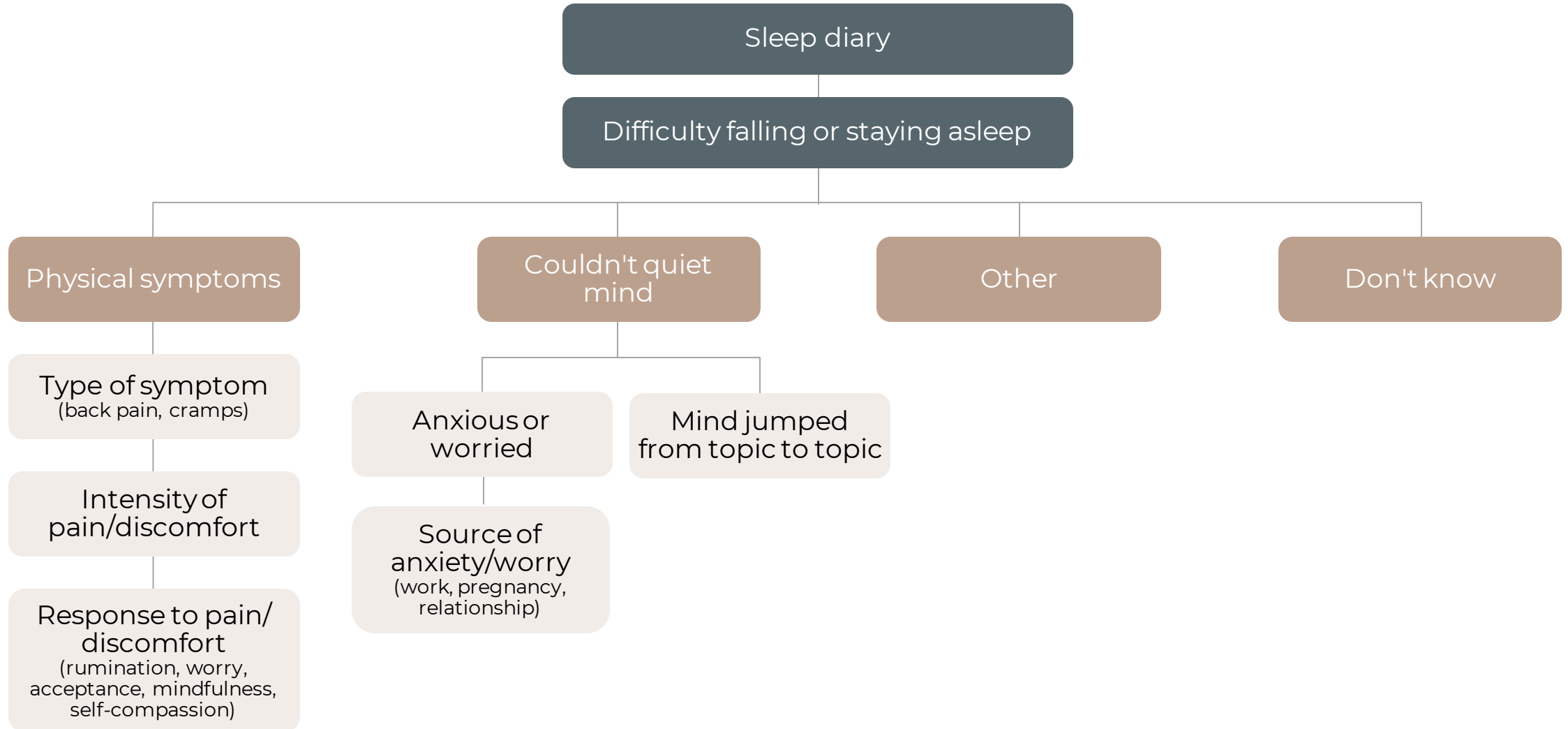
ASLEEP Study Participant Characteristics

	Mean or N	Standard Deviation or %
Race and Ethnicity		
White	24	48%
Latina, Latin American, or Hispanic	11	22%
Asian or Pacific Islander	10	20%
Bi- or multi-racial or -ethnic*	3	6%
African American or Black	2	4%
College graduate	43	86%
Employment Status		
Full-time job	32	64%
Part-time job	7	14%
Student	5	10%
Homemaker	6	12%
Married or living with partner	50	100%
Pregnant for the first time	33	66%
Age (years)	33.34	3.96
Gestational age (weeks)	21.50	5.26
Pittsburgh Sleep Quality Index total	8.44	3.41

ASLEEP Study Participant Characteristics, Cont.

	Mean or N	Standard Deviation or %
Diary-defined Sleep Variables		
Sleep onset latency (minutes)	20.32	18.37
Number of awakenings	3.08	2.88
Wake after sleep onset (minutes)	34.46	21.71
Sleep duration (hours)	7.18	0.84
Time in bed (hours)	8.99	0.98
Sleep efficiency (%)	80.39	7.10
Percentage of Nights with Trouble Falling Asleep		
Physical symptoms	15%	22%
Intensity of pain/discomfort	5.19	1.90
Mind jumped from topic to topic	9%	12%
Anxious	3%	6%
Other	3%	6%
Unknown	3%	8%
Percentage of Nights with Trouble Staying Asleep		
Physical symptoms	46%	34%
Intensity of pain/discomfort	5.08	1.78
Mind jumped from topic to topic	12%	14%
Anxious	4%	7%
Other	12%	15%
Unknown	6%	11%

Associations Between Responses to Nightly Physical Symptoms and Sleep Quality

State Variable	Estimate	SE	P value
I felt annoyed or bothered by my physical symptoms.	**-0.17**	**0.05**	**0.003**
I felt like it was hard to think about anything other than my physical symptoms.	**-0.15**	**0.05**	**0.004**
I thought negative thoughts about myself or my body.	**-0.41**	**0.15**	**0.015**
I was kind to myself.	**0.2**	**0.08**	**0.019**
I paid attention to my physical symptoms without trying to change them.	**0.12**	**0.06**	**0.046**
I worried about my physical symptoms.	-0.1	0.07	0.161
I realized that others experience this type of pain or discomfort, too.	0.1	0.07	0.221
I accepted the fact that I was having pain or discomfort.	0.12	0.11	0.284
I reassured myself that my symptoms were normal.	0.08	0.07	0.286
I felt like I could handle the pain or discomfort.	-0.09	0.08	0.297
I immediately tried to make my physical symptoms go away.	-0.06	0.06	0.337

Development of PS

Session	Content
1	General sleep education; Two strategies for coping with an active mind (scheduled worry time during the day; unwinding time before bed)
2	Mindfulness- and acceptance-based strategies for responding to sleep disturbances during pregnancy
3	Sleep consolidation and stimulus control
4	Options for responding to fatigue; Tips for optimizing sleep during pregnancy
5	Infant sleep education; Strategies for responding to postpartum sleep disturbances
6	Postpartum sleep education; Tips for optimizing sleep during the postpartum period
7	Developing a sleep action plan
8	Review of lessons learned

What is Pain?

- Pain signals your brain to "pay attention"

- Pain is USEFUL -- often indicates injury or illness

- But pain is not ALWAYS a sign that something is wrong – can be a sign that your body is transforming!

- Can you think of examples where pain does not mean injury or illness?
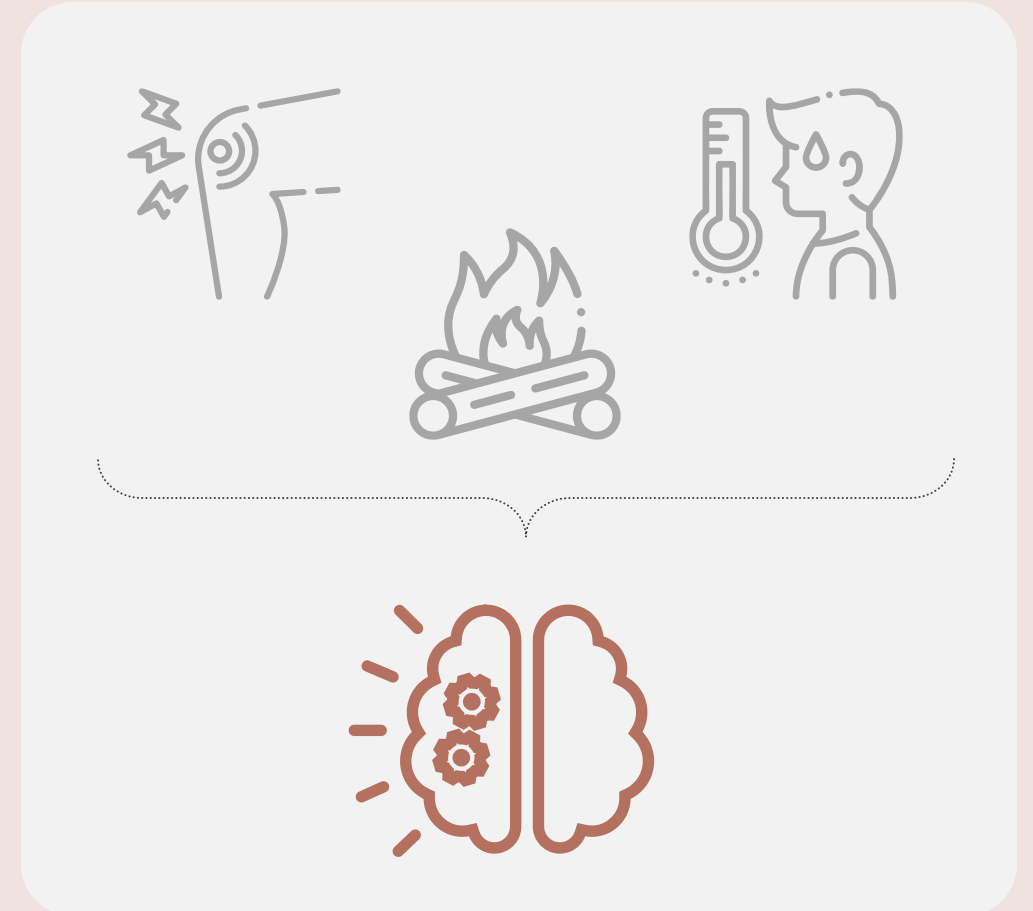
Half-smile

Bringing awareness to the muscles at the corners of your mouth, tighten those muscles so that the corners of your mouth turn upward slightly.

Mindfulness principle: *Non-striving*

The best way to achieve your goals is to back off from striving for results and instead to start focusing carefully on seeing and accepting things as they are, moment by moment.

Sleep is a process that cannot be forced but instead should be allowed to unfold. Putting more effort into sleeping longer or better is counterproductive.

# Changes in Mechanisms Were Correlated With Changes in Sleep Quality

	WASO	Duration	Efficiency	Quality	Restful
I worried about my physical symptoms.	r=-0.01	r=0.07	r=-0.02	r=-0.86	r=-0.74
I ignored or avoided thinking about my physical symptoms.	r=0.69	r=-0.63	r=-0.55	r=0.13	r=0.07
I wondered whether there was something seriously wrong.	r=0.27	r=-0.1	r=-0.4	r=-0.57	r=-0.58
I tried to think of something other than my physical symptoms.	r=0.7	r=-0.84	r=-0.35	r=-0.05	r=-0.05
I was kind to myself.	r=0.04	r=-0.17	r=0.28	r=0.55	r=0.49
I felt like it was hard to think about anything other than my physical symptoms.	r=0.09	r=0.12	r=-0.04	r=-0.49	r=-0.57
I felt annoyed or bothered by my physical symptoms.	r=-0.11	r=0.34	r=0.44	r=-0.35	r=-0.31
I thought negative thoughts about myself or my body.	r=0.41	r=-0.43	r=0.05	r=-0.27	r=-0.35
I immediately tried to make my physical symptoms go away.	r=0.38	r=-0.34	r=0.04	r=-0.41	r=-0.58
I paid attention to my physical symptoms without trying to change them.	r=-0.55	r=0.47	r=0.06	r=0.29	r=0.45
I reassured myself that my symptoms were normal.	r=0.08	r=-0.12	r=0.12	r=0.56	r=0.52
I felt like I could handle the pain or discomfort.	r=-0.13	r=0.12	r=-0.05	r=0.74	r=0.65
I accepted the fact that I was having pain or discomfort.	r=-0.1	r=-0.25	r=0.15	r=0.59	r=0.63
I realized that others experience this type of pain or discomfort, too.	r=0.23	r=-0.3	r=-0.06	r=0.45	r=0.38

Honestly, I think [the PS sessions] were the more valuable parts of the study. I feel like I could have only participated in the PS sessions and would have gotten as much out of the study.
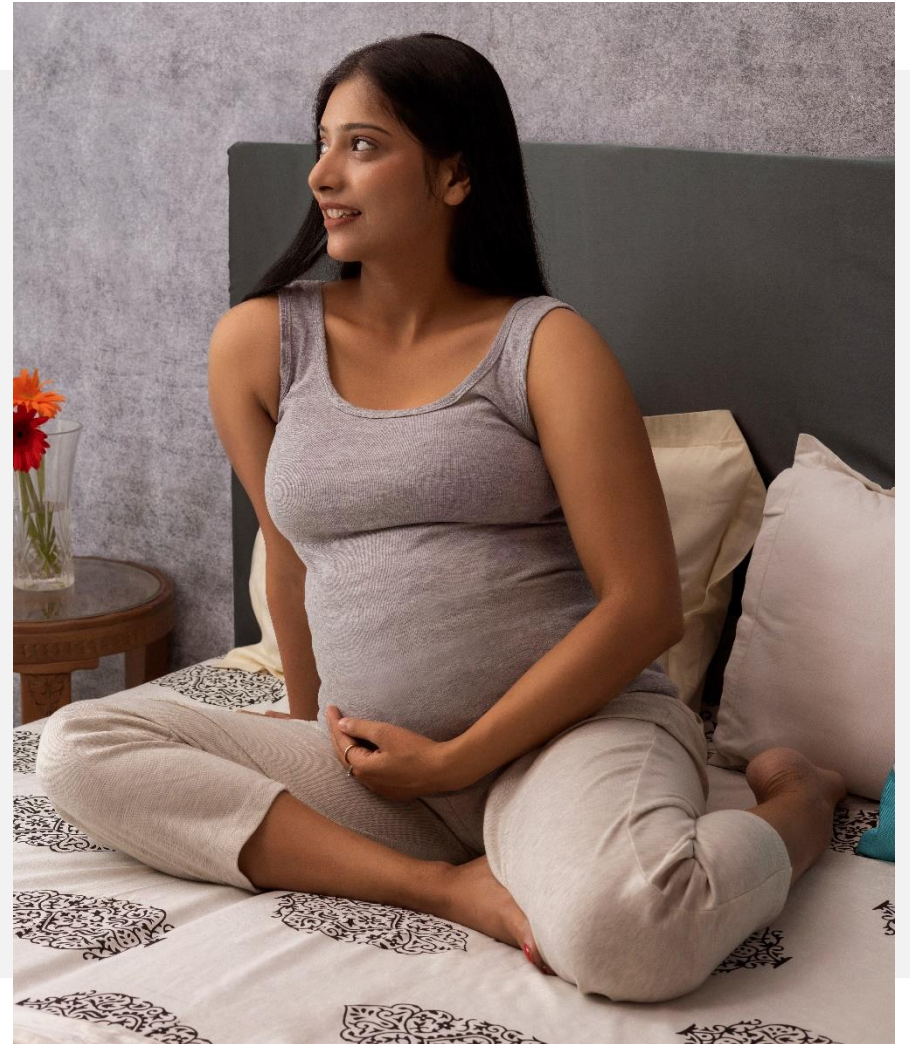
"I am hoping to use mindfulness in my approach to childbirth and parenting. I think it's a great way to roll with the punches."

"I think the PS helped as expected and the MBSR helped in a more holistic way on getting through pains and changes of pregnancy and hopefully postpartum."

Design Considerations

- Pitfalls of a standard 2-arm trial
  - Unknown whether both MBSR and PS are essential
  - Would next need to conduct a dismantling trial
  - Important because MBSR+PS is time-intensive (26 hours + 4 hours)

- Advantages of a factorial 2x2 trial
  - Efficient, simultaneous analysis of efficacy of MBSR, PS, MBSR+PS

		MBSR	
		Yes	No
PS	Yes	MBSR+PS	PS
	No	MBSR	TAU

Outcomes and Impacts

Possible Outcomes	Clinical Impacts
MBSR and PS are Both Effective, Together are Additive	• Refer a patient to either based on access, preference • Refer to MBSR for someone who could also benefit from stress reduction or from learning generalizable mindfulness skills • Refer to PS for a briefer, sleep focused intervention • Refer to MBSR+PS for someone with more severe symptoms
Only MBSR (or PS) is Effective	• Can avoid referring patients to a treatment component that is inactive or unnecessary
MBSR+PS are Synergistic	• May typically refer patients to MBSR+PS

Mindfulness-based Cognitive Therapy (MBCT) for Preventing Depression

- MBCT was designed to target the automatic cognitive patterns (e.g., rumination) that precipitate relapse among people with histories of depression[1]

- Outperforms active controls and antidepressants in non-perinatal populations[2]

- After adapting for a perinatal population,[3] we found that it significantly outperformed treatment as usual for preventing depressive relapse during the perinatal period[4] (50% vs 18% relapse rates, p=.008)

- We found that our digital adaptation[5] was feasible and acceptable to pregnant people[6]

[1]Segal et al., 2013; [2]Kuyken et al., 2016, JAMA Psychiatry; [3]Dimidjian, Goodman, Felder et al., 2014, Archives of Women's Mental Health; [4] Dimidjian, Goodman, Felder et al., 2015, Journal of Consulting and Clinical Psychology; [5]Dimidjian, Beck, Felder et al., 2014, Behaviour Research and Therapy; [6]Felder et al., 2017, Cognitive and Behavioral Practice

Prenatal Sleep Disturbance and Risk for Elevated Postpartum Depressive Symptoms
(PHQ-9 > 10)

PHQ-9 Item	First Trimester n=2314	Second Trimester n=781	Third Trimester n=2104
	Multivariate OR (95% CI, p value)	Multivariate OR (95% CI, p value)	Multivariate OR (95% CI, p value)
Sleep disturbance	**1.90 (1.18-3.13, p=0.009)**	**3.74 (1.47-11.49, p=0.010)**	**3.43 (1.88-6.78, p<0.001)**

Bolded cells indicate p values < .05. Multivariable models adjust for age, race, ethnicity, and nulliparity.

PATIENT HEALTH QUESTIONNAIRE (PHQ-9)

NAME: _____   DATE:_____

Over the *last 2 weeks,* how often have you been bothered by any of the following problems? (use "✓" to indicate your answer)	Not at all	Several days	More than half the days	Nearly every day
1. Little interest or pleasure in doing things	0	1	2	3
2. Feeling down, depressed, or hopeless	0	1	2	3
3. Trouble falling or staying asleep, or sleeping too much	0	1	2	3
4. Feeling tired or having little energy	0	1	2	3
5. Poor appetite or overeating	0	1	2	3
6. Feeling bad about yourself—or that you are a failure or have let yourself or your family down	0	1	2	3
7. Trouble concentrating on things, such as reading the newspaper or watching television	0	1	2	3
8. Moving or speaking so slowly that other people could have noticed. Or the opposite—being so fidgety or restless that you have been moving around a lot more than usual	0	1	2	3
9. Thoughts that you would be better off dead, or of hurting yourself in some way	0	1	2	3

add columns: _____ + _____ + _____

(Healthcare professional: For interpretation of TOTAL, please refer to accompanying scoring card.)   **TOTAL:** _____

10. If you checked off *any* problems, how *difficult* have these problems made it for you to do your work, take care of things at home, or get along with other people?

Not difficult at all _____

Somewhat difficult _____

Very difficult _____

Extremely difficult _____

Prenatal Sleep Disturbance and Risk for Elevated Postpartum Depressive Symptoms

(PHQ-9 > 10)

PHQ-9 Item	First Trimester n=2314 Multivariate OR (95% CI, p value)	Second Trimester n=781 Multivariate OR (95% CI, p value)	Third Trimester n=2104 Multivariate OR (95% CI, p value)
Sleep disturbance	**1.90 (1.18-3.13, p=0.009)**	**3.74 (1.47-11.49, p=0.01)**	**3.43 (1.88-6.78, p<0.001)**
Fatigue	**3.44 (1.27-14.11, p=0.04)**	1.42 (0.58-3.99, p=0.46)	**2.24 (1.18-4.71, p=0.02)**
Appetite disturbance	**2.10 (1.30-3.47, p=0.003)**	2.01 (0.78-4.76, p=0.12)	**2.15 (1.23-3.65, p=0.006)**

Bolded cells indicate p values < .05. Multivariable models adjust for age, race, ethnicity, and nulliparity.