



‘Our mind could be our biggest challenge’: A qualitative analysis of urban adolescents’ sleep experiences and opportunities for mind-body integrative health approaches to improve sleep

Malia C. Maier^a, Jodi Y. Scharf^a, Melanie A. Gold^{a,c,d}, April J. Ancheta^{b,1}, Jean-Marie Bruzzese^{b,*}, Samantha Garbers^{a,*}

^a Heilbrunn Department of Population and Family Health, Mailman School of Public Health, Columbia University, New York, NY, USA

^b Columbia University School of Nursing, New York, NY, USA

^c Division of Child and Adolescent Health, Department of Pediatrics, Columbia University Irving Medical Center, New York, NY, USA

^d School-Based Health Centers, New York-Presbyterian, USA

ARTICLE INFO

Keywords:

Sleep hygiene
Mind-body integrative health
Emotional freedom technique tapping
Adolescent
Focus groups
Intervention development

ABSTRACT

Objective: To inform the development of a combined sleep and mind-body integrative health (MBIH) intervention, we explored urban adolescents’ sleep experiences and perceptions of MBIH techniques.

Methods: We conducted eight focus groups with school-based health center patients in New York City, exploring sleep experiences; mindfulness, body awareness, tapping, acupressure, and self-hypnosis; and intervention delivery preferences. We recorded, transcribed, and analyzed the discussions applying methods from grounded theory.

Results: Participants (n = 25) were ages 14–17, predominantly female (64%), Latino (60%), and Black (40%). Participants reported social, physical, and internal sleep barriers, but had limited success implementing sleep improvement strategies. Participants viewed MBIH techniques positively, noted audio-guided techniques’ accessibility, and were intrigued by less-familiar techniques. Preferences varied around domains of intervention delivery.

Conclusion: Results underscore the need for adolescent-informed interventions offering sleep improvement strategies. Participants’ interest and willingness to engage in MBIH techniques present an opportunity for practitioners to develop and deliver sleep interventions incorporating MBIH components to urban adolescents. Varied intervention preferences highlight the need to be adaptable to adolescents’ lived experiences, comfort levels, and learning styles.

Innovation: This study elucidates the perspectives of underrepresented adolescents whose perspectives on MBIH have rarely been explored, an important first step in developing tailored interventions.

1. Introduction

Sleep is essential for health, well-being, and cognitive functioning [1,2], but inadequate sleep duration and poor sleep quality are common among adolescents [3]. Associations between poor sleep and diminished psychological [4] and physical health [5], poor academic performance [6], and increased risk of depression [7] are well-established. Hispanic and Black adolescents are disproportionately affected by insufficient sleep, averaging less sleep per night and reporting lower sleep quality compared to non-Hispanic white adolescents [8]. These sleep disparities may reflect contextual stressors that are common in urban settings — where the proportions of Hispanic and Black adolescents are higher — including noise, perceived

neighborhood and school safety, and shared sleep space, that influence sleep behaviors [9–11]. Stress has also been identified as a barrier to sleep in adolescence, increasing cognitive pre-sleep arousal and thereby delaying sleep onset [12,13]. Traditional approaches that seek to improve sleep hygiene — hereafter referred to as sleep behaviors — fail to account for urban adolescents’ sleep barriers, including stress [14]. Interventions that address both sleep behaviors and stress reduction are needed to improve adolescent sleep quality and duration.

Mind-body integrative health (MBIH) approaches — including acupressure, mindfulness, meditation, and yoga — improve sleep outcomes in adults, particularly through the mechanism of stress reduction [15–17]. Studies also show school-based MBIH interventions reduce stress in

* Correspondence to: J.-M. Bruzzese, Columbia University School of Nursing, 560 West 168th Street, New York, NY 10032, USA.

** Correspondence to: S. Garbers, Heilbrunn Department of Population and Family Health, Columbia University Mailman School of Public Health, 60 Haven Avenue, New York, NY 10032, USA.
E-mail addresses: jb3958@cumc.columbia.edu (J.-M. Bruzzese), svg2108@cumc.columbia.edu (S. Garbers).

¹ Current affiliations: Perelman School of Medicine, University of Pennsylvania, Philadelphia, PA, USA; Craig-Dalsimer Division of Adolescent Medicine, Children’s Hospital of Philadelphia, Philadelphia, PA, USA.

adolescents [18–20], with one study highlighting the role of mindfulness in ameliorating stress and reducing trauma-associated symptoms among Black, urban youth [21]. However, MBIH techniques have seldom been used to improve sleep in adolescents, especially for Latino or Black adolescents [22]. School-based health centers (SBHCs) provide a unique context to deliver an intervention that integrates MBIH approaches for sleep to predominately Latino and Black urban youth, as SBHC access is associated with increased adolescent engagement in health-promoting behaviors, positive health outcomes, and reduced health disparities [23–25].

Recent years have seen an increase in qualitative studies that explore adolescent experiences with, and perceptions of, sleep behaviors and habits. Several studies have investigated sleep difficulties among adolescents [26–31]. Studies have found that despite participant knowledge of the importance of sleep and recommended sleep behaviors, most adolescents report getting less than the recommended 8 to 10 hours of sleep per night [28,30–32]. While adolescents express a desire to improve sleep and a willingness to change sleep behaviors [26,33], they face a range of barriers including time demands (e.g., homework), electronic device use, difficulty winding down, unpredictable schedules, and neighborhood and environmental factors [26,28–30,33,34].

To our knowledge, there are no qualitative studies to date analyzing the role of MBIH techniques in improving sleep, especially among adolescents. This study aims to address this gap by exploring adolescents' sleep experiences and perceptions of MBIH techniques. This analysis can inform sleep interventions to be more effective and centered around the adolescents they intend to serve and can highlight the importance of ensuring the inclusion and prioritization of adolescent perspectives in intervention development and implementation.

2. Methods

2.1. Study design and setting

We conducted this qualitative study as part of a study to develop and to pilot test a novel intervention that combines sleep behaviors with MBIH approaches to improve sleep quality among adolescents served in urban SBHCs ([ClinicalTrials.gov](https://clinicaltrials.gov/ct2/show/study/NCT04484649), NCT04484649). To develop the intervention we used a participatory design, which considers adolescents to be the experts on what an effective and relevant intervention would include. We conducted eight focus groups in three rounds, with some adaptations to the

discussion guide to delve deeper into topics that emerged in previous rounds (Table 1).

We implemented this study in six SBHCs serving 17 high schools in New York City, part of a network of SBHCs sponsored by NewYork Presbyterian. The proportion of students in these schools whose family incomes were below the federal poverty line ranged from 82.1% to >95%, according to 2020–2021 New York City Department of Education data. SBHC staff consist of nurse practitioners, mental health professionals (psychologists and licensed clinical social workers), and health educators who offer a full range of free services, including physical examinations, medical care for acute and chronic conditions, laboratory tests, immunizations, and reproductive health care, as well as mental health counseling and services, and health education and counseling.

2.2. Ethical considerations

The Columbia University Irving Medical Center Institutional Review Board approved all study procedures.

2.3. Recruitment and enrollment

We recruited participants through virtual, verbal, and posted SBHC communications. We provided flyers to SBHC providers and staff to share with patients in-person, through telehealth visits, and via secure messages sent by the SBHC medical director. We also reached participants through word-of-mouth recruitment by Teen Advisors, who were adolescent study team members that advised on intervention development and recruitment strategies. Interested adolescents were then screened for eligibility. Participants were included if they were between ages 13 to 17 years, in grades 9 to 12, and enrolled as a patient at the SBHC serving their school. Participants were excluded if they had ever been diagnosed with a sleep disorder or if they were unable to communicate in English. Oral informed assent was solicited and documented in a private telephone consultation prior to the focus group, and electronic parental informed consent was obtained for each participant. Participants received a \$30 gift card as compensation for their time and effort.

2.4. Data collection

We conducted eight, one-hour, semi-structured focus groups between December 2020 and August 2021 with two to four participants per group.

Table 1
Topic areas included in the eight focus group discussions.

	Focus group							
	Round 1			Round 2			Round 3	
General Topics About Sleep	1	2	3	4	5	6	7	8
Barriers to sleep (social, physical, internal)	x	x	x					
Strategies for improving sleep	x	x	x					
Sleep tips (heard from doctors, social media, school)	x	x	x					
Mind-Body-Specific Topics	1	2	3	4	5	6	7	8
Previous experience with mind-body techniques	x	x	x					
Attitudes towards mind-body techniques	x	x	x					
Willingness to participate in learning mind-body techniques (mindfulness, Emotional Freedom Technique tapping, acupressure, self-hypnosis)	x	x	x					
Preferences around format and order for learning each mind-body technique				x	x	x	x	x
Intervention Preferences	1	2	3	4	5	6	7	8
Barriers and facilitators to participation	x	x	x					
Interest in and feedback on intervention components, topics, and structure (time of day, online vs. in-person, group vs. individual)	x	x	x	x	x	x	x	x
Preferences around health professionals facilitating the intervention				x	x	x	x	x
Preferences around timing, length, and mode of intervention communication				x	x	x	x	x
Willingness to involve family members in the intervention				x	x	x		
Tips for recruitment strategies and sustained engagement in the intervention				x	x	x	x	x
Proposed Intervention Content	1	2	3	4	5	6	7	8
Relevance of proposed terminology				x	x	x		
Suggestions for look and feel of intervention materials				x	x	x		
Feedback on proposed intervention activities and materials							x	x

One Principal Investigator (SG) led the sessions and was assisted by a trained study team member (MCM). All sessions took place virtually via Zoom, as New York City public schools were remote or hybrid during this time due to the COVID-19 pandemic. We audio and video recorded the sessions using the Zoom platform, and a study team member (MCM) reviewed auto-generated transcriptions for accuracy. Recordings were destroyed immediately following transcription.

Semi-structured discussion guides sought to identify salient intervention components, gauge the relevance of proposed messaging (e.g., terminology, handouts), and evaluate the feasibility, acceptability, and utility of proposed intervention activities. Topics included: current experiences and challenges with sleep; familiarity with and willingness to learn MBIH techniques, including mindfulness, body awareness, Emotional Freedom Technique (EFT) tapping, acupressure, and self-hypnosis; and proposed intervention logistics (e.g., time, duration, and frequency of sessions; session facilitator, format, and mode of delivery; and facilitators and barriers to participation). The Principal Investigator leading the sessions described each mind-body technique, performed brief demonstrations of tapping and acupressure, and played a short self-hypnosis for sleep audio clip [35].

2.5. Data analysis

This study design was guided by grounded theory. We used constant comparison analytic method to analyze our data. Our inductive coding began with open coding, then moving to axial and selective coding to arrive at categories [36]. Two authors (MCM, JYS) familiarized themselves with the data and inductively shaped central concepts into an initial codebook. These authors independently coded the first four transcripts. In weekly team meetings (MCM, JYS, SG), coding discrepancies were resolved and categories were iteratively refined and collated. Once the codebook was deemed stable (i.e., no additional revisions were needed), one author (JYS) used the codebook to guide coding of the remaining transcripts. NVIVO 12 was used to manage the qualitative data.

2.6. Rigor

Several measures were taken to increase the trustworthiness of findings. The coding team acknowledged initial hypotheses, prior knowledge, and their positions as researchers [37], including MCM's role assisting with focus group facilitation and JYS's personal and professional experience with MBIH techniques. Ongoing discussions with the interdisciplinary study team broadened perspectives and audited biases. Quotations were included from a range of participants across focus groups to increase authenticity.

3. Results

A total of 25 adolescents, ages 14 to 17 years, participated in focus groups (Table 2). The majority identified as female (64%), Latino (60%), and Black (40%) (not mutually exclusive).

Table 3 details the four key categories that emerged from the focus group discussions: need for ways to implement sleep strategies; MBIH has value; openness to learning new techniques and implementation preferences are personal.

3.1. Need for ways to implement sleep strategies

Participants identified a range of factors in their social and physical environments, as well as internal factors, that were impeding their sleep. The most commonly identified barrier to sleep was the use of electronic devices before bed, particularly cell phones. Reasons cited for phone usage included browsing social media, managing school assignments and emails, setting alarms, texting, or playing music. Participants also discussed physical factors that hindered sleep. These included noise and light in their immediate

physical surroundings — often from family members with whom they shared a living or sleeping space — as well as outside the home:

“You feel like you can't get to sleep in bed cause there's like people outside screaming, the lights.”

[P1009, Female, Latina, FG2]

Internal factors, such as stress and anxiety, were also raised by participants as barriers to sleep:

“When I have tough time sleeping it's cause mostly there's a lot on my mind or I'm sad about something or I'm overthinking stuff... I feel like our mind could be our biggest challenge.”

[P1026, Female, Latina, FG5]

Schoolwork was frequently cited as a source of stress.

Participants discussed possible strategies they had either heard of or implemented to address these sleep barriers. Phone application locks or timers were commonly brought up as a potential method to reduce phone usage before bed, in addition to finding alarm alternatives or placing the phone out of reach at bedtime. However, participants expressed difficulty with continued implementation of these strategies, noting the addictive nature of social media and societal and schoolwork dependency on technology. A few participants described moderate success controlling certain aspects of their immediate physical surroundings, such as turning off lights, closing the door, playing music, or communicating with siblings who share their sleep space. Napping was discussed by some participants as a short-term strategy to address daytime sleepiness or to reduce stress, but was countered with the acknowledgement that napping “seems to rejuvenate me a bit,” making it more difficult to fall asleep at night.

Table 2

Descriptive characteristics of adolescent focus group participants (N = 25).

Characteristics	n	%
Age		
Median (range), in years	16	(14–17)
Grade		
9 th grade	3	12
10 th grade	9	26
11 th grade	5	20
12 th grade	8	32
Gender		
Female	16	64
Male	7	28
Genderfluid ¹	1	4
Non-binary	1	4
Ethnicity		
Hispanic or Latino	15	60
Not Hispanic or Latino	9	36
Prefer not to answer	1	4
Race		
Black or African American	10	40
White	6	24
Asian	2	8
Other	2	8
Two or more	1	4
Prefer not to answer	1	4
Not indicated ²	3	12
Self-reported sleep quality		
Very good	2	8
Fairly good	15	60
Fairly bad	6	24
Very bad	2	8

¹ Write in response.

² All three respondents identified as Hispanic or Latino, but did not indicate a race.

Table 3

Categories and quotations from semi-structured focus group discussions with adolescents (N = 25).

Need for ways to implement sleep strategies “Going through social media, seeing what’s going on in the world. Sometimes your friends might be texting you... you might have a lot of homework ahead to keep you up late at night. So, although you’re tired, it makes it a bit more difficult to go to sleep... I’ve tried to postpone using it, but it’s been very difficult to follow through.” [P1002, Male, Black, FG1] “Sometimes it could be a TV or if your sibling is using their computer. And it’s like the distraction if it’s on because some people work at different schedules since we live in one home.” [P1019, Female, Prefer not to answer, FG3] MBIH has value “So before [a friend] goes to sleep, she meditates because she told me that it helps like if you have anxiety from the whole day...you’re like forgetting about everything until the morning and you’re relaxing and then it gets you a little bit tired and helps you go to sleep.” [P1007, Female, Latina, FG1] “I’ve heard something like that, but I don’t think it would help personally because...by focusing on their breathing or their thoughts, [people] start to wander off into different thoughts and it excites the brain and keeps them awake.” [P1019, Female, Prefer not to answer, FG3] Openness to learning new techniques “I think [mindfulness] might be one of the better solutions to teenagers who can’t really sleep because it’s something that everybody can do and it’s something that, from my experience, is effective. And you can do it whenever...you could do it in the shower...you can do it in your room.” [P1007, Female, Latina, FG1] “I want to learn more about how you do [tapping], how it helps you, because I feel like it helped me at the moment I was doing it. [P1003, Male, Latino/Two or more, FG2] Implementation preferences are personal Intervention facilitator “I’d probably go with my nurse practitioner because I think they like know more or like they already studied some of the things and it’ll just be like they’ll tell us, like the information, like the facts they know.” [P1032, Female, Latina/White, FG6] “[Sleep]’s something that’s kind of overlooked a lot. So I think if it’s coming from a psychologist or a serious medical professional, it could start to change the view on sleep from being like, oh, it’s just sleep to being like, oh, this is an actual important thing that I need to focus on. [P1030, Non-binary, White, FG6] Intervention format “People will be more motivated to go to the meetings because I mean, they will see their peers going to the meetings too and it will be more exciting.” [P1023, Female, Latina/Black, FG4] “I feel like it will best take place in person because we can’t build a trust with people that we’ve never met, like in person... it will feel like a more safer environment.” [P1018, Female, Latina/Black, FG3] “Teenagers nowadays have realized...the convenience of video meetings and being able to learn certain practices that you could apply at home where you’re not in front of other students and hence won’t have to feel a bit awkward learning these sort of practices... I think it allows many teenagers to express themselves at home and to focus on themselves.” [P1002, Male, Black, FG1] Intervention setting “I just feel like if we have other teenagers, we can all agree with each other. Like learn stuff off each other. I would feel like if it was one-on-one it’s gonna be like a therapy session.” [P1026, Female, Latina, FG5] “I feel it will be best to do in a group, because when people see their peers doing something, it will make them feel like more intrigued in it or like more motivated to do it.” [P1018, Female, Latina/Black, FG3] “I feel like it should be like one on one, or maybe like if it’s like in a group everybody has to actually commit and be like silent for it to work.” [P1031, Female, Latina/Black, FG6] It might be hard to pay attention to yourself when you’re surrounded by other people, especially if they’re your peers or your friends. [P1030, Non-binary, White, FG6]
--

3.2. MBIH has value

While participants ranged in their familiarity with MBIH techniques, the majority had positive perceptions of the general concept of mind-body practices and the specific techniques presented during the focus groups. Most participants who had previous experience using MBIH techniques such as mindful attention and mindful breathing described them as “working” or being “helpful.” In many cases, participants had used MBIH techniques for reasons other than sleep, such as waking themselves up, calming themselves down while completing schoolwork, or assuaging physical discomfort like body soreness or headaches:

“Oh, I’m pretty sure [acupressure] works. Every time when I get headaches, I think there’s like a pressure point in like your hand... Usually when I do that, my headache tends to go away faster.”

[P1032, Female, Latina/White, FG6]

Other participants had not implemented MBIH techniques but had heard of them through friends or family members, and had learned about MBIH techniques from healthcare providers and teachers. These participants discussed benefits such as managing anxiety, relaxing, and falling asleep. Participants whose MBIH exposure was limited to the brief explanations and demonstrations provided during the focus groups acknowledged the relationship between the brain and body and postulated that redirecting the brain to focus on the body would be an effective means of reducing stress, thereby improving sleep:

“I’m sure that focusing on your body, focusing on yourself, and clearing your mind of stressful thoughts and just accepting them as they come would be very effective... Maybe touching your body will allow you to acknowledge that you yourself do exist and it might make you calm down.”

[P1002, Male, Black, FG1]

A few participants who had previously heard of MBIH techniques thought they either would not help or would be difficult for adolescents. One participant expressed concern that focusing on one’s thoughts would “excite the brain and keep them awake,” or that adolescents would not be interested in a technique that “involves feelings” as “sometimes us teenagers don’t want to confront them.” Some participants found certain MBIH strategies simply “didn’t work” for them. For example, a few participants with self-hypnosis experience expressed a preference for falling asleep in silence or difficulty focusing given other distractions in the room. One participant anticipated challenges implementing audio-guided techniques, noting that some adolescents are unable to play audio in shared spaces or may find sleeping with earphones “disrupting.” However, these participants reported positive perceptions of other MBIH techniques discussed during the focus group, such as tapping, that they had not yet implemented.

3.3. Openness to learning new techniques

Overall, there was a consensus among participants that an MBIH intervention for improving sleep was appealing: participants were curious about MBIH techniques, perceived the techniques to be relatively easy to do, and described the mechanisms of the techniques as applicable to the lives of teenagers for both reducing stress and improving sleep quality.

The majority were willing to engage in mindfulness techniques related to breathing and body awareness. They cited being present, calming down, addressing anxiety, and relaxing the body as reasons for why they would be likely to incorporate mindfulness into their daily routine or engage in a sleep intervention that included such techniques. Likewise, tapping was consistently discussed as an intriguing way to improve sleep. Participants found that practicing the brief guided tapping demonstration during the focus group calmed them down in the moment. These positive perceptions of tapping were countered by some hesitancy when thinking about intervention implementation. Specifically, one participant felt it might be difficult to engage in tapping in a group setting, given varying maturity levels in adolescence:

“It kind of depends on the age group...especially if you’re with like freshmen, there probably would not be a lot of people taking it seriously.”

[P1030, Non-binary, White, FG6]

Discussion around self-hypnosis was in parallel with the other techniques: participants were willing to participate in an MBIH-related

intervention if self-hypnosis was taught. Most participants expressed familiarity with self-hypnosis — though not by name — and found these types of audio-guided techniques to be both easy to engage with and accessible:

“Even if you’re a shyer person...you don’t really want to speak or you don’t want to do anything in front of other people, [self-hypnosis] is just something you can listen to.”

[P1007, Female, Latina, FG1]

3.4. Implementation preferences are personal

Participant perspectives varied widely regarding who should deliver a sleep behavior combined with MBIH intervention and how it should be delivered. Participants were prompted with three options for an intervention facilitator based on personnel at participating SBHCs: psychologist/mental health provider; nurse practitioner; or health educator. Some participants expressed a preference for psychologists to facilitate the intervention, drawing associations between sleep and the mind. One participant noted a preference for nurse practitioners, who they felt would be able to provide “facts.” Others felt either a psychologist or a nurse practitioner would be a good fit given their content expertise as well as their experience working with adolescents. No participant specifically expressed a preference for a health educator to lead the intervention. Despite varied opinions around who should facilitate, participants shared a preference for facilitator continuity throughout the intervention (i.e., the same facilitator would facilitate each session), as it would allow participants to feel more comfortable and to build on previous conversations.

Regarding intervention format, many participants preferred an in-person intervention as they felt it would be “more exciting” than remote participation and would foster a “safer environment.” Other participants expressed a preference for virtual intervention delivery, either because they had grown accustomed to the format following a year of virtual learning or because it would be easier to engage in practices that may feel “awkward” to do in-person. Some participants proposed a hybrid version of the intervention, with both in-person and virtual elements, noting the benefits of both.

Participants also varied on whether the intervention should be delivered in a group or individual setting. Those partial to a group setting felt it would make the intervention more fun and engaging, or that it would be validating to hear other participants’ thoughts and perspectives:

“Everyone in the group could kind of share how they’re feeling and realize, yeah, these feelings that I’m feeling are okay.”

[P1027, Female, Black, FG5]

Some also cautioned against individual sessions feeling akin to therapy. Other participants were neutral, expressing that a group or individual setting would not make a substantial difference in their experience or that it depended on the person. In contrast, some participants had specific opinions on setting depending on the intervention activity. For instance, they felt mindfulness exercises requiring introspection or silence could be distracting to learn in a group, or that “activities that maybe you have to discuss something that’s personal” would be best fit for an individual setting.

Beyond preferences for intervention structure, participants offered a range of suggestions for optimizing adolescent engagement. They emphasized the need to use peer recruitment to gain legitimacy and to highlight the perks of participation, including the specific benefits of improved sleep and the opportunity to learn new techniques. Participants stressed the importance of incorporating activities and games to differentiate the intervention from school, with some suggesting a competitive aspect. Reminders about upcoming sessions were considered essential given adolescents’ busy lives, and post-session positive affirmations were recommended to motivate and to encourage participants, especially those who “feel like we don’t get the recognition that we should get” at home or at school and “want to get acknowledged.” Participants also discussed the need to consider adolescents’ realities when promoting sleep strategies.

One participant explained staying up late is at times unavoidable due to schoolwork demands:

“The reality is, you kind of need to get your homework done...and you’re not going to stay up another two hours after homework just so your mind kind of relaxes.”

[P1045, Genderfluid, Latino/White, FG8]

Another participant explained they stay up late “just for the alone time.” Along these lines, participants raised scheduling conflicts as a potential barrier to participation in a sleep intervention, noting their busy lives and multiple school, family, and extracurricular commitments.

4. Discussion and conclusion

4.1. Discussion

This study explored the perceived relevance and acceptability of an intervention that uses MBIH strategies to improve sleep in urban adolescents. Consistent with existing research, our findings indicate that adolescents face multiple social, physical, and internal barriers to sleep [1]. Participant discussions regarding electronic device use as a deterrent to sleep onset align with other qualitative studies establishing electronic devices as a predominant sleep barrier among adolescents [27,28,30,38]. This is in large part motivated by social media engagement and fear of missing out [34]. Beyond social media, our findings build on the literature by adding online homework and school-related communications as key motivators for pre-sleep use of electronic devices. The role of schoolwork in impeding sleep is thus two-fold: it increases screen time before bed, and it serves as a main source of stress and anxiety for adolescents. Our findings also surfaced external sleep barriers such as noise, light, and shared sleep space that acknowledge sleep environments particular to urban youth. This is consistent with other studies citing specific stressors urban adolescents face that interfere with sleep [10,39,40]. In order for interventions to center health equity and combat well-documented inequities in sleep quality [8], they must address structural factors that drive sleep disparities such as neighborhood disadvantage and the built environment (including noise, air pollution, safety, physical activity resources, and household crowding) [9,39,40], some of which emerged in this study, but not all.

While participants discussed non-MBIH strategies they had heard of to address barriers to sleep, there was a notable lack of discussion around strategies they had implemented successfully to improve sleep. This underscores the need for sleep behavior interventions that are both acceptable and feasible among adolescents. Positive sleep behaviors, such as limiting electronic device use before bed and maintaining consistent sleep and wake times, have been associated with higher sleep quality [41,42]. MBIH techniques target these sleep behaviors by bringing in the present moment, and increasing self-efficacy and confidence around building healthy behaviors [18,19]. The use of MBIH techniques with behavioral strategies may therefore facilitate adolescent engagement with positive sleep strategies.

Participants’ high level of interest and curiosity around MBIH techniques add greater depth to a recent quantitative study where most urban adolescents (77%) reported they would be likely to participate in an SBHC-based sleep intervention that utilized MBIH modalities [14]. Our findings reflect positive perceptions of MBIH techniques. Participants’ perceived benefits of MBIH techniques — including anxiety management, relaxation, and falling asleep — seemed to directly correlate with a willingness to participate in an intervention that used MBIH techniques to improve sleep. Participants who claimed their previous experience with a particular MBIH technique was suboptimal stated willingness to engage in another technique presented during the focus group. This finding suggests the need for practitioners to offer a menu of MBIH techniques to account for a diverse range of adolescent needs and preferences. Some participant responses regarding perceived drawbacks of MBIH

techniques — such as concerns about thoughts stimulating the brain — reflect a limited understanding of the mechanisms through which MBIH techniques operate. This finding illuminates the need for MBIH interventions to not only include instruction on MBIH techniques but also to provide explanations of how the techniques work, as well as strategies and skills to successfully implement them (e.g., using letting go techniques to manage wandering mind during mindfulness-based practices). There were some domains of inquiry for which we did not reach consensus, including intervention facilitator role, format (in-person versus virtual), and setting (group versus individual sessions). The perspectives brought forth in this study may therefore be enriched by an analysis of post-intervention feedback from participants [43].

These findings should be interpreted with a consideration of limitations. This study assessed participants' interest in hypothetical use of MBIH strategies in a future sleep intervention. While focus group facilitators used recommended strategies for minimizing social desirability [44], interest expressed by participants may overestimate true likelihood of engagement. Focus groups were conducted while the participants were receiving either remote or hybrid educational instruction due to the COVID-19 pandemic, which may have influenced participant responses regarding preferences for intervention format. The move to a virtual format necessitated smaller focus groups which may have impeded richer discussion. Recruitment challenges restricted our ability to exclude participants with adequate sleep quality, potentially limiting the generalizability of findings specifically to adolescents with poor sleep quality, who are the population of interest for the intervention. However, adolescents often overestimate their sleep [45,46], and even with the majority of the study sample self-reporting "fairly good" sleep quality, participants still discussed numerous sleep barriers and expressed interest in improving their sleep.

This qualitative analysis was part of a larger study employing a participatory design process to guide intervention development in urban SBHCs. Data were, therefore, not collected for the sole purpose of this qualitative analysis, and discussion guides varied across focus groups to inform each step of the intervention design process. Given that all participants were patients at urban SBHCs, this study may have limited generalizability to adolescents in settings beyond SBHCs or to SBHC adolescent patients from other sociodemographic backgrounds and/or in non-urban settings. Despite these limitations, the findings contribute to a burgeoning field of qualitative research on adolescents' sleep experiences and offer valuable insights into developing an integrated sleep behavior and MBIH intervention for adolescents in SBHC networks.

4.2. Innovation

This study sought to explore preferences of Latino and Black urban adolescents for the delivery of an integrated sleep behavior and MBIH intervention. By leveraging MBIH techniques, which have seldom been used to improve sleep among urban Latino and Black adolescents, the proposed intervention represents a novel approach to improving sleep quality among this population. The study makes an important contribution to the evidence base as it elucidates the perspectives of underrepresented adolescents whose perspectives on MBIH have been rarely explored, with some exceptions [43,47]. Measuring preferences is an important first step in developing tailored interventions and identifying strategies for increasing engagement [14], especially for novel modalities or populations with specific needs [48].

4.3. Conclusion

In this qualitative study with predominantly Latino and Black urban adolescents, participants expressed a need for strategies to help them improve their sleep. Participants' high level of interest and willingness to engage in MBIH techniques present an opportunity for practitioners to develop and deliver sleep interventions incorporating MBIH components to urban adolescents. Varied preferences regarding intervention delivery highlight the

need for future interventions to be adaptable to adolescents' lived experiences, comfort levels, and learning styles.

Funding

This publication was supported by the National Institute on Minority Health and Health Disparities (R21 MD013991; PIs: Garbers and Bruzese) and the National Center for Advancing Translational Sciences (UL1TR001873). The content is solely the responsibility of the authors and does not necessarily represent the official views of the National Institutes of Health.

Authorship confirmation/contribution statement

MAG, JMB, and SG conceived the study and secured funding. MCM and SG developed study instruments with input from MAG and JMB. MCM, AJA, and SG collected the data, and MCM and JYS conducted the analyses. MCM, JYS, MAG, and SG contributed to the interpretation of the data. MCM and JYS created the first draft of the manuscript, and MAG, AJA, JMB, and SG offered critical revision. All authors read and approved the final manuscript.

Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Acknowledgments

The authors thank the focus group participants for generously sharing their time and valuable insights. Thank you to our Adolescent Advisors, Juliana Blitzer PhD, Janet Garth MPH, Donya Rhett PhD, Edwin Hernandez MPH, and the rest of the school-based health center staff for their support with recruitment, and to Maureen George PhD for her guidance on manuscript refinement.

References

- [1] Owens J. Insufficient sleep in adolescents and young adults: an update on causes and consequences. *Pediatrics*. 2014;134:e921–32. <https://doi.org/10.1542/peds.2014-1696>.
- [2] Ramar K, Malhotra RK, Carden KA, Martin JL, Abbasi Feinberg Fariha, Aurora RN, et al. Sleep is essential to health: an American Academy of Sleep Medicine position statement. *J Clin Sleep Med*. 2023;17:2115–9. <https://doi.org/10.5664/jcs.9476>.
- [3] Kann L. Youth risk behavior surveillance — United States, 2017. *MMWR Surveill Summ*. 2018;67. <https://doi.org/10.15585/mmwr.ss6708a1>.
- [4] Scott AJ, Webb TL, Martyn-St James M, Rowse G, Weich S. Improving sleep quality leads to better mental health: a meta-analysis of randomised controlled trials. *Sleep Med Rev*. 2021;60:101556. <https://doi.org/10.1016/j.smrv.2021.101556>.
- [5] Laposky AD, Van Cauter E, Diez-Roux AV. Reducing health disparities: the role of sleep deficiency and sleep disorders. *Sleep Med*. 2016;18:3–6. <https://doi.org/10.1016/j.sleep.2015.01.007>.
- [6] Okano K, Kaczmarzyk JR, Dave N, Gabrieli JDE, Grossman JC. Sleep quality, duration, and consistency are associated with better academic performance in college students. *Npj Sci Learn*. 2019;4:1–5. <https://doi.org/10.1038/s41539-019-0055-z>.
- [7] Lovato N, Gradišar M. A meta-analysis and model of the relationship between sleep and depression in adolescents: recommendations for future research and clinical practice. *Sleep Med Rev*. 2014;18:521–9. <https://doi.org/10.1016/j.smrv.2014.03.006>.
- [8] Guglielmo D, Gazmararian JA, Chung J, Rogers AE, Hale L. Racial/ethnic sleep disparities in US school-aged children and adolescents: a review of the literature. *Sleep Health*. 2018;4:68–80. <https://doi.org/10.1016/j.sleh.2017.09.005>.
- [9] Nahmod NG, Master L, McClintock HF, Hale L, Buxton OM. Neighborhood disadvantage is associated with lower quality sleep and more variability in sleep duration among urban adolescents. *J Urban Health*. 2022;99:102–15. <https://doi.org/10.1007/s11524-021-00570-x>.
- [10] Jackson CL, Walker JR, Brown MK, Das R, Jones NL. A workshop report on the causes and consequences of sleep health disparities. *Sleep*. 2020;43:zsaa037. <https://doi.org/10.1093/sleep/zsaa037>.
- [11] Martin SR, Boergers J, Kopel SJ, McQuaid EL, Seifer R, LeBourgeois M, et al. Sleep hygiene and sleep outcomes in a sample of urban children with and without asthma. *J Pediatr Psychol*. 2017;42:825–36. <https://doi.org/10.1093/jpepsy/jsx052>.

- [12] Maskevich S, Cassanet A, Allen NB, Trinder J, Bei B. Sleep and stress in adolescents: the roles of pre-sleep arousal and coping during school and vacation. *Sleep Med.* 2020;66:130–8. <https://doi.org/10.1016/j.sleep.2019.10.006>.
- [13] Bauducco SV, Flink IK, Jansson-Fröjmark M, Linton SJ. Sleep duration and patterns in adolescents: correlates and the role of daily stressors. *Sleep. Health.* 2016;2:211–8. <https://doi.org/10.1016/j.sleh.2016.05.006>.
- [14] Garbers S, Suruki C, Falletta KA, Gold MA, Bruzzese J-M. Psychosocial stress, sleep quality and interest in mind-body integrative health sleep intervention among urban adolescents in the school-based health setting. *Complement Ther Med.* 2021;58:102714. <https://doi.org/10.1016/j.ctim.2021.102714>.
- [15] Hmwe NTT, Subramaniam P, Tan LP. Effectiveness of acupressure in promoting sleep quality: a systematic review of randomized controlled trials. *Holist Nurs Pract.* 2016;30:283–93. <https://doi.org/10.1097/HNP.0000000000000165>.
- [16] Neuendorf R, Wahbeh H, Chamine I, Yu J, Hutchison K, Oken BS. The effects of mind-body interventions on sleep quality: a systematic review. *Evid Based Complement Alternat Med.* 2015;2015:902708. <https://doi.org/10.1155/2015/902708>.
- [17] Goyal M, Singh S, Sibinga EMS, Gould NF, Rowland-Seymour A, Sharma R, et al. Meditation programs for psychological stress and well-being: a systematic review and meta-analysis. *JAMA Intern Med.* 2014;174:357–68. <https://doi.org/10.1001/jamainternmed.2013.13018>.
- [18] Cheng FK. Is meditation conducive to mental well-being for adolescents? An integrative review for mental health nursing. *Int J Afr Nurs Sci.* 2016;4:7–19. <https://doi.org/10.1016/j.ijans.2016.01.001>.
- [19] Noggle JJ, Steiner NJ, Minami T, Khalsa SBS. Benefits of yoga for psychosocial well-being in a US high school curriculum: a preliminary randomized controlled trial. *J Dev Behav Pediatr.* 2012;33:193–201. <https://doi.org/10.1097/DBP.0b013e31824afdc4>.
- [20] Wall RB. Tai Chi and mindfulness-based stress reduction in a Boston Public Middle School. *J Pediatr Health Care.* 2005;19:230–7. <https://doi.org/10.1016/j.pedhc.2005.02.006>.
- [21] Sibinga EMS, Webb L, Ghazarian SR, Ellen JM. School-based mindfulness instruction: an RCT. *Pediatrics.* 2016;137. <https://doi.org/10.1542/peds.2015.2532>.
- [22] Garbers S, Umar NQ, Hand RE, Usseglio J, Gold MA, Bruzzese J-M. Mind-Body Integrative Health (MBIH) interventions for sleep among adolescents: a scoping review of implementation, participation and outcomes. *Adolescent Res Rev.* 2021. <https://doi.org/10.1007/s40894-021-00176-z>.
- [23] Arenson M, Hudson PJ, Lee N, Lai B. The evidence on school-based health centers: a review. *Glob Pediatr Health.* 2019;6. <https://doi.org/10.1177/2333794X19828745>.
- [24] Love HE, Schlitt J, Soleimanpour S, Panchal N, Behr C. Twenty years of school-based health care growth and expansion. *Health Aff.* 2019;38:755–64. <https://doi.org/10.1377/hlthaff.2018.05472>.
- [25] Knopf JA, Finnie RKC, Peng Y, Hahn RA, Truman BI, Vernon-Smiley M, et al. School-based health centers to advance health equity: a community guide systematic review. *Am J Prev Med.* 2016;51:114–26. <https://doi.org/10.1016/j.amepre.2016.01.009>.
- [26] Jakobsson M, Sundin K, Högberg K, Josefsson K. “I want to sleep, but I can’t”: adolescents’ lived experience of sleeping difficulties. *J Sch Nurs.* 2020. <https://doi.org/10.1177/1059840520966011>.
- [27] Palimaru AI, Brown RA, Troxel WM, Dickerson DL, Johnson CL, D’Amico EJ. Understanding sleep facilitators, barriers, and cultural dimensions in Native American urban youth. *Sleep. Health.* 2020;6:478–88. <https://doi.org/10.1016/j.sleh.2020.03.004>.
- [28] Quante M, Khandpur N, Kontos EZ, Bakker JP, Owens JA, Redline S. “Let’s talk about sleep”: a qualitative examination of levers for promoting healthy sleep among sleep-deprived vulnerable adolescents. *Sleep Med.* 2019;60:81–8. <https://doi.org/10.1016/j.sleep.2018.10.044>.
- [29] Gaarde J, Hoyt LT, Ozer EJ, Maslowsky J, Deardorff J, Kyauk CK. So much to do before I sleep: investigating adolescent-perceived barriers and facilitators to sleep. *Youth Soc.* 2020;52:592–617. <https://doi.org/10.1177/0044118X18756468>.
- [30] Hedin G, Norell-Clarke A, Hagell P, Tønnesen H, Westergren A, Garmy P. Facilitators and barriers for a good night’s sleep among adolescents. *Front Neurosci.* 2020;14. <https://doi.org/10.3389/fnins.2020.00092>. (accessed May 19, 2022).
- [31] Godsell S, White J. Adolescent perceptions of sleep and influences on sleep behaviour: A qualitative study. *J Adolesc.* 2019;73:18–25. <https://doi.org/10.1016/j.adolescence.2019.03.010>.
- [32] Paruthi S, Brooks LJ, Ambrosio Carolyn D, Hall WA, Kotagal S, Lloyd RM, et al. Consensus statement of the American Academy of Sleep Medicine on the recommended amount of sleep for healthy children: methodology and discussion. *J Clin Sleep Med.* 2023;12:1549–61. <https://doi.org/10.5664/jcsm.6288>.
- [33] Paterson JL, Reynolds AC, Duncan M, Vandelanotte C, Ferguson SA. Barriers and enablers to modifying sleep behavior in adolescents and young adults: a qualitative investigation. *Behav Sleep Med.* 2019;17:1–11. <https://doi.org/10.1080/15402002.2016.1266489>.
- [34] Scott H, Biello SM, Woods HC. Identifying drivers for bedtime social media use despite sleep costs: the adolescent perspective. *Sleep Health.* 2019;5:539–45. <https://doi.org/10.1016/j.sleh.2019.07.006>.
- [35] I want to be able to sleep. <https://imaginaction.stanford.edu/able-to-sleep/>; 2022. (accessed June 4, 2022).
- [36] Glaser Barney G, Strauss Anselm L. *The Discovery of Grounded Theory: Strategies for Qualitative Research*. Aldine; 1967.
- [37] Berger R. Now I see it, now I don’t: researcher’s position and reflexivity in qualitative research. *Qual Res.* 2015;15:219–34. <https://doi.org/10.1177/1468794112468475>.
- [38] MacKenzie MD, Scott H, Reid K, Gardani M. Adolescent perspectives of bedtime social media use: a qualitative systematic review and thematic synthesis. *Sleep Med Rev.* 2022;63:101626. <https://doi.org/10.1016/j.smrv.2022.101626>.
- [39] Mayne SL, Mitchell JA, Virudachalam S, Fiks AG, Williamson AA. Neighborhood environments and sleep among children and adolescents: a systematic review. *Sleep Med Rev.* 2021;57:101465. <https://doi.org/10.1016/j.smrv.2021.101465>.
- [40] Mayne SL, Morales KH, Williamson AA, Grant SFA, Fiks AG, Basner M, et al. Associations of the residential built environment with adolescent sleep outcomes. *Sleep.* 2021;44:zsaa276. <https://doi.org/10.1093/sleep/zsaa276>.
- [41] Gellis LA, Lichstein KL. Sleep hygiene practices of good and poor sleepers in the United States: an internet-based study. *Behav Ther.* 2009;40:1–9. <https://doi.org/10.1016/j.beth.2008.02.001>.
- [42] Hale L, Guan S. Screen time and sleep among school-aged children and adolescents: a systematic literature review. *Sleep Med Rev.* 2015;21:50–8. <https://doi.org/10.1016/j.smrv.2014.07.007>.
- [43] Tobin J, Hardy J, Lou Calanche M, Gonzalez KD, Baezconde-Garbanati L, Contreras R, et al. A community-based mindfulness intervention among Latino adolescents and their parents: a qualitative feasibility and acceptability study. *J Immigr Minor Health.* 2021;23:344–52. <https://doi.org/10.1007/s10903-020-00985-9>.
- [44] Bergen N, Labonté R. “Everything is perfect, and we have no problems”: detecting and limiting social desirability bias in qualitative research. *Qual Health Res.* 2020;30:783–92. <https://doi.org/10.1177/1049732319889354>.
- [45] Holzhausen EA, Hagen EW, LeCaire T, Cadmus-Bertram L, Malecki KC, Peppard PE. A comparison of self- and proxy-reported subjective sleep durations with objective actigraphy measurements in a survey of Wisconsin children 6–17 years of age. *Am J Epidemiol.* 2020;190:755–65. <https://doi.org/10.1093/aje/kwaa254>.
- [46] Combs D, Goodwin JL, Quan SF, Morgan WJ, Hsu C-H, Edgin JO, et al. Mother knows best? Comparing child report and parent report of sleep parameters with polysomnography. *J Clin Sleep Med.* 2022;15:111–7. <https://doi.org/10.5664/jcsm.7582>.
- [47] Dariotis JK, Mirabal-Beltran R, Cluxton-Keller F, Gould LF, Greenberg MT, Mendelson T. A qualitative exploration of implementation factors in a school-based mindfulness and yoga program: lessons learned from students and teachers. *Psychol Sch.* 2017;54:53–69. <https://doi.org/10.1002/pits.21979>.
- [48] Noar SM, Benac CN, Harris MS. Does tailoring matter? Meta-analytic review of tailored print health behavior change interventions. *Psychol Bull.* 2007;133:673–93. <https://doi.org/10.1037/0033-2909.133.4.673>.