J. Baumeister et al., "Augmented Reality as a Countermeasure for Sleep Deprivation," in IEEE Transactions on Visualization and Computer Graphics, vol. 22, no. 4, pp. 1396-1405, 21 April 2016, doi: 10.1109/TVCG.2016.2518133

Spatial augmented reality (AR) can be an effective countermeasure for sleep deprivation, alleviating several neurocognitive symptoms associated with sleeplessness. For shift workers whose occupations require unconventional sleep schedules and consistent attentiveness at late hours, maintaining task performance may be a significant point of concern. The integration of spatial AR can help maintain alertness by reducing the "cognitive demand for task completion" (Baumeister et al., 2016). Participants were required to press buttons in numerical order according to instructions shown on either an LCD monitor or a wearable SAR projection device. Those in the LCD monitor groups made a significant number of errors and demonstrated a speed-accuracy tradeoff. Compared with an LCD monitor, participants who used a SAR device to complete the monotonous task exhibited better task performance in terms of both response time and errors. Wearable devices and augmented reality have demonstrated substantial benefits when integrated with mundane tasks that make up the fabric of our reality. The prospect these devices have in the realm of counteracting sleep deprivation may also provide some insight into sleep promotion, though this domain has not been thoroughly investigated.

Bønlykke, S. K., Madsen, K. A., & Jenkins, T. (2024). Taking the bizarre seriously: Dreams as a material for interaction design. Designing Interactive Systems Conference, 699–713. https://doi.org/10.1145/3643834.3661562

Dreams are a peculiar, subjective phenomenon that epitomizes the distinct sleep behaviors each individual experiences. In a study conducted by Krogh and her colleagues, dreams are an extension of one's sleep behaviors and patterns, though there is a critical disconnect between fantasy and reality. They propose that perhaps by integrating user dreams with AI technologies, people can begin to further understand their dreams, allowing them to be reimagined in the real world. By using an AI image generator to produce physical stickers, a dream trace can be created and shared in both private and personal spaces, allowing user dreams to take tangible form. With this, dreams can become source material for design research. As significant developments in sleep technologies continue to make progress through means of sleep tracking for improved sleep quality, much can be learned about how to optimize sleep by integrating technologies with dreams. An autobiographical study on participants' perceptions of their dreams and what they mean in reality was conducted. Based on user responses, Krogh and her colleagues found that an AI-generated sticker machine was the best medium to integrate dreams with the physical world, creating a connection between the intangible and tangible. These stickers embellish one's surroundings, augmenting their sleep environments for a greater sense of unity between oneself and both domains of the real and dream world.

Choe, E. K., Consolvo, S., Watson, N. F., & Kientz, J. A. (2011). Opportunities for computing technologies to support healthy sleep behaviors. Proceedings of the SIGCHI Conference on Human Factors in Computing Systems, 3053–3062. https://doi.org/10.1145/1978942.1979395

To properly assess how contemporary technologies can support healthy sleep behaviors, Choe et al. defined and analyzed sleep hygiene practices. Some of which they found included only sleeping as much as needed for proper cognitive function the following day, keeping consistent sleep and wake times, limiting eating and exercising within three hours of bedtime, ridding the sleep environment of light and noises, and so forth. With this extensive list of sleep hygiene practices, they assessed which factors were most important to their study participants in getting quality sleep. Surprisingly, many participants had noted that sleeping at controlled temperatures was both an obstacle and benefit to their sleep quality, suggesting that optimal temperatures can be advantageous to an extent but often introduces problems as one's body temperature fluctuates throughout the night. Additionally, the researchers also assessed how current available technologies meet their sleep demands. Many participants appreciated sleep tracking data, means to increase sleep quality, and recommendations for enhanced sleep conditions. However, they noted a remarkable distaste for wearable devices or tools requiring manual input. These kinds of

perspectives are valuable in informing product design, ensuring that users can get the best experience tailored to their specific needs.

Ravichandran, R., Sien, S.-W., Patel, S. N., Kientz, J. A., & Pina, L. R. (2017). Making sense of sleep sensors. Proceedings of the 2017 CHI Conference on Human Factors in Computing Systems, 6864–6875. https://doi.org/10.1145/3025453.3025557

Sleep sensing technologies are poorly understood in terms of how they effectively impact sleep behaviors. Commercial sleep technologies are widely available and perform remarkably when it comes to accurate predictions and observations of sleep patterns. However, little is known about how they improve sleep quality. While understanding sleep behaviors and patterns can help a user understand their habits, it does not allow them to make an actionable steps to improve their sleep quality. Sleep sensors can increase awareness in prioritzing sleep and promote the development of good sleep hygiene. However, sleep quality is highly subjective matter and requires a different, more personalized approach to thoroughly address.

Cláudio, A. P., Carmo, M. B., Pinheiro, T., Esteves, F., & Lopes, E. (2013). Virtual environment to treat social anxiety. Lecture Notes in Computer Science, 442–451. https://doi.org/10.1007/978-3-642-39241-2_49

Existing research in cognitive behavioral therapies that integrate VR technology have shown promising results in treating psychological disorders such as social anxiety. By using a VR simulation with an avatar-like audience, therapists can introduce their patients into a public setting and practice social behaviors such as public speaking. With the VR technology, they can modify the environment by introducing distractors, more avatars, or change the environment as a way to increase exposure for their patient. VR therapies can help simulate environments that address underlying neuropsychological issues such as anxiety and depression. With that being said, additional applications for other disorders such as those associated with sleep may be possible.