Sleep Good Hood System: Reducing Sleep Deprivation In Hospital Settings With Light Attenuation

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Statement of Purpose: The hospital room is a high-stress environment that contains adverse stimuli such as bright lights and high levels of noise that contribute to the high prevalence of sleep deprivation in hospital patients, negatively impacting the body and its natural circadian rhythms [1]. Sleep deprivation can impair the body's immune system which can leave hospital patients even more susceptible to infections, disease, and may affect patients' ability to heal [2]. To address this clinical issue, we designed a novel localized environment prototype, with the goal to aid patients in retaining a regular sleep cycle. The device is a hood-like structure, the Sleep Good Hood System, that attenuates blue light and noise, and allows patients to rest comfortably without impeding necessary hospital workflow. Light attenuation is achieved by using red translucent acrylic components to filter blue light passively, without obstructing visibility of a patient.

Methods: For fabrication of an initial prototype, two types of cast acrylic were used: a red translucent acrylic and an opaque white acrylic. The acrylic sheets were laser cut, thermoformed and reinforced with aluminum brackets. Baseline ambient lux attenuation of clear acrylic and red translucent acrylic was measured and compared by running 3 lux meters run for 1 hour. A spectrophotometer was used to average replicates of percent transmittance of the red translucent acrylic.

Results: A first-generation prototype was fabricated from our CAD design (Fig.1) (Fig.2). For ambient lux attenuation, red translucent acrylic attenuated a larger 37 lux over the clear acrylic (Fig.3), while red translucent acrylic transmittance was observed to be maximum in the red wavelength (620 to 780 nm) region (Fig.4).

Conclusions: A first-generation prototype was fabricated, and initial light testing demonstrated red translucent acrylic attenuates light more than uncolored acrylic. Percent transmittance measurements demonstrated overall red wavelength light passes through red translucent acrylic. Future studies will also include measuring lux intensity of multiple hospital light sources using red and blue colored filters, finite element analysis, and mechanical testing.

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References: [1] Al Mutair, A., DSAHMJ, 2019, vol.1, pp.30-35. [2] Kamdar, B., JIC, 2011, vol.27, pp.97-111.

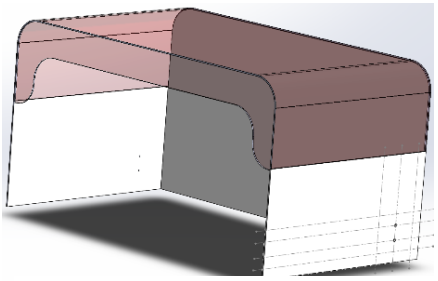

Fig 1. *CAD model of prototype*

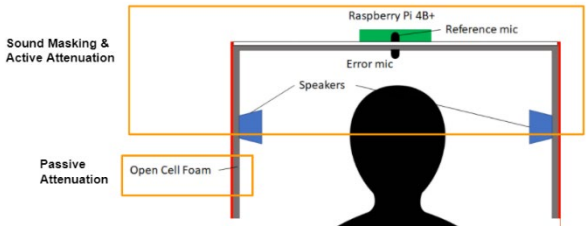

Fig 2. *High level overview of prototype*

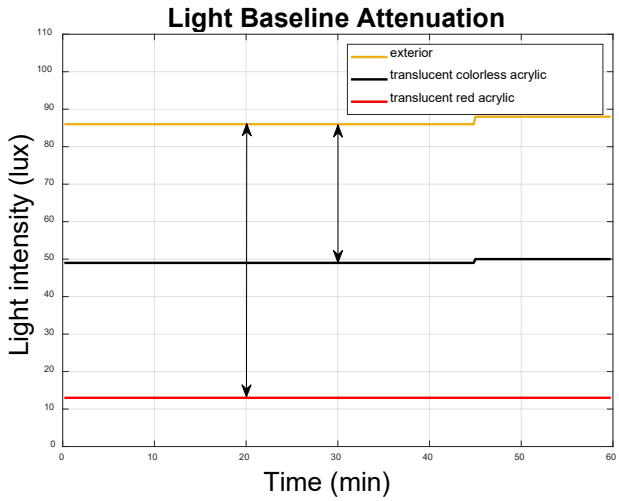

Fig 2. *Ambient lux attenuation*

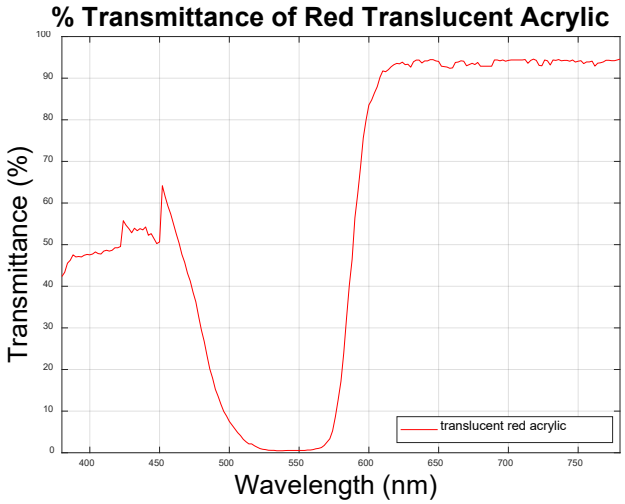

Fig 4. *Average % transmittance*