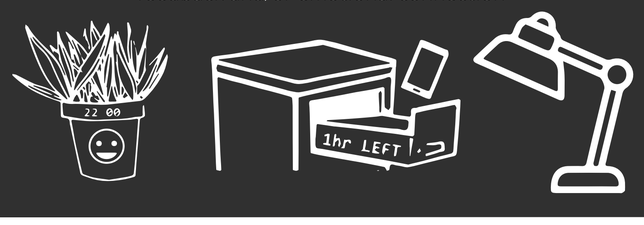
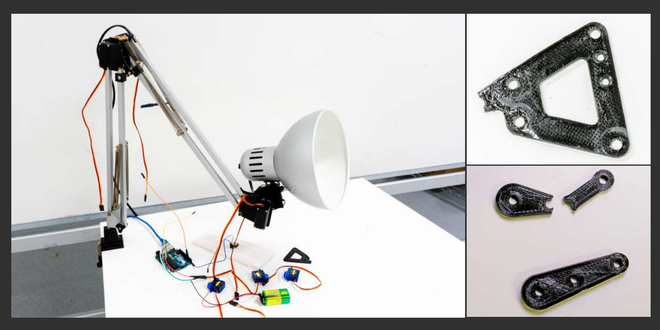
PROJECT JOURNEY.

IDENTIFY
Observing the campus environment, particularly hostel rooms, lead us to problems of sleep deprivation and study habits

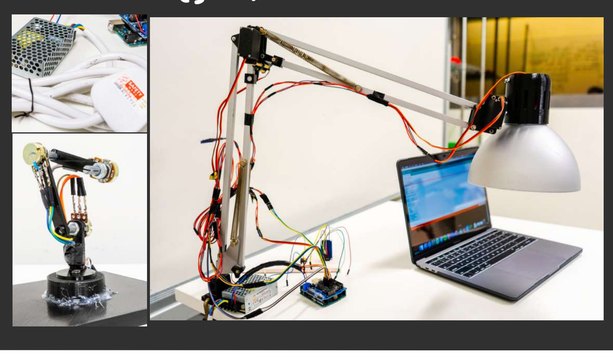
IDEATE
To integrate play, explored possible solutions with encouragement, negative reinforcement, feedback and/or emotional connection



FIRST ITERATION



SECOND ITERATION



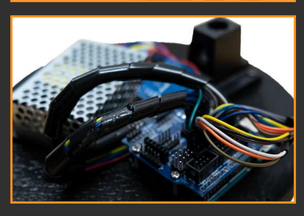
AT PLAY.

When you are tired, lampaholic will ...

Dozing off — **Point to the bed** — **Sleep**

COMPONENTS.

Lifelike Gestures
Reflect user's fatigue level and encourage interaction.



Compact Base
Stores all electronics and has clamp attachment included.

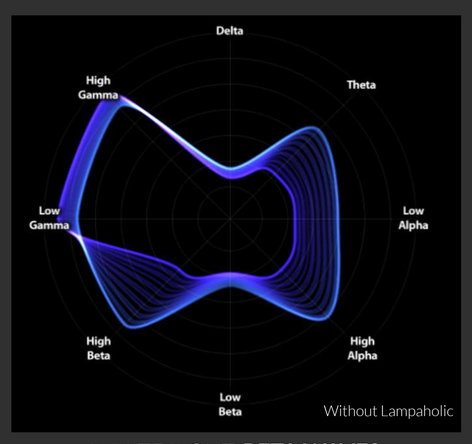
Adjustable Colour Temperature
Creates comfortable work environment and has sleep inducing effect.

VALIDATION.

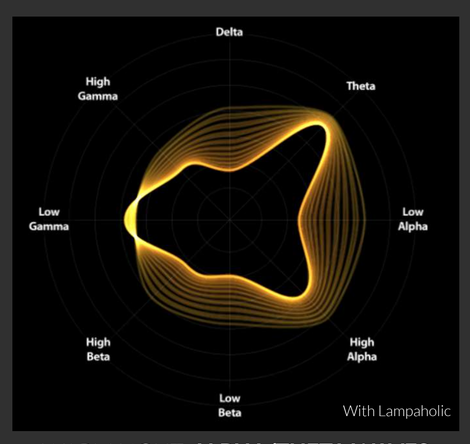
85% of our respondents say that they will use our product

Time-average of **5** minutes for assembly

17 out of 20
say gestures are life-like

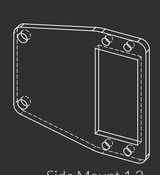


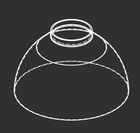
WHITE LIGHT: **BETA WAVES**
Indicate normal alertness



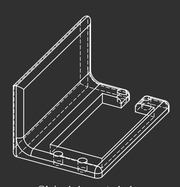
WARM LIGHT: **ALPHA/THETA WAVES**
Indicate relaxed mood

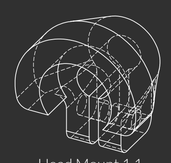
PROTOTYPING PROCESS.

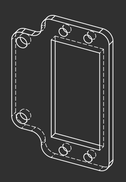

Side Mount 1.2

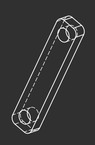

Bottom Shade

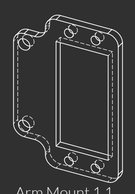

Top Shade 1.1


Side Mount 1.1

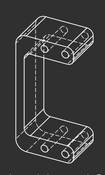

Head Mount 1.1

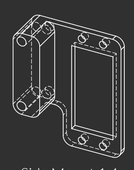

Side Mount 1.3

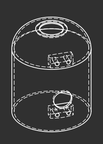

Right Mount

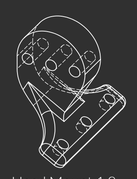

Arm Mount 1.1

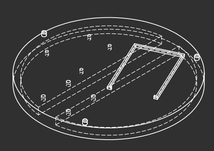

Top Shade 1.2

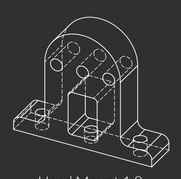

Arm Mount 1.2

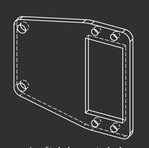

Side Mount 1.4

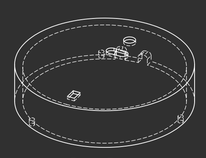

Top Shade 1.3

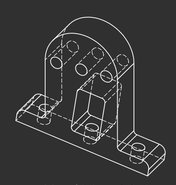

Head Mount 1.2


Base

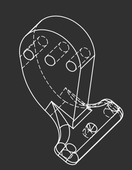

Head Mount 1.3

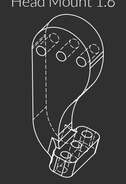

Left Mount 1.1

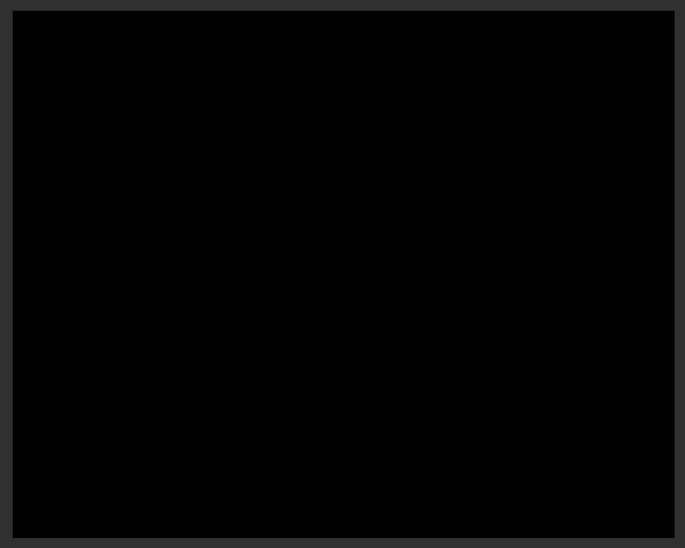

Base Cover


Head Mount 1.4


Head Mount 1.6


Head Mount 1.5


Head Mount 1.7



MATH

SLEEP DEPRIVATION AND GRADE

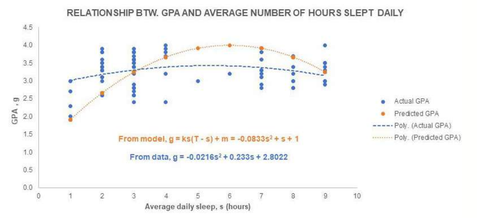
Singapore is the third most sleep-deprived city in Philip's 2019 edition of "The Global Pursuit of Better Sleep Health". Moreover, high-school and university students represent the most sleep-deprived group of the population. This is despite being aware of the detrimental effects of sleep deprivation on their health and work performance.

To support our choice of project problem, we decided to model the impact of sleep on academic performance. Our objective was to determine the relationship between average daily sleep (s) that university students get for a term and their GPA (g) for that term, and hence determine the average daily sleep for highest GPA. Primary assumptions include that all students have 12 hours of free time (T) which they utilise only for sleeping or studying and that they have the same sleep quality, studying efficiency and level of motivation.

The model uses a 4.0 GPA scale, from 0 to maximum GPA (M) of 4.0, but we assume that a student can attain a minimum GPA (m) of 1.0 equivalent to pass by doing work only during class hours. Average daily sleep ranges from 2 to 10 hours because averaging a lower or higher number of hours of daily sleep is not realistic for a person to properly function or for academic performance, respectively. Average daily study (w), consequently, also ranges from 2 to 10 hours based on our primary assumption about utilisation of free time.

GPA is a metric for academic performance, particularly on assessments. Assessments are generally cognitive tasks which require you to have knowledge and the ability to concentrate. GPA must then logically be directly proportional to both, s and w. The GPA is adjusted by a scaling factor (k) which is the ratio of the possible range of GPA (M-m) to the squared value of s at which GPA attains maxima (for our model, s=6). Using this model, a quadratic relationship is established between GPA and average daily sleep for a term.

To test our model, we plotted the quadratic regression graph of g versus s for 75 students1. The mean absolute error of our model is 0.25 when we compare our modelled GPA to the actual data. Furthermore, the average daily sleep to attain the highest GPA is found to be 6 hours which coincides with the lower limit of recommended sleep for young adults. However, our model fails to account for anomalies arising due to medical issues, sleeping environment and/or stimulants. To gain deeper insights about the impact of sleep, the model can be improved by including other important factors like consistency in sleep schedule and sleep pattern.



PHYSICS

PROBLEM STATEMENT

Due to the addition of the motor and a new lamp shade design, the weight of the front of the lamp differs from the original angle poise lamp which results in a need of a different spring. However instead of varying the type of spring, we decided to vary the distance between each anchor of each spring to vary the extension of the spring for any given position the lamp is in.

Measuring Spring Constant of Zero Free Length Spring

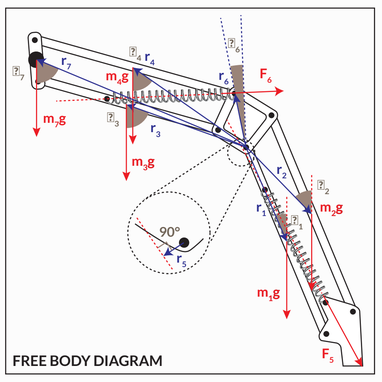
According to Hooke's Law, X metres is the extension of the spring once known mass of 50g to the free end of the freely suspended spring.

$k_{spring} X = mg = Nm^{-1}$

$k_{spring} = (0.050*9.81)/0.163 = 3.0Nm^{-1}$

Assumptions:

1) The moment due to the weight of the trapezium support to be negligible since both weight of the support is small and the distance from the pivot A and its centre of mass is small too.
2) Do not take into account of the motor mounts which off side the trapezium support.
3) Assume the mass of the whole lamp shade and its component, mass 7 to be concentrated at the black dot as seen in the image.
4) Pre-set the value for the distance between the anchors for the two bottom spring



Taking moments about Pivot A, for translational equilibrium,
where $r_1 = 0.182m$, $r_2 = 0.152m$, $r_3 = 0.196m$, $r_4 = 0.201m$, $r_5 = 0.0055m$, $r_6 = 0.044m$, $r_7 = 0.374m$, $\theta_1 = 8.6°$, $\theta_2 = 14.7°$, $\theta_3 = 82.1°$, $\theta_4 = 73.2°$, $\theta_5 = 90°$, $\theta_6 = 37.3°$, $\theta_7 = 79.7°$, $x_5 = 0.140\,m$, $g = 9.81ms^{-2}$, $m_{1,3} = 0.1kg$, $m_{2,4} = 0.07kg$, $m_7 = 0.31kg$, $k_{spring} = 2.50Nm^{-1}$

$$g(r_1 m_1 \sin\theta_1 + r_2 m_2 \sin\theta_2) + 2F_5 \sin\theta_5 + 2F_6 \sin\theta_6 = g(r_3 m_3 \sin\theta_3 + r_4 m_4 \sin\theta_4 + r_7 m_7 \sin\theta_7)$$

$$\tfrac{1}{2} g[(r_1 m_1 \sin\theta_1 + r_2 m_2 \sin\theta_2) - (r_3 m_3 \sin\theta_3 + r_4 m_4 \sin\theta_4 + r_7 m_7 \sin\theta_7)] + k_{bottomspring} x_5 \sin\theta_5 = -k_{topspring} x_6 \sin\theta_6$$

$$x_6 = \{\tfrac{1}{2} g[(r_1 m_1 \sin\theta_1 + r_2 m_2 \sin\theta_2) - (r_3 m_3 \sin\theta_3 + r_4 m_4 \sin\theta_4 + r_7 m_7 \sin\theta_7)] + k_{bottomspring} x_5 \sin\theta_5\} / (-k_{topspring} \sin\theta_6)$$

$$x_6 = \{4.905[(0.0027215 + 0.0026700) - (0.019414 + 0.013469 + 0.11407)] + k_{bottomspring} 0.140\} / (-k_{topspring} \sin\theta_6)$$

$x_6 = 0.150m$ and $x_5 = 0.140m$

INSTRUCTION

← Folding line

← CUT LINE

← BLEED
(Where to put your poster)

Compulsory to have at least one table texture

Cut along this line

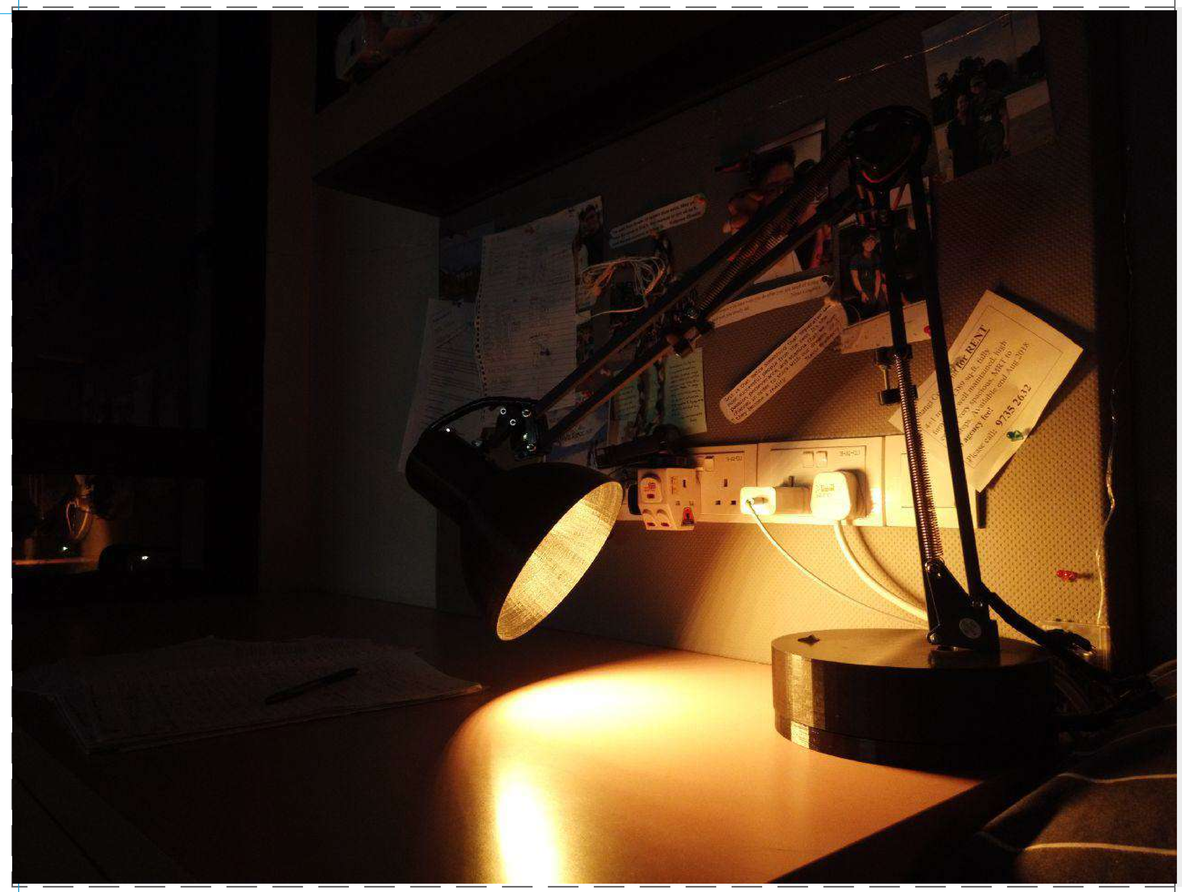
Cut along this line

Cut along this line

← Folding line

← Folding line

← Folding line



AT PLAY 2.0

PROJECT LAMPAHOLIC

Sleep deprivation is detrimental to health and academic performance yet students work long hours into the night. **LAMPAHOLIC** recognizes the lack of a system which forces students to acknowledge their level of fatigue. Hence , it integrates a feedback mechanism with the desk to detect the user's fatigue and responds with playful interaction.

Designed to adjust colour temperature and execute gestures like dozing or stretching, **LAMPAHOLIC** creates a comfortable work environment and encourages an emotional connection with the user. As your smart companion, it intervenes in your vicious work cycle by reminding you to not compromise sleep.

F08-05

INTRODUCTION TO DESIGN

FACULTY
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Deniz Manisali Leba

COHORT 08
TEAM 05

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Samuel Sim Wei Xuan

2019