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# How can the effects of insomnia be mitigated without the use of medication?

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Insomnia : effects and prevention

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8/12/2015



## **Abstract**

### *Insomnia: effects and prevention*

What are the key areas, tasks and ideals that need to be addressed when attempting to aid a person suffering from insomnia and how can it this done without the use of medication?

06/11/2015

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### *Research for Design and Reflective Practice*

M154ID – Research for Design and Reflective Practice

#### *Abstract*

The UK is tired, with over 50% of the population getting less than the recommended 7-9 hours of sleep per night. This is having serious effects on the effectiveness and safety of our country, work places and driving around the UK are becoming increasingly dangerous due to the effect the lack of sleep has on the human body.

Professional interviews, focus groups and questionnaires were used to gain a wide breath of knowledge, exploring the NHS's treatment options as well as insomnia sufferers' own actions. The foremost issues affecting the subjects' were their attitudes towards sleep and the effects the surrounding environment had, with adverse sound, temperature and light playing the key roles in the inability to get to sleep. Ultimately this report concludes that a device that can induce a discreet method of suppressing these primary adverse environmental effects will help a user transition into sleep. Furthermore by encouraging and promoting the actions of healthy sleeping this will aid with the UK's issue of lack of sleep and reduce safety issues due to tiredness.

#### *Keywords*

Insomnia, Sleep deprivation, Sleep Environment, Treatments, Design Specification

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## Glossary

REM	Rapid Eye Movement
Non-REM	Non-Rapid Eye Movement
Neurotransmitter	Chemicals in the brain that relay signals
Cerebral Cortex	The outer layer of the brain
Neurons	A specialized cell transmitting nerve impulses
Ventrolateral preoptic area (VLPO)	A group of sleep-active neurons
Melatonin	Hormone that anticipates the daily onset of darkness
Millennial generation	Generation born from 1980 - 2000

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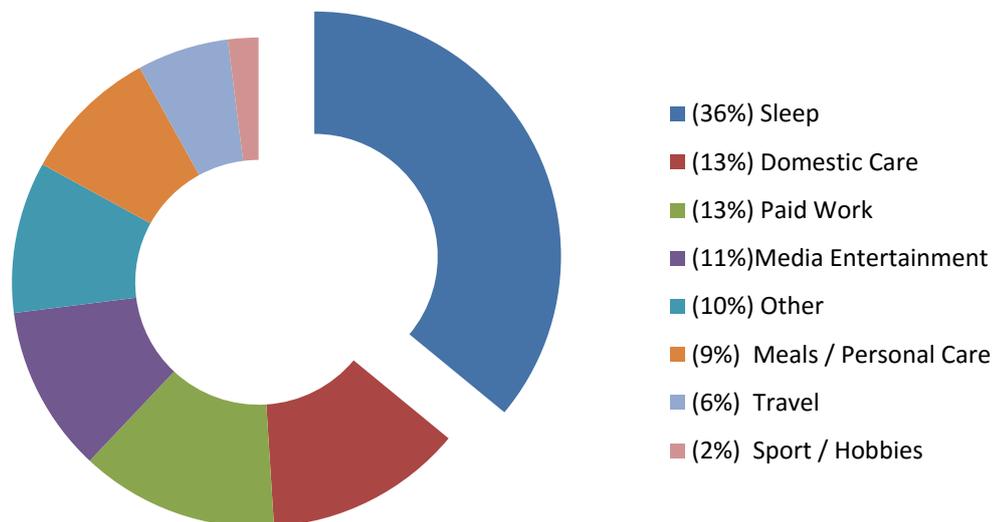
*Figure 4. Generalised scenario for some insomnia sufferers (Wilde, 2015)*

## Summary

### *Exploring the problem*

Sleep takes up a large amount of our living life; almost one third of our time on this planet is spent sleeping (Lader, 2005). Traditionally it was thought that sleep was a state where the brain activity would reduce and encourage recovery of the rest of the body; however sleep has turned out to be one of the brains most active times. More recent research in sleep has turned over some fairly interesting facts about sleep, not only does it help the body to physically recover but also aids with our ability to remember, understand and learn; control and regulate our hunger patterns and increases alertness and creativity (Siegel, 2005).

*Figure 1. Graph to show the percentage of time spend on different activities in the UK [population]. (Lader, 2005)*

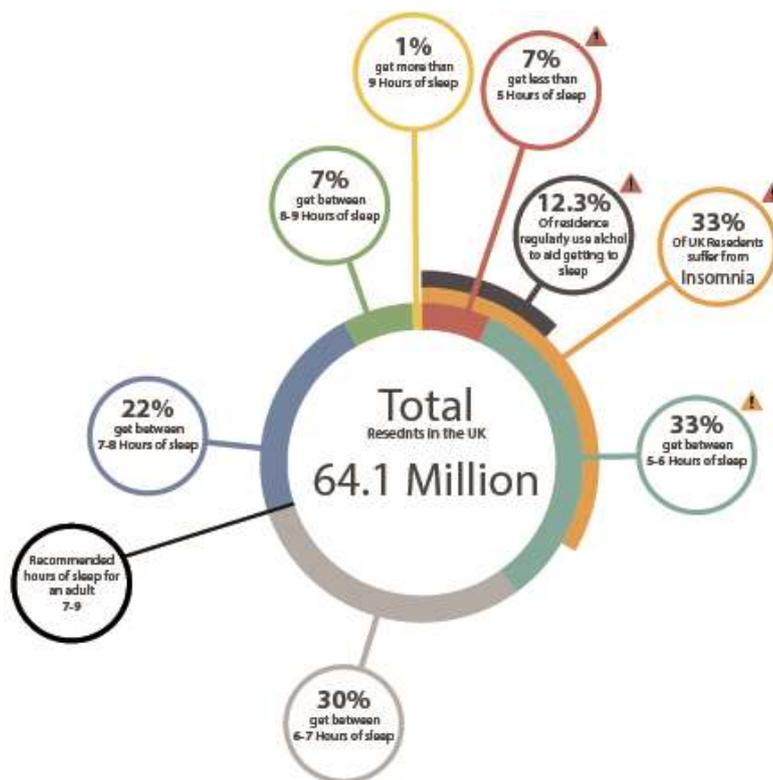


A full understanding of how our brains control sleep has not been established, scientists however have located key areas and actions of the brain that seem to have a large influence on our ability to sleep. Simply put, when we are awake neurons stimulate the cerebral cortex and arousal centres in brain keeping the brain in an alert state. When our body switches to sleeping conditions neurons in the ventrolateral preoptic area (VLPO) release neurotransmitters reducing the activity in the arousal centres, causing us to pass into NREM sleep (CB Saper, 2001). For different stages of sleep and their differences see appendix 1.2.2.

### *The Problem*

With 30% of the population suffering from some level of insomnia and many getting less than 5 hours sleep a night this is having serious effects on the effectiveness and safety of our country (National sleep foundation, 2005) (The sleep council, 2013). UK statistics suggest that around 20% of major road accidents are due to lack of sleep (Gov.UK, 2015). This is hardly surprising as “moderate sleep deprivation produces impairments in cognitive and motor performance equivalent to legally prescribed levels of alcohol intoxication” (Williamson, 2000). Reducing our decision making and reaction time people as well as work places (specifically labour intensive jobs) are at higher risk of injury. “Countries should consider developing standards for fatigue to ensure that people who have had 18 hours or longer without sleep are kept from high-risk behaviour such as driving, piloting aircraft or operating machinery” (Williamson, 2000).

Figure 2. Infographic displaying the number of hours we sleep in % (Wilde, 2015) (The sleep council, 2013)



Unfortunately insomnia can affect any one at any age. Most people will suffer from acute insomnia at some point in their life; this is because it has so many potential causes. Medical examples include: Sinus allergies, arthritis, asthma, chronic pain and neurological conditions (e.g. Parkinson’s disease). Physiological issues such as anxiety and depression can also be triggered by lack of sleep and worsen if it is a standing condition (National Sleep Foundation, 2014). More common causes are lifestyle and food diets. A stressful day, jet lag or caffeine too late in the day can cause people to stay awake at night but people with chronic insomnia might find that it’s down to the brain being over stimulated by environmental factors such as a certain colour of light, noise or physiological issues such as depression and/or anxiety. (Chanin, 2014)(Appendix 1.4.6)

## Treatments and effects

There are currently a collection of ideas, practices and medications that help with both acute and chronic insomnia. Many people believe the most assertive and simple solution is using sleeping pills. Doctors (information gained via email interview with GP, Dr Hale) are however reluctant to use this method and it is often a very last resort; potentially becoming addictive and, as they are used, the body develops immunity to the pills slowly reducing their effect until they are redundant (Appendix 1.4.6). As mentioned earlier neurons stimulate the brain, medicated pills help block the stimulation allowing for an easier transition into sleep, **this is not a cure from insomnia**, it is purely a method to diminish the effects of insomnia in the short term.

Fundamentally the most important thing to do when treating insomnia [From a medical view] is to identify the cause; this is not always a medical issue. Non-medical treatments include people looking into their lifestyles and ensuring they have a haven for sleeping “restful, dark and [How] quiet their bedroom is, including the need for a good bed!” (Hale, 2015). These can also include therapy sessions that encourage behavioural changes, relaxation training and even sleep restriction to help reset the circadian clock.

Table 1. Displaying the conclusions from each environmental effect researched.



1. Light mainly affects the lead up to sleep and how much it stimulates the brain. Light influences the level of the hormone melatonin in the body which help control the sleep and wake cycles. High intensity of light early in the day will increase melatonin levels as long as the intensity decreases throughout the day. Ideally no light at night would result in the best sleep, however if it is necessary, a dim red light would keep the disruptive effect of light to a minimum, whereas exposure to blue (especially LED) has the most disrupting and stimulating effect. (Appendix 2.1.3)



2. Sound mainly affects the ability to transition into sleep and the first two stages of lighter sleep (Appendix 2.2.0). A manifestation of white noise, “noise whose amplitude is constant throughout the audible frequency range” (Sleep Junkies, 2014), would increase the tolerance baseline during sleep. Reducing the likelihood of being woken due to sound peaks. (Appendix 2.2.1)



3. Body temperature drops while falling asleep to help transition into sleep. So by having a cooler room or by having cooling bedding it helps the body do its job of staying cooler. The increase in body temperature is one of the processes that our body undertakes to help us wake up naturally. A product that aids with this process or at the very least, does not add negative effect, could important when designing a sleeping aid. (Appendix 2.3.0)



4. Air quality is less fundamental to the sleep process compared to the others. Clean air will help someone stay asleep and not disturbed them by interrupting their breathing pattern while asleep. In some cases the increase of air pollution in summer months was enough to increase the risk of people completely stopping breathing for up to ten seconds at a time during sleep (IQAir, 2015). Due to the size, cost and complication of air filtration systems this technology would limit the ability to design in other technologies; in response to this the idea to have an air quality monitor would help keep tabs on the sleeping environment and would encourage action by the user. (Appendix 2.4.0)

Few products currently exist that help suppress multiple environmental stimuli in addition to aiding with relaxation and the promotion of sleep. Four different environmental factors were researched and how they affect sleep, this was done to help gain an understanding of the current technology and procedures that influence sleep (Appendix 2.0.0).

### Profiling of users

With the millennial generation so interested in healthy living many people are eating better, exercising more and more aware of medical implications than previous generations. (Appendix 3.1.1) Sleep, one of the most important factors to leading a healthy lifestyle, is viewed in a very diverse way, especially between sufferers and non-sufferers of insomnia. Results from questionnaire (Appendix 1.1.6) (0% = very poor, 100% excellent)

Figure 3. A visual comparison of the attitude towards sleep. (Wilde, 2015)



People who suffer from insomnia have a worse attitude towards sleep and often see it as a chore that has to be complete, whereas non-sufferers are more welcoming and embrace sleep.

Interviews with insomnia sufferers pulled some interesting data about their routines and processes when coming up to, preparing for and attempting to sleep. (Appendix 3.3.0) These further allowed for the development of personas to help create a design brief and specification. In this process a scenario was created to visualise the struggles of some of the sufferers and at what point they resorted to using medication.

Note: many [Of the people interviewed in this study] really disliked the idea of using medication and found it frustrating not being able to control their own sleep pattern.

Figure 4. Generalised scenario for some insomnia sufferers (Wilde, 2015)



### Conclusion

The design specification (Appendix 4.4.0) was crafted using the combined conclusions of qualitative and quantitative data. Tailoring a list of design fundamentals and recommendations that will aid with designing a discrete method of suppressing or reflecting the primary environmental effects (light, sound, temperature and air quality) that will help a user transition into sleep. It is very important to have a device that effectively communicates with the user as to provide data to track and monitor their sleep progression. The conditions can always be improved to create a haven for sleep, however the product has to also encourage and promote the actions of healthy sleeping as the attitude towards the sleep process by insomnia sufferers has to be radicalised to will aid with the UK's issue of lack of sleep and increase safety due to tiredness.

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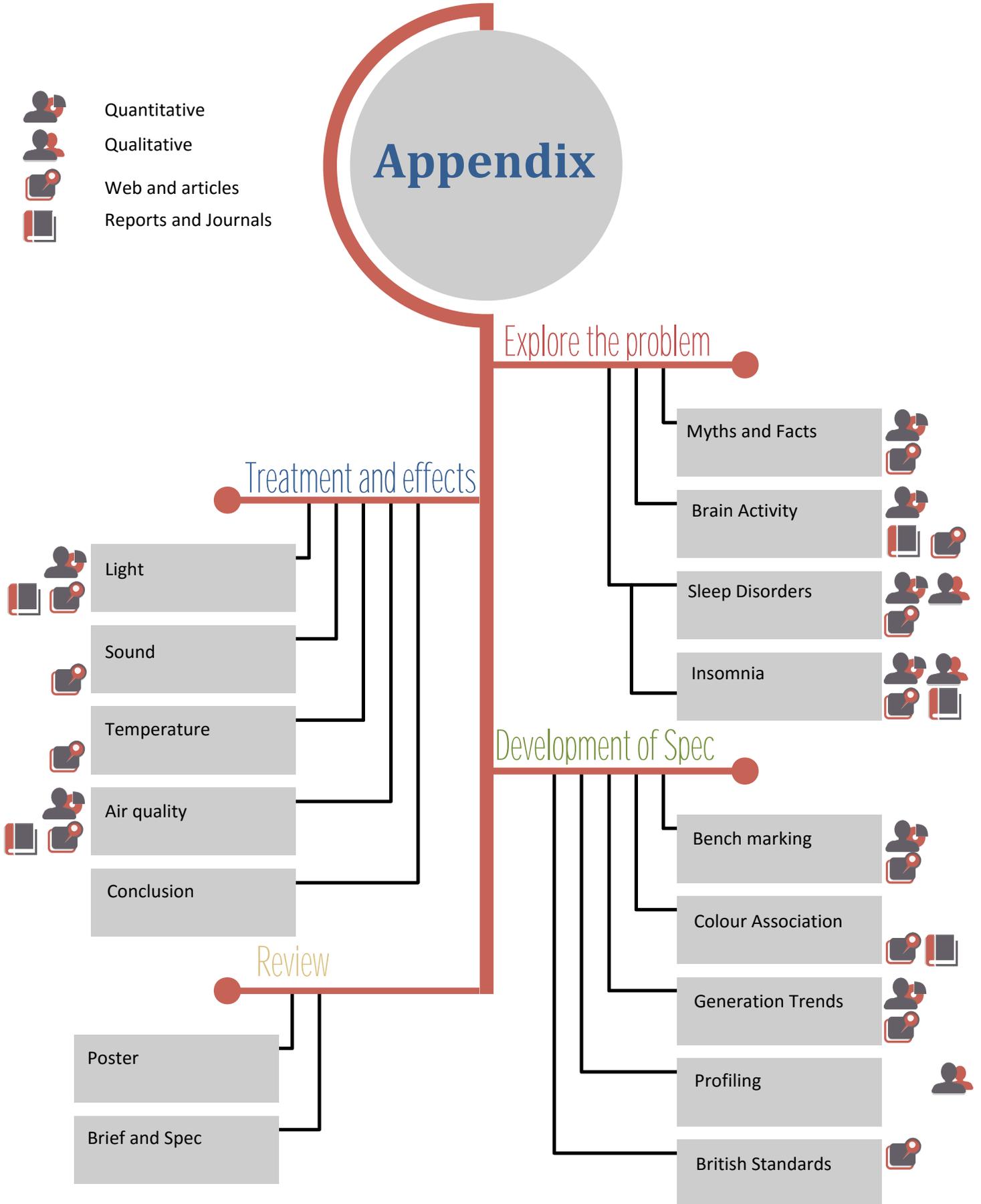
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-  Quantitative
-  Qualitative
-  Web and articles
-  Reports and Journals

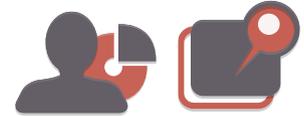
# Appendix



# I | Explore the problem

## I.1 Sleep: social view, Myths and Facts

02/11/2015



### *Aim*

As mammals sleep is an integral part of our life. This section aims to create a plot of statistics on the UK sleep population. Furthermore identify the facts surrounding sleep covering how the attitude towards sleep has changed over time, including how and why the social convention of sleep is the way it is.

### *Objectives*

1. Gather a selection of academic and social reports. This includes UK statistics, recommended sleep durations and facts about sleep.
2. Produce a questionnaire that is aimed to gain an understanding of people's perception of sleep and their reaction when presented with sleep concepts.
3. Compile a review of results
4. Draw a conclusion as to how the social aspects of sleep would affect a product.

### *Strategy*

News websites along with Gossip Mags will be used to gain an understanding of social trend on sleep. After these have been pulled together Coventry University library database (Locate) will be used to gather a number of academic papers and cross reference findings. The use of a questionnaire will then create an immediate population sample for different age demographics. A conclusion will then help with strategizing a further design specification.

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### 1.1.1 Sleep and time

With sleep taking up on third of an average life, sleep is the single largest time use of our lives. With the average life expectancy in the UK being 81.50 (as of 2012), 10,106 days or 27 years of our lives are spent asleep.

Figure 1. Graph to show the percentage of time spend on different activities in the UK [population]. (Lader, 2005)

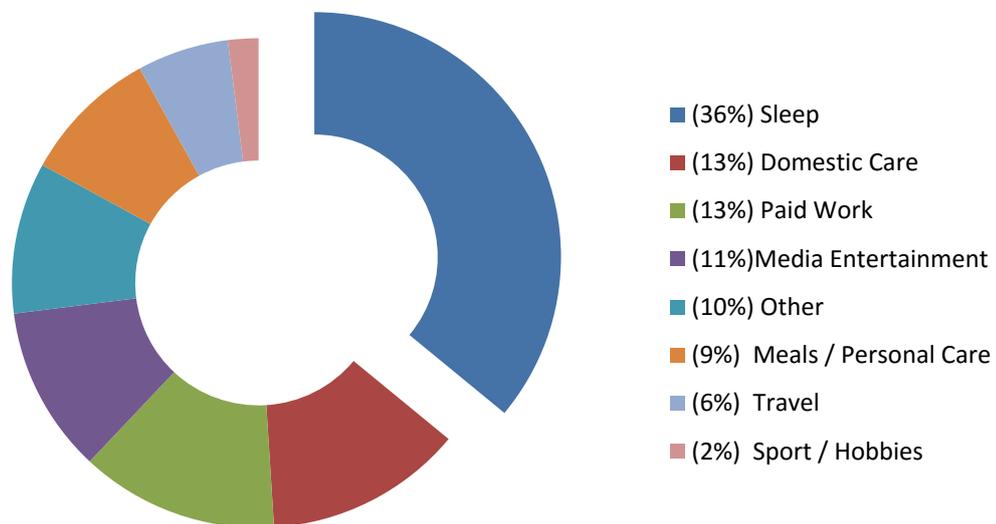


Table 1. Table to show the recommended sleep lengths for different age groups (Hirshkowitz, 2014)

<i>Age</i>	<i>Recommended</i>	<i>Not Recommended</i>
School aged Children 6 – 13 y	9 - 11	Less than 7 More than 12
Teenagers 14 – 17 y	8 - 10	Less than 7 More than 11
Young Adults 18 – 25 y	7 - 9	Less than 6 More than 11
Adults 26 – 64 y	7 - 9	Less than 6 More than 10
Older Adults 65 < y	7 - 8	Less than 5 More than 9

### 1.1.2 Social convention of sleep

Over the last several centuries sleep has come and gone out of fashion. With influential people making comments, voicing opinions or simply projecting it through art, the topic of sleep has, until recently, not been fully understood. Often depicted in Shakespearean plays as a peaceful wonderful thing then slated and insulted by Thomas Edison and more recently making a popular come back .

*“O sleep! O gentle sleep! Nature’s soft nurse “ (Shakespeare, 1600)*

*“I never really understood why people sleep, wasting a third of your life & becoming vulnerable for almost 8 hours every night doesn’t seem appealing to me...” (Banksy, n.d.)*

However sleep is making a comeback. With generations becoming more health conscious, sleep is recommended to help with weight loss and reduce hunger cravings (see appendix XX). There are also falsified situations, for example it may be “cooler” for teenagers to sleep in a long time, waking up late in the afternoon, however the counterpoint to this is the fact that very often the same teenagers will stay up late on their phones or computers looking at their screen causing the issues already highlighted above.

### 1.1.3 Sleep Myths and Facts

1. During sleep, your brain rests (False)

The body relaxes allowing for cell recovery; however the brain remains active. Sleep can promote learning, memory and there is also a correlation to the amount of sleep someone gets and their ability to be creative or solve solutions.

2. Older people need less sleep (False)

Older people experience more disturbed sleep; this is mainly due to underlying health issues where their circadian rhythms (Appendix 2.1.1) change, but more elderly people will benefit from a good night’s sleep as much as they would have when they were younger.

3. Drinking alcohol will give you a better night’s sleep (False)

Alcohol, being natural sedative, helps block stimulation centres in the brain and will help subjects fall asleep quicker. However as the alcohol is metabolised the level of sleep becomes gradually lighter and the chance of being woken up is increased.

4. Early to bed, early to rise, makes a man health, wealthy and wise. (False)

Made famous by Benjamin Franklin this ditty suggests that an early start contributes to attributes such as healthy and wisdom. However the population is divided into both larks, whose mental performance is greater in the morning, and owls, who perform better in the later hours of the day. (Appendix 1.1.4)

5. Teenagers are lazy and love lying in bed (False)

During puberty a 2-3 hour delay of the circadian rhythm occurs, known as “sleep phase disorder” and naturally encourages later sleeping and waking times. There is very recent work on this and some schools are considering starting in the afternoon and going on into the evening (Suarez, 2015). Also because of the sudden increase in hormones the body reacts and requires more sleep meaning teenagers tend to need around 9-10 hours of sleep over the average 7 – 8 for most adults.

(Sleep Junkies, 2014)

### 1.1.4 Owls and Larks

Owls and larks are the names used to describe whether a person best functions in the morning or the late evening. These are the extreme cases, as around 10% of people are considered larks and 20% are owls the rest of us fall somewhere in the middle with tendencies towards a certain direction. “Your owl or lark status is called your Chrono type” (Jessica Rosenburg, January 2014) who then goes on to further explain that studies done in this field seem to suggest that Owls experience poorer sleep and more fatigue throughout the day.

### 1.1.5 Sleeping positions

Figure 2. Basic chart to show the different styles of sleeping that the majority of people fit into. (BBC, 2003)

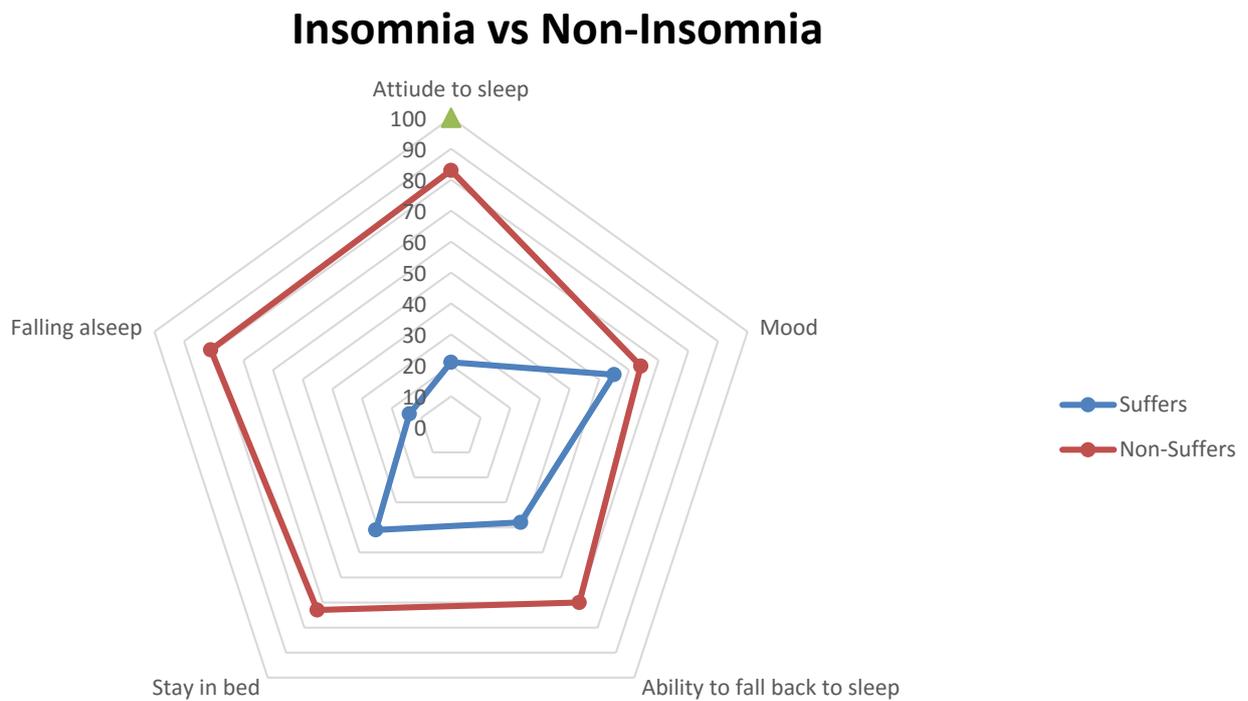


There have been some reports that have linked the sleeping position to a particular type of personality. (schredl, 2002) However these reports are not often accepted by the physiological community but they do give an interesting look at the number of people sleeping in different ways.

### 1.1.6 Results from questionnaire

A questionnaire was produced to gain a sample of data about the feelings and attitudes that people had towards sleep. 45 questionnaires were returned but three had to be annulled because of invalid results. (0% = very poor, 100% excellent)

Figure 3. Graph to show the relation between participants: 42 (author 2015)



### 1.1.7 Conclusion

The supporting statistics show that sleep takes up a huge amount of time in the average life. Data on the recommended amount of sleep, outlying the specific ages and at what point too much or little sleep is unhealthy, has been gathered. This gives a functional requirement for a product in that it should enable a user to sleep up to, and ideally over, six hours but does not allow the user to sleep for longer than eleven.

## 1.2 Sleep: Brain activities

06/11/2015



### *Aims*

Explore the fundamental physiology of how the brain effects and controls our sleep. Outlining the area of the brain that stimulates the awake and sleep cycles and creating definitions of the different stages of sleep further making a list of processes that are influenced by the brain and sleep.

### *Objectives*

1. Use academic reports to create a literature review on the brain in conjunction with sleep
2. Further explore medical journals to create a list of questions
3. Use these questions to interview an expert in the field.
  - a. Cognitive
  - b. Medical expert
4. Create a conclusion to identify the key areas that need to be tackled to create a product from a medical perspective.

### *Strategy*

Scientific and medical databases will be used to build a selection of journals and reports. This will help create a short report that will then be used in a review with an expert to confirm, explain and explore information to do with sleep and the brain.

### *References*

Sleep medicine at Harvard Medical school, 2007. *Arousal centres in the brain*, Boston: Harvard Medical School.

Morton, K., 2015. *Sleep Deprivation*. [Online]

Available at: <http://www.end-your-sleep-deprivation.com/stages-of-sleep.html#graph>

[Accessed 11 11 2015].

Dement, W., 2006. *The Stanford sleep book*. 5th ed. s.l.:Independent Publisher.

Holistic online, 1998 - 2007. *Holisticonline.com*. [Online]

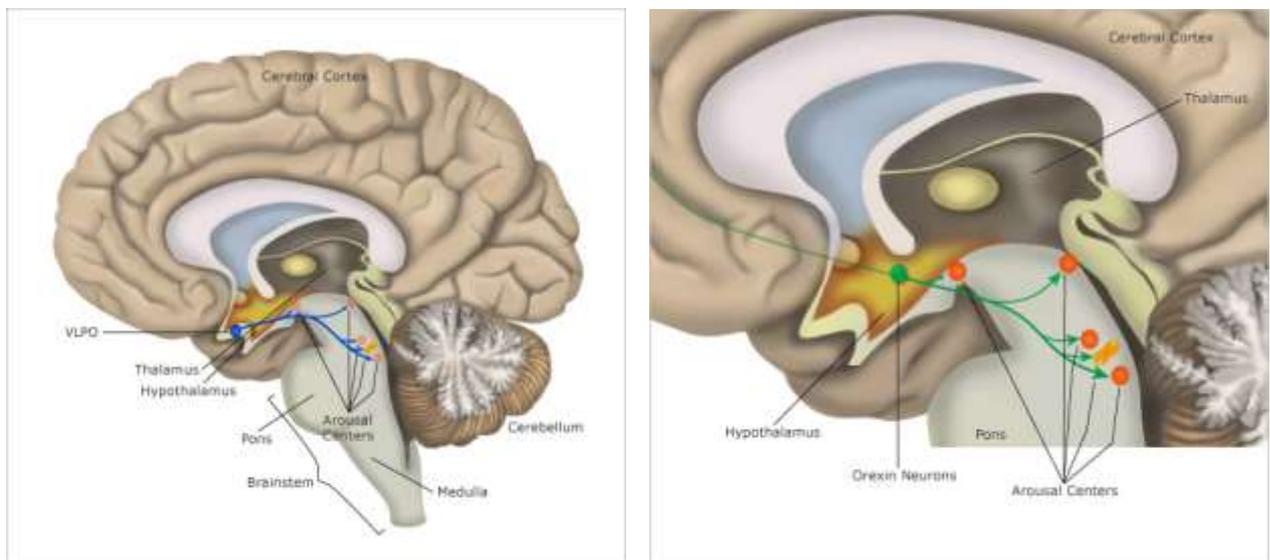
Available at: [http://www.holistic-online.com/remedies/sleep/sleep\\_stages-1-4NREM.htm](http://www.holistic-online.com/remedies/sleep/sleep_stages-1-4NREM.htm)

[Accessed 09 11 2015].

### 1.2.1 Brain stimulation

A full understanding of how our brains control sleep has not been established, scientists however have located key areas and actions of the brain that seem to have a large factor on our ability to sleep. Simply put, when we are awake neurons stimulate the cerebral cortex and arousal centres in brain keeping the brain in an alert state. When our body switches to sleeping conditions, neurons in the ventrolateral preoptic area (VLPO) release neurotransmitters reducing the activity in the arousal centres, causing us to pass into NREM sleep (CB Saper, 2001).

Figure 4 & 5. Diagram of the brain showing different areas and the arousal centres (Sleep medicine at Harvard Medical school, 2007)



### 1.2.2 Stages of sleep

During sleep the body experiences two different behavioural states, distinguished by different levels during EEG scans. (Recently non-REM stages 3 and 4 have been combined into one stage) Non-REM usually takes of 75% of our sleep cycles and REM the other 25%

#### **Non-rapid eye movement: (non-REM)**

##### Stage 1:

This is the transition period from being awake to the other three stages of Non-REM sleep. It's a very light stage of sleep, easily woken and can often happen without the person being aware they have been asleep.

##### Stage 2:

At this point the blood pressure and heart rate decrease and it becomes increasingly hard to become woken up. Stage 2 is the largest percentage of most people's average night consisting of about 40-45% of their time asleep. This is still considered a type of light sleep.

Stage 3:

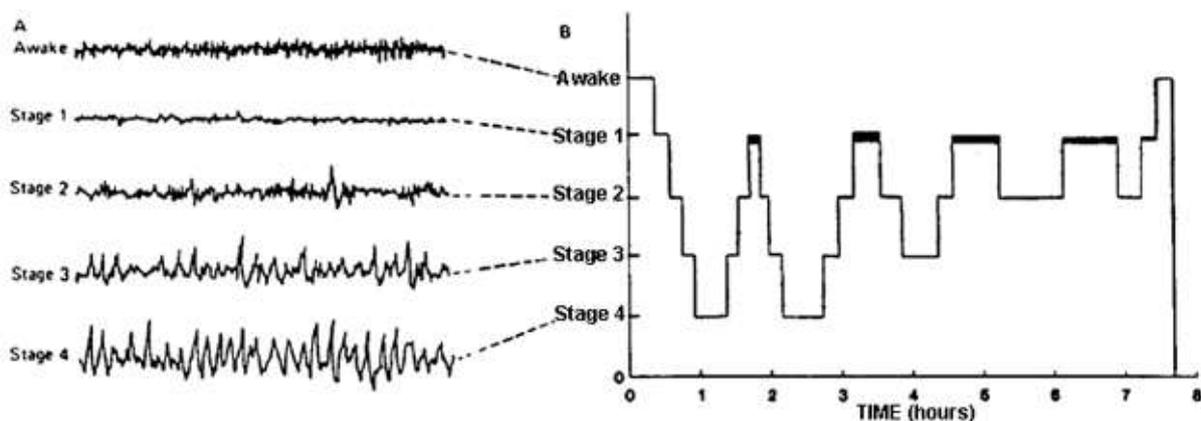
More recently stages 3 and 4 have been combined into one stage, stage 3. This is the start of deep sleep and brain waves are growing to maximum amplitude (see stage 4 figure 6). It is at this stage that REM sleep starts to occur.

### Rapid eye movement: (REM)

This is the stage where brain activity is at its highest during sleep. Because of this dreams are often induced at this stage and a result of this the fast flicker of our eyes. “The rapid eye movement for which REM sleep takes its name are a result of the brain trying to scan the events in the dream world” (Morton, 2015)

“The simplest definition for REM sleep is a highly active brain in a paralyzed body” (Dement, 2006)

Figure 6. Relation of EEG brainwaves to stages of sleep including the older edition of stage 4 (Holistic online, 1998 - 2007)



### 1.2.3 Conclusion

By understanding how our brain affects how we sleep, the information in this section allows conclusion to be pulled to give timings for effective use. For example, Understanding that Non REM stages 1 and 2 are the most likely times that people are going to wake during a cycles will allow for a product to actively work harder during this time to try and reduce the change of this happening.

Figure 7. Simplified infographic to visually display the stages of sleep

# WHY YOUR BODY LOVES SLEEP



Photo: Getty

Sources: National Sleep Foundation; U.S. Department of Health and Human Services; University of Rochester Medical Center; National Center on Sleep Disorders Research; Philip Gehrman, Ph.D., assistant professor of psychiatry, University of Pennsylvania

## 1.3 Sleep Disorders

08/11/2015



### *Aims*

To identify the most prominent sleep disorders that are affecting the UK. Produce and display statistics surround these to allow for an evaluation of any that could be selected and tackled. Use this to further identify the selected problem(s) and discover more in-depth information: Causes, effects and scenarios.

### *Objective*

1. Use UK statistics to identify the leading sleeping disorders.
2. Create a conclusion for the chosen problem(s)
3. Further discover and explore chosen problem(s)

### *Strategy*

The use of UK surveys will help create an overview on peoples sleep quality and with the use of a map will help determine the location and plot out an infographic to display data. Furthermore graphs or tables will help display the desired information. This will be done to help create visual data for the final analysis and report.

### *References*

Heffron, T., 2014. *Insomnia awareness day facts and stats*. [Online]  
Available at: <http://www.sleepeducation.org/news/2014/03/10/insomnia-awareness-day-facts-and-stats>  
[Accessed 08 11 2015].

The Telegraph, 2015. *The Telegraph*. [Online]  
Available at: <http://www.telegraph.co.uk/news/newsttopics/howaboutthat/11548379/Five-UK-places-where-people-are-getting-more-sleep-than-you.html>  
[Accessed 16 11 15].

WebMD, 2015. *WebMD*. [Online]  
Available at: <http://www.webmd.com/sleep-disorders/guide/sleep-disorders-symptoms-types>  
[Accessed 28 11 2015].

Sleepio, 2012. *The Great British Sleep Survey*, UK: Sleepio.

### 1.3.1 Are we getting enough sleep?

There is a lot of variation and inconsistencies on exact figures or percentages, but the general consensus is that the UK population is not sleeping enough. Around 50-55% of people will suffer from an episode of insomnia at some point in their adult life. 30-35% will just be a brief occurrence, 15-20% will have short-term insomnia. 10% have chronic insomnia. (Heffron, 2014)(for types of insomnia see appendix XX).

Below is one representation estimating the average amount of sleep in different towns and cities in the UK. Some of these figures are very worrying as a lack of sleep has a direct correlation to health problems, both not enough sleep causing health problems or health problems causing a lack of sleep. This picture shows an average mean, not just the people suffering from sleep deficiency.

Figure 8. Time of sleep rated in different areas of the UK (The Telegraph, 2015)

#### 5 places getting the most sleep



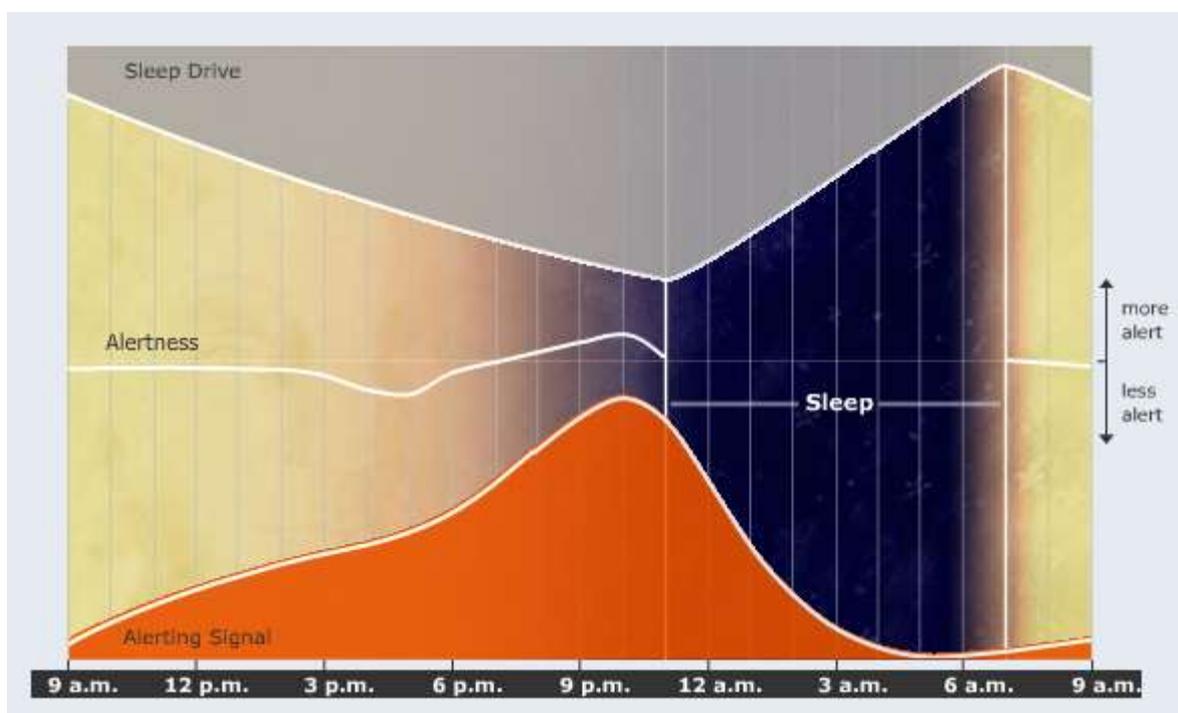
#### 5 places getting the least sleep



### 1.3.2 Sleep and our body clock

Humans are the only mammals to willingly delay sleep. From social activities to shift work humans delay or neglect sleep to complete additional tasks in a day after our body is telling us to go to sleep. Figure 9. Shows a standard sleeping cycles, with the Sleep Drive (The amount our body wants to sleep) and the Alerting Signal (The amount our brain is stimulated to keep us awake). The Alerting Signal is affected by many things, including energy from food, physical activity or even certain wavelengths of light.

Figure 9. Graph to demonstrate average sleep pattern (Harvard medical school, 2007)



The following two graphs show how the Sleep Drive and Alerting Signal go out of sync, (Figure 10. A late night),( Figure 11. Getting up for shift work). These are both screen shots from a video, the video explains in more detail the phase disruption.

Link to video

<http://healthysleep.med.harvard.edu/healthy/science/variations/jet-lag-and-shift-work>

Figure 10. Graph to show a skewed sleep cycle due to a late night. (Harvard medical school, 2007)

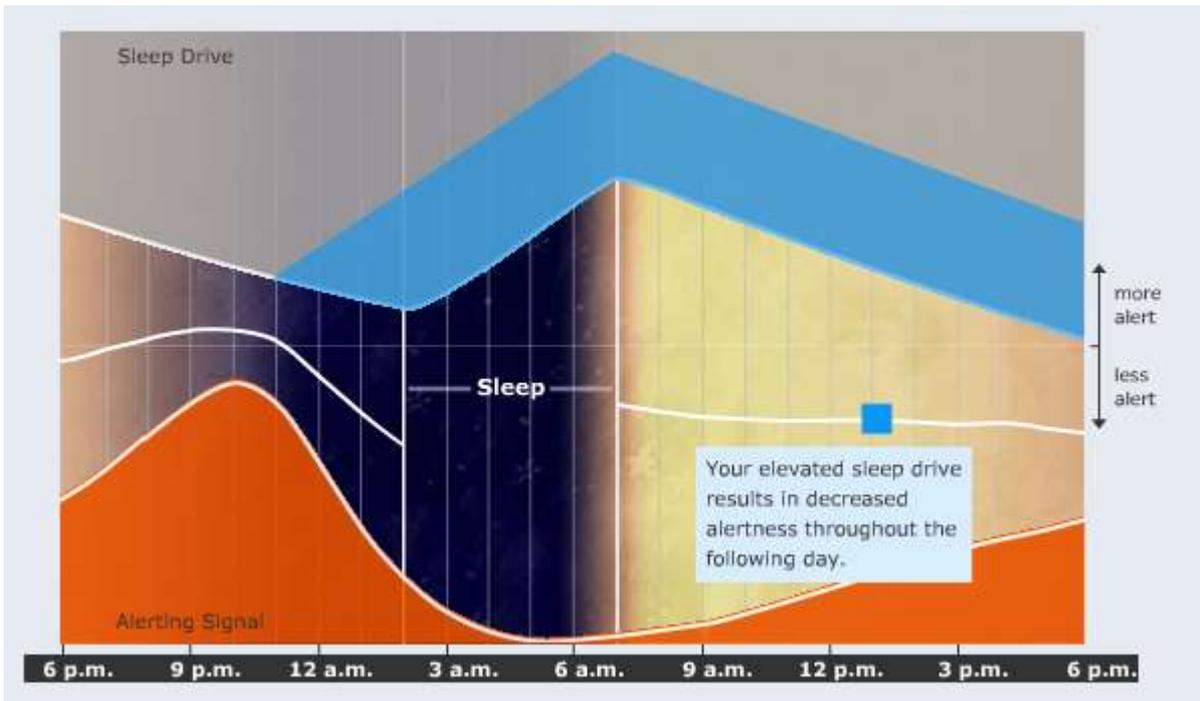
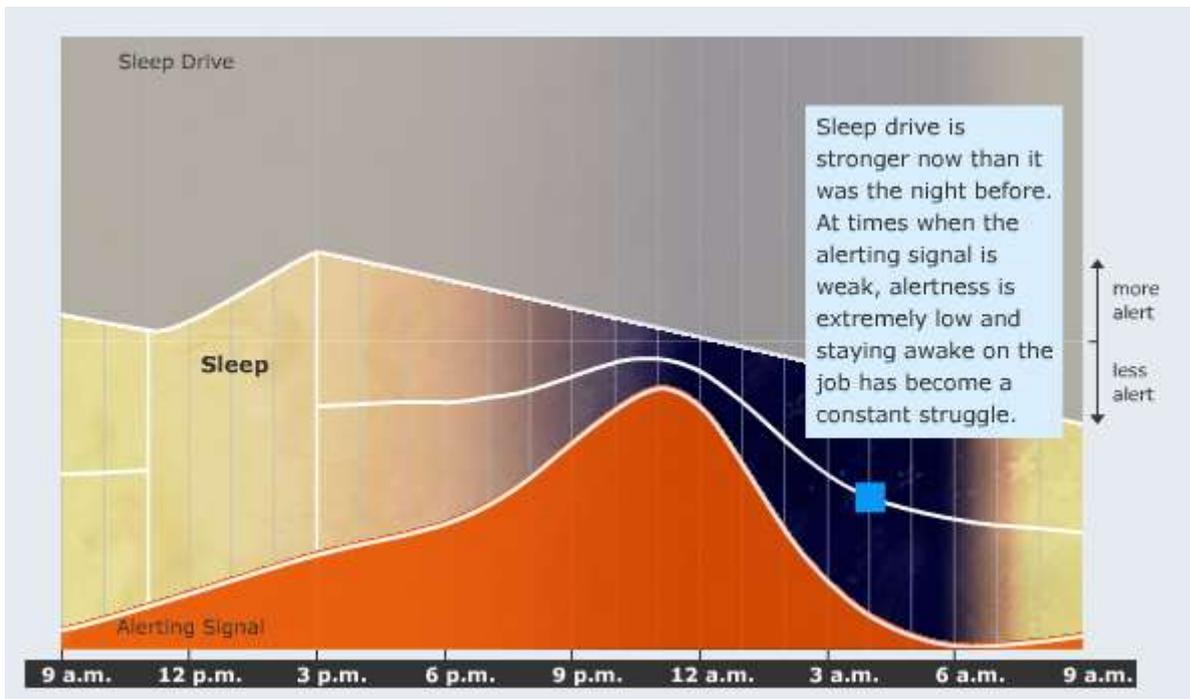


Figure 11. Graph to show the body's reaction to shift work. (Harvard medical school, 2007)



### 1.3.3 What people complain about

Table 3. Top 5 physical factors that keep the UK population awake at night (Sleepio, 2012)

<i>Complaint type</i>	<i>Percentage of complaints</i>
Bodily discomfort	67%
Noise	36%
Partner	34%
Room temperature	34%
Light levels	19%

Table 4. Top 5 Persistent thoughts that keep the UK population awake at night (Sleepio, 2012)

<i>Complaint type</i>	<i>Percentage of complaints</i>
What happened today & what I've got tomorrow	82%
How long have I been lying awake	79%
Trivial things of no importance	76%
What the future might hold	71%
Things that happened in the past	71%

### 1.3.4 Types of sleeping disorders

#### **Snoring**

A very common disorder and normally harmless except for the nuisance it can cause people sleeping in the same room, or even the next room in extreme cases. However, recurring chronic snoring can cause disrupted sleeping patterns of those in close proximity and also suggest reduced quality of personal sleep.

#### **Parasomnias**

This is a collective name for a number of different disorders that can occur during the REM stage of sleep. These include sleepwalking, night terrors and nightmares.

## **Night Terrors**

Different from common nightmares, night terrors are reoccurring symptoms of uncontrollable episodes of crying, sweating, shaking and fear during sleep and immediately after waking. These are more common in children.

## **Insomnia**

This is one of the most common sleep disorders and is characterised by the difficulty of falling and/or staying asleep. This can affect anyone, in brief episodes or chronic illness.

## **Hypersomnia (daytime sleepiness)**

Excessive sleepiness during the day or trouble staying awake during sunlight hours. Suffers can find themselves randomly falling asleep, at work or while they are driving for example.

## **Sleep Paralysis**

This is the sudden consciousness during REM sleep, the body is still paralysed but the mind is aware is it still in a sleep trance. This often causes anxiety attacks and can make people feel very scared during an episode.

(WebMD, 2015)

## 1.4 Insomnia

11/11/2015



### *Aims*

Gain a more in depth and professional understanding of insomnia. Have an easy to decipher group of points that outline the key areas that need to be addressed. Further gather proposed treatments that help with insomnia: medical, over the counter and placebo.

### *Objective*

1. Define insomnia and how it is different from other sleeping disorders
2. Graph of effects and dangers
3. Possible treatment or assistants
4. Conclude the area of insomnia and treatment methods to explore.

### *Strategy*

Medical journals, will be used to see the current strategy to treat insomnia. Further UK methods will be reviewed by using the NHS website "NHS Choices". The ability to check all of these are cross referenced with a medical expert will help clarify and confirm medical knowledge.

### *References*

NHS, 2015. *nhschoices*. [Online]

Available at: <http://www.nhs.uk/Conditions/Insomnia/Pages/Introduction.aspx>

[Accessed 28 10 2015].

National Heart, Lung and blood insitute, 2011. *National Instituets of health*. [Online]

Available at: <https://www.nhlbi.nih.gov/health/health-topics/topics/inso/causes>

[Accessed 23 10 2015].

The sleep council, 2013. *the great british bedtime report*, UK: s.n.

Bozich, R., 2013. *10 Tips for better sleep*. [Art] (Signature MD).

Wilde, R., 2015. *Sleep Infographic*. [Art] (CU).

### 1.4.1 Definition of insomnia

“Inability to fall sleep or to enjoy uninterrupted sleep”

(HarperCollins, 2000)

#### Origin



Google search “define Insomnia”

### 1.4.2 Types of insomnia

There are many types of sleep disorders and even more sub-categories inside of these. Focusing on insomnia as this is the most common form of sleeping disorder in the UK, insomnia can be divided into two categories:

- Primary insomnia, Sleeplessness that cannot be attributed to medical, psychiatric or environmental causes (National Heart, Lung and blood insitute, 2011) .
- Secondary Insomnia is the symptom of another problem; emotional, neurological or other medical disorder (National Heart, Lung and blood insitute, 2011).

These two definitions then have a time scale associated with them, Chronic (Long-term) occurring more then 3 times a week lasting longer then three months and Acute (Brief episode) lasting under three months.

### 1.4.3 Symptoms of insomnia

The main symptoms of insomnia:

- Difficulty falling asleep
- Waking up many time during the night
  - Not being able to easily get back to sleep
- Daytime fatigue
- Not feeling refreshed in the morning

#### *1.4.4 Common causes of insomnia*

- **Stress and anxiety**
- **Lifestyle factors**, such as social life, shift work, or drinking alcohol/ caffeine before going to bed.
- **Mental health conditions**, Such as depression
- **Physical health conditions**, Such as heart problems and chronic pain
- **A poor sleeping environment**, Such as an uncomfortable bed, or a bedroom that is too noisy, too light or the wrong temperature.
- **More prevalent in women**

#### *1.4.5 Effects*

The effects of insomnia are in a two stages. The first one of these is the effect on the body due to the lack of sleep and the other is the risk of other health complications that can arise due to the fact the body has not had enough sleep or been able to allow the DNA recovery at a cellular level.

##### **Directly from insomnia**

The more short term effects of insomnia / day to day effects tend to only really affect the cognitive ability of the brain. This includes: Increased irritation, poor memory and concentration, disturbed digestion and lethargy.

##### **Because of insomnia**

Other issues that can arise because of insomnia include both physical and psychological conditions. Both anxiety and depression can be linked to insomnia; normally present beforehand these can both develop if not properly attended. Physical effects include an increased risk in heart disease and even obesity.

#### *1.4.6 Treatments*

Medical professionals were emailed asking about the NHS procedures to treat insomnia, with prompting questions about certain practices that had previously been researched and any professional involvement in them. There are also products that aid with sleep/ address some of the issues that people face when attempting to get to sleep and these are explored in [appendix XXX](#)



**Branch Surgery**  
Outwoods Medical Centre  
4 Beaumont Road  
Loughborough  
Leicestershire  
LE11 2JB  
Tel: 0844 576 9811 Opt 2  
Fax: 01509 260058

**Main Surgery**  
Rosebery Medical Centre  
Rosebery Street  
Loughborough  
Leicestershire  
LE11 5DX  
Tel: 0844 576 9811 Opt 1  
Fax: 01509 213002

**Branch Surgery**  
Forest Edge Medical Centre  
Old Ashby Road  
Loughborough  
Leicestershire  
LE11 4PQ  
Tel: 0844 576 9811 Opt 3  
Fax: 01509 260069

Dear Ronan,

Thank you for your enquiry into how we manage insomnia in General Practice.

Insomnia is a common presentation in General Practice and can have a marked impact on quality of life.

I have no doubt you have read around this so I won't reiterate what you have probably already found out about the importance of sleep for good health in general, although it can sometimes be tricky knowing if insomnia is the cause of the problems or whether it is merely the symptom of a deeper, underlying issue.

If we can identify a cause for the insomnia then it is really important that we tackle this first. This is **not always a medical issue** and we encourage patients to look at their **lifestyle including their drinking and sleeping habits**, as well as simple things such as how **restful, dark and quiet their bedroom is, including the need for a good bed!** We encourage good sleeping habits and these are explained and laid out in our Sleep Hygiene advice sheet which I attach and if persistent we can even consider Sleep Restriction Therapy (enc.)

Sleep can be disrupted by underlying medical issues such as anxiety, stress, depression or chronic pains. It is really important that we explore and help with these otherwise to treat the insomnia is not getting to the root cause of the problem and merely papering over the cracks. We make sure pains are well controlled and encourage engagement with services that can help with **distressing issues such as stress, depression and bereavement**. This can involve any number of options from signposting patients to the Citizens Advice Bureau (regarding debt and money worries), through legal advice (regarding divorce etc) to bereavement support, self-help groups and even formal psychiatric help through CBT.

Medications are frequently used to treat underlying issues (e.g. painkillers, antidepressants) but usually in tandem with the options above. We also have to be aware that certain medications given for other conditions can actually cause insomnia!

However, the role of “sleeping tablets” is less common than previously. Patients can sometimes come requesting them as a quick fix. Although they have a limited role in helping “reset” the body’s sleep clock at times of acute sleep disruption (eg bereavement, jet lag) they are less appropriate in the long term because of side effects such as a hangover effect in the morning, lose their effectiveness over time and the very real risk of addiction.

I hope this helps and good luck with your studies,

Yours sincerely,

A handwritten signature in cursive script that reads "Clare Hale". The ink is dark and the signature is centered on the page.

Dr M. Clare Hale

MB, ChB, Dip Pall Med Paeds

(GP Partner CCMG)

#### *1.4.7 Review of letter*

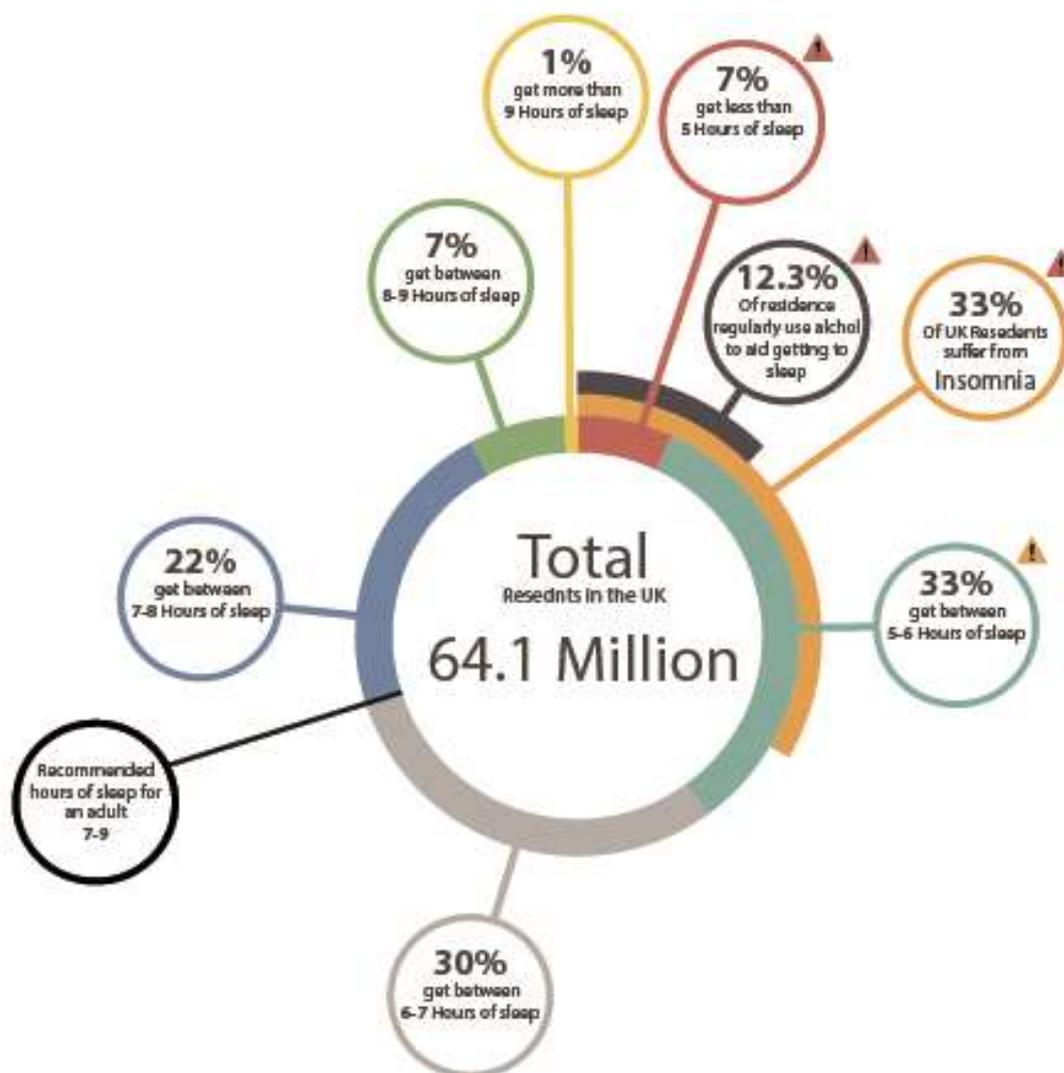
Highlighted are some of the key points of the letter and that can be useful when designing a manifesto. The NHS Choices website was also reviewed and many things can be cross referenced, however this letter gave a more personal insight into the process of treating insomnia and also highlighted other key areas that can affect insomnia and could be explored.

A number of NHS Leicester leaflets were also attached and have been read and considered to gain a wider understanding around the subject and how sleep problems are approached by specialist services (NHS Leicester, 2015)

## “The Problem“Conclusion

A third of people are suffering from at least mild insomnia in the UK and almost everyone will experience insomnia symptoms at some point in their life. Studies show that being awake for 17 hours is equivalent to a blood alcohol content of 0.05 (A Williamson, 2000) this is equivalent to being slightly intoxicated. This suggests that as a nation we are potentially less effective than we could be. A large number of these people regularly use medicated pills to aid sleep and over 12% regularly use alcohol to get to sleep. Sleeping medication is not a fix for insomnia, as it has a “limited role in helping “reset” the body’s sleep clock at times of acute sleep disruption ” (Hale, 2015). It’s not just the insomnia sufferers that are affected, 70% of the population as a whole are getting less than the 7-9 hours of recommended sleep. Causing reduced attention span, limiting productivity, creativity and slowing motor response times with an increased risk of work place accidents.

Figure 13. Infographic displaying the number of hours we sleep in % (Wilde, 2015) (The sleep council, 2013)



Literature Review

## 2 | Treatments and Effects

### Environmental Factors

17/11/2015



#### *Aims*

Discover how different environmental factors effects or quality and ability to sleep, furthermore how these affect the stimulation and relaxation of human body. This will allow for an understanding of different processes and how they interact, combinations of factors would be desirable. Repeat for all factors to get a full understanding.

#### *Objective*

1. Use journals to gain the interaction knowledge
2. Create a condensed summary of the interaction
3. Conclude how a factor will affect product design and how to utilise them
4. Repeat for each factor

#### *Strategy*

Medical and research journals will provide the largest amount of information, this research will then be cross referenced. Further ideas and theories will be drawn from articles and social media.

#### *References*

## 2.1 Effects of Light and sleeping

### 2.1.1 Light and Circadian Rhythm

“In humans and other diurnal animals, most behavioural activity occurs during the day, whereas in nocturnal animals, such as mice, most activities are confined to the dark phase.” (DJ. Dijk, 2009). Throughout the development of human life, humans were really only exposed to two kinds of light that conditioned and regulated the circadian rhythm in our body’s. The sun during the day where we spend time completing activities and the moon at night where it would be too dark to do much work so we would spend the time sleeping and recovering.

More recently the use of artificial light changes this binary response and can allow us to work or socialise much later tricking and confusing our brain and circadian clock. Artificial lighting is substantially less intense than sunlight.

Figure 14. Graph displaying lux of different lighting (Dvorsky, 2014)

<i>Type of light</i>	<i>Lux</i>
Bright sun	100,000
Partly Cloudy	20,000
Studio Light	1000
Fluorescent light	320
Full Moon	1
Starlight	$10^{-4}$

*Note: This is a logarithmic scale*

### 2.1.2 Melatonin and light

Melatonin is a naturally occurring hormone in all animals. It is made by a small gland in the brain called the Pineal gland, melatonin is thought to help regulate the bodies sleep and wake cycles. “In part, your body clock controls how much melatonin your body makes. Normally, melatonin levels begin to rise in the mid- to late evening” (WebMD, 2015).

Light also has an influence on the amount of melatonin produced by the body, regulated according to the exposure of light we had during the day. More information (Dvorsky, 2014) (WebMD, 2015) (Phipps-Nelson, 2003)

### 2.1.3 Coloured light

Colour of light seem to have quite a large impact on our ability to sleep, with different colours being better or worse than others in terms of how much they stimulate the brain and cause wakefulness. The ideal scenario is complete darkness, as the sensors in the backs of our eyes still pick up small light sources and can stimulate the brain. (DJ. Dijk, 2009)

*“Even dim light can interfere with a person’s circadian rhythm and melatonin secretion. A mere eight lux—a level of brightness exceeded by most table lamps and about twice that of a night light—has an effect”*

(Harvard Medical School, 2012)

#### **Red vs Blue**

There is somewhat of a paradox here:

Although blue has a natural calming effect, in the form of lights (especially LED and fluorescent) blue coloured light is telling our brain not to go to sleep.

*“There are about 30,000 cells inside your eye that are reactive to the wavelength of light which would be considered blue,” explains clinical psychologist and sleep therapist, Dr. Michael J. Breus. “Blue runs in about the 460 nanometer range, in terms of the spectrum of light. That particular spectrum of light hits these cells and makes them send a signal to an area of the brain known as the suprachiasmatic nucleus and tells it to turn off melatonin production. Melatonin is the key that starts the engine for sleep.”* (Hill, 2015)

Red light on the other hand has a much longer wavelength and is less disruptive to the circadian rhythm. Another point to make is in both these cases whatever light is used the lower the intensity the less effect it has on disrupting sleep.

### 2.1.4 Conclusion

Light can affect the circadian rhythm and levels of melatonin. High intensity of light will increase levels on melatonin produced later on in the day as long as light levels are reduced closer to natural bed time. Best results when attempting to sleep are achieved with no light exposure, but in the case of light being needed (eg. Using the bathroom late at night) blue light over stimulates the brain more than red light. Attempt to reduce exposure to blue light (especially for LED’s) before bed and if needed use low intensity red light to reduce the disruptive effect light can have on sleep.

## 2.2 Effects of Sound and sleeping

The Ideal scenario is “no noise”, as any amount can affect sleep. During sleep the brain will still continue to process sounds, causing shifts between sleep stages or changes in heart rate. Noise is more likely to disturb during Non-REM stages one and two (lighter sleep). Different noises affect people in different ways and it tends to be what people associate with a particular noise that can alter how someone will react in their sleep.

### 2.2.1 *White noise*

White noise is a sound created by the combinations of many different frequencies of sound. “In technical terms white noise can be described as noise whose amplitude is constant throughout the audible frequency range” (Sleep Junkies, 2014).

In sleep “white noise is better noise” (Firlinger, 2014). It is very difficult to get a completely sound proof night’s sleep, as there are many random factors that cannot be controlled eg, car horns or someone using the bathroom late at night. Sudden increases of sound are called peaks, white noise works by creating a raised baseline level above complete silence, if and when peaks happen the increased baseline will reduce the difference between background sounds and peaks.

Examples of white noise include: (Sleep Junkies, 2014)

- Nature Sounds, Rain, sea waves
- Machinery Noises, Air conditioning units, Washing machine
- Ambient Sound, Crowds, Campfire

### 2.2.2 *Conclusion*

The reduction of external disturbing noise is potentially expensive and aesthetically unappealing and furthermore cannot be completely eliminated due to random peaks in sound. The use of white noise increases the noise tolerance baseline reducing the effects of being woken by random peaks in sound.

## 2.3 Temperature

It is normal that during the day the human body rises and falls slightly depending on the temperature of the ambient surroundings and other lifestyle factors. This pattern is linked with our sleep cycle. When there are drops in our alert level (feeling more tired) our body slightly goes down. The increase in our body temperature is one of the processes that our body undergoes to help us wake up naturally.

*“Air in your room can affect the quality of your sleep: if it's too hot, it may interfere with your body's natural dip and make you more restless through the night.”* (National Sleep Foundation, 2015)

Throughout the day the brain attempts to set a consistent body temperature, when going to sleep the brain reduces this temperature and the average body temperature decreases. Before falling asleep, as the body cools, the mild drop in temperature helps induce sleep. , *“if you are in a cooler [rather than too-warm] room, it is easier for that to happen.”* (Heller, 2010) However, if the room becomes uncomfortably hot or cold, you are more likely to wake up.

*“Dr. Rachel Salas, MD, a neurologist at Johns Hopkins University who specializes in sleep medicine, cites a National Sleep Foundation study that puts the magic number at 65 degrees.*

*Why so low? Your body's core temperature is naturally low during deep sleep. It starts to raise towards the end of your sleep cycle, as a sort of signal to your body that it's time to wake up.*

*By keeping the temperature low, you're helping your body do its job. Too hot and it can interfere with your body's natural temperature adjustments and create restlessness throughout the night. That's a recipe for insomnia.”*

(Lewinski, 2015)

### 2.3.1 Conclusion

This variable factor creates both a design option and a design constraint. It allows the opportunity to design a product that could both monitor and then directly alter the body temperature of the user but is limiting in that the product should not itself produce a large amount of heat that adversely affects the body temperature of the user.

## 2.4 Air Quality

The air quality of a room or a house does not hugely affect a person's sleep in the short term (unless the room is dusty and/or someone has a breathing condition), but over a couple of weeks to months they may start to see a negative effect on their breathing, health and quality of sleep.

*“People who have sleep Apnea or kids with asthma are more vulnerable to breathing problems. This creates a domino effect: Poor indoor air leads to poor sleep. Poor sleep weakens the immune system, leaving both adults and kids vulnerable to a host of illnesses. “*

(uHoo, 2015)

Harvard School of Public Health conducted a study that investigated the effects of air pollution. They found that air pollution massively increased the likelihood of the development of Sleep-Disordered Breathing (SDB). Obstructive Sleep Apnea, the most common of this group of sleep disorders, refers to abnormal pauses in breathing or, in some cases, abnormally weak breathing.

During this study the experiments found *“that as the presence of air pollution increased, so also did problems breathing during sleep.”* (IQAir, 2015) Some results concluded that in summer months, when pollution is at the upper threshold, the risk to completely stop breathing for up to ten seconds increased by 13%. *“Although the direct causal relationship between the air pollution and the sleep disorders was unclear, the association between the two was established.”* (IQAir, 2015)

The Harvard study linking air pollution to sleep quality offers more evidence that an air purifier may be as important as the right mattress and bedding when it's time to sleep.

### 2.4.1 Conclusion

Air quality is less fundamental to the sleep process compared to the other environmental effects. Clean air will help someone stay asleep and not disturb them by interrupting their breathing pattern while asleep. Due to the size, cost and complication of air filtration systems this technology would limit the ability to design in other technologies; in response to this the idea to have an air quality monitor would help keep tabs on the sleeping environment and would encourage action by the user.

## 2.5 Bench Marking

This is a quick comparison of available technologies that can be assessed and developed. This is not a comparison of products to find the market location, which will be done in the design phase. This will help with further development and help deduce combinations of products for a design aim.

Simplicity – How easy the technology is to implement (0 = bad, 5 = very good)

Effect – The effect the technology has on inducing sleep (0 = bad, 5 = very good)

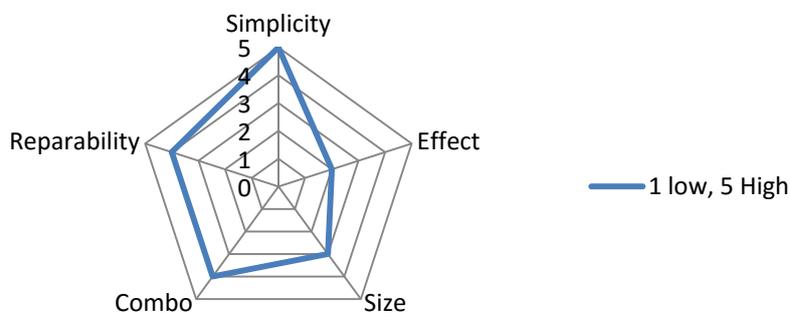
Size – a rough guide to the size of the technology (0 = big, 5 = small)

Combo – How well it could work with other technologies (0 = bad, 5 = very good)

Reparability – How easy it is for consumer repair (0 = bad, 5 = very good)

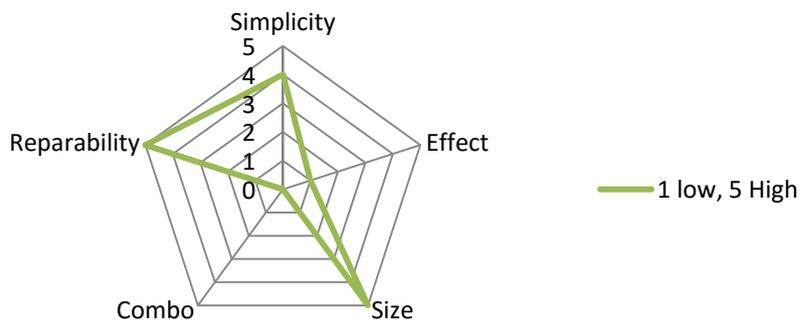
### 2.5.1 Bedroom night light

A colour changing light to help aid the transition of relaxing and reducing the number of stimulating light waves.



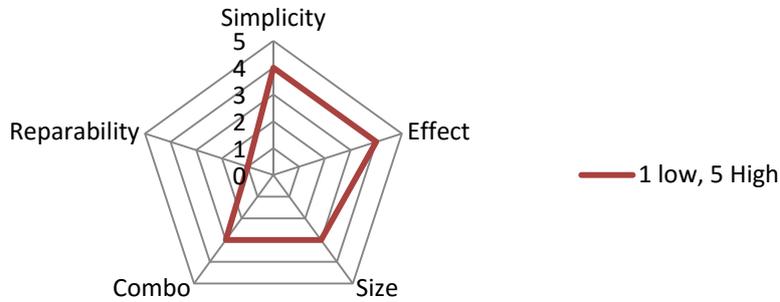
### 2.5.2 Blue screen filter

A filter that reduced the amount of blue light when using electronic screens.



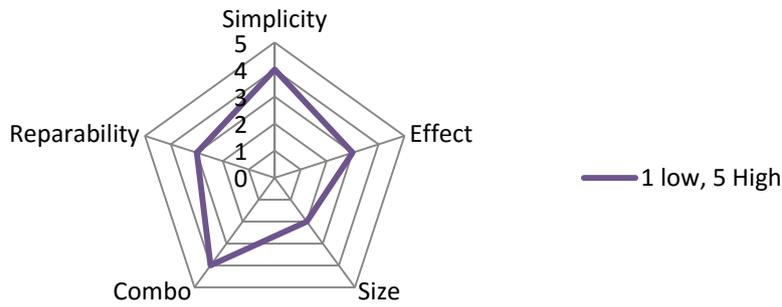
### 2.5.3 Cooling pads

Pads that help cool or warm certain parts of the body to help aid sleep.



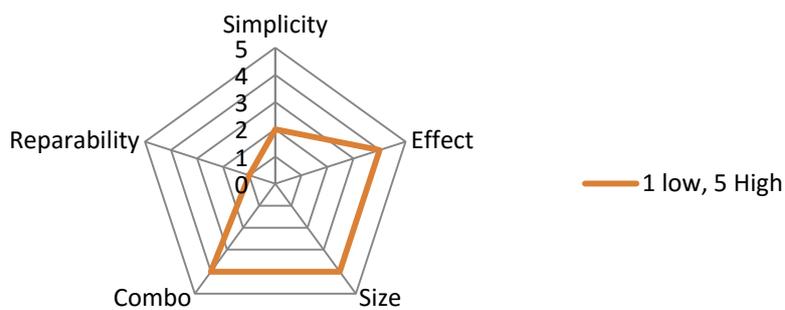
### 2.5.4 Fan

A device that pushes air to cool areas, these naturally produce white noise.



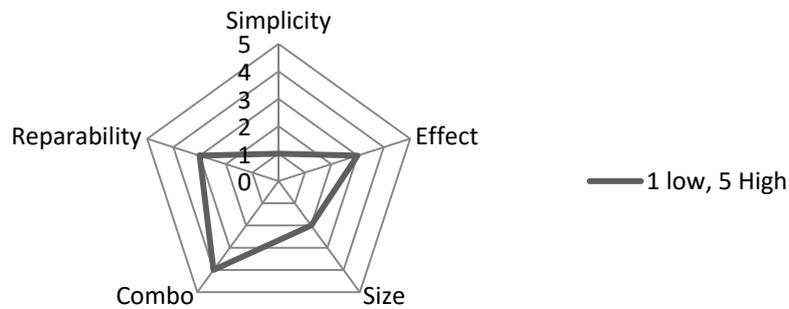
### 2.5.5 White noise machine

A noise that raises the threshold of peak noises so that people don't randomly wake due to noise.



### 2.5.6 Air Purifier

Help keep the air quality of the room high and will help continue sleep as it reduces breathing problems.



### 2.5.7 Conclusion

Basic review of current technology that will help create a specification as it gives an idea of how technologies interact and what are the most important aspects of each one.



## 3 | Development of spec

### 3.1 Generation Trends

15/11/2015

#### *Aims*

This is to cross reference Individuals to see if it is possible to develop personas to focus the target audience. Gain an understanding of the priorities and trends for the selected age demographic.

#### *Objective*

1. Create a brief description of the generation
2. Make a list of the key points

#### *Strategy*

Use online sources to pull together different views on the generation so that it can be referenced when writing the design brief.

#### *References*

Prosper insights & analytics, 2015. *Prosper*. [Online]

Available at: <http://prosperdiscovery.com/>

[Accessed 20 11 2015].

Goldman sachs, 2015. *Goldman Sachs Global Investment Research*. [Online]

Available at: <http://www.goldmansachs.com/careers/why-goldman-sachs/our-divisions/global-investment-research/>

[Accessed 18 11 2015].

### 3.1.1 Millennials

As insomnia affects people of any age it is important to pick an age demographic. Younger sleep problems tend to be associated with normal developmental issues, such as puberty or mental health such as ADHD. Conversely for older people insomnia is more commonly due to underlying health conditions such as chronic pain or heart conditions.

The selected age demographic is the millennials, aged from 18-35+.

#### **Who are they?**

Born Between: 1980-2000

“Millennials have grown up in a time of rapid change, giving them a set of priorities and expectations sharply different from previous generations.” (Goldman Sachs, 2015)

Millennials have grown up in the digital age and with the internet almost anything is accessible from tablets computers or phones. They are the most connected and social generation with 44% using social networking every single day. (Prosper insights & analytics, 2015)

- Social and connected
- Biggest usage of technology
- Health awareness, exercising more and eating smarter than previous generations
- Technology influences how they shop and compare products/companies

*“Millennials have come of age during a time of technological change, globalization and economic disruption. That’s given them a different set of behaviours and experiences than their parents.*

*They have been slower to marry and move out on their own, and have shown different attitudes to ownership that have helped spawn what’s being called a “sharing economy.”*

*They’re also the first generation of digital natives, and their affinity for technology helps shape how they shop. They are used to instant access to price comparisons, product information and peer reviews.*

*Finally, they are dedicated to wellness, devoting time and money to exercising and eating right. Their active lifestyle influences trends in everything from food and drink to fashion.*

*These are just some of the trends that will shape the new Millennial economy.”*

(Goldman Sachs, 2015)

## 3.2 Colour Association

11/11/2015

### *Aims*

Gain a brief understanding of the effects of colours and coloured light. This is important because of the previous section (Appendix 2.1.3) as it explains the importance of different colours and how it affects brain activity.

### *Objective*

1. Create a list of colours and the positive/negative effects
2. Compare the emotional effects to the brain effect from Appendix 2.1.3

### *Strategy*

Use online resources and reports to gain a brief knowledge and then apply strategic thinking to compare sleeping effect of colour to emotional effects.

### *References*

Colour affects, 2015. *Colour Affects*. [Online]

Available at: <http://www.colour-affects.co.uk/psychological-properties-of-colours>  
[Accessed 21 11 2015].

### 3.2.1 Psychological properties of colours

There are 3 primary colours: Red and Blue being the first two with the third being Yellow (for paint) or Green (for light). Different colours represent different things for different people; however there tend to be trends and correlations for large populations with both positive and negative features.

Examples, full list can be found (Colour affects, 2015)

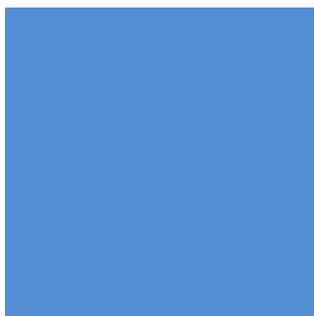
<http://www.colour-affects.co.uk/psychological-properties-of-colours>



**RED.** Physical

**Positive:** Physical courage, strength, warmth, energy, basic survival, 'fight or flight', stimulation, masculinity, excitement.

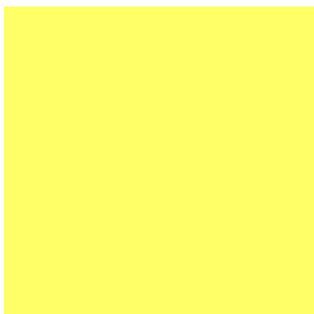
**Negative:** Defiance, aggression, visual impact, strain.



**BLUE.** Intellectual.

**Positive:** Intelligence, communication, trust, efficiency, serenity, duty, logic, coolness, reflection, calm.

**Negative:** Coldness, aloofness, lack of emotion, unfriendliness.



**YELLOW.** Emotional

**Positive:** Optimism, confidence, self-esteem, extraversion, emotional strength, friendliness, creativity.

**Negative:** Irrationality, fear, emotional fragility, depression, anxiety, suicide.



**GREEN.** Balance

**Positive:** Harmony, balance, refreshment, universal love, rest, restoration, reassurance, environmental awareness, equilibrium, peace.

**Negative:** Boredom. stagnation. blandness. enervation.

### 3.3 Profiling

11/11/2015



#### *Aims*

Build a number of design personas to help define the project brief and draw a specification to meet the requirements of the chosen personas. This is to allow for a constant reminder for the brief and design phase and have a reference point.

#### *Objective*

1. Interview a number of insomnia sufferers
2. Create a list of both common and unique factors
3. Create persona (2 main, 1 secondary)

#### *Strategy*

Use a combination of questionnaires and interview techniques to create the personas. The first person contact will allow for a more in-depth and personal development of the personas.

#### Note:

These personas are created using the previous information and an interview with insomnia sufferers. These are to help with creating a design brief and can be further developed to aid with the design phase. These are useful for this stage but are not the final ones.

## Prompt questions on insomnia for focus group/ Interview

Length of time you can remember you have suffered from sleep problems?

The length of sleep problems have lasted over the last 15 years  
Started in the teens, due to an over active brain

Type of sleep problem

not medically confirmed case of insomnia

What are your attitudes to sleep? Do you dread it, try and put it off because you don't like the idea of staying awake.

See it as a task, something that must be done to function the following day

will actively avoid it and can find themselves in places around the house  
Last time you:

Drink coffee / tea / energy drink

Drink coffee / tea whenever

↳ does not pay attention to time or amount consumed

Use your phone before bed

Just before eyes are closed

↳ also used to check time if woken at night

---

Is there any patterns that you see before you have troubles sleeping?

Eg a day when you don't have breakfast you notice that you can't sleep that night.

If there is a time ~~limit~~<sup>limit</sup> on sleep → have to be up at  
Stress in the day 6... the number of  
→ Thinking about trying to get to sleep hours of sleep causes  
Panic

Is there anything you find that help you get back to sleep?

Focus on tensing then relaxing each part of the body  
get up to have a drink (cold) to help body relax then can  
find a better position to fall asleep

Is there one thing in particular that keeps you up? Thinking about things or noise/light

Can't be any noise or light!  
if stressed or over thinking things

Is there anything that is notably effect due to the ability of not falling asleep?

mood and motor functions



Name	Bethany
Age	30
Gender	Female
Occupation	Midwife
Sleep Profile	Yearner

“ I will try anything and everything to get to sleep quicker ”

## Motivations

Bethany wants the ability to control her sleeping pattern, she has been with her husband for 5 years now and they have started to talk about having their first child. She is worried that her current sleeping problem and the knowledge that children are a constant night alarm and that she will really damage her health.

## Goals

- Be able to get to sleep in under an hour of going to bed
- Relax and fall asleep at the same time as my partner
- See an improvement to her health

## Frustrations

- Lives next to noisy street
- Stays awake for hours after partner has fallen asleep
- Stresses about the lack of hours of sleep
- Hates how the lack of sleep is causing “bags” under her eyes

### Primary



Name	Sean
Age	38
Gender	Male
Occupation	Cartographer
Sleep Profile	Soldier

“ I will wake 4-5 time ever night and am constantly restless ”

## Motivations

Sean has only been suffering from disrupted sleep for the last 12months shortly after a big medical surgery. He can tell this is having an effect on his work and his home life, constantly feeling tired but unable to remain a sleep is a huge frustration.

## Goals

- Sleep for more than 6 hours at a time
- Be able to reduce the amount he snores

## Frustrations

- Wakes up for no reason
- Has tried a few different methods of treatment but none have worked
- Some times when woken can't get back to sleep
- Job means that not being able to sleep for decent periods of time makes it difficult to concentrate the following day.

### Primary



Name	Amanda
Age	52
Gender	Female
Occupation	Accountant
Sleep Profile	Starfish

“ My partner never gets to sleep and causes me to stay up too ”

## Motivations

Amanda loves sharing a bed with her husband, but he is constantly tossing and turning during the night that keeps them both awake. She really wants to get a good night's sleep and is almost at the point where she is moving out of the room so she can sleep better.

## Goals

- Stay in same bed as partner
- Have partner to be less restless
- Both sleep better
- See an improvement in sleep

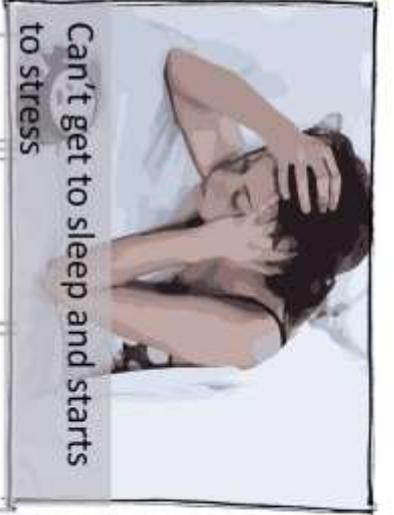
## Frustrations

- Husband moves too much
- Can't relax into sleep when husband is constantly moving
- Can see her work and mood slipping

## Secondary



Uses phone before bed



Can't get to sleep and starts to stress



Gets up as they can't get comfortable

# Scenario



Trys again to get to sleep



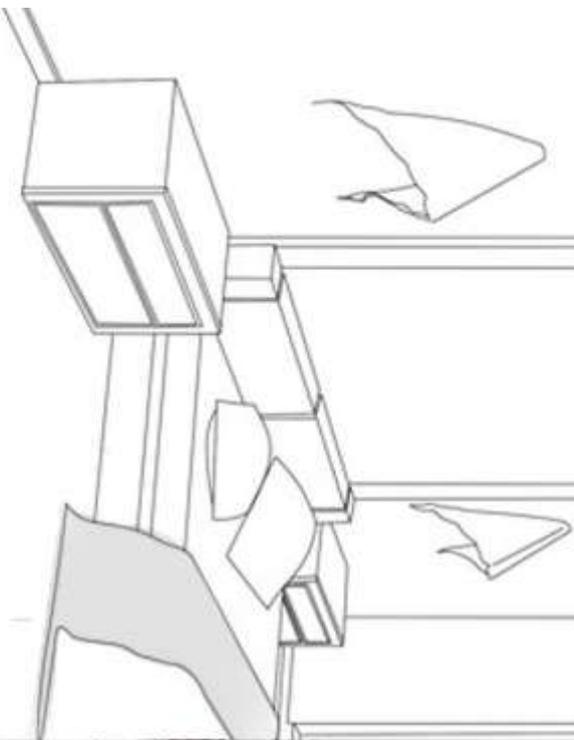
In the hours of the morning decides to use sleeping pills



Relaxes and pills help get to sleep



Wakes up in a hour or so to go to work



Literature Review

### **3.4 British Standards and Manufacturing**

Some examples of important British standards that might want to be utilised or expanded on to help design a product to aid the ability to get to sleep.

#### *3.4.1 Air*

##### **BS EN ISO 17510-2:2009**

Sleep apnoea breathing therapy. Masks and application accessories

#### *3.4.2 Lights*

##### **BS EN 13032-4:2015**

Light and lighting. Measurements and presentation of photometric data of lamps and luminaries. LED lamps, modules and luminaries.

##### **12/30263964 DC and DID ICE/PAS 62717:2011**

LED modules for general lighting. Performance requirements.

#### *3.4.3 Magnets*

##### **BS EN 60404-5:2015**

Magnetic materials. Permanent magnet (magnetically hard) Materials. Methods of measurement of magnetic properties.

#### *3.4.4 Sound*

##### **BS 5942-7:1987**

High Fidelity equipment and systems: minimum performance requirements. Specification of loud speaker.

### 3.5 Responsibility and Ethics

11/11/2015

#### *Summary*

Ethical consent was processed when undertaking all empirical research (Appendix 1.1.6 : 1.4.6 : 3.3.0). This was important when published results and answers to questions and interviews throughout the report. Further investigation into possible ethical issues when designing the product where also explored such as the *Data Protection Act 1998*.

Following are some examples of legislations and specimen forms that were used during the research for the report.

#### ***The Data Protection act 1998***

“The Data Protection Act controls how your personal information is used by organisations, business or the government. Everyone responsible for using data has to follow strict rules called ‘data protection principles’”. (Gov.UK, 2015)

#### **General Product Safety Regulations 2005**

<http://www.legislation.gov.uk/uksi/2005/1803/contents/made>

### Research Method Record Sheet (F1) (Industrial Design UG and M Level Students)

Please complete one of these record sheets for each significant piece of empirical or ethnographic research task you are planning e.g. interviews, observation, survey/questionnaire/focus group. Once you have completed this form please show it to your design tutor and when they are confident that you have a safe and sensitive structure for your research task then go to the Ethics portal and complete the submission process and await approval. Note that grey areas on the form suggest more information or discussion with tutor will be required.

Student name		Ronan Wilde			
Project title		How can the effects of insomnia be mitigated without the use of medication			
Task description		focus group of insomnia sufferers			
Date you intend to conduct the research		November 2015	Final major project tutors name		
Research Method					
General research approach <small>(Tick appropriate box – circle around sub-choices)</small>	Interview	<u>focus group</u>	Observation	Questionnaire or survey	Other (please specify)
	<ul style="list-style-type: none"> <li>• Structured (circle)</li> <li>• Semi-structured</li> <li>• Unstructured</li> </ul>				
How many people and events will be involved <small>(Circle appropriate and indicate where process will be repeated.)</small>	1 person	2 - 3 people	1 person	20	?
	2 two people	<u>4-6</u> other please state	small group 1 to 5	50	
	<small>(will it be repeated – how often?)</small>	<small>(how many will be held?)</small>	variable number <small>(how many will be conducted?)</small>	100+	<small>(how many do you aim to complete?)</small>
Will you know the participants?		Yes (circle) I am familiar with them	<u>FAMILY FRIENDS</u>	No I have not had prior contact with those involved.	
Participant Info					
What is the characteristic of the group? <small>(please circle)</small>	• Students	<u>Professional groups or individual</u>	Under 18	Vulnerable adult or group	Other (please specify)
	• Friends or family				
Where will the research take place?	Within the University	<u>Within a known and regularly visited space (home, café, official community space)</u>	<u>In a professional environment</u>	• In a school • In a medical practice or hospital • A sensitive environment	Non-specific or variable location (please explain)
How far will you have to travel to conduct the research and how will you get there?	Local	<u>Within the region</u>	To another city	Abroad	
	What mode of travel will you use? <u>train / bike</u>				
What time of day will you conduct the research	<u>Daytime 9-5</u>	Early morning	Evening	At night	
Data collection					
What type of information do you need to collect?	Statistics e.g. Numbers or patterns for comparing)	<u>Words e.g. Opinion, attitudes, feelings or ideas.</u>	<u>Measurements of people (e.g. measuring anthropometric data)</u>	Collections e.g. materials, pictures, artefacts	Observations of situations, tasks, behaviour

October 2013 – Version 1 Design Method Record Sheet (Karen Bull k.bull@coventry.ac.uk)

<b>Data will be captured in the form of....</b>	Words ✓	Numerical	Audio ✓	Photos	Video	Samples
<b>Please provide a list of the questions you intend to ask</b> <i>(interview, questionnaire or focus group) or the foci you wish to observe e.g. utilisation of public seating from the perspective of comfort, use and misuse)</i>	<p>List questions below – A concise number of simple, clear and focused questions.</p> <p>Prompts</p> <ol style="list-style-type: none"> <li>1. when did insomnia occur — a life event?</li> <li>2. does it affect your everyday? work, social etc</li> <li>3. how much time do you spend when you sleep?</li> <li>4. what technology do you tend to use 2 hours before sleep?</li> <li>5. what are your current treatments (inc self-prescribed)</li> </ol>					
<b>Resources</b> Will any specialist equipment or facilities be required to complete this task?	(please list)		(highlight any resources requiring special booking or access)			
<b>Tutors comments</b> <i>(Please add any useful information that will help the reviewer)</i>						
<b>Tutors signature</b>	I have discussed the research method with the student and feel that this can be considered for review on the Ethics Portal [ <a href="https://ethics.coventry.ac.uk">https://ethics.coventry.ac.uk</a> ]			Date		
	Signed: 			3/11/15		

Now your tutor has reviewed this research method you can complete the online Ethics Portal process – refer to the guidance provided on Moodle. You will find the link on Moodle and a profile will need to be set up. The reviewing tutor will be Karen Bull and the project supervisor will be your Final Major Project tutor.

**PLEASE REMEMBER THAT ANY PARTICIPANT IN YOUR RESEARCH PROCESS MUST HAVE SIGNED A PARTICIPANT CONSENT FORM AS PROVIDED ON THE ETHICS PORTAL.**

October 2013 – Version 1 Design Method Record Sheet (Karen Bull [k.bull@coventry.ac.uk](mailto:k.bull@coventry.ac.uk))

**CONSENT FORM (For all participants) (F3)**

**Title of Project:** Insomnia: effects and prevention

**Student researcher:** Ronan Wilde

**Supervising tutor:**

*All participants involved in primary data collection should be given a consent form. This should also be uploaded to the CUethics site as an attachment to the application.*

- |   | Please tick                         |
|---|-------------------------------------|
| 1. I confirm that I have read and understood the participant information sheet for the above study and have had the opportunity to ask questions.                               | <input checked="" type="checkbox"/> |
| 2. I understand that my participation is voluntary and that I am free to withdraw at anytime without giving a reason.   | <input checked="" type="checkbox"/> |
| 3. I understand that all the information I provide will be treated in confidence  | <input checked="" type="checkbox"/> |
| 4. I understand that I also have the right to change my mind about participating in the study for a short period after the study has concluded ( <i>insert deadline here</i> ). | <input checked="" type="checkbox"/> |
| 5. I agree to be <del>filmed/recorded</del> ( <i>delete as appropriate</i> ) as part of the research project  | <input type="checkbox"/>            |
| 6. I agree to take part in the research project   | <input checked="" type="checkbox"/> |

Name of participant: .....

Signature of participant: .....

Date: .....

Name of Researcher: Ronan Wilde .....

Signature of researcher:  .....

Date: 19/4/15 .....

### 3.6 Task Analysis and Gantt chart

This is the breakdown of the project tasks, the order in which they need to be completed and then a graph to show the correlation to the tasked to the desired time frame. This has been divided up into the three main stages of the research: The planning, the research and the conclusion.

#### 3.6.1 Planning Stage

<i>Task</i>	<i>Assignment</i>
Development of question	A
Introduction of Subject	B
Preliminary research	C
Research objectives	D
Conceptual Framework	E
Ethics Approval	F

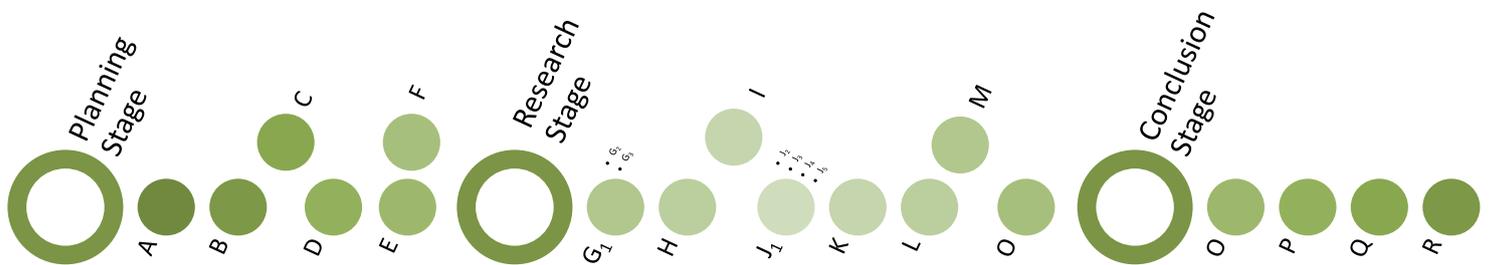
#### 3.6.2 Research stage

<i>Task</i>	<i>Assignment</i>
Sleep: Statics	G <sub>1</sub>
Sleep: Brain	G <sub>2</sub>
Sleep: Disorders	G <sub>3</sub>
Insomnia	H
Treatments	I
Effects of: Light	J <sub>1</sub>
Effects of: Sound	J <sub>2</sub>
Effects of: Magnets	J <sub>3</sub>
Effects of: Temperature	J <sub>4</sub>
Effects of: Air Filters	J <sub>5</sub>
Profiling	K
Generation Trends	L
British Standards	M
Design Brief and manifesto	N

### 3.6.3 Conclusion Stage

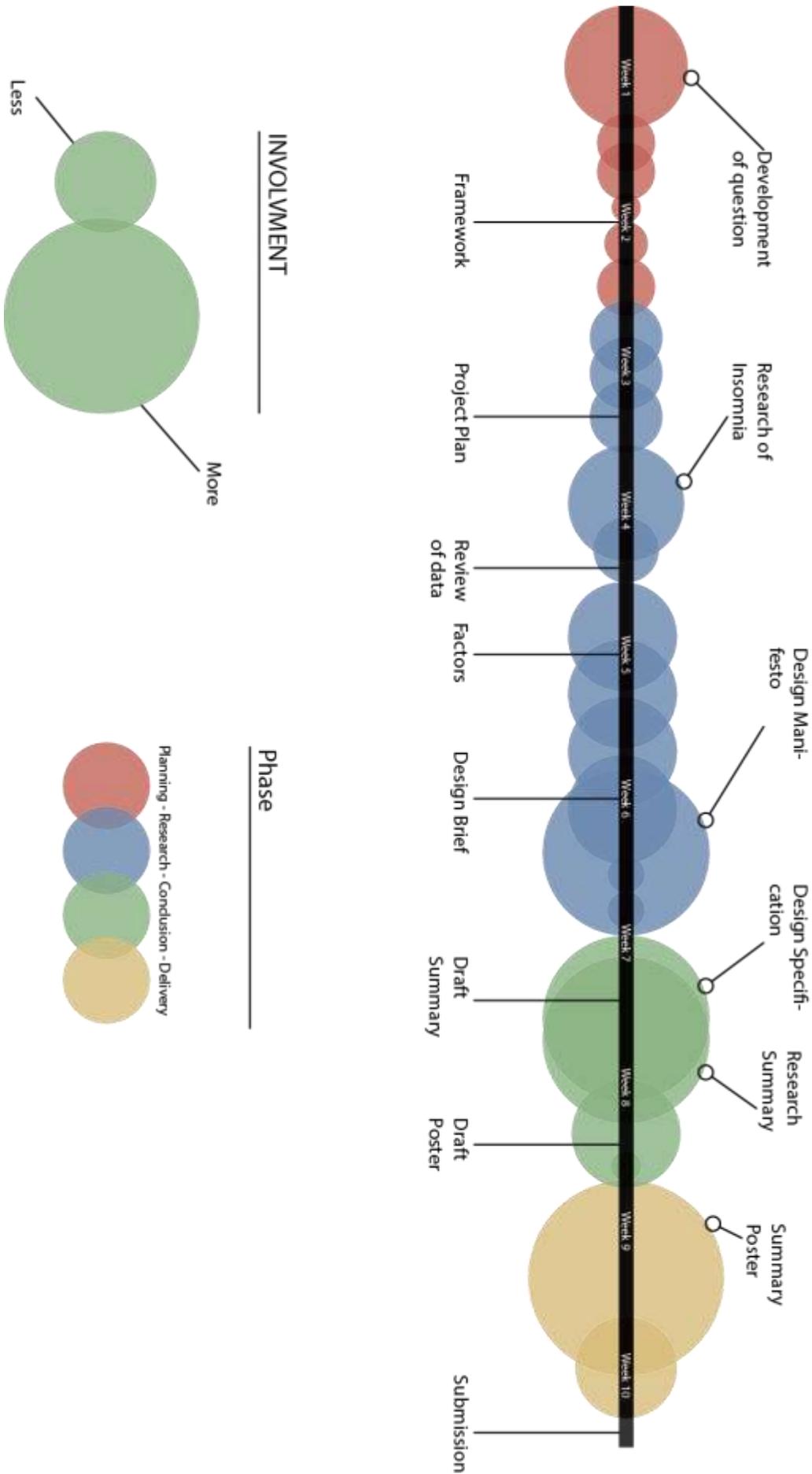
Task	Assignment
Design Specification	O
Summary	P
Bibliography	Q
Research Poster	R

A process in which the tasks need to be completed...



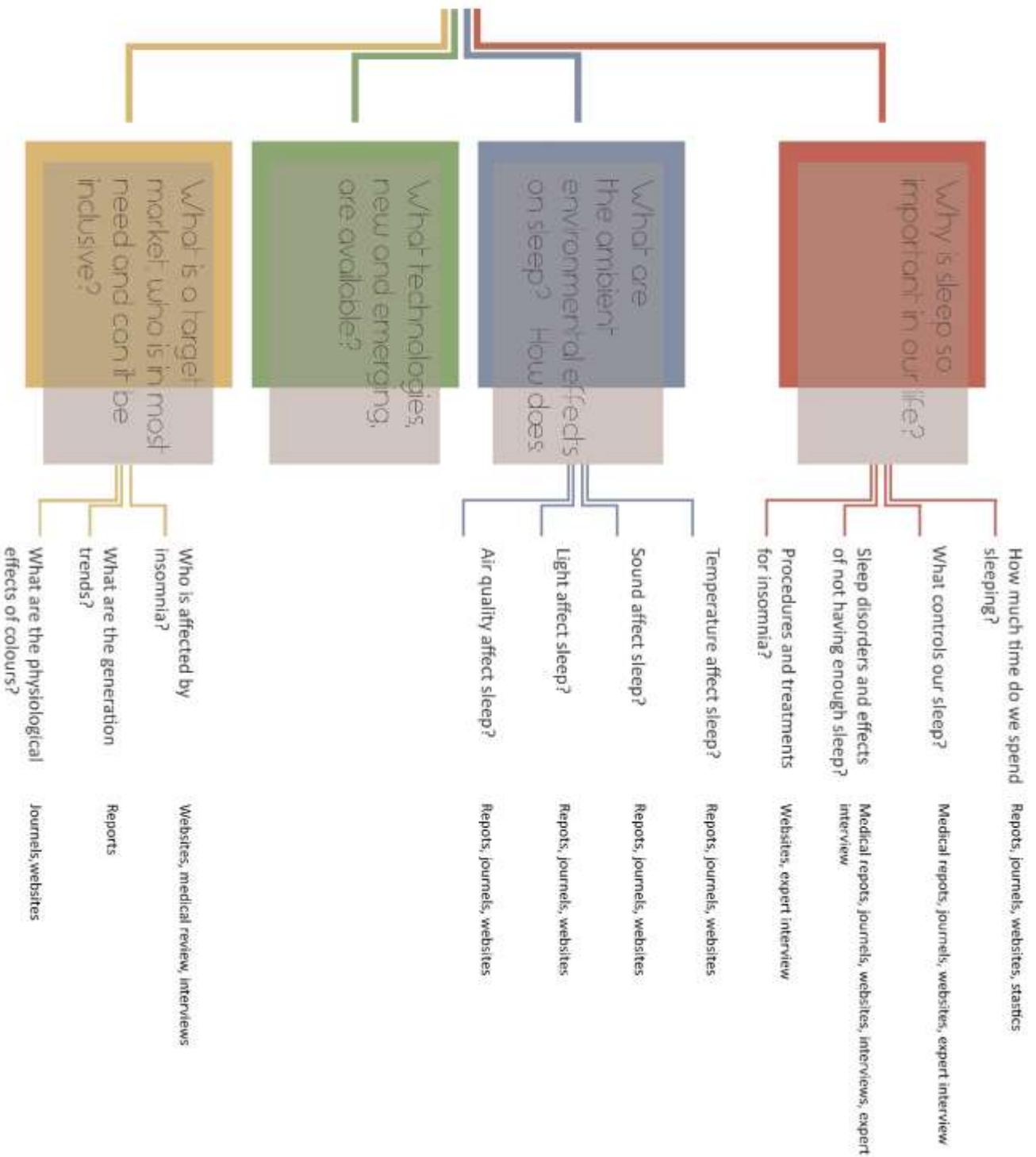
#### Gantt chart

The circles are indications of the tasks that have to be done (can be linked with the task analysis) some of the major task have been named. The size of the circle indicates the involvement and the amount of time went into the task. The colours are the phase of the research.



# To what extent can the effects of insomnia be mitigated without the use of medication?

**Conceptual framework**, outlining the ideas and exploration of the report. This gives a basic approach of to how the report will be tackled and how each area will be addressed with the predicted and desired data requirements from each area of research.



## 4 | Development of spec

### 4.1 What I did not manage to complete

#### 4.1.1 *Research*

More research into the effects of melatonin and white noise would assist with future development of the specification.

#### 4.1.2 *Experiments*

It would have been desirable to experiment and test different theories surrounding the environmental effects (Appendix 2.0.0). This would allow for a more in depth understanding on how these different environments affect sleep culture. By keeping a sleep diary over a period of time while being exposed to these conditions would allow for a more practical development of the specification.

#### 4.1.3 *Design spec*

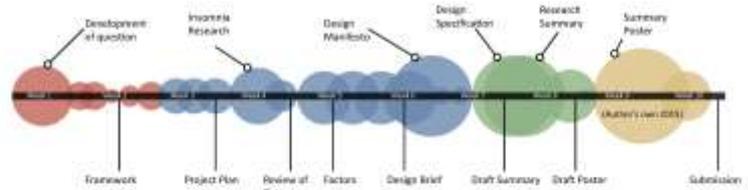
There are a couple more areas that could assist with designing of the specification if they had been included. This includes a more concise evaluation of the visuals and a wider breath in technology researched that could be used to induce sleep.

## 4.2 Research Poster

# How can the effects of insomnia be mitigated without the use of medication?

Ronan Wilde  [orcid.org/0000-0001-9000-1000](https://orcid.org/0000-0001-9000-1000)  
M54D – Research For Design and Defective Practice

What are the key areas, tasks and ideals that need to be addressed when attempting to aid a person suffering from insomnia and how can this be done without the use of medication?



### Problem

The UK is tired, with over 30% of the population getting less than the recommended 7-9 hours of sleep per night. Included within this figure is 33% of the population suffering from some form of insomnia. This is having serious effects on the effectiveness and safety of our roads. Work places and driving around the UK are becoming increasingly dangerous due to the effect the lack of sleep has on the human body.

**Total Residents in the UK**  
64.1 Million  
Lamb, 2005

**Average**  
The average number of hours slept each night by adults across the UK. This is 20% less than 100 years ago.

**33%** Of UK residents suffer from insomnia

**12.3%** of adults regularly use alcohol to aid getting to sleep

**7%** Get less than 5 hours of sleep

**7%** Get between 6-8 hours of sleep

**22%** Get between 7-8 hours of sleep

**30%** Get between 6-7 hours of sleep

**1%** Get more than 9 hours of sleep

Recommended hours of sleep for an adult 7-9  
Lamb's own (2012) The Sleep Council (2012)

### Research

Professional interviews were used alongside focus groups and questionnaires to gain a wide breadth of knowledge and really dig deep into the field, exploring both the NHS's treatment options as well as insomnia sufferers' own methods and actions. Profiling was used to help create a number of personas based on the focus groups that helped with defining an age demographic in addition to considering a list of trends and design constraints. The foremost issues affecting the subjects' ability to get to sleep were their attitudes towards sleep and the effects the surrounding environment had on helping them relax, with adverse sound, temperature and light playing the key roles in the inability to do this.

**“** We encourage patients to look at their lifestyle including their drinking and sleeping habits, as well as simply things such as how restful, dark and quiet their bedroom is, including the need for a good bed!  
**”**  
(Dr Hale, 2012)

**“** Why is sleep so important in our life?  
How much time do we spend sleeping?  
What controls our sleep?  
Sleep disorders and effects of not having enough sleep?  
Procedures and treatments for insomnia?  
Temperature affect sleep?

**“** What are the current environmental effects on sleep? How does  
Sound affect sleep?  
Light affect sleep?  
Air quality affect sleep?

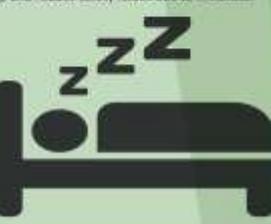
**“** What technologies, new and emerging are available?  
Who is affected by insomnia?  
What are the generation trends?  
What are the physiological effects of colours?

**“** What is a target market who is in need and can't be inclusive?  
Who is affected by insomnia?  
What are the generation trends?  
What are the physiological effects of colours?

Lamb's own (2012)

### Conclusion

Ultimately this report concludes that a device that can induce a discreet method of suppressing or reflecting these primary adverse environmental effects will help a user transition into sleep. Furthermore by encouraging and promoting the actions of healthy sleeping this will aid with the UK's issue of lack of sleep and reduce safety issues due to tiredness.



### Risky Business

UK statistics suggest that around 20% of major road accidents are due to lack of sleep (Gov.UK, 2015). This is hardly surprising as "moderate sleep deprivation produces impairments in cognitive and motor performance equivalent to legally prescribed levels of alcohol intoxication" (Williamson, 2000).

**Drowsy Driving**  
100,000 police-reported crashes each year

**60%** of UK drivers have driven while drowsy

**37%** of UK drivers have taken alcohol to help them sleep

**Insomnia**  
Insomnia is one of the most common sleep disorders in the UK having the ability to affect any one at any age. Most people will be affected by at least one form of acute insomnia at some point in their life.

**Just 1 in 10** have consulted their doctor about sleeping problems

Three times this number have taken medication to relieve the problem  
(The Sleep Council (2012))

### Insomnia

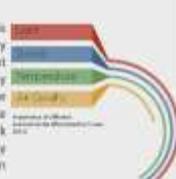
\* 21% of insomnia sufferers needed to have some of their tasks towards sleep often thought of as a chore rather than a pleasure

**Comparison of the attitude towards sleep**  
Interviews were done to compare the attitudes between people with insomnia and people without. The pictorial representations depict the score the participants gave when rating their attitude towards sleep. 0% being that they completely hated the idea of sleep and 100% with sleep being something that was eagerly anticipated. Insomnia sufferers averaged a score of 21% with comments on how they disliked the prospect of sleep. Non-sufferers averaged 83% with more positive attitudes towards sleep. (0% = very poor, 100% = Excellent)

**No Insomnia**  
\* Of non-insomnia sufferers had more embracing attitudes towards sleep

### Sleeping Environment

A literature review established that the sleep environment is hugely important to both the quality of sleep and the ability to get to sleep. Light, sound and temperature playing the most important roles in the immediate time-line, and air quality having a more gradual effect. Key points were to reduce the exposure to light (especially blue LED light), reduce noise levels/ reduce the differences between baseline and peak noise levels and keep the temperature of the room slightly cooler as this helps the body complete its job of cooling down when attempting to sleep.



### Specification

**Target Group**

- Age: +18 years. Not exclusively the target market is people suffering from primary chronic insomnia. This use affect people at any age however the largest demographic is 21-46 years (Appendix).
- Non gender specific: Although insomnia has a higher prevalence in females (Kaperidis), there is still a large percentage of male sufferers, and designing a gender specific product would drastically reduce the effectiveness of the product across the diverse population.
- Other health problems: Many people suffering from insomnia develop further health problems or develop resistance from an existing health problem. (Appendix) It is important to be aware of the physiological impact of the designed product.

**Visuals**

- Light:** The length of waves of lights important to the quality of sleep (Appendix) it is important not to use blue light (due to the increase of brain activity effect) despite its daytime soothing nature. Red light has a negative physiological effect (Appendix) but it much less disruptive and a better choice of colour (to use).
- Colours:** It is important to choose a pleasing colour palette. The age demographic suggests that although the selected population suggests the feeling of association they also want the option to have alternatives.

**Use**

- Independent use:** The ability to use the product by itself and not to encourage the use of a phone or other electronics with a screen before bed. (Appendix)
- Simple to use:** Not overly complicated because increased frustration before bed is not going to help the transition to sleep.
- Not counterproductive:** Sounds or or little other counter productive aspects are active when the product is in use. Sounds however that is important not to over stimulate the brain before sleep otherwise it negates the purpose of the product. No screen. The use of a light emitting screen would counteract the point of the product and with increased stimulation before sleep.

**Technology**

- Phone/Android:** As the population is becoming more reliant on phones and social connectivity (Appendix) the ability to track and monitor sleep progress would allow for further operation of the product range.
- WIFI:** Will allow for the ability to upload status that can be read by either a phone or computer. This will help them track their sleep progress and if it is improving.

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## 4.3 Design Brief

### 4.3.1 Introduction

In a world with increasing connectivity and social ability humans as a species are spending more time awake doing things, not giving their body's time to unwind, relax and recover. Every animal needs sleep, humans are no exception and due to the habits that have been picked up from previous generations mixed with the technology boom we are getting less and less of that much needed sleep. There are also a large number of people whom cannot physically get to sleep even when they are feeling very tired, one of the main diagnosis in this area is called insomnia. Sleeping pills are sometimes referred to as a "quick fix" solution; however these do not "cure" insomnia and often the body become addicted and immune to them, so the effect becomes negligible.

### 4.3.2 Project aim

Design a physical product that helps reduce some of the causes and/or effects of sleep disorders especially in insomnia. This should be done without medication. Address some or all of the problems mentioned in appendix 2.1.0 – 2.4.0 to help increase productivity of insomnia sufferers and allow for a method for tracking so the data can be displayed in an easy form that will demonstrate to the user whether or not they are improving.

### 4.3.3 Project objectives

- A product that reduces some or all of the effects of insomnia
  - Primarily addressing the environmental factors
- Does not use medication
- Fits in with the chosen target generation's trends for a healthier lifestyle
- Easy and simple to use so that it is inclusive
- Has the ability to track and record sleep data to allow for data feed back

### 4.3.4 Target user

The target population are people that currently suffer from insomnia or other sleep problems and also potential people that are affected by people with sleep problems and are at risk of forming itthem themselves. The age ranges are the current generation of adults with some thoughts towards the upcoming and older generations.

### 4.3.5 Initial design constraints

- Fits discretely onto a bedroom environment
- Does not creative a negative effect for other sleepers
- Has a sleep mode, where the product does not produce light or negative noise during sleep
- Data can be read and analysed to track progress of sleep

### 4.3.6 Project plan and management

See appendix 3.6 onwards

## 4.4 Design Specification

### 4.4.1 Target Group (Appendix 1.3.3 : 1.4.4 )

- **Ages >18:** Not exclusively, the target market is people suffering from primary chronic insomnia. This can affect people at any age however the largest demographic of only insomnia sufferers is 21 – 46 (Appendix 1.3.3 : 1.4.4).
- **Non gender specific:** Although insomnia has a higher occurrence in females (Appendix 1.4.4) there is still a large percentage of male suffers and designing a gender specific product would drastically reduce the effectiveness of the product across the chosen generations.
- **Other health problems:** Many people suffering from insomnia develop further health problems or develop insomnia from an existing health problem. (Appendix 1.3.3) It is important to be aware of the physiological impact of the designed product.

### 4.4.2 Visuals (Appendix 2.1.1 : 3.2.1 : 3.1.0 : 3.3.0)

- **Light:** The length of wave of light is important to the quality of sleep (Appendix 2.1.1) it is important not to use blue light (due to the increase of brain activity effect) despite its daytime soothing nature. Red light has a negative physiological effect (Appendix 3.2.1) but it much less disrupting and a better choice of colour to use.
- **Colours:** It is important to choose a trending colour pallet. The age demographic suggests that although the selected population requires the feeling of association they also need the option to have uniqueness. (Appendix 3.1.0 : 3.3.0)

### 4.4.3 Connectivity / technology (Appendix 3.1.0)

- **iPhone/Android:** As the population is becoming more reliant on phones and social connectivity (Appendix 3.1.0) the ability to track and monitor sleep progress would allow for further expansion of the product range.
- **WiFi:** Will allow for the ability to upload statics that can be read by either a phone or computer.

### 4.4.4 Use (Appendix 2.1.2 : 2.1.3)

- **Independent use:** The ability to use it by its self and not to encourage the use of a phone or other electronics with a screen before bed. (appendix 2.1.2 : 2.1.3)
- **Simple to use:** Not overly complicated because increased frustration before bed is not going to help the transition to sleep.

### 4.4.5 Other

- **No screen:** The use of a light emitting screen would counter act the point of the product and with increased stimulation before sleep.
- **Counterproductive:** Ensure no or little other counter intuitive aspects are active when the product is in use. Seems obvious but it is important not to over stimulate the brain before sleep otherwise it negates the purpose of the product.

#### 4.4.6 Responsibility Factors (*Appendix 3.5.0*)

- **Data Protection Act:** As personal data is being used and monitored for the user it is important to implement safety precautions so the data cannot be accessed by unauthorised people. (Appendix 3.5.0)
- **Ethics,** the device should not record data without the consent or knowledge of the user.

#### 4.4.7 Manufacturing Factors (*Appendix 3.4.0*)

- **Production,** due to the number of people affected by insomnia the ability to make large quantities of the product and ensure that thought is put into the materials and the production methods.
- **British Standards,** these British standards need to be considered. (Appendix 3.4.0)