

Brevane Stone: Combating Tiredness and Promoting Wakefulness with Wearable Scent

by

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Brevane Stones

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To my mom...

Who taught me to always say yes to new opportunities and chances, which have led me to new findings towards my surroundings and myself.

To my sister...

Who gave me housing during my long commutes to school each week.

To my friends...

Who reminded me to take a break and move forward with their messages of encouragement.

To my dog...

Who would force me to have breaks and sleep.

ABSTRACT

Because people ignore the need to sleep, deciding to work nightshifts, or complete a task, our natural circadian rhythm begins to go off balance, till we reach a point where we feel drowsy and fatigue near constantly. This is a dangerous notion since those most at risk of this work multiple jobs or long hours, like essential work (nurses, doctors, pilots, etc.). This can result in harm to themselves or others. While we cannot fix the issue of getting people to sleep immediately, what can be addressed is the possibility of keeping one awake till they are meant to sleep. Current products that do this include loud alarms or items that are too big to carry and draw attention to themselves like therapy lights. Even consuming caffeine can make the situation worse if consumed over excessively or at the wrong time. But what about smell? The area of smell being used to wake a person up and keep them alert has not been studied, but there have been cases showing how powerful it is when linked to our brains¹. We can recall hidden memories in our psyche just from a smell alone. This led to me questioning how smell can be used to create a wearable device to help promote wakefulness and alertness for those suffering from a lack of time. I looked towards jewelry and ceramics, finding that they have the potential to absorb essential oil scents, and carry that scent for days on end. In the end I was able to design pendants for necklaces and bracelets that allow the user to apply oil inside to absorb and then wear it. The necklace provides a continuous scent one can smell, while the bracelet gives relief only when you bring the stone close to one's face.

¹ Anna Chen, "Perfume and Vinegar: Olfactory Knowledge, Remembrance, and Recordkeeping," *The American Archivist* 79, no. 1 (2016): 103–20.

INTRODUCTION

There's never enough time. In a day, a week, a month, a year. There is never enough. There is so much that needs to be done. But the instant one task is complete, other piles on. They grow and grow each day. Every free second is delegated. Things believed to be unimportant or changeable get pushed back. Breaks are combined with work; a nurse plans her next task while taking her lunch break, and a mother working longer hours at her job comes home to take care of her children and chores instead of relaxing or doing a loved hobby. And sleep? With only twenty-four hours in a day, and sleep meant to occupy eight of them, why can't it be pushed back further and shorter? Why not use some of those eight hours every day to finish the tasks? The paperwork and forms are not completed in the office, or the forgotten homework assignments are due tomorrow! due the next day. Can't we hold off sleep till we are able to complete our check list?

No, we cannot. Sleeping is our body's way of healing from the damage it suffered throughout the day. Just like how eating fuels us, sleep gives us the rest and healing to continue moving every day. When we start to ignore our bodies', natural responses telling to sleep, we start to face issues such as depression, anxiety, lack of alertness and more. And the more it is ignored, the worse it will get. But society today treats sleep like it's a choice. Many jobs and positions, both at home and work, require people to work night shifts, longer hours, or even from home when they should be off the clock. And with the lack of time to rest, tiredness can set in when we need to be awake, like when working or doing tasks that need to be completed during the day. For a society that decided to run twenty-four hours, we lack a way to fix the issue of irregular sleep schedules.

Now, of course I cannot make people fall asleep, nor can I change how society works. But I can look at the biggest issue caused by it, which is the growing number of exhausted people living and working on irregular sleep schedules. The main factor in why this is a growing issue is that many people who fall into this category are essential or hourly workers, who do not have a set time for their job. This can range from hospital workers like doctors and nurses, to a college student commuting from home each day. Sleep is important, but when fatigue hits while doing a task, mistakes will happen. Now why can't someone just set an alarm to wake them up? As someone who currently has twenty different alarms set throughout the day, I know from experience that it is not a long-term solution. Especially when it goes off in the middle of a task. And, of course, alarms are not the only way to stay awake. This thesis looks at numerous methods of keeping one awake, including but not limited to, wearable tech, light therapy lamps, and caffeine. During this research, I noticed a pattern. All the current technologies and devices we have are made to wake someone up with light, sound, and vibrations. Scent was largely ignored. This led me to ask; how can olfactory cues integrate into

wearable devices influence alertness and conditioned wakefulness in individuals with disrupted circadian rhythms or irregular sleep schedules?

By first understanding how our body naturally responds to sleep, the lack of it over time, and smell, we can see how smell alone can be used to encourage alertness in individuals experiencing growing fatigue. Along with this, the process including scents in discrete, wearable items can bring forth new techniques in the ceramic industry.

In this book I will introduce the neurological studies and findings of circadian rhythms, how they are relevant to our daily lives, and how they affect one physically and mentally. I will then bring in studies and findings of the current issue with the societal norms we face with scheduling and working with little to no rest. I will attempt to answer the question of how we got to this point in time. Then I will introduce research focused on how the power of smell can be used to help mitigate and fix our own natural sleep-wake cycle overall.

Once the research is understood, I will introduce my own research journey through material studies and testing that took place, along with a look at the design process and understanding of the initial choices I would make. All this then leads to my final user testing, which led me to creating the final ideation of the designs for the pieces presented.

BACKGROUND

I grew up with the idea that you should always work hard. That the results of the labor put in will be great in the end. I was also taught to always be smart with what you do. That even if one choice might be easier now, later it could cause more problems.

I started working in an hourly position the moment I turned sixteen, where I went to work at my neighbors' farm. There the hours were random. Somedays I need to get there at five in the morning, working till two in the afternoon. Other days, depending on the season, I would work a full twelve plus hour shift, going from nine in the morning till one at night. And through all of this, I was in high school. Only I would go to two sperate schools each day. One being a vocational high school and the other a normal school. A bus would take the commute between the schools each day for the handful of students doing the program.

This didn't stop when I graduated and started to go to college. Even though it was a time during the Coronavirus pandemic, when allowed back to school to learn I worked a front desk security job on campus in the residential halls. The position, while simple, was one that allowed students to work at any hour, even at night. And because of the higher pay, I would work midnight to four AM shifts, or even eight in the morning shifts, where I would get either an hour or two of sleep before going to one of the six to seven classes I would take in the morning.

Even now in graduate school I continue this line of thinking, where instead of living in New York City, I instead decided to live in my childhood home with my family in Somerset County, New Jersey. Which is a commute of around four to six hours round-trip each day I go for class. This decision, while crazy to most who hear it, was the best since it's a whole lot cheaper to commute on NJ Transit compared to the cost of living in the city. But the drawback is having to leave the house by six in the morning to catch the train for a morning class, and the possibility of arriving home close to midnight if needed to stay in the studio for work.

The reason I bring up my past and current issues is that because of these experiences, I can confidently say that I have a clear understanding the issues and struggle people face from a lack of a proper schedule for their day, and how it can affect every aspect of ones day if anything changes, even if it is small. It is why I feel strongly about my thesis study into how we can regulate our internal clock back to normal.

NOTE

With all the success that came out of this project, I did have limitations that I had to face. One of the biggest being the lack of variety in material research. Because of time and money, I focused on creating testing materials with materials I had on hand through the school. Another limitation that needs to be addressed is the lack of user testing for long periods of time to see the effects. I did user testing with young adult women in New York City as my focus group. However, I was only able to conduct the study for a two-week period. Because it focuses on the effects scent can have on our circadian rhythm, I believe that the user testing period should be at least a month, if not a year or more. But because of timing that was not a possibility.

Even with the limitations that I faced, there was success in this work, leading me to create a product that is both beautiful in its simplicity and form, while also giving a power statement to fixing our own scheduling of wakefulness.

METHODOLOGIES

The focus of this study looks deeply into the neuroscience of circadian rhythm and the effects of smell, as well as the psychological effects of the lack of sleep has on one's psych over time. It also goes into the craftsmanship of ceramics, pulling knowledge of the diverse types of clays and glazes into the study for an intensive understanding of how it can be used in connection to scent. Looking into the history and knowledge of aromatherapy being used as a method of healing one's body for centuries², a new line of research can be created to find new ways of experiencing aromatherapy to stimulate someone when desired.

² "What Is Aromatherapy and How Does It Help Me?," Healthline, May 15, 2018, <https://www.healthline.com/health/what-is-aromatherapy>.

LITERATURE REVIEW

When choosing literature for my research, I focused heavily on scientific discussions of the biological effects of sleep on the body. Then I went on to focus on the downsides of feeling tired at work when doing tasks. When I couldn't find research on aromatherapy and wakefulness, I first investigated the psychological effects of smell, and then other effects

RESEARCH SETTING AND DATA COLLECTION

Even though the topic focuses on staying awake to promote better circadian balance and sleep, the research setting will not be conducted in a traditional sleep study space. All work is conducted in a studio space to conduct material research on not only the different effects of scent on a person, but also how it reacts to each of the different clay body types that it can be absorbed into. It's important to note that research on smell used in sleep studies is limited to them promoting one asleep. Since my study is focused towards promoting wakefulness instead, research into the long-term benefits of smell being used to wake a person up while being limited but conducted through user testing and research into the effects a scent can have individually.

MATERIALS AND PARTICIPANTS

The material research focuses on a range of clay bodies to find absorption rate, as well as duration of the scent after firing, as well as with the different body shapes and glazes applied to it. Participants in the study are focused on those working night shifts or have multiple positions, such as college students working full time or commuting, those working night shifts, and those who have multiple jobs. While testing, users will be asked to use the pieces for several days long term, while conducting their normal routines. Finding if they experience any differences in their awareness and fatigue before and after using the scented pieces.

MEASURE OF SUCCESS

I am not trying to solve the societal norms of the twenty-four-hour wakening lifestyle that we face. Nor am I expecting to solve how to keep someone awake in the longer-term setting using smell alone. I expect however to create a wearable piece that can hold scent for an extended period, without creating wasteful materials as a byproduct of continued usage. The scents should focus on stimulating one awake and alert instead of creating drowsiness and fatigue.

1 LITERATURE REVIEW

The idea of sleep is something people both seek out and avoid. When given the choice to sacrifice a biological need so that they may continue a task they want to complete, sleep is one of the first to go. Why wouldn't it? According to the CDC, adults aged 18-60 years old need seven hours or more of sleep each day to be considered healthy³. Meaning they would have 17 hours awake at most in a full day, not including time spent traveling, at work, doing chores, and more. Compared to drinking water and eating, sleeping is the most time-consuming biological need we have today. But it is also the most important one. Sleep is our body's way of healing itself from all damage that it goes through, letting us wake up, refreshed and recharged to go out once more. It isn't something that can be replaced or replicated with more sleep later, like eating a meal. But as much as we know this, because of how society works, we continue to treat sleep like it *can* be replaced. This mistreatment alone can cause numerous issues to our mental and physical health, as well as lives outside. And while there have been solutions to combat the sleepiness of our lives, our social norms and habits continue to impede any progress that can be made. To have a clear grasp on the matter, one must first understand the science behind sleep, as well as the effects a lack of it can have on our psychological overtime. Once that is understood, one can fully grasp the matter of how standard time against nature has affected us today in our modern world, and how it has the potential to be fixed with our own senses. Specifically, our scent smells. This chapter will examine scholarly sources that will give an understanding of all these topics, so that we can better understand the research question and thesis statement of this project.

1.1 UNDERSTANDING SLEEP

1.1.1 The Biological Understanding of Circadian Rhythms

One of the most popular terms used when discussing sleep is 'Circadian Rhythm,' usually in the context of feeling tired after a series of nights without proper sleep. This is, however, only a fraction of what the term means. The circadian rhythm is the body's natural 24-hour cycle where certain chemicals within the body are released at certain set points throughout the day, which can also be influenced by the outside environment, like the sun rising and setting⁴. All biological creatures have a circadian rhythm, but common people don't have a clear understanding of the notion, or even where this is in our own brains. Having a better understanding of what circadian rhythm is and its effects on our body from a neurological standpoint allows us to see how current methods of sleep regulation have been affecting it, either negatively or positively.

³ CDC, "About Sleep," Sleep, February 12, 2025, <https://www.cdc.gov/sleep/about/index.html>.

⁴ "Circadian Rhythm: What It Is, How It Works & What Affects It," accessed April 27, 2026, <https://my.clevelandclinic.org/health/articles/circadian-rhythm>.

One of the first things that should be known about the human body's circadian rhythm functions is that it's driven by something called the suprachiasmatic nuclei in our brains. This is the part that controls our bodies internal clock and allows regulation for not just our sleep, but also body temperature and hormone secretion throughout the day⁵. It is because of this that even if we lost all external cues, like sunlight and night, our rhythm would continue to function in a 24-hour continuous cycle. If the suprachiasmatic nuclei were ever to be damaged, that damage *would* affect our circadian rhythm, leading to numerous irregularities to our bodies, not just our sleep.

Neurology is an ever-growing and expanding field of research with endless possibilities for what could and should be. The reason behind this is because our brains are extraordinarily complex, allowing us to understand many tasks and skills throughout our lifetime. Without it we would be a dead husk. Each biological creature has its own unique brain with its own size, instincts, and internal wiring. Which is why current information is always popping up about it, even though doctors have yet to study everything. For this reason, the focus on the circadian rhythms function in our brains was one that only started to be looked up to in the past 30 years, even though records have been shown to have known to some degree about it for thousands of years⁶. Recent studies, such as one we'll examine that investigate the brains of mammals to see how much it is influenced by the outside environmental changes such as light changes from day and light, can give a bigger understanding of the topic and where we are today in those terms.

A study conducted by the National Academy of Sciences of the United States of America presented how damaging a disrupted circadian rhythm can cause to ourselves⁷. The study was conducted on two groups of mice. The first group lived in a world with a twenty-four-hour day cycle, while the other lived in a world with a twenty-hour day cycle. Over the weeks, they noticed that mice in the twenty-hour cycle, over time, would have increased weight gain, low cognitive recognition, as well as other changes to their metabolic hormones⁸. It showed the negative impact that could be faced when we are forced to ignore our own sleep cycle and change it against what our body needs naturally. However, given the increased need in society to continue to push ourselves to complete tasks, we end up ignoring our own needs, resulting in times where we shouldn't be sleeping at all, which further messes with the circadian rhythm,

⁵ Michael Hastings, "The Brain, Circadian Rhythms, and Clock Genes," *BMJ: British Medical Journal* 317, no. 7174 (1998): 1704–7.

⁶ Fred W. Turek, "Neurobiology of Circadian Rhythms in Mammals," *BioScience* 33, no. 7 (1983): 439–44, <https://doi.org/10.2307/1309072>.

⁷ Ilia N. Karatsoreos et al., "Disruption of Circadian Clocks Has Ramifications for Metabolism, Brain, and Behavior," *Proceedings of the National Academy of Sciences of the United States of America* 108, no. 4 (2011): 1657–62.

⁸ Karatsoreos et al., "Disruption of Circadian Clocks Has Ramifications for Metabolism, Brain, and Behavior."

and in correlation, our mental health. Even though we know how important sleep is, we still ignore it.

1.1.2 Sleep and Mental Health

No one likes to be stressed. The feeling of a continuous pressure that slowly builds up till it crushes you in a continuous cycle that never ends is one that no one wants to experience but still must because of the life that we live. While there are ways to lessen stress, there are also things that end up increasing as well. One of the issues that can be making it worse is the lack of proper sleep. Even if one were to sleep on and off through the twenty-four-hour cycle through naps, which is not going to give them the proper amount of sleep needed to help with their mental health in the long term. Links have been found where one's sleep problems can be caused by or cause several mental health disorders in a person⁹. And while this can be fixed later to prevent such issues, when we live in a society that prides itself on losing sleep to get tasks done, that may be an impossible task.

When one thinks of Seasonal Affective Disorder (SAD) sleep will not be the first thing that comes to mind. SAD is a depressive disorder which takes place during times of year when the sun is out for fewer hours than the moon¹⁰. When the sun goes down, our brain's chemistry naturally begins production of melatonin, a chemical only produced at night and is meant to induce sleep for use. However, because in the winter the sun goes down earlier each day, melatonin production starts earlier¹¹, which leads to SAD disorders over time because of it. Even though it is a seasonal disorder, the effects can be huge. There are also outside influences that can cause impaired sleep to a person through their mental health, the biggest being from stress.

In a 2006 study by Torbjörn Åkerstedt, Swedish Researcher of Psychology at Karolinska Institute, evidence was found that high demands pushed onto oneself can cause a reduction of sleep because of burnout from long-term, or even short-term stress from the pressure¹². But stress goes away, right? It's not present forever, only there till the issue is no longer dire in one's mind, correct? Except that's not the reality of the issue. Much like a scar, the effects of stress-influenced sleep disruption fade slowly over time and can last for over two weeks till corrected. But even then, it can still be longer if the stress is still persistent in the person's life. Sleep

⁹ UHSAdmin, "The Relationship Between Sleep & Mental Health," April 7, 2025, <https://granitehillshospital.com/blog/the-relationship-between-sleep-and-mental-health/>.

¹⁰ Melanie Abas and Declan Murphy, "Seasonal Affective Disorder: The Miseries Of Long Dark Nights?," *British Medical Journal (Clinical Research Edition)* 295, no. 6612 (1987): 1504–5.

¹¹ Abas and Murphy, "Seasonal Affective Disorder."

¹² Torbjörn Åkerstedt, "Psychosocial Stress and Impaired Sleep," *Scandinavian Journal of Work, Environment & Health* 32, no. 6 (2006): 493–501.

disruption itself can also be the cause of stress in a person as well ¹³. Sleep has been shown to help with the management of stress and self-regulation in a person, but when sleep is impacting one's life in a negative manner like missing or delaying tasks, increasing fatigue, and more, it can become the cause, making stress the consequence at the end. As a result, it becomes an endless cycle of which one was the cause and consequence to the negative impacts towards our own mental health. Like another endless question of the chicken and the egg, we end up asking ourselves which came first? Stress or sleep disruption.

1.2 THE SOCIAL NORM TO AVOID SLEEP

Now powered with the understanding of how our bodies' circadian rhythm works to help our bodies each day, as well as the mental and physical impact that happens when ignoring, why is this relevant today? If the issue is that we are not sleeping enough, then why don't we just sleep? Wouldn't that solve our problem? Well, that is all easier said than done. Especially when you take off the rose-tinted glasses and look closely at our societies.

There are essential things that biologically living beings must do to survive. Eat food for fuel, drink water for hydration, as well as sleep for recovery. No one can survive for long without any of these things. But as a society we feel the need to shorten or omit our sleep, shortening it or just not sleeping some nights, so that any unfinished tasks can be completed no matter how big or small they are to us. This issue expands to many people, from parents raising their kids, to shift workers who have irregular or rotating schedules. And while some can get away with continuing with their irregular lifestyle changes to their circadian rhythm, many still struggle to catch-up, resulting in even worse sleep regulation. Especially when trying to fix it later. As a result, people end up decreasing their attentiveness while also increasing their risk of making mistakes each day. If we have a natural clock within our bodies telling us when we need to sleep, wake up, and more, then why don't we listen to it? Well first, you must understand time and how it changed throughout ancient times till what we have today.

1.2.1 Time: Nature vs Man

Time is a remarkably interesting concept when you think about how it was created, if it was created at all, in the traditional sense. When you think about time, one would imagine a clock or a schedule that they have throughout the day, something that can become tangible. But when it comes down to breaking down the concept of time, you must ask what exactly it is. Society created numbers and dates to keep track of history, tasks, and the passage of time as we all grow older. Evidence of the first devices made to measure time was at least 5,000 years prior to today, in the ancient civilizations of Babylon and Egypt ¹⁴. The reasonings for these time keeping devices were to help with deciding when to harvest and plant new crops for the season,

¹³ N. A. Hamilton et al., "Sleep and Psychological Well-Being," *Social Indicators Research* 82, no. 1 (2007): 147–63.

¹⁴ William J. H. Andrewes, "A Chronicle of Timekeeping," *Scientific American* 287, no. 3 (2002): 76–85.

and any other thing that had to do with the shipment of items to others. The use of horology and devices created for it to help people find how long they could do a task increased over the years when the need to track time for tasks became more important. It was only in the 17th century when the first Huygenian clocks, which are the standard timekeeping clocks we see and use today, were introduced to be standard worldwide ¹⁵. The biggest thing to note about this, however, was that when compared to using natural devices like tracking the sun, Huygenian's artificial time was not shown to be using the same time. Much like traveling between time zones, the two methods had a time difference between them, making it difficult to follow till years later when artificial time became our new standard.

The rise of Neo-Weberian began in the twenty-first century, which focused on modernizing traditional principles to become more efficient to people. The use of time was no exception to these changes. In my opinion, it was the biggest one to change, even if it was so little. Civilizations prior to this would track time spent, but they would do so with the idea of allowing the person to dedicate much of their time to a single task, mastering and perfecting what they are focused on instead of rushing through their day like a checklist. The best way to describe what time has become today post-modernization of time keep, is that time today is only seen as an economic tool to get things done ¹⁶. This is not to say that people did not do this throughout history in the past, as there is evidence to show that this is something that has been used around the Renaissance period to encourage betterment of oneself for their own self-improvement and families. However, societal norms today have made it seem like the only way we can improve or get anything done is to do it as fast as possible so that we have more time in the day to do more tasks with the same level of completion. This way of life is one that hasn't changed in decades; however, we have seen challenges to this lifestyle in the new generations today. The idea of spending all day working without time for oneself is one that many people today are trying to avoid or not do. And while older generations criticize this movement, saying that the newer generation is lazy, it does show a greater understanding in how we see our own mental and physical health when it comes to the need for rest and proper scheduling.

The eight-hour workday was not something that just popped out of nowhere in history. Labor throughout human history was always based on survival and the need for resources. And with our natural timekeeper being the rise and fall of the sun, it should be no surprise that it was also how people figured out when they should be working during the day. Even when the modernization of the clock and time first appeared, many workplaces around the world were stuck to working longer shifts. This was challenged, with the biggest one being Thomas

¹⁵ Anthony Turner, "The Eclipse of the Sun: Sun-Dials, Clocks and Natural Time in the Late Seventeenth Century," *Early Science and Medicine* 20, no. 2 (2015): 169–86.

¹⁶ Benjamin H. Snyder, "From Vigilance to Busyness: A Neo-Weberian Approach to Clock Time," *Sociological Theory* 31, no. 3 (2013): 243–66.

More, who was one of the first to propose a six-hour workday¹⁷. The reason he proposed it was because he believed that time should be allowed for workers to rest and have a leisure activity they like to do to have a healthy work-life balance. It was after numerous experiments found that shorter hours of work resulted in fewer sick leaves and high production rates that Russia proposed an eight-hour shift schedule mandate during the revolutionary period in their country. So other countries began to follow the eight-hour day movement that had started. This leads us to today where now one of the biggest issues that is happening in the workforce is the rising need for online and remote jobs. After the coronavirus pandemic, which led to a global shutdown because of the outbreak of this infectious disease, many positions turned remote. And while a few were unable to do that because of the nature of their jobs, it was found that many office jobs could be done at home¹⁸. After the pandemic was lifted and companies tried to go back to fully remote work, there was a protest it. People found that they could get more free time and less stress working from the comfort of their homes, without having to worry about travel time and costs of going and leaving work each day.

1.2.2 The cycle of work and sleep

Usually, people are awake while the sun is out, when they can go to work and complete any tasks that need to be done throughout the day. And then at night they will go to sleep till the sun rises again to start the cycle all over again. This is the ideal schedule that people would follow. But in our twenty-four-hour society, that's not the case. In positions that require people to work throughout the night, especially in large cities like New York City, it is almost a requirement that there must be night shift workers so that the business can stay open for other late-night visitors. This wouldn't be a bad arrangement, if not for the fact that most tasks outside of work like grocery shopping, cleaning, and other business-like doctor visits or phone calls, are only available during daylight hours, instead of at night. This results in any person doing night shift work not only staying awake during the day to complete personal tasks, but to also staying awake and alert at night when working, especially when their brains tell them they should be sleeping¹⁹. This cycle would then be repeated each day when they work the night shift. The issues later can affect their lifestyle choices as a result like lack of physical activity caused by daytime sleepiness. This reduction of sleep length has been shown to have a correlation to the decrease in life expectancy²⁰. Even with everything just mentioned about the

¹⁷ Stephan Bauer and Alfred Maylander, "The Road to the Eight-Hour Day," *Monthly Labor Review* 9, no. 2 (1919): 41–65.

¹⁸ "The Rise in Remote Work since the Pandemic and Its Impact on Productivity : Beyond the Numbers : U.S. Bureau of Labor Statistics," Bureau of Labor Statistics, accessed April 27, 2026, <https://www.bls.gov/opub/btn/volume-13/remote-work-productivity.htm>.

¹⁹ Mikko Härmä et al., "Combined Effects of Shift Work and Life-Style on the Prevalence of Insomnia, Sleep Deprivation and Daytime Sleepiness," *Scandinavian Journal of Work, Environment & Health* 24, no. 4 (1998): 300–307.

²⁰ Atanu Kumar Pati et al., "Shift Work: Consequences and Management," *Current Science* 81, no. 1 (2001): 32–52.

negative impacts night shift work has on our health, it doesn't compare to the issues that can be brought up when working, especially high-risk positions that always require complete focus and alertness, which are positions that have irregular shift hours.

Irregular work positions are jobs that have changing schedules, with the understanding that the person in the position can be called in at any time outside of their own hours and would need to remain at work long after their shift ends. These positions are mainly jobs like doctors and nurses, 911-dispatchers, emergency services, drivers, and more. Positions like these make it so that they cannot afford to make a mistake on the job because of lack of sleep, but because of a lack of time to do so, the risk of an incident happening because of them is ever present. One tragedy that comes to mind took place in 2004 on Corporate Airlines Flight 5966, where the plane crashed due to the pilot being fatigued from being on duty for 14 hours and ignoring standard procedures from their tiredness²¹. This is just one story out of many of the risks that come from working substantial risk positions when they affect one's rest period that they need to continue to work without causing irreparable damage to themselves or others.

I have gone at length about the negative impacts of the societal norms at the workplace on our sleep and its consequences but haven't touched upon another side to the issue which is the home dynamic. No matter which generation one grows up in, and no matter what time period you study, one thing that has been drilled into our subconscious at a young age was that the man in a relationship needed to be the breadwinner of the family, while the woman takes care of the family and home. This dynamic is drastically changing today where women are more independent and getting money for the family, sometimes being the breadwinner themselves instead. But that's how far the changes have gone.

A study released in 2010 which looked at twenty-five heterosexual couples who both had jobs and children. It was shown that the men saw themselves as breadwinners of the family with the women being default caregivers. This resulted in showing that sleep was more important for the man at night, making the women bound to do any night routines that may come up²². They ended up proving that women faced a hidden gender inequality at home, called a second and third shift focused on the management of the home and childcare. As a result, compared to their male counterparts, a woman's sleep was often sacrificed to complete the numerous added tasks needed to keep the home running on top of their own work schedule.

²¹ John A. Caldwell, "Crew Schedules, Sleep Deprivation, and Aviation Performance," *Current Directions in Psychological Science* 21, no. 2 (2012): 85–89.

²² David J. Maume et al., "Gender, Work—Family Responsibilities, and Sleep," *Gender and Society* 24, no. 6 (2010): 746–68.

1.2.3 Fighting the Pull of Sleep

We seem to accept that the issues faced that affect our natural circadian rhythm are something that must be accepted and ignored, with no real consideration for the impact that it has on us overtime. While in recent years there has been a focus on learning how to fix it, it is another matter entirely whether the solutions used today can be a permanent solution to fixing the damage that has been caused.

One of the biggest solutions to fixing one's circadian rhythm is the prevention of falling asleep. The idea might seem redundant at first and at first glance. Shouldn't a person be sleeping more to prevent it from getting worse? If you have been reading and understanding anything that was written earlier, then you can understand why sleeping is not a solution. In case you haven't, even if a person were to go to sleep, it could make matters worse if they were doing so at any time that wasn't during the intended sleep hours. When one goes to sleep for hours when they are not meant to be sleeping, but instead awake, this can further negatively affect their rhythm for future sleep. Many solutions have been created as solutions, with the most popular being light therapy and caffeine. However, even with these methods having positive outcomes, issues also have arisen with their continued use as well.

1.2.4 Practices and Products

One of the most popular methods used to help prevent sleep is the use of light therapy, which is when a person gets exposed to a large amount of light to stimulate sunlight. It is a favored method when treating mental disorders such as Seasonal Affective Disorder (SAD), since it has been found to help with depression when done correctly on the individual²³. Light therapy has the potential to be used with helping other groups of people such as shift workers with their irregular schedules, as well as those working indoors or where sunlight is not readily available. But the issue that is faced when using it is timing. When trying to fix anything connected to one's circadian rhythm, the timing of when you use it is important so that you are not just making the matter worse. For light therapy, if you use the light during a time you are meant to be sleeping, you would be preventing yourself from going to bed at the appropriate time that you would need. Another issue with light therapy is that while it does work when used correctly, overtime over exposure diminishes its results²⁴. And even if that was not the case, light therapy isn't a method that can be done anywhere. The amount of light exposure needed to the devices currently available on market requires users to be sitting either at home, or somewhere they can relax while being exposed to the light.

²³ Kathy Lee Dunham, "Seasonal Affective Disorder: Light Makes Right," *The American Journal of Nursing* 92, no. 12 (1992): 45–46, <https://doi.org/10.2307/3426875>.

²⁴ Yudhijit Bhattacharjee, "Is Internal Timing Key to Mental Health?," *Science* 317, no. 5844 (2007): 1488–90.



Figure 1. Caffeine

Now how about caffeine? It is one of the most consumed products to help people stay awake²⁵ while also having the benefit of being able to have anywhere when proper since it can be consumed on the go. It shouldn't be a surprise when I say that there are also limitations to caffeine consumption, which can also negatively affect if your circadian rhythm is consumed incorrectly, which, much like light therapy, is all based on the timing of its use. One thing that is important to note about caffeine is that when consumed, it causes delays in melatonin production in the

brain²⁶. Which, mentioned previously, is what helps us fall asleep when we need to at night. Because of this, if one were to consume coffee mere hours before they were meant to go to sleep, they can prevent themselves from being able to sleep when they need to, causing a sleep disruption. This does not mean that it cannot help when consumed correctly. But when incorrectly used, it can cause more harm than good to our circadian rhythm.

1.3 THE POWER OF SCENT

When it comes to ranking our senses from most important to least, smell would be put at the bottom. When compared to seeing art, listening to music, feeling human contact, and tasting delicious food, our sense of smell is overlooked to the point at which we don't appreciate it till it is gone. The best way to describe smell was written by historical scientist, Diana Ackerman, who wrote in her book "A Natural History of the Senses", that "smell is the mute sense, the one without words."²⁷ We can give a description of a smell, but never one to make it unique to that smell alone. For instance, one can say that a drink smells sweet, but nothing specific to the smell itself. Leonardo Da Vinci, one of the most famous Italian High Renaissance painters, also said in his research on the human sense that each time we breathe in, we are also smelling the world around us as well, but we never acknowledge that, even subconsciously²⁸. But even though we are mute to our own sense of smell, it is the most important scent we have when experiencing life.

In terms of survival, we use it to tell us if something is toxic to be near before we can see or hear what the source is. It is also powerful to our psychology, where we can recall memories

²⁵ Hans Peter Landolt, "Caffeine, the Circadian Clock, and Sleep: Why Is Caffeine Intake at Bedtime a Sleep Disrupter?," *Science* 349, no. 6254 (2015): 1289–1289.

²⁶ Landolt, "Caffeine, the Circadian Clock, and Sleep."

²⁷ Dalnavert Web, "In A Sense Episode 2: Smell," Dalnavert Museum, July 13, 2022, <https://www.friendsofdalnavert.ca/blog/2022/7/13/in-a-sense-episode-2-smell>.

²⁸ *Think Like Leonardo Da Vinci Series Part 3-Refining Your Senses To Access Your Genius: Sensazione!* - Dr. Eva Selhub, MD, Self-Esteem Care, August 31, 2015, <https://www.drselhub.com/think-like-leonardo-da-vinci-series-part-3-refining-your-senses-to-access-your-genius-sensazione/>.

based on smell alone. "Psychological studies have shown that odor-cued memories are more emotional and vivid than memories activated by visual or verbal cues" ²⁹. It is only recently that our society is starting to notice the power of smell, bringing attention to ways it can be used to our own benefit today.

1.3.1 Smells Today



Figure 2. Sensorwake photo ad.

One of the most popular ways smells has been used today is in aromatherapy. "Aromatherapy is a holistic healing treatment that uses natural plant extracts." ³⁰ While this is not a new method of healing, since it has been used by ancient civilization, mainly Chinese, Indian, and Egyptian cultures, its use today around the world has grown since it is seen as both a science and art form ³¹. There have been several products focusing on smell, and while many of them are meant to mask another like perfume sprayed on oneself, there have been a

number made focusing on waking a person up from deep sleep. Sensorwake Trio is an alarm clock that's focus wasn't on rousing one awake with a loud noise ³². But instead, focus on using scents like peppermint and coffee to stay awake. This alarm clock did use sound and light as well in its product, but they focused on incorporating all three of these senses to wake one up from deep sleep.

Another aromatherapy product created was the Scentstone by Cayla Gray ³³. Cayla Gray is a perfume and scent company focused on using scent to create a unique story for each woman that changes throughout the day when mixed with their own scent ³⁴. While not advertised much, they had created a stone which absorbed the oils and dispersed it around one's home slowly over time. While this product doesn't connect to sleep, they focus on scent to stimulate one's experience in a room by creating a natural way to slowly dispense the scent around.



Figure 3. Cayla Gray: Scent Stone Photo Ad

²⁹ Chen, "Perfume and Vinegar."

³⁰ "What Is Aromatherapy and How Does It Help Me?," accessed April 13, 2026, <https://www.healthline.com/health/what-is-aromatherapy>.

³¹ Healthline, "What Is Aromatherapy and How Does It Help Me?"

³² "Sensorwake Trio: The Smell-Based Alarm Clock," *Dornob | Architecture, Interior and Furniture Design*, July 23, 2018, <https://dornob.com/sensorwake-trio-the-smell-based-alarm-clock/>.

³³ "Scentstone Set," Cayla Gray ®, accessed April 13, 2026, <https://caylagray.com/products/scent-stone-set>.

³⁴ "Our Story," Cayla Gray ®, accessed April 13, 2026, <https://caylagray.com/pages/our-story>.

There are several different items today which focus heavily on smell, using it has power to entice others towards them, sometimes to push people away. Just on the top of my head, I can think of a few popular ones such as perfumes, air fresheners, and even food that's just been cooked. Scent may be overlooked in the world in multiple fields, but it is the one thing that we always use and rely on each day. Even with a lack of study of scent being used to stimulate awareness in a person, the potential that it must do so over time is interesting. If we can use aromatherapy to help relax ourselves, then why not use it to wake us back up?

We love to think that we can push off sleep because we cannot push off anything else. If we can delay sleep for the night, it can be fixed later unlike the task that needs to be completed that day. But the consequences of doing just that are devastating to our bodies' natural cycle. It creates an endless cycle of stress and sleep deprivation that makes the situation progress without a clear end to it, affecting our mental health in many ways. And even though we can point out the issues that have led to this matter growing the way it has in our lives, the social norms associated with the issue in the workplace and in our lives at home have made it so just continuing to accept the issue. The need to address and fix disruptions to our circadian rhythm have been growing throughout the years today, but because of the success light therapy and caffeine has had in fixing sleep, the negative impacts of them when over used or used incorrectly continues to be ignored, preventing any consideration into other alternatives that can allow users to stay awake while out and be used long term. The need to look at new pathways towards fixing our circadian rhythm is needed now more than ever. The question now is what will that new pathway be?

2 IDEATION AND DESIGN

Working on a new topic has many challenges with many different outcomes. The lucky ones can get from point A to point B with minimal difficulty, with only a few stopping points making the journey pause. There are those who end up revisiting their research to reach a new conclusion, resulting in a completely new scope for their research. I wish I could say I fell into either one of the earlier results, but the truth is that it was neither. Initially, I wanted to develop a new way to bring nature into urban residences for home-bounded individuals-people who are unable to leave their homes without aid. My research in the field brought up numerous philosophical questions about how we define nature, and if nature includes the man-made or if it is meant to be separate and untouched by society. The idea of bringing nature into urban spaces fascinated me, but I struggled to find those willing to consider it.

I began to believe that I had failed my thesis before it even began. Something had to change, but what was the question that eluded me? What had interested me in the research that could push me in a new direction? I asked myself that question repeatedly. Reading and rereading my research and notes on topics was the best thing I could have done.

2.1 THE NEW PATH STARTS WITH A SCENT

One of the topics I had investigated in my first topic, and as you have read in Chapter 1, was timekeeping in nature, specifically our circadian rhythm, which is in tune with our environment, predominantly, the rotation of the Earth. The topic itself fascinated me, so I decided to dive deeper into it. My search led to the struggles that society faces with our current jobs and lifestyles, keeping us awake during hours we are meant to sleep. Especially for those who are shift-workers or essential workers who have no fixed schedule and work longer hours into the night. I also had struggled with my own sleep and day schedule being out of sorts from night-shift work, as well as long commute times each day.

With the path to my new direction opening, I began to look for others who had issues with staying awake when they needed to. I created a survey and posted it on a Reddit form focused on those who worked night shifts called r/Nightshift, which holds ninety-three thousand followers. Twenty-five participants completed the survey. The results showed in the pie chart below (Figure 4) that most people experience fatigue when doing stationary or minimal tasks. 28.6% of people found that the hardest time to stay awake was when they would be sitting down and doing either computer or paperwork. Following this, 24.5% said it was when they were meant to watch a device, camera, or equipment. And 22.4% found it was when they had nothing to do at all. Probably the most frightening result from this survey was that 8.2% said that it was when they were driving that they found it hardest to stay awake.

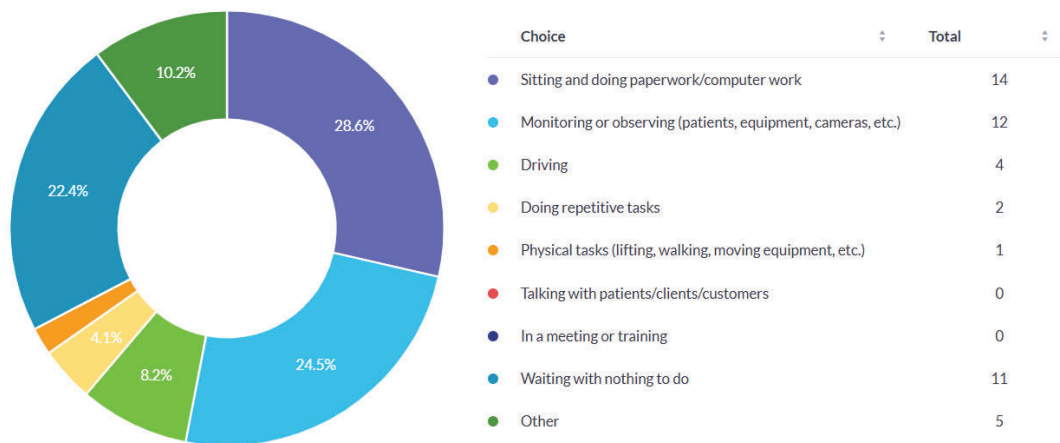


Figure 4. Sleep-Work Survey - What are you doing when it is hardest to stay awake?

Being alert and aware of what you are doing and seeing is critical for our day-to-day lives. Especially to prevent any mistakes that could lead to injury or worse. Following awakening, when one felt the most tired, I inquired what they would use to stay awake so they may complete the tasks that were set out. The results showed that it wasn't an action that people took, but instead a stimulant. 23.7% of participants stated that to stay awake, they consumed coffee or tea (Figure 5). Following this trend of using oral stimulants for wakefulness, 9.2% reported consuming energy drinks, and 3.9% claimed that consuming soda or sugary drinks was their method of choice.

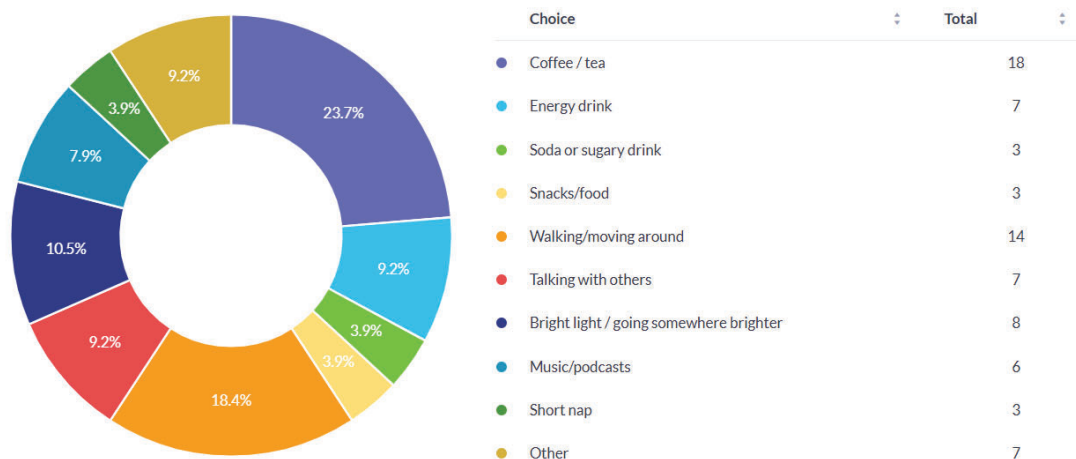


Figure 5. What have you used to stay awake?

Outside the use of oral stimulants being used, I noticed other environmental stimulants had been used as well, such as visuals with bright lights, and hearing with the use of music playing. This itself is not surprising, as discussed previously with current products on the line for sleeping, the use of sound in objects such as an alarm clock, as well as our own circadian rhythm focusing us awake when we see sunlight or mimicked sunlight through light therapy.

Biological beings have five senses: sight, hearing, taste, touch, and smell. The products we see today for waking up and staying awake are mainly focused on sight and hearing. With touch and taste being lesser, respectively. The use of smell, however, might as well be nonexistent. Could using our other senses, which have been neglected in studies, be the answer to staying awake?

2.2 IDEATION OF THE SENSES

To answer this, I started to design with the focus on our sense of touch and smell. Omitting taste because of the amount of oral stimulation that was taken based on my survey in Figure 5. With items using touch and smell needing to be close to the user using it, I began to design items that could be carried or worn by a person, so it is not only easy to access but also subtle when in use. I decided to focus first on touch. Currently, products on the market to keep us awake with touch are items that vibrate. For instance, if you own a Fitbit, you might have seen a setting allowing for an alarm to go off. This alarm, when triggered at the set time, will vibrate till the user turns it off. One of the first items created was designed as a neck brace. The concept

was based on the idea that when one feels a sudden touch of coldness, like jumping into an ice bath, it would jolt them awake. The cold sensation would be triggered when the user moved their head back against the top section, as shown in Figure 6. However, this idea was discarded because of the use of freezing temperatures. When administering ice packs on our bodies when bruised or otherwise, keeping it on for longer than fifteen minutes can result in more damage to the body. This meant that if used repeatedly to stay awake throughout one day alone, it could do more harm than good for the person.



Figure 6. 3D Render: Neck brace



Figure 7. 3D Render: Neck Brace

I moved onto a different approach then, with the idea of complex jewelry and gothic art on my mind. Pain is something we all have experienced. And with pain, there is a level of discomfort that is faced, especially when trying to relax. Because of this idea, I redesigned the neck brace originally created into a jewelry piece. Designed to be based on a spider, the “legs” functioned as pain points on the neck. If one started to doze off, they would be forced awake when they felt the pricks. I had loved the design idea, but concerns were also brought forth in terms of bruising from long-term

use. As well as being a piece that could not be worked every day in work settings, especially in professional ones such as the medical or emergency field. So, while the concept was lost, I began to dive deeper into jewelry being used as the base of the stimuli.

The toughest thing about designing a containment for smell isn’t the smell itself. It’s the options that can be used to hold it in. Especially what that “it” is. Everything has a scent, or the potential to hold a scent. But keeping it contained for its use, while also addressing the matter of how the user can access the scent used, is another matter. Even more important when it is something the user is going to be wearing all day, every day. Because I decided to focus on jewelry as the holder, I began to research different jewelry out there. One of the first things I decided to create was something based on my own family pieces, specifically bangles. Bangles refers to the style of a bracelet, meant to be circular and closed either with a hinge or by the form itself³⁵. There are multiple styles of bangles in thickness, colors, and material of the piece. And in South Asian beauty and culture, it is a significant piece with different meanings ranging from a simple wedding piece to protection to the wearer³⁶. I own many Bangles that were passed down to me from my mom, who brought them with her from India.

³⁵ TrueFacet, *The History of the Bangles and Bracelets* -, July 24, 2015, <https://www.truefacet.com/guide/722-history-popular-banglebracelet-styles/>.

³⁶ TrueFacet, *The History of the Bangles and Bracelets* -.



Figure 8. Google Images: Indian Bangles

Bangles have no seam to open or close them and have the potential to be both extremely detailed in design and minimalistic. I created a bangle, which had a compartment that would hold sandalwood within. Sandalwood alone has a very subtle, distinct, earthy smell. It has been used as incense when burned in homes. But it also has an added effect of enhancing the smells of essential oils when they are added to it. So, with the essential oil soaked into the wood, the smell that came out was both stimulating and allowed the user to become more alert. However, there was an issue with the storage and material use. With all the benefits that Sandalwood has, it isn't something that can be used forever by the user. Eventually, the wood will decay with the extended use of oils soaked into it. Along with this, when the wood was left in the bangle, the oil would seep out, creating a mess inside which would need to be cleaned. This would create more work and stress for the user.



Figure 9. 3D Print: Scented Bangle

This issue appeared again when a capsule design was created, wood with essential oils was placed inside, and a second opening was used to smell the scent instead of opening the same compartment directly to the shavings like the bangles had as shown. It became clear that my current method was not going to work long-term. But there were not a ton of options available. While I could make another small capsule to just hold the scents shown to improve wakefulness and alertness, such as eucalyptus, citrus, peppermint, and coffee³⁷. The issue of accidentally spilling when going to smell it was brought back. And if an insert was placed with the oils, it brings back the matter of what material the insert is made of and the potential waste that would come out of it. I went back to ideating, looking for something I was missing or overlooking.



Figure 10. 3D Render: Capsule Keychain

2.3 CAN CERAMICS SMELL?

A thought accrued to me. Until this point I was imagining the vessel and the material absorbing and holding the scent as two separate parts being put together to work. But the answer itself should be if they were one piece alone instead. One of the first things I evaluated this idea on was a bisque fired ceramic test tile with no glaze.

Clay is very versatile, being able to bend and shape however the artist wants it to be and will stay that way when fired in the kiln and glazed. One of the most favorite forms we see ceramics used is dishware such as plates, bowls, and cups. But that is only if the ceramic is food



Figure 11. Bisque Tile and Coffee Essential Oil

safe. When I say this, I don't mean that ceramic is made from toxic materials. What makes a ceramic piece not food safe is that if a piece is unglazed or uses a toxic glaze. Ceramic pieces naturally are porous, meaning anything put on the piece if left unglazed, will be absorbed into it. Which can cause bacterial growth, and it absorbs any food or liquids. The process of glazing makes ceramics food safe since it seals the pores of the piece. There are only a few times that glazing stays unsafe, which is if one uses a

³⁷ "Best Scents for Waking Up," WebMD, accessed February 6, 2026, <https://www.webmd.com/sleep-disorders/features/best-scents-for-waking-up>.

toxic glaze that also keeps the pores, or if using a glazing method such as cracked glazes, which is purposefully used in teacups.

This meant that if essential oils were applied to the ceramic piece themselves, the ceramic could potentially absorb the oil, allowing for a continuous release of the scent. I had placed coffee essential oil onto the fired piece, and found that it not only absorbed the oil, but the scent on the piece lasted for a few days and still was going strong. With this new discovery I began to plan how I could test this method of scent collection and smelling. The test tile I had



Figure 12. *Essential Oils*: Essential oils used for material testing. From order of Left to right, Coffee, Eucalyptus, Lemon and Peppermint.

done only accounted for firing once, not twice, which was needed to keep the ceramic piece strong and not brittle. And it only accounted for one type of clay. As a result, I started to collect diverse types of ceramic pieces for testing as well as the best scents that stimulate wakefulness in a person. I gathered four essential oils (Coffee, Eucalyptus, Lemon, and Peppermint) as shown in Figure 12, and I ended up

collecting three diverse types of ceramic pieces available to me, 182 Angel White Clay, Tan Slip Stoneware, and White Porcelain.

After deciding the ceramic types I would be testing with, a deep dive into the source and characteristics of each of them was conducted. In which I found that after firing each piece in both the bisque kiln, and then cone 6 kilns, the absorption rates of the pieces varied. For 182 Angel White Clay, the absorption rate was at 3.0%³⁸. For Tan Slip Stoneware it was 1.25%³⁹.



Figure 13. *Clay Materials*: 182 White Clay (Left), Tan Stoneware (Middle), Porcelain (Right)

³⁸ "182 Angel White – Standard Clay Company," accessed February 17, 2026, https://www.standardclay.com/products/182-white-stoneware-clay?_pos=1&_sid=6c989f2b6&_ss=r.

³⁹ "Tan Stoneware – Standard Clay Company," accessed February 17, 2026, https://www.standardclay.com/products/tan-stoneware-slip?_pos=1&_sid=37a09585c&_ss=r.

And Porcelain was set at 1.2% ⁴⁰. Based on this data alone, the 182 Angel White Clay has the potential to not only absorb the oils more but hold the scent longer. But determining how long it takes and lasts was what I needed to look out for.

With each type of ceramics, I made sure to get ten sample pieces each and split them up. Five of each were kept unglazed, while the other five were glazed. This allowed me to not only test absorption rates of each oil, as well as a combination of two together, on each sample piece. But it also allowed me to test if there was a difference in scent strength and the time it lasted between unglazed and glazed pieces.



Figure 14. Ceramic Material Testing with Essential Oils

During my material testing, I took note of how many drops I put on each piece, which ranged from three to seven drops based on the size of the tile used, how long it took for the oil to absorb into the test piece, and finally how long the scent lasted on each of the tested pieces.

After observing the pieces for a week, I did confirm that the oil on 182 clay absorbed the oil faster, taking only around eight hours to do so, with little to no residue left behind. For the Tan Stoneware, at the eight-hour mark, the oils were still present on the tiles, but not as much as what was applied. The porcelain pieces, while some of the oil dissipated by hour eight, were still present on the pieces like they were never touched. At the eighth mark I wiped off any excess residue from all the pieces to determine the amount of time the smell would remain on each of the pieces.

While I had noticed that the smell of the coffee essential oil faded faster than the other essential oils on all the pieces, glazed and unglazed, I also realized that when observing the absorption rate in those eight hours, the coffee took longer than the other three smells to evaporate on the 182 clay test tiles. Outside of this, the scents on the 182 clay had begun to fade over twenty-four hours after its application was finished. With the scent fully disappearing between day five and six. For the Tan slip, the same thing accorded where the smell only began to fade after twenty-four hours. However, it took three to four days for it to disappear fully.

⁴⁰ "Porcelain," Standard Clay Company, accessed February 17, 2026, <https://www.standardclay.com/products/porcelain-slip>.

What surprised me the most, however, was the Porcelain. The scent in the beginning had stayed strong, lasting around six hours. Longer than I believed with how the absorption went initially. The smell only dissipated from the tile a little over a day after application. The application of oil on the glazed versus the unglazed ceramic pieces had no difference between the two. The only



Figure 15. Form Ideation

thing of note was that the oil could not be applied on the glazed side, or the absorption would not take place. As a result of this experiment, I was able to move forward with making the pieces through hand building techniques with the 182 clay. While the Tan stoneware would be perfect for mass production and unification of the pieces, the product would not have allowed for the ideal results I want to create with quick absorption and a long-lasting smell. In the future, looking at other clay bodies such as terracotta, I've been told it has a high absorption rate, or other slip casting clays can be used to address any issues of mass production.

It was then I started to experiment with the shape, design, and size of the pieces created. One of the issues I noticed when doing my experiment was that if the oil was put on a piece that was flat, or curved downward, the oil would end up spilling off the ceramic and onto the surface of the table. Now this could be fixed by putting the piece on a dish to catch any excess, but that still doesn't directly address the matter of the mess being created in the first place. So, when making the designs, I started to also look at how I could fix that issue. The best solution I had found for this matter was to create a divot on the back where it would remain unglazed. Not only would it be a clear indicator for the person using that it was where the drops of oil should be placed. But it also created a spot to hold the oil without spilling outside. When it

came to the shape of the pieces, I looked for inspiration at current stone jewelry and pendant shapes. While there are many who love pieces made with extreme detail on every curve. Most professional jewelers often sell pieces that are simple and minimalistic in shape and color. And while I appealed to that logic, I also believed the pieces should have a natural look to them, because of their connection to our natural senses and material use overall.

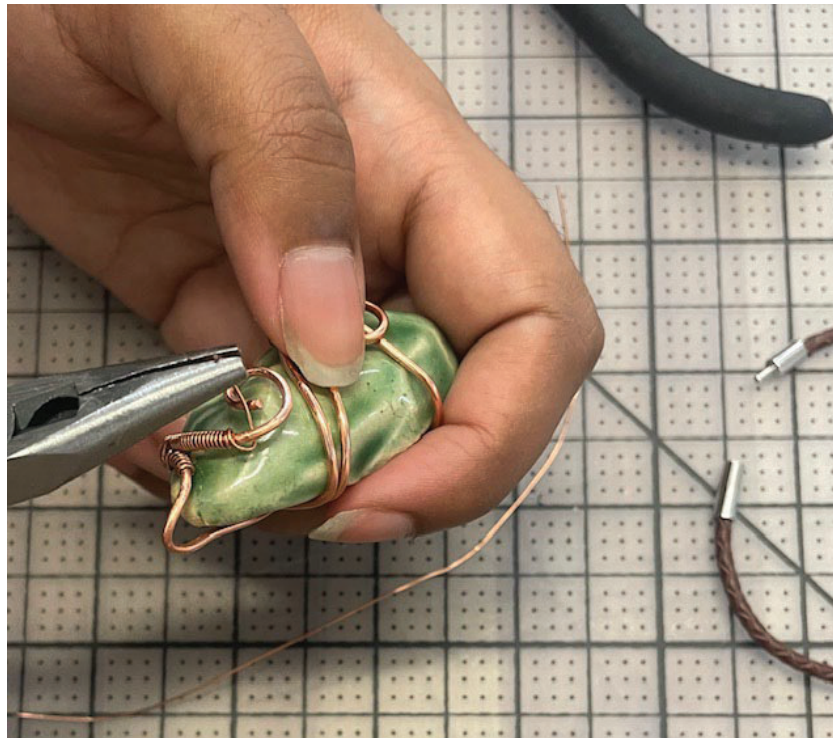


Figure 16. Wire Wrapping

2.4 DESIGNING THE STONE

The next task I had to address was how I would have the piece attached to a bracelet or necklace. While it could have simply been a hole created to attach a hook through, I also wanted to explore other avenues in designing its look to see all the potential options that I could use. This led me to considering wire wrapping. Wire wrapping, just as it's called, focuses on using wire to create designs around an object. The results of using such a technique can vary from a minimalistic design to an incredibly detailed one. Wire wrapping, I found, allowed for more creative freedom to create an additional layer of detail in the visual design of the jewelry pieces. In the one created and shown in Figure 16, it resulted in almost a fantasy, industrial look. Combine organic shapes with model metals. For certain looks that are meant to be unique to the individual wearing it, wire wrapped jewelry would be great. However, the process was not free of issues.



Figure 17. Wired Necklace

While one of the issues was time commitment when it comes to hand wrapping each piece. The other issue was that, while it did give the opportunity to make a hook to attach to a chain, which was all it did, outside of the added visuals of it. When oil was added to the back of the piece, the wire did not impede the application. It was when cleaning up any leftover residue afterwards that I found a complication with this method. The more complex the design of the



Figure 18. Wired Necklace: Oil Application

wire warped was, the more likely there would be wire over the back of the piece, preventing the ability to get all the areas of the back of the piece. I decided from this point that when using wire wrapping on the pieces, it would be a minimalistic design, such as a simple one wire wrap. Outside of this, I began to focus on making the pieces have a hole to insert a wire to create a hook to be attached to a necklace or bracelet.

2.5 OILS AND CLOTHES

One issue that I hadn't addressed till this point was the effects of the pieces on clothes. Because I was able to solve my first problem of combining both the jewelry piece and the material absorbing the essential oil, I had neglected to factor in the issue of if the oil would and could leave stains on clothes, especially if excesses were not wiped down any excesses. This resulted in me testing this on two different clothing fabrics. One was a red, polyester jacket. And the other was a white cotton shirt. These are both common fabric types that people wear every day.

On the red jacket I placed a piece that had fully absorbed the oil, and I didn't wipe it down beforehand. On the cotton shirt I placed a piece that hadn't absorbed all the oil, but I did a quick wipe down of it. Placing them immediately on the fabrics and then removing them after a minute, I did not see any residue or stains on the fabrics. So, I decided to leave the ceramic pieces with oil applied to them the night before, all day and check on the results at the end. I ended up having nothing to worry about. At the end of the day, both articles of clothing didn't

have any sign of a stain present. The fabrics also didn't carry the heavier smell of the oils, further showing that jewelry will not affect clothes worn under them.



Figure 19. Fabric Testing: Red Polyester Jacket (Left) and White Cotton Shirt (Right)

2.6 THE FIRST USER-TESTING



Figure 20. First User Tester: User wore a necklace scented necklace while presenting to her class.

At this point, other than focusing on the final design ideation of the piece with clay, I needed to look at how others interacted and used the jewelry worn, and the effects that it had on them. The first person to start wearing it was my classmate, who at the time was becoming visibly exhausted from her own thesis work, experiencing little rest throughout that week. During a class presentation she wore a necklace which had a peppermint scent. While watching her speak I noticed that while she could smell the scent continuously, she also would bring the piece directly to her nose to smell. At the end of the class I had asked her about her thoughts on the piece. She stated that not only did she like the weight of the large piece on her, but the smell of peppermint did also work when it came to her wakefulness. She said that “it helped lift a fog in my mind” especially when starting to feel sleepy⁴¹. With this new insight, I began to create more simple

⁴¹ Thalia Lee, “User Testing: Ideation 1 - Necklace with Peppermint Essential Oil,” (Pfizer Building), March 5, 2026.

pieces. It was later during the second-to-last presentation that I was advised to push towards a final design for my topic. And while I agreed to this for the final presentation of my thesis, I also wished to test the current pieces I had made with others for a longer duration of time, and with different essential oils given.

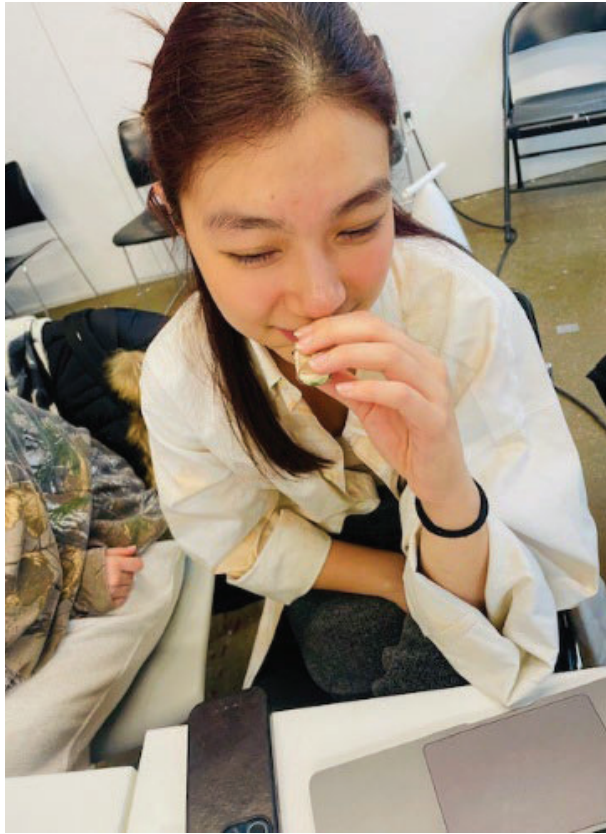


Figure 21. User Testing: Smelling Peppermint

3 USER TESTING



Figure 22. User Testing: 2 Weeks: Mina (Left) wearing white glazed necklace with simple chain and no wrapping. Serena (Middle), wearing rust belt glaze bracelet with copper chains. Rishona (Right) wearing an unglazed necklace with copper white wrapping.

The feedback I received from my advisors and peers reflected the design of the final product. And while I considered what that design would look like, I knew if I started to make a design without doing user testing first with what I currently developed, I would face an issue I may not have accounted for. As a result, I presented two necklaces and one bracelet to three housemates living in Brooklyn, New York. The girls each worked multiple jobs, full and part-time positions, with one who started going to graduate school. The idea was for them to have and wear the pieces for the next two weeks, noting how often they would reply to the oil, how long they would do, and how often they would smell the pieces. I let them choose which pieces they wanted to wear, and which essential oil they wished to use during that time. Which allowed me to see design preferences, as well as scent choice overall. My intention for this user test was to see how they used and interacted with the pieces during a two-week period.

The two wearers of the necklaces, Rishona and Mina, chose the lemon essential oil, while the bracelet tester, Serena, picked the coffee essential oil. I instructed them on how the product worked and what to do but did not show them a demonstration to see how they would interpret my instructions. From there I watched how they applied the oil and wore it. The first thing I noticed was that even though there were indents in the piece to prevent oil from spilling out, they



Figure 23. User Testing: Application of Oil Observation

would still use a dish underneath it to hold the jewelry during its time absorbing the oils. While I did try to address this matter by making the indents deeper and larger earlier on, it seems that even with doing that, there was a fear present of a mess being created by the product. This observation alone made me think about the practical solutions I could use to fix the issue by applying the oils.

Right before the two-week period was over, I met with all of them and went out to a Yakiniku (Japanese BBQ) restaurant in Chinatown. If you have ever been to an all-you-can-eat Yakiniku, then you know that smell is everywhere. You are not only cooking your own meats and vegetables at the table, but you are also experiencing the smells from all the surrounding tables as well.

For this night, Mina was wearing her necklace. At the restaurant, we found that even though it had been a couple of days since she had reapplied the essential oil to the piece, not only was the scent still present in it, but she was still able to smell the citrus from the lemon in when bringing the stone to her nose to smell. After that amazing night of fun, the two-week period ran up.

The responses I received about the pieces were positive. All three of the girls would smell their scented stones numerous times a day when starting to feel tired. While one said the lemon scent only sometimes worked to keep them awake, another said that it worked when they needed a burst in energy. The one who had the coffee scented oil noted that the smell of the coffee gave her more encouragement to stay awake and alert. While these two weeks did show positive results in terms of using scent to promote wakefulness, I believe that for more concrete results, a longer time of use would be needed to ensure better results to my hypothesis.

With regard to the design of the jewelry, there was positive feedback given, with love for how easy it was to incorporate the pieces into their daily lives, and with how it blended with their wardrobe each day. They also said they had received compliments about the pieces from others. When asked for anything that they would have changed to make the experience better, I was asked if it was possible to separate the chain from the stone when needing to apply more oil. Since this matched up with my own observation of how they put the oil on the stones in the beginning, I began more sketches towards a solution. Seeing that making the indents on the



Figure 24. Mina smelling lemon scented oil in Yakiniku Restaurant

back deeper and larger did not solve the issue, I began exploring other options. The simplest choice was to create a dish for the jewelry to sit on so if oil spilled out, it would land on the dish below instead. However, this did not address the issue of the oil leaking all over the stone and chain. I went back to focusing on the piece itself and began to change how the back of the piece looked and functioned. It was during this time that I started to ask myself if I would have time to make both the jewelry and the dish.



Figure 25. Final Design Pendant

I moved forward with the idea and started to create a single shaped pendant that was capable of being both a necklace and bracelet based on orientation. The pendant looks like a normal stone, but when turned over the user can find an opening going into the hallowed inside. This function allows users to drop oil into the piece with no risk of it falling out. It also has a bonus of being able to keep any excess oil not absorbed within if it did not have time to do so overnight.

With this innovative design, I moved on from using hand building techniques to create my stones. While they had worked to give a unique shape to each individual piece, as well as a clear indentation on the back to hold the oil initially. It was not a technique that could be used to create hollowed stones. While there are methods to do so, the best solution to create unfirm shapes with the hollowed-out feature was to slip cast them. Because of this, I created a 3D model of the pieces

for both the necklace and bracelet design, with the only difference between the two being the orientation of the hole on the back being on the side for the bracelets and on top for the necklaces. Once they were printed in 3D, a plaster mold of the design slip cast the pieces to its exact shape and size. While I was using tan slip instead of the 182-white clay, which has a higher absorption rate as mentioned before in Chapter 2, to better show how the final product would look, slip casting was the best option. In the future, further testing on different slips will be needed to determine which has the highest absorption rate.

After getting the pieces fired, then glazed and fired once more, I can say with confidence that the results of the pieces were worth the work. The final design did create the hollowed inside, and with it I was successfully able to put a few drops of essential oil into the pendants. I also noticed that because of this feature, it allowed control for how much should be used. The previous design allowed for too many drops that would eventually spill. But with this design, I could place three to five drops of oil without spilling anything out. And it would still retain its scent throughout the day. The designs also looked more professional because of its uniform finish, integrating cleanly with the person wearing it. As a test, I took a white glazed necklace out, which matched my blue top and white jacket outfit. Because of the color choice, the item blended with my outfit perfectly.

Because I also created pendants with different colors and patterns ranging in numerous colors from white and black, to emerald and blue, it can be assumed correctly that the one when choosing, the person can choose one that matches a specific outfit or based on their favorite color or design.



Figure 26. Oil Application Area on Back



Figure 27. Necklaces and Pendants



Figure 28. Model Shot Image

CONCLUSION

How can olfactory cues integrate into wearable devices influencing alertness and conditioned wakefulness in individuals with disrupted circadian rhythms or irregular sleep schedules? This question, a result of numerous changes in my topic, and understanding of my research, has been one I thought of throughout my journey with this project. As a result, it has led me to understanding new concepts and ideas in material research when it comes to the world of ceramics and jewelry. While many focus on scent worn by a user being something that must spray on their person, the notion of it being not only applied, but absorbed into ceramic jewelry is one that has not been explored or thought of before, according to my research. While I cannot say that this design works long term to prevent tiredness throughout the day, I can say that from user testing conducted, it is something that does stimulate one's mind to wake them up now.

There were several limitations that I must accept, mainly focused on time and material cost. I was limited in how much time and how much I could spend on materials when it came to experimenting with the different clay types, having only used the three that were most available to me during my semester working in the ceramic studio. As a result, I couldn't produce a final product with a slip casting clay that has a higher absorption rate. Once given the time and funding to continue this work, conducting further material research on not only different types of clays, but also firing techniques and glazing would take place to have a full understanding of how each type of ceramic would react with essential oil being absorbed within the piece.

Another limitation that must be addressed is the limited time for testing, the number of users testing and how long the testing lasted. As mentioned in Chapter 3, I conducted a user test for a period of two weeks. During those two weeks I did gain a lot of insight into how effective the piece was. However, because of limited time till the final presentation, I was unable to do another round of user testing for the newly designed models created. I was also unable to see the effect of the scent for a period longer than two weeks. I would have liked to see the results from several people, especially women working and raising a family, in the span of two to six months for the best results. Further, a larger test group-several thousand people-would produce more useful data.

The final limitation that I faced was with jewelry choice. While I was able to create bracelets and necklace pendants, I could not create rings, earrings, or hair accessories with the product. Not for a lack of trying, but more so with concerns of how the person would smell the scent based on where it was on the body, as well as how the oil would be absorbed into those pieces, especially if they have not absorbed fully and were still wet when the person wore it. I do plan to continue my work in this in the future, and with the knowledge that I have gained from the success and mistakes that happened, I know that my next steps would be focused on the material research of clay bodies, as well as possible other materials that could be used to

absorb essential oil scent. From there, an expansion of wearable items would be explored to see what possible items could be used.

Even though I focused on the benefits wearable scents can have on stimulating wakefulness, the possibilities of branching to other fields of research in the industrial design field are endless. We already have a vague understanding of how scents like lavender can help relax a person and promote sleep. We also have an understanding (replicated in this study) of how scents like peppermint and citrus can stimulate a person to be alert and awake. But how about using scent for other issues, such as helping people when feeling anxious or to help them ground when stressed and feeling panicked? There is also the possibility of looking towards expanding beyond scented jewelry to something that could fill a room. One idea that comes to mind would be ceramic home décor being infused with scent to stimulate a person based on the room or environment they are in. A lavender statue in a bedroom or therapy office could help promote relaxation and calmness, especially if people are known to feel anxious in specific situations. This idea is something I personally will be exploring in the future alongside my jewelry pieces. Another benefit of my research is that it brings a new branch of ideas to the ceramic industry. Most people see ceramics as décor, or dishware to be used in the kitchen. But the idea of using it as a hidden scent dispenser that doesn't need to be plugged in or sprayed around the room each day is something that can be further explored by artisans of the craft.

One of the biggest things that I was able to take away from this study was that failing with one idea can lead to another. That going backwards creates a better path. Which is something I believe all designers will have to face and except in their futures. I have always been a person you love learning new skills and techniques. And I love the idea of experimenting with things that haven't been done before. This thesis was one where I was able to do just that. I know that when I continue this in the future it can expand to even more possibilities. And with that understanding, I can at least close this part of my journey confidently. Ready to move forward with the possibilities that it has created for the future, not just industrial design. But also, the world of smell.



Figure 29. Hero Shot

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