Colin Weed

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NMD 430

Final Paper

**The Second Alarm**

**Introduction:**

An individual's time management skills especially for college students is very important. Being able to have enough time during the day to complete a multitude of tasks without overwhelming oneself is vital to stay successful. But one of the leading causes to someone's time management skill being interpreted is an individual's oversleeping habits. Oversleeping can have a serious amount of consequences for college students who are already balancing a number of responsibilities. It can lead to missed classes, assignments, and meetings, which can ultimately impact their grades and academic success. Oversleeping can also affect one's mental health, causing them to feel lethargic, unmotivated, and even depressed. This unhealthy habit happens to a majority of individuals around 55-60% of men and women tend to oversleep due to hitting the snooze button on they're alarms. Being in arms reach it can be very simple to hit the snooze button. On average around 6.31% of women and 5.56%of men admit to hitting the button multiple times since it's so simple to turn off your alarm and go back to bed. To go more into detail the **snooze button** is a button on an alarm clock that stops the alarm from making noise for a short time so that the sleeper can rest for a few more minutes.

To improve time management skills, it's important to develop healthy sleeping habits. In order to prevent the habit of hitting the snooze button or oversleeping we are developing a device that will be able to detect sound at a higher frequency and sense light differences. The sound detection will be used to detect when the alarm will be going off and once the alarm is detected it will begin to sense light differences in the room. If there are no changes in the room then the device will begin to go off on its own. The user will have to get up and manually turn the device off therefore getting them up out of bed. The device will be installed in a specific spot in a room where it will be able to detect light differences, for example putting the device in the top corner of your room. The goal is to get the person out of bed while also getting rid of the habit of hitting the snooze button/oversleeping.

**Literature Review:**

**Sleep Duration in Adolescents Correlates with Daily Stressors**

<https://doi.org/10.1016/j.sleh.2016.05.006>

From a developmental perspective sleep deficit is common for adolescents. When adolescents attempt to compensate for their insufficient sleep, (i.e. delaying their sleep time and wake time on weekends) they inadvertently contribute to worsening their sleep deficit. Creating an irregular circadian rhythm and thus impacting their everyday functioning. Both younger, (ages 12-13,) and older, (ages 14-16,) adolescents with a less than optimal TST, (Total Sleep Time,) were associated with increased emotional and behavioral problems. Reducing the drastic shift between weekday and weekend sleep-wake patterns, which contribute to an irregular circadian rhythm, is an important factor in mitigating the risk for further sleep deficits and daytime impairment.

**How Many Times People Hit Snooze** <https://www.apartmenttherapy.com/how-many-times-do-most-people-hit-the-snooze-button-and-more-fascinating-alarm-clock-stats-243011>

A little more than one third of (35.7%) of women and (43.39%) of men admit that they never hit the snooze button, while the rest in the case study admitted to hitting the snooze at least once. But around (6.31) of women and (5.65%) of men admit to hitting the snooze button multiple times.

**Effects of Hitting Snooze**

<https://link.springer.com/article/10.1186/s40101-022-00317-w>

The article examines the effects of using a snooze alarm on sleep inertia, a state of drowsiness and impaired cognitive and motor performance that can occur after waking up. The study involved 22 healthy participants who were randomly assigned to either a snooze or no-snooze group. The results showed that the snooze group experienced less severe sleep inertia than the no-snooze group, suggesting that using a snooze alarm may help reduce sleep inertia and improve alertness after waking up. The study highlights the potential benefits of using a snooze alarm but notes that further research is needed to determine the long-term effects on sleep quality and daytime functioning.

**Average American Sets 4 Alarms to Wake Up**

<https://studyfinds.org/snooze-button-social-life/>

The article investigates the relationship between snooze button reliance and social life. According to the article, the study found that people who frequently hit the snooze button in the morning are more likely to have a negative impact on their social life. The study involved 2,000 American adults and found that snooze button users are more likely to be less productive, less motivated, and more socially isolated than those who wake up immediately after their alarm goes off. The article highlights the importance of developing good sleep habits, such as getting enough sleep and waking up at the same time every day, to improve productivity, motivation, and social interactions.

**Sleep/Wake Patterns are Associated with Poor Academic Performance**

<https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5468315/>

College students are notorious for suffering from sleep deficiency, however, there are more variables at play than just sleep duration. A students quality of sleep varies depending on their circadian rhythm and the time that they go to sleep/wake up. Students who frequently change their sleep patterns, (i.e. sleep timing & light exposure levels,) will experience the effects of a misalignment between their circadian rhythm and their sleep/wake cycle. Results have shown a positive correlation between the SRI, (Sleep Regularity Index,) of a student and their academic performance. Meaning that a regular sleep pattern is associated with higher academic performance, where every increase of 10 in a students SRI was associated with an averaged increase of 0.10 in their GPA. This means that waking up at a consistent time can be an influential factor in a college student’s academic success.

**CDC talking out importance of getting enough and shows statistics** [**https://www.cdc.gov/media/releases/2016/p0215-enough-sleep.html**](https://www.cdc.gov/media/releases/2016/p0215-enough-sleep.html)

The article cites a study conducted by the CDC that found that one in three American adults are not getting enough sleep on a regular basis, which can lead to various health problems such as obesity, diabetes, and depression. The article also provides recommendations for adults to improve their sleep habits, including maintaining a consistent sleep schedule, creating a relaxing sleep environment, and avoiding stimulating activities before bedtime. The CDC hopes to raise awareness about the importance of getting enough sleep and its impact on overall health and wellbeing.

**Repercussions of Turning Off Alarm Clocks in the Morning**

[**https://nypost.com/2022/12/12/people-using-an-alarm-clock-are-chronically-tired-study/**](https://nypost.com/2022/12/12/people-using-an-alarm-clock-are-chronically-tired-study/)

The article reports on a study that suggests people who use an alarm clock to wake up in the morning are more likely to be chronically tired. According to the article, the study involved 1,000 American adults and found that those who rely on an alarm clock to wake up are more likely to experience fatigue, irritability, and difficulty concentrating during the day. The study also found that those who wake up naturally without an alarm clock are more likely to feel refreshed and alert throughout the day. The article highlights the importance of getting enough sleep and developing good sleep habits, such as maintaining a consistent sleep schedule and creating a relaxing sleep environment, to improve overall health and wellbeing.

**Circadian Rhythms** <https://www.sleepfoundation.org/circadian-rhythm>

Circadian rhythms are physical and mental changes that follow a 24-hour cycle, and are a part of our body’s internal clock. The master clock, located in the brain, synchronizes the different rhythms throughout our body. It itself is influenced by environmental cues, such as light. This explains why our body is tied to a day-night cycle, as well as how our rhythms can be thrown off due to an inconsistent sleep-wake cycle. A good way to regain your alertness is to maintain a consistent cycle of waking up at the same time and exposing yourself to natural light, especially early in the day.

Sleep affects all aspects of our day, so it’s important to maintain a healthy sleep cycle. People of all ages are susceptible to sleep deficit, and it is easily seen affecting every aspect of our daily lives. Ranging from emotional and behavioral outbursts, poor academic performance, impairment of cognitive and motor performance, as well as an increased likelihood of depression, among many other things.

Fixing the problems created by a sleep deficit is more than just getting extra sleep on the weekends. It’s quite the opposite, it’s about getting the same amount of sleep by maintaining a consistent schedule of waking up and going to bed at the same time every day. Waking up at the same time and exposing yourself to natural sunlight early in the morning doesn’t just improve your health, but it makes you more alert, refreshed, and able to have a productive day. Eventually leading to a sleep pattern where you don’t even need an alarm, naturally waking up on your own.

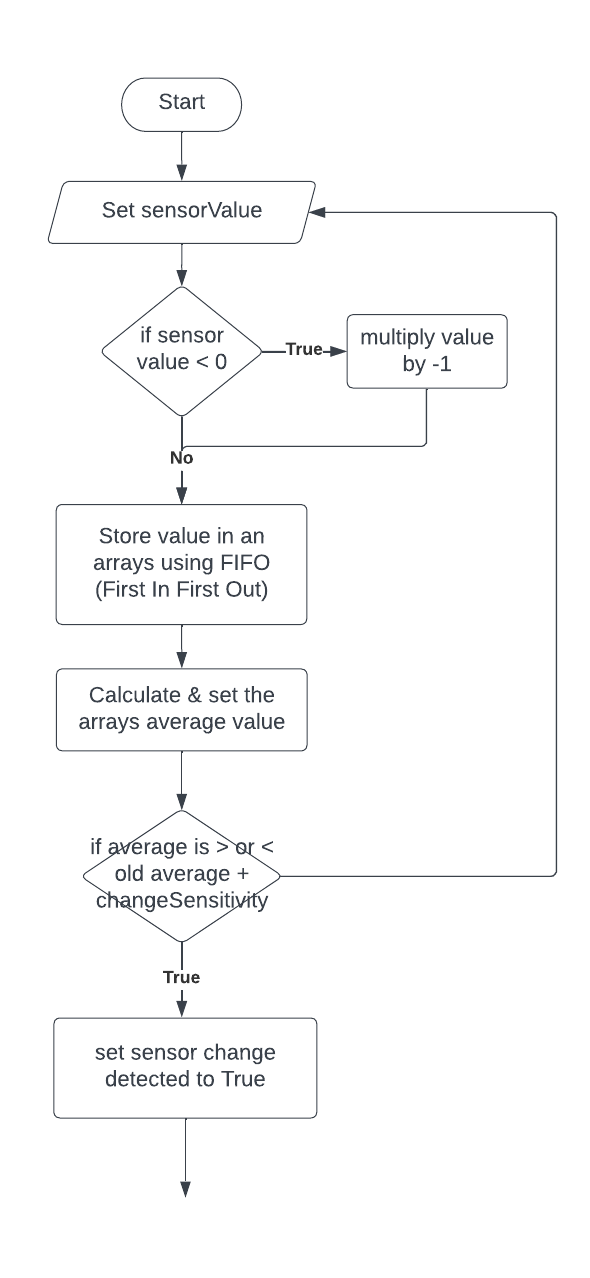
However, it can be difficult to achieve this if your circadian rhythm is out of sync, and especially if you can’t wake up in the first place to correct it.Often time we try to counteract this by setting multiple alarms. But even then we still hit the snooze button, exacerbating the problem, and succumbing to the sleep inertia and chronic fatigue that plagues our everyday life. Drastically reducing our ability to get things done. What’s needed is a foolproof way to ensure we wake up and get out of bed, and cannot be avoided with the tap of a button.

**System Description:**

The purpose of this tool is not only to get an individual out of bed but to avoid the recurring problem of turning off one's alarm. This is a common issue around the world as it can be very easy to turn off your alarm when it’s in reach.

When first going through the design process we were set on creating a tool that can be used as an addition to an object or device. This device “The Second Alarm” is an addition or backup to your normal everyday alarm system whether it be an alarm clock or the alarm on your cellular device. To clarify though this tool is a separate object and is not attached to an alarm system. The Second Alarm is a sound detection system that will be used to detect when the alarm will be going off and once the alarm is detected it will begin to sense light differences in the room. If there are no changes in the room then the device will begin to go off on its own. The user will have to get up and manually turn the device off, therefore, getting them up out of bed.

When considering the physical design of the Second Alarm the goal is to provide it with enough protection so that if it were to fall it won't break, but something that won't cover the light sensor. So implementing a rubber back to the device will provide the necessary protection without interfering with the light sensing. On the back of the device, we will also implement a built-in command strip. This will ensure the device can be installed on multiple places and surfaces. Such as on the roof of someone's room or on the side of the wall.

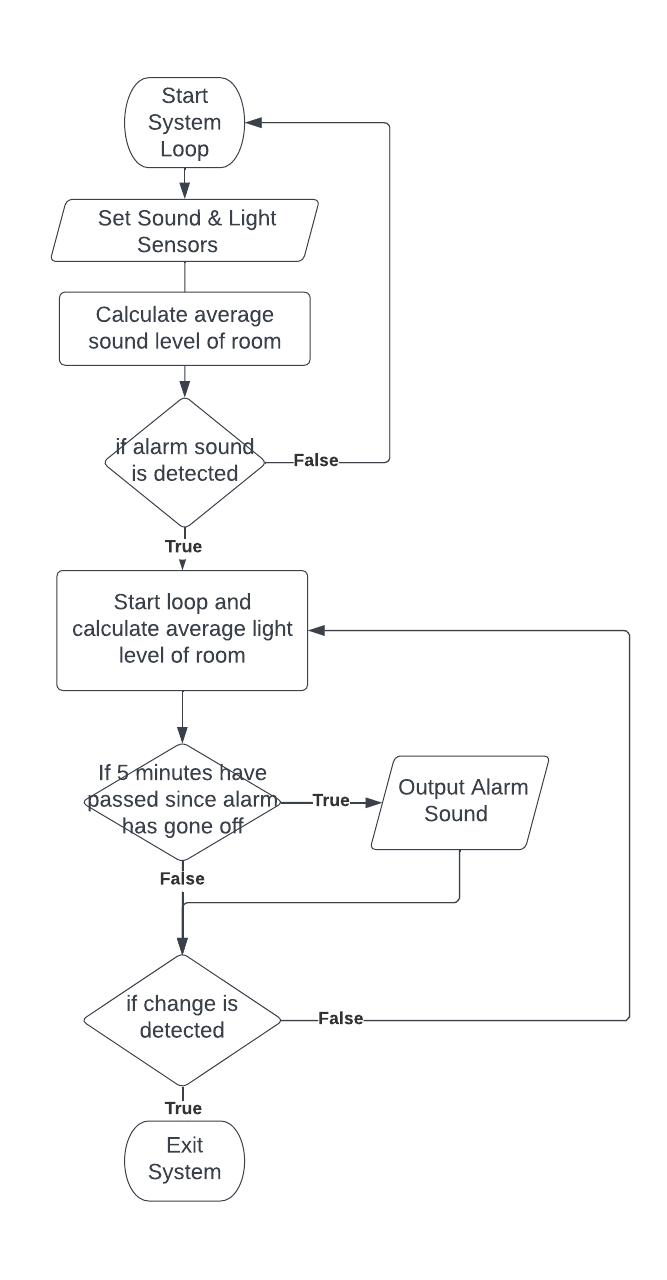
The system when turned on executes a series of functions which continue as a loop until the system is turned off. By the user manually, or by the system itself when it detects that the user has affected the environment, i.e., a sudden change in the average light level of the room. The chart below depicts how the sensor system will:

1. Set the value for the respective sensor.
2. Format the value to ensure it is a non-negative number
3. Store it in the respective array
4. Iterate over the array & calculate average value
5. Compare the average value with the previous value
6. If value is outside the sensitivity range of the old value:

set boolean for sensor level change to True

1. Else: Loop again

The chart above depicts the sensor system, for both the light and sound sensors. It shows how they will record their respective value, format it, and then determine if a significant change has been detected.

The first detection recorded by the system will be for the sound sensor. If an alarm has been detected, the system will then watch for any significant changes in the average light level of the environment. If no changes are detected after a set amount of minutes later, the system will then loop an alarm noise. The alarm noise will continue until either a significant light change has been detected or the user has manually gotten up and disabled the system. The chart below depicts the general operation of the main system:

**User Evaluation:**

When demonstrating the Second clock, the following specific goals and criteria were highlighted:

* Making the secondary clock user friendly/easy to use.
* Not only easy to use but easy to learn.
* Able to figure out any issues by oneself when using the product.
* Creating a clear scenario to provide an understanding of the product.
* Showcase the purpose and the importance of the device.

In this experiment, a total of five individuals were selected to participate in the testing of a new product, specifically a clock. The participants were given a series of tasks to perform in order to provide feedback and obtain a better understanding of the product as a whole.

First, the participants were asked to watch a showcasing of the product, which involved the two creators discussing the product and demonstrating how to use it. This was done to provide a comprehensive overview of the product's features and capabilities.

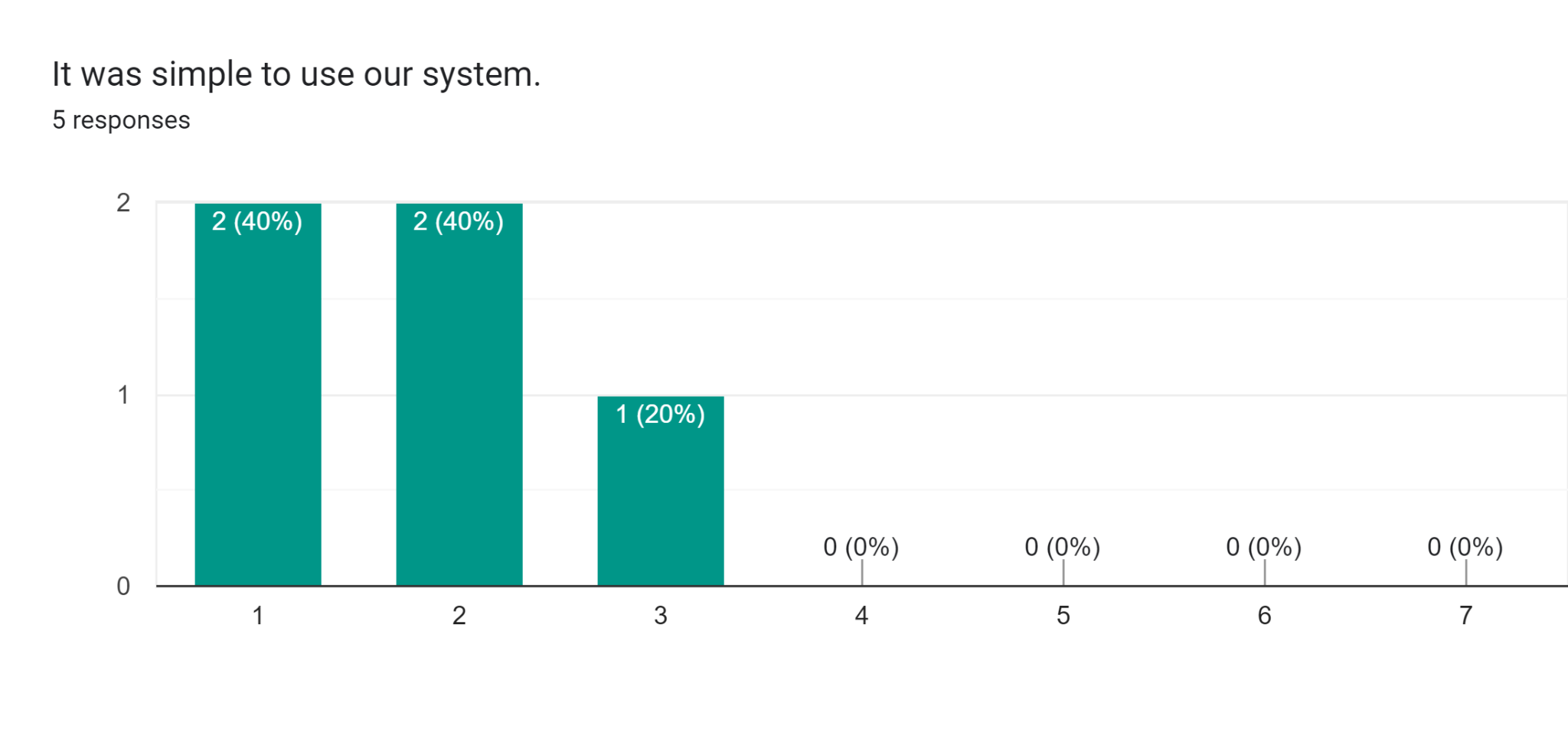
After the showcasing was completed, each participant was given the opportunity to use the clock one by one. This was done to ensure that there was no confusion and that each participant had ample time to explore the product and its functionalities.

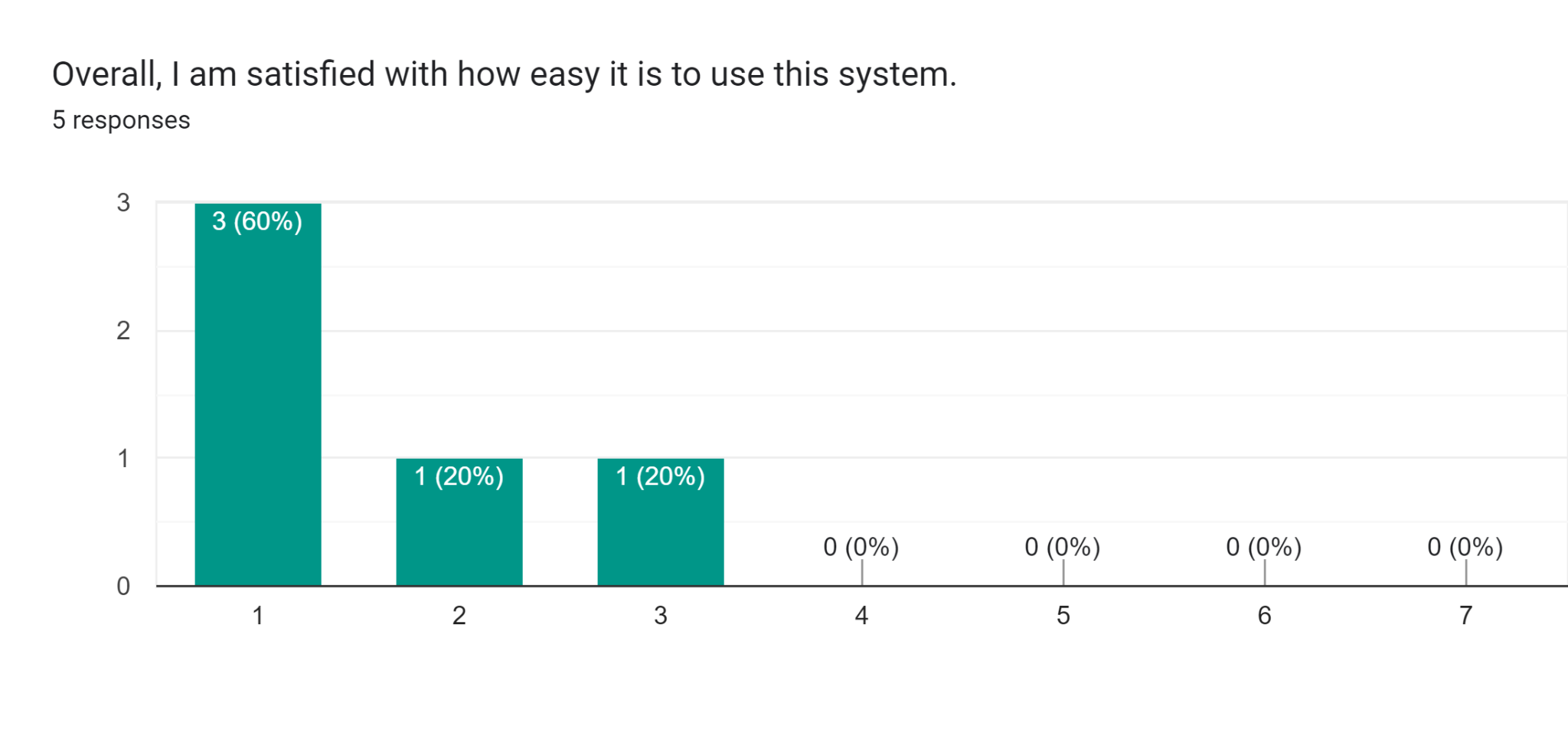
During the testing phase, each individual was tasked with reviewing the code and providing feedback on their experience using the clock. This was done to ensure that the product was intuitive and user-friendly, while also allowing for the identification and resolution of any issues or bugs.

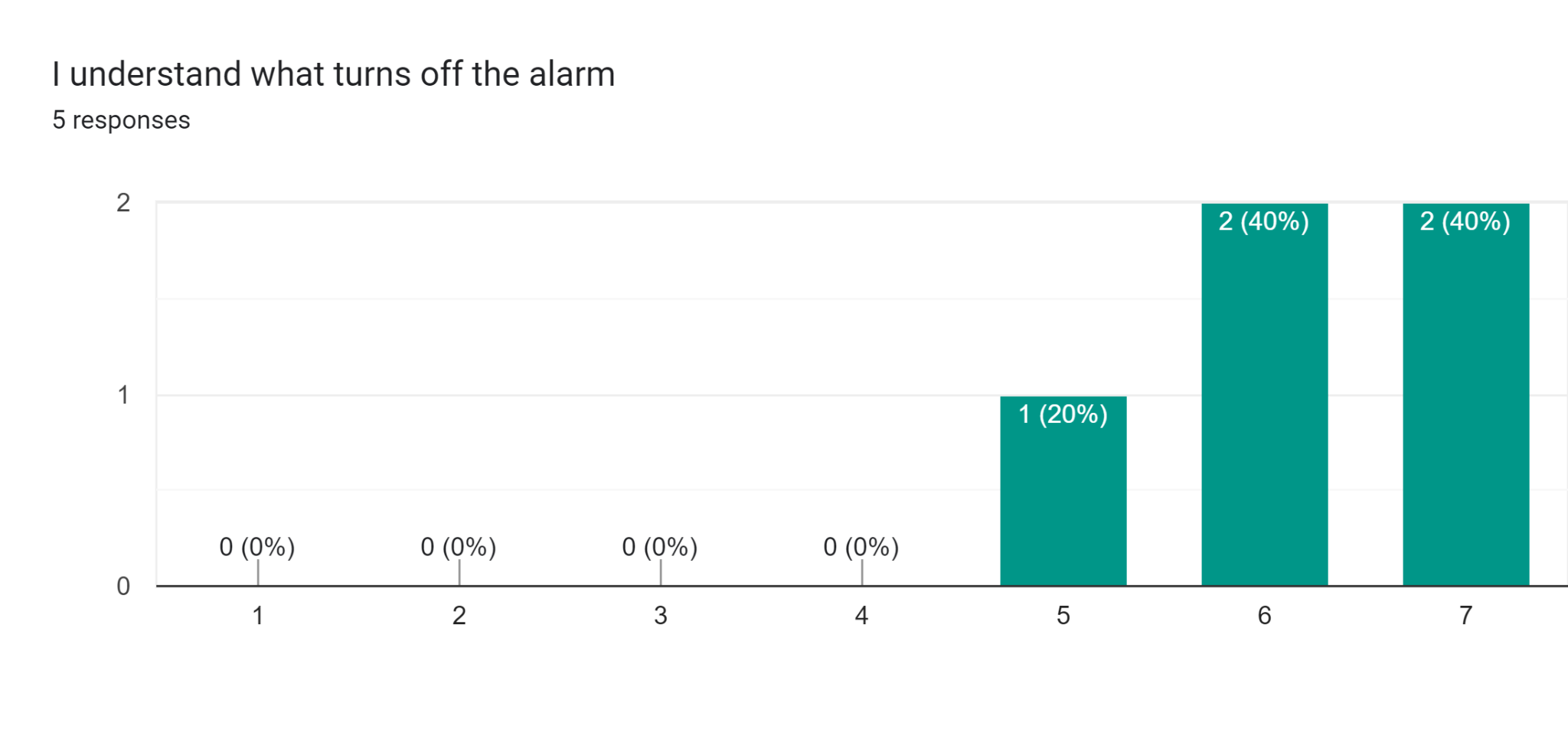
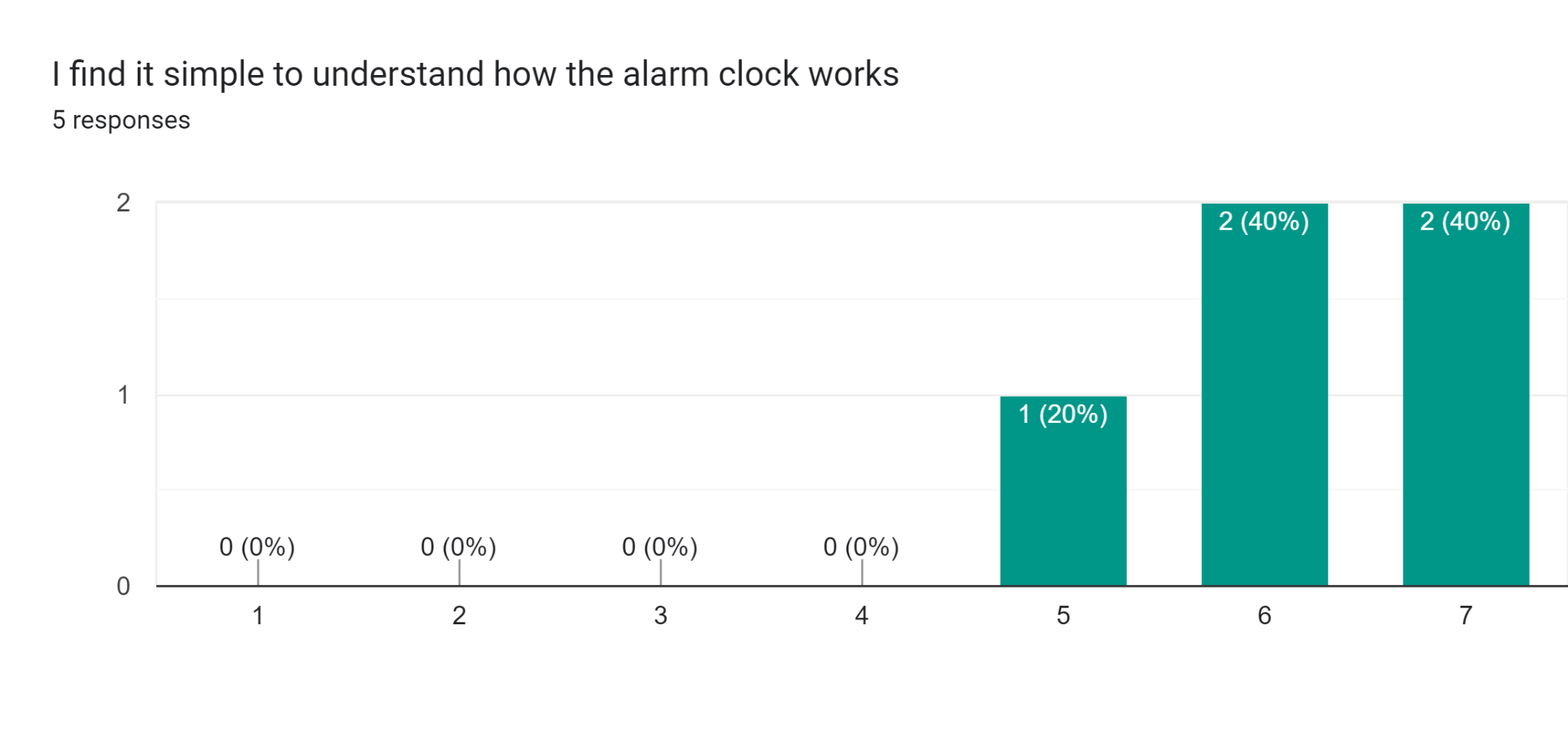
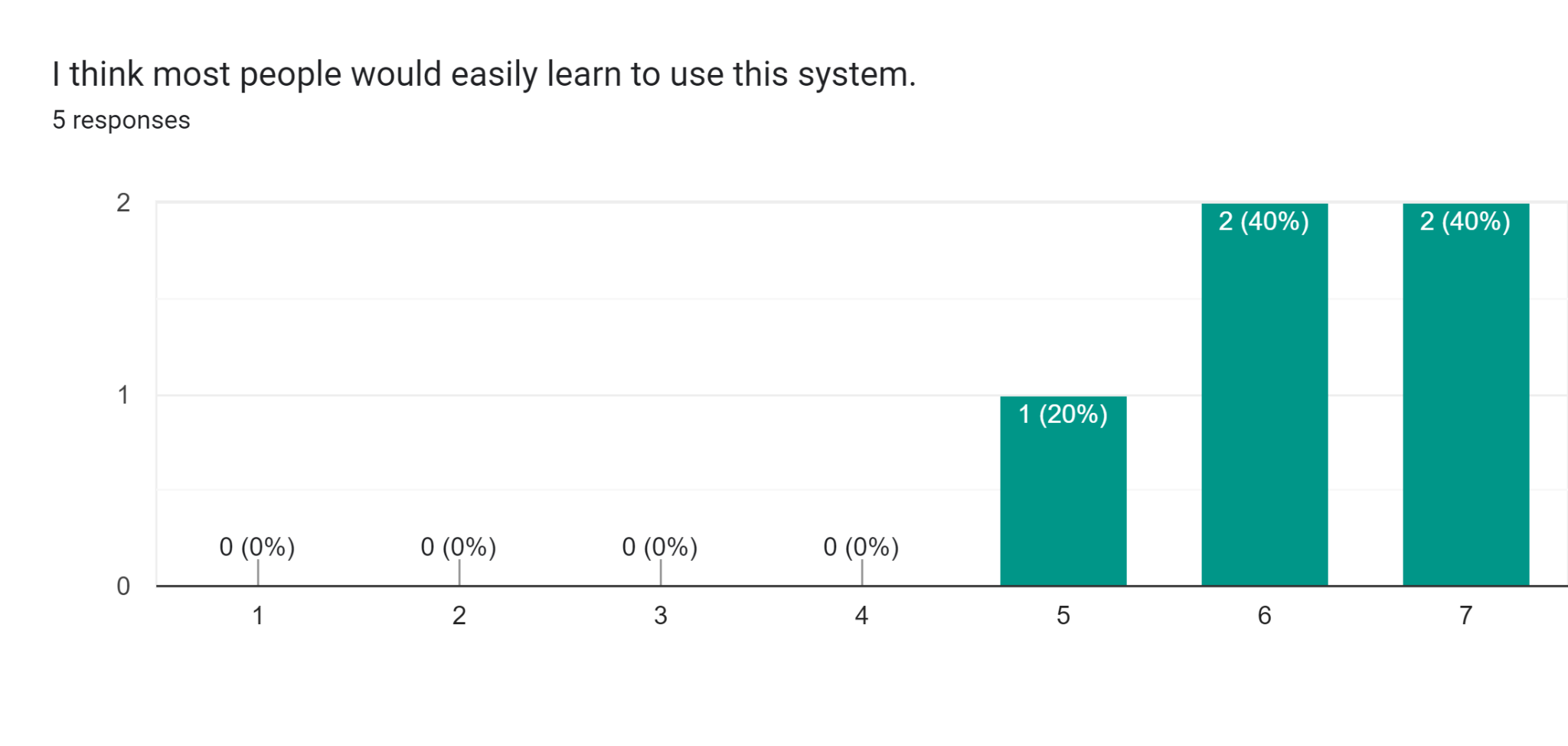
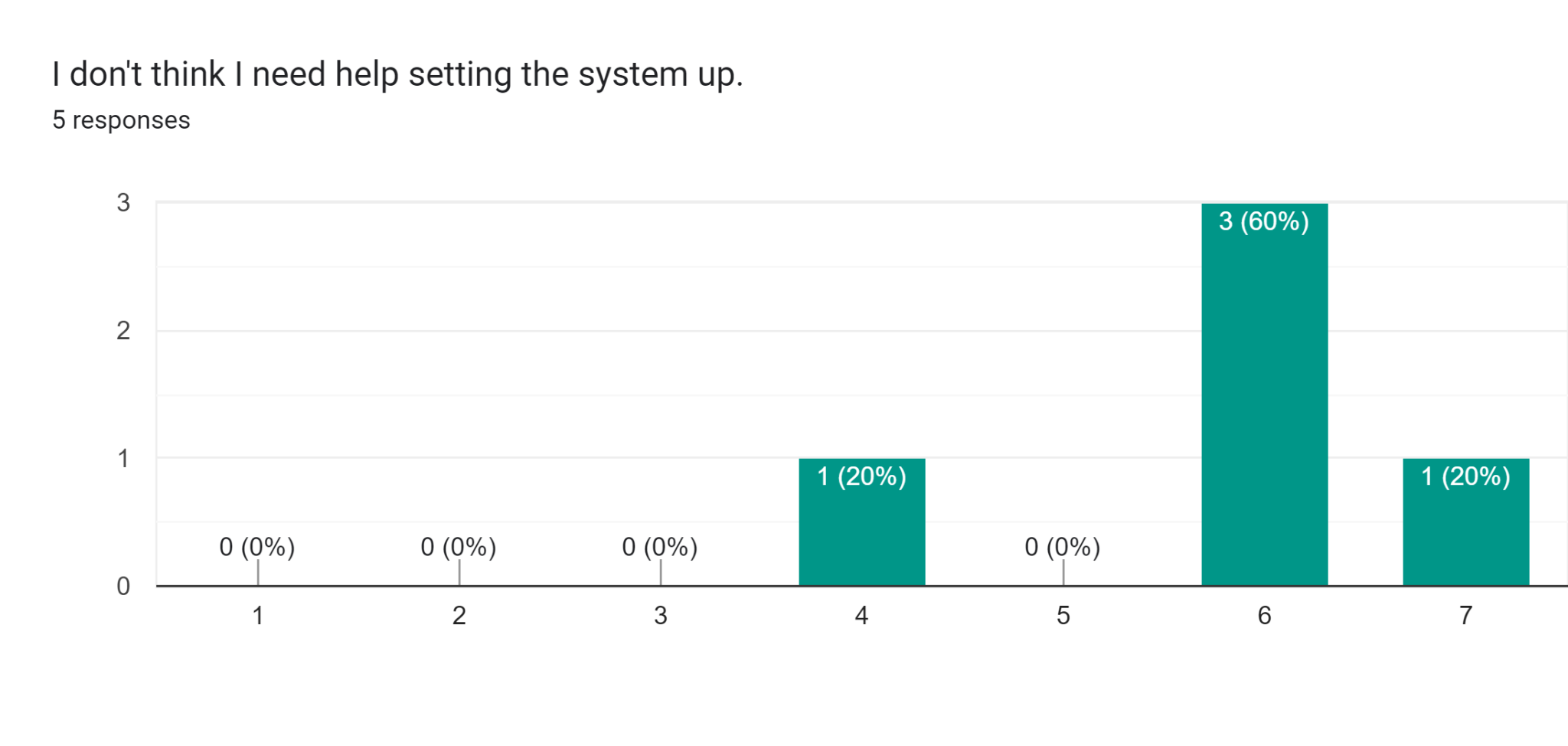
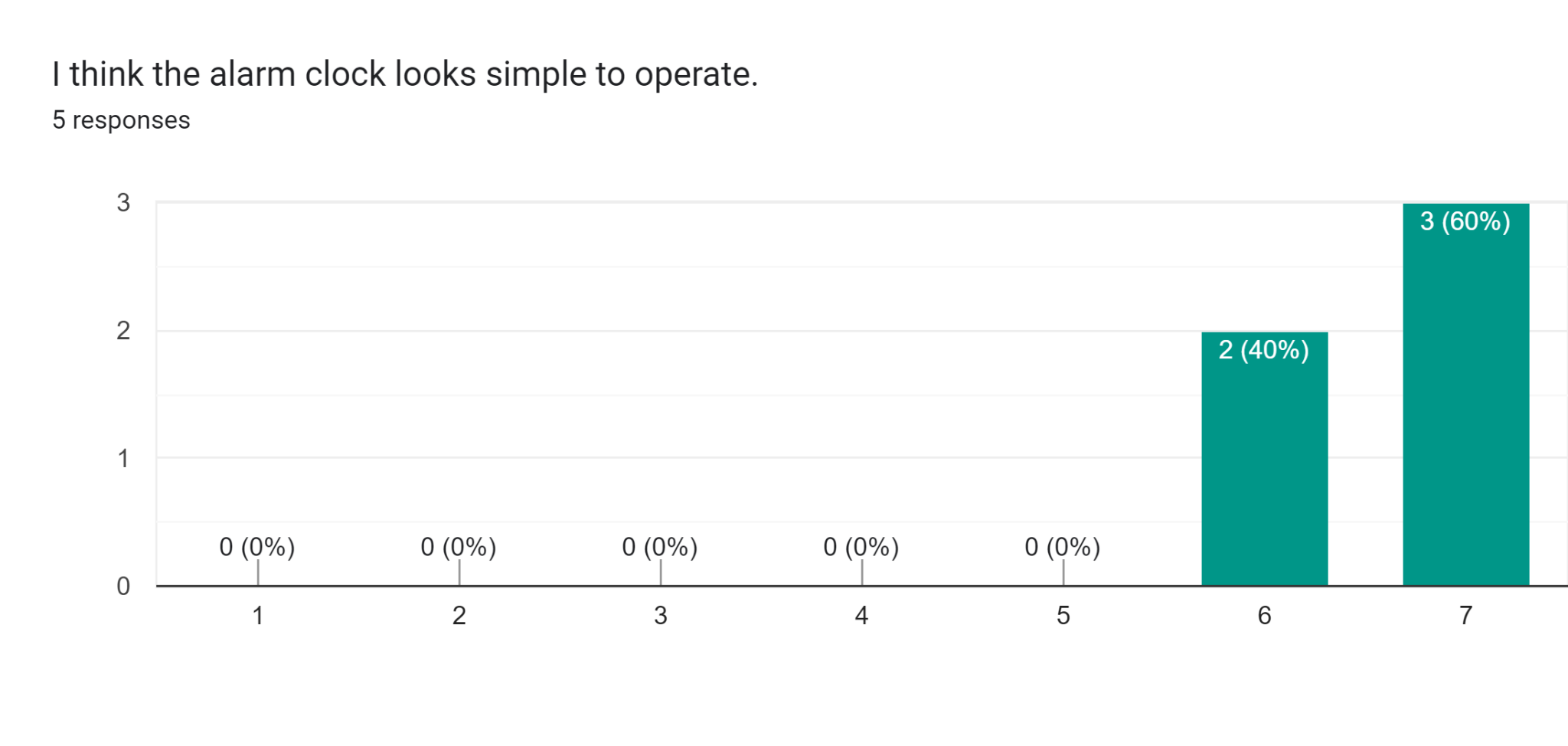
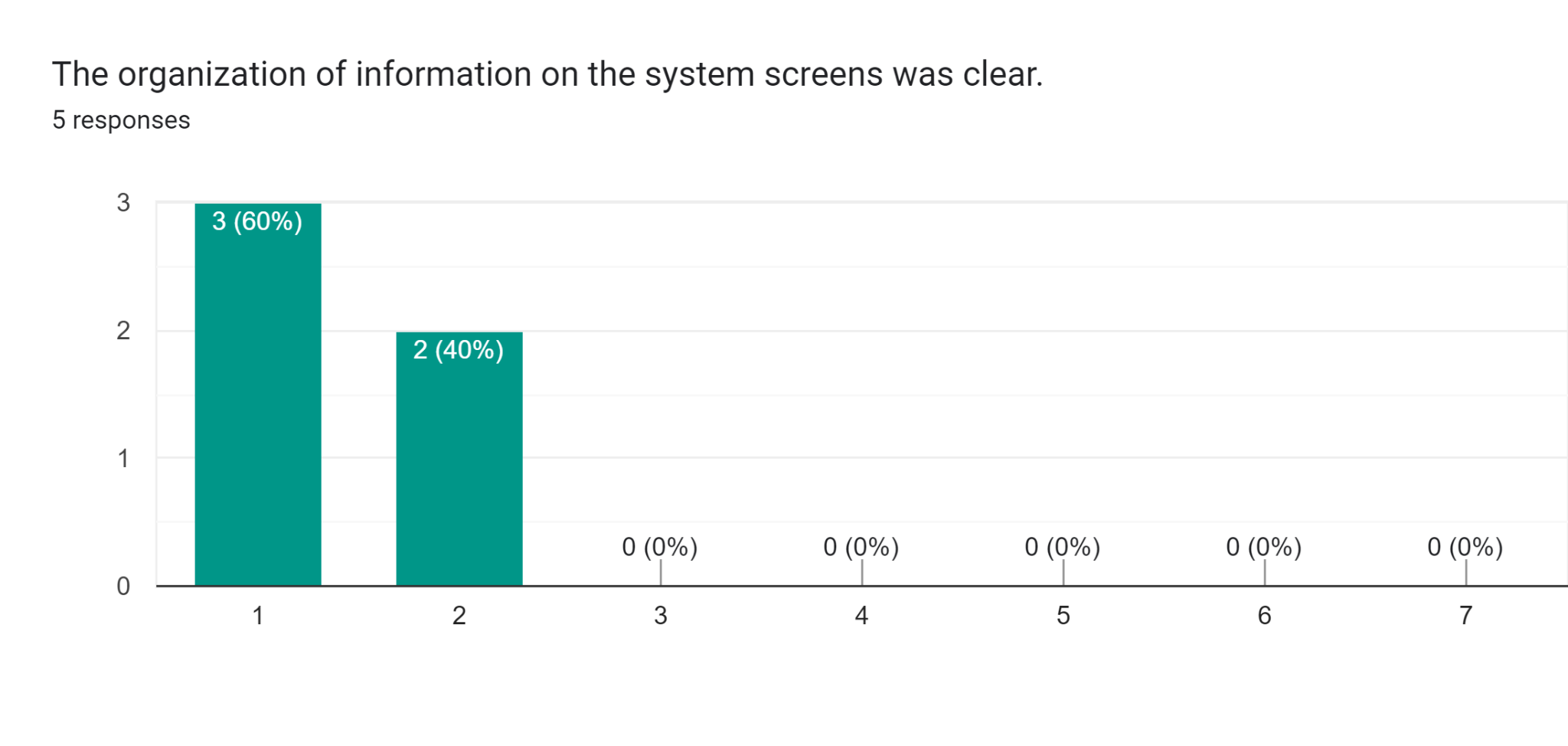
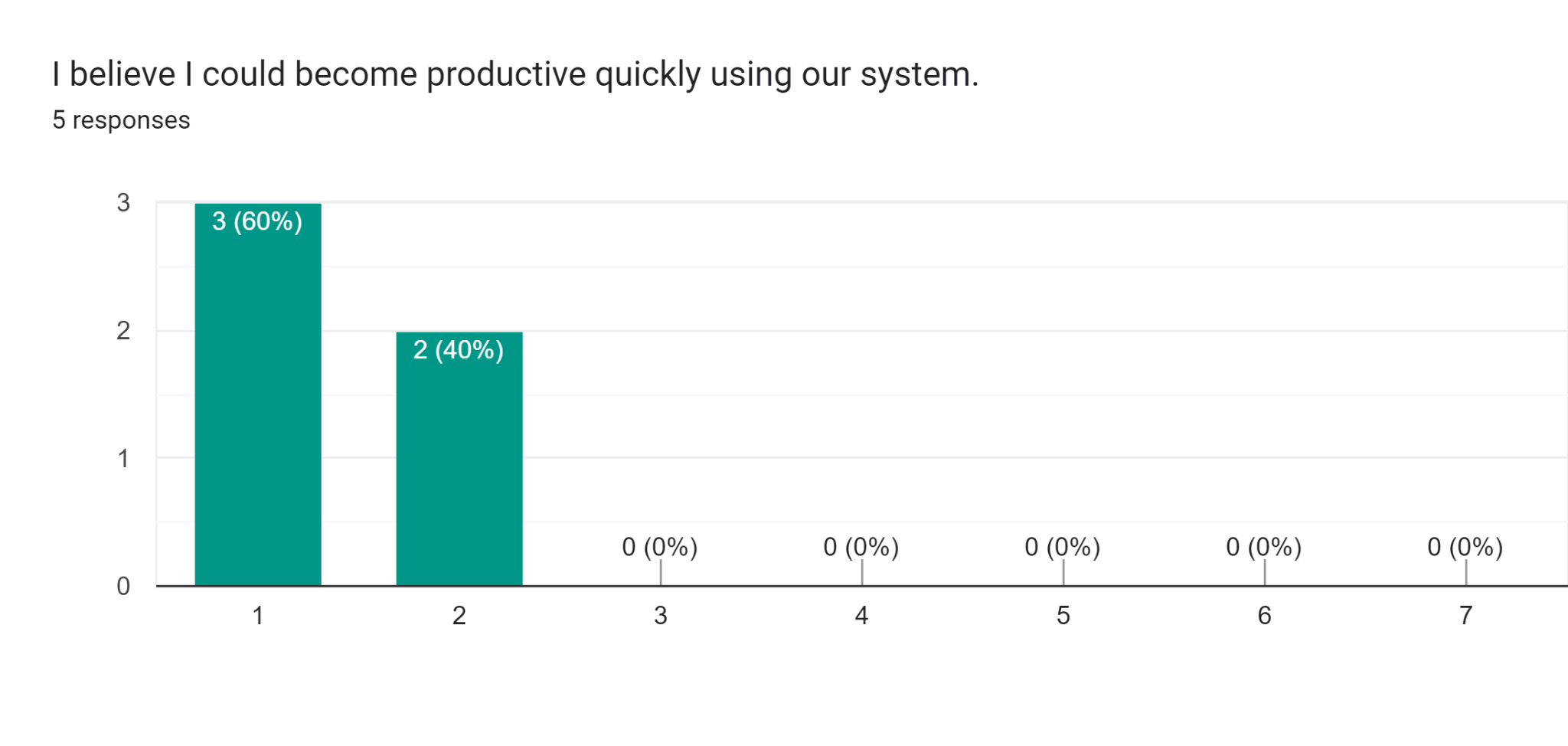
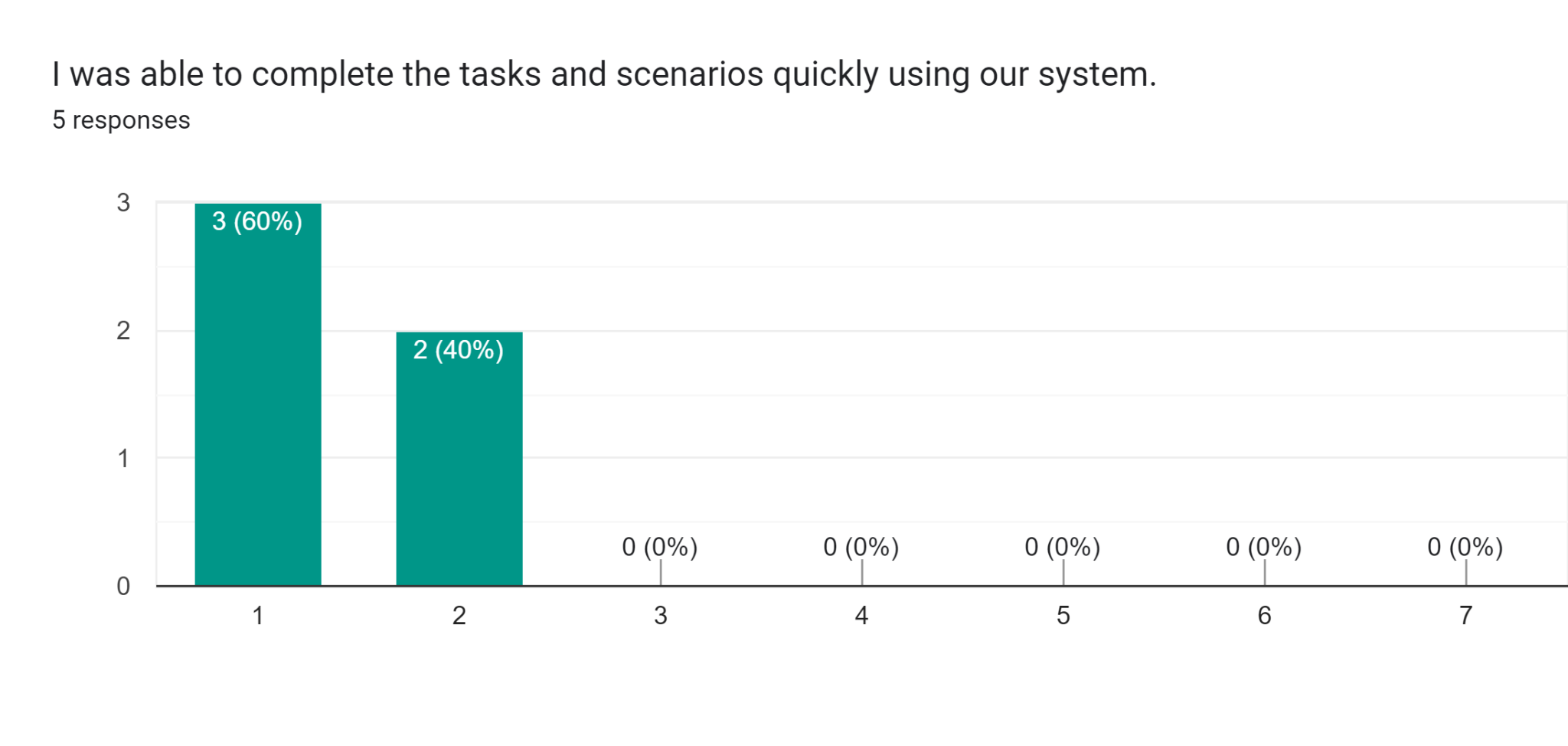
Once the testing phase was completed, each individual was tasked with completing a 10-question survey. This survey was designed to assess the participant's satisfaction with the product, and included questions such as how easy it was to use the system, the simplicity of operating the alarm clock, and whether or not they believed they could become productive quickly using the system. The survey also evaluated the clarity of the information presented on the system screens, as well as whether participants believed they would require assistance setting up the system.

Through this methodology, the experiment was able to provide valuable insights into the product's usability and user-friendliness. The feedback obtained from the participants allowed for the identification of any areas that required improvement, while also highlighting the product's strengths and features that were well-received by the participants.

* Overall, I am satisfied with how easy it is to use this system.
* It was simple to use our system.
* I was able to complete the tasks and scenarios quickly using our system.
* I believe I could become productive quickly using our system.
* The organization of information on the system screens was clear.
* I think the alarm clock looks simple to operate.
* I don't think I need help setting the system up.
* I think most people would easily learn to use this system.
* I find it simple to understand how the alarm clock works
* I understand what turns off the alarm.

Once the results were analyzed it was clear that for the most part the experiment was very easy to follow, learn, and overall provided the necessary information to showcase the importance. Here are all the graphs:





Even though the overall test of the experiment has been fairly successful so far there were a few criticisms or constructive feedback which consist of:

* How could you avoid someone from going over to the device and turning it off to then go back to bed.
* If the device is too out of reach how is someone going to be able to turn it off.
* What if someone sleeps with their lights on?
* What if someone's room isn’t dark enough to trigger the timer for the alarm?
* Can you adjust the sound of the alarm?
* Can there be a secondary trigger if the light detections isn't working.
* Changing the sound of the alarm would be pretty nice.

Our goal is to ensure that in the most critical of situations our product does not let the user fail, but instead it helps them succeed. There are certainly many important scenarios where our product can improve the lives of our users. The following examples help highlight this:

* Needing to wake up for an early flight.
* Waking up for an important interview that’s early in the morning.
* Resetting the body’s circadian rhythms by waking up at the same time every day.
* Waking up for a final exam that starts at 8AM.
* Waking up from a power nap in order to make it to your next class, rather than sleeping through it.

What all of these situations have in common is that the user wants to sleep and recharge themselves, but there is an important event that they need to wake up for, something that is clearly more important than sleep, and rightly so. All of these example scenarios, which are common in many people's lives, have a great risk associated with them.

Situations where this product may have no effect are those where the user can reliably wake up on their own at a certain time. For example, if the goal is to wake up consistently at 8AM, but the user is already waking up at that time or earlier then this product would not be useful. It may even become a slight irritant if they attempt to use it and then have to deal with an alarm going off an hour after they’ve already woken up.

However, the most important aspect to our product and the biggest point of potential failure stems from the users. The product relies on them to plug it into an outlet that is out of reach. That way it cannot be unplugged and turned off, nor can the user shine a light into the alarm to disable it. This is fair criticism, and if time was permitting then we the development team would attempt to address it by exploring the problem further.

In conclusion, the results of our experiment show that a majority of the participants responded positively to our questions. The first part of the survey, graphs 1 through 5, were ranked with 1 being strongly agree and 7 being strongly disagree. On average, participants responded between 1 and 2. In comparison to the second part of our survey, graphs 6 through 10, they were ranked with 1 being strongly disagree and 7 being strongly agree. On average, participants responded between 6 and 7.

When comparing the two sections, they show a similar trend of positive responses, from both before and after the participants used the product. Although there are outliers within the trend we have established, this is to be expected considering our focus group only had five participants.

Overall, the results show a positive reaction. This appears to support our hypothesis that this is a product which can fulfill an unrealized need in the daily lives of almost everyone, and can be extremely beneficial. Moving forward, the analysis of our experiment appears to show that further development into the concept of our product should be encouraged, as well as expanded upon in order to address the feedback received.