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Physical & Mental Health Enhancing Smart Chair

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Abstract

Mental illnesses such as depression and anxiety are prevalent in the young adults of today's western society. In recent years, the rate of depression has been increasing in young adults and continues to grow. Approximately 800,000 people lose their life to suicide every year, making it the second leading cause of death in 15 to 29-year olds. Substance abuse, major traumatic events, and changes in life stages are all common triggers for depression and anxiety. However, maladaptive coping methods such as excessive overthinking, withdrawal, and avoiding help are proven to be the primary causes. This is especially true in young adults where these traits are more common than any other age group. For these reasons, young adults are the primary target user for this project. With further research into the users' needs through interviews, user studies, and testing of current solutions, new ways of coping with depression and anxiety will be explored. These coping methods will be tested through surveys asking the target users to rate which coping methods are most helpful to them. With the information discovered, various coping methods will be combined to provide a full body solution that helps the user cope more adaptively with depression and anxiety.

Acknowledgements

Advisors, professors, supervisors, family and friends, thank you all. I want to thank Catherine Chong and Sandro Zaccolo for supervising me for the duration of this project, and for constantly pushing me to think outside the box.

I also want to thank my professors Karen White and Patrick Burke for helping with the research of the topics, and Reece Bennett for your styling input. A special thank you to my advisor Christine Kim for helping me understand the topic better and giving key insights into psychotherapy. Lastly, I want to thank my friends and family for their ongoing support and help with surveys.

I would like to dedicate this project to the millions of people suffering from depression, especially during this time of Covid. I hope this product finds you and can help you cope a little bit better.

CHAPTER 1:

Problem Definition

Figure 1 – Retrieved from https://unsplash.com/photos/Pv5WeEyxMWU

1.1 PROBLEM DEFINITION

The definition of depression by *the Centre of Anxiety and Mental Health (CAMH):*

> "*Depression is much more than simple unhappiness. Clinical depression, sometimes called major depression, is a complex mood disorder caused by various factors, including genetic predisposition, personality, stress and brain chemistry. While it can suddenly go into remission, depression is not something that people can "get over" by their own effort."*

Mental illnesses such as depression and anxiety are plaguing the young adults of today's western society. In fact, studies have shown that depression has increased in young adults by 5% from 2000 to 2006 and continues to grow by the year *(Mahmoud et al. 2012)*. According to a study done by *The Anxiety Disorder Association of America* 75% of American adults that suffer from anxiety said they experienced their first episode in young adulthood (the age of 22). There are many triggers for depression, such as:

- Genetics
- Substance abuse
- Major/traumatic events
- change in life stages

Depression does not have one single cause. Individuals often describe it as a downward spiral of events that lead to depression. However, according to *Mahmoud et al. (2012),* **maladaptive coping mechanisms** were the primary cause of depression, anxiety and stress. Some examples of maladaptive coping methods are:

- Rumination – obsessively thinking about something
- Withdrawal from the stressful situation
- Emotional numbing
- Escape
- Intrusive thoughts

It was also stated in the same article that young adults are using more maladaptive coping methods compared to any other age group. For this reason, young adults between the ages of 18-30 are the primary target users of this study.

This thesis report seeks to design and create a full body solution that helps the user cope more adaptively with depression and anxiety.

Figure 2 – Retrieved from https://blogs.iu.edu/sharedsolutions/2020/06/02/individuals-with-brain-injury-experience-chronic-fatigue/

"Problems are not the problem; coping is the problem."

– Virginia Satir, renown author and therapist

Figure 3 – Retrieved from http://satir.web.unc.edu/about-virginia-satir/virginia-satir-cropped/

1.2 RATIONALE & SIGNIFICANCE

Currently, depression is the leading cause of disability worldwide, having more than 264 million people of all ages suffer from depression. World Health Organization has stated that close to 800,000 people die due to suicide every year making it the second leading cause of death in 15-29 year olds.

That's more than 5 times the amount of people that the world's largest stadium can hold. (Pyongyang Stadium: The largest stadium in the world can hold up to 180,000 people)

Figure 4 – Retrieved from https://www.businessinsider.com/inside-north-koreas-may-day-stadium-2015-10

Many depressed individuals go undiagnosed. The ones that do seek treatment are sometimes prescribed pharmaceutical medication with a lot of negative side effects.

Some of the side effects of antidepressants are nausea, fatigue, drowsiness, low sex drive, constipation and insomnia.

1.3 BACKGROUND/HISTORY/SOCIAL CONTEXT

Although depression is being spoken about more often than in the past there is still a lot of social stigma and prejudice against it. People often confuse depression with sadness. Some negative stereotypes such as calling those with depression weak, lazy or dramatic are examples of social stigmas. This often makes individuals dealing with depression feel worse, and afraid to speak about it.

According to *the Centre of Anxiety and Mental Health "Stigma prevents 40% of people with anxiety or depression from seeking medical help."*

This has a role to play in why over 10 Canadians die each day due to suicide. Social stigmas are caused by a lack of awareness on the topic. By educating and spreading awareness on the topic of depression, social stigmas will slowly diminish.

Although depression cannot be cured, it can be treated. According to *Lakeland Regional Health* depression is highly treatable. Like diabetes, symptoms can be treated through lifestyle changes and medication.

CHAPTER 2:

Research

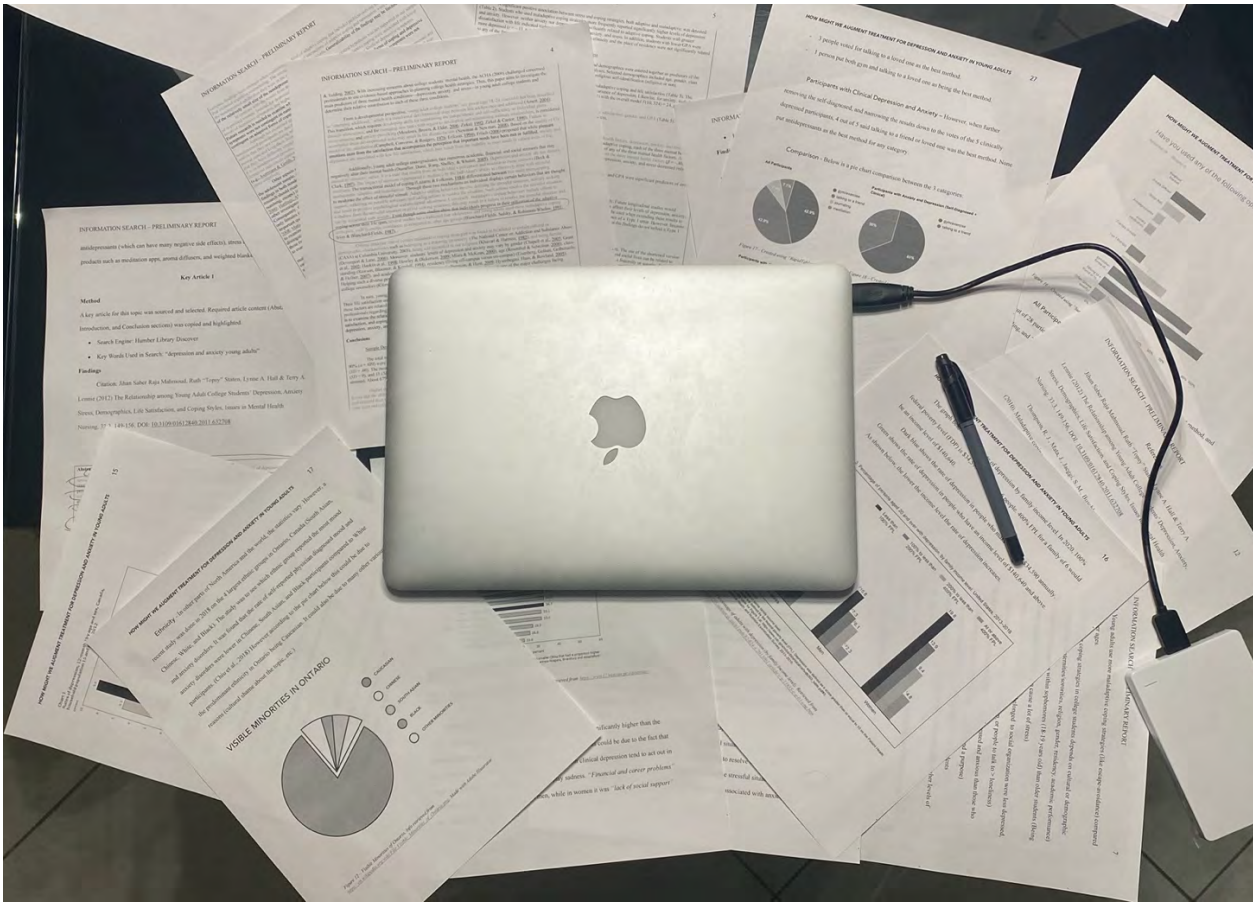


Figure 5 – Research. Photo taken by Benjamin Chew on November 4 2020

2.1 USER RESEARCH

Research into depression and anxiety has grown exponentially in recent times, yet there is still so much unknown about the topic. To better understand how to help individuals facing depression, this report creates a user profile of a young adult with clinical depression to further empathize and understand the demographic user's traits and characteristics. Using personal surveys, peer reviewed articles, and statistical data, a general user profile will be created to better understand the user demographic and behaviour.

2.1.1 USER PROFILE – PERSONA

2.1.1.1 PERSONAL SURVEY

Personal Survey - A preliminary survey was created on *"SurveyMonkey.com"* consisting of 12 questions. The questions asked the users their age, what their living environment was like, if they dealt with anxiety/depression, if they were clinically diagnosed, and what were the coping methods they used. The participants were also asked to write what was the best coping method, and how it could improve. The survey was sent out to friends and friends of friends who were all between the ages of 21-26. The participants answered the survey on October 6 to October 7 2020 and were all anonymous. 32 young adults in Ontario participated in the survey.

This was a preliminary survey to briefly understand young adult coping methods. The sample size was relatively small, and was not the only information used to understand the users

Key Findings on Users – The preliminary survey had several key findings that was a good introduction into the topic. Out of the 32 young adults 5 of them were diagnosed with clinical depression, while 1 of them was diagnosed with social anxiety. When viewing all of the 32 results, it was difficult to find any consistency. However, when narrowing down the filter to the 5 participants that were diagnosed with clinical depression, there most certainly was a pattern in the users interviewed. Here were the similarities they shared:

- Out of the 5 participants, all of them stated they have used <u>both</u> *excessive overthinking*, and *emotional numbing* as a way of maladaptive coping.

- All participants lived with their parents and were either working or were university/college students.
- None of the participants chose the option *"I'm not in school or working"* (indicating that their depression did not stem from physical loneliness/nothing to do).
- All participants were between the ages of 22-26.
- They all felt like they had no one to talk to.
- Mornings and nights were the worst times of the day.

2.1.1.3 TARGET DEMOGRAPHIC DATA

The following data was discovered using peer reviewed articles, online statistical data, and a personal survey to find a target demographic in Canada. The target demographic data that was sought after included gender, age, ethnicity, income levels, hobbies/activities, physical/social isolation.

Gender - According to statistical data provided in the graphs below *(Figure 10* and *Figure 11)*, the amount of female reported cases of depression are significantly higher than the amount of male reported cases in every age group.

According to Source: *(Krause et al., 2018)*, "girls report higher levels of depressive symptoms and disorders than boys during the transition from early to late adolescence. By adulthood, women are nearly twice as likely as men to report having experienced a major depressive episode."

In the same article it states that people who use rumination as a way to cope rather than problem solving have greater risk of having an onset of depressive symptoms. It also states that

females tend to cope with sadness by ruminating more often than males. This excessive rumination leads to more intense depressive symptoms.

According to the Government of Canada's website (Canada.ca) *"about 11% of men and 16% of women in Canada will experience major depression in the course of their lives."*

Gender Behaviour Differences - Although more female reports of depression have been found, there are still countless number of males who also face depression. In fact, it might just be that more female cases are reported. In one article it states that depression in men might be harder to diagnose as "sadness" and "crying" aren't frequently reported by men to their doctors, due to social stigmas. *(Medical News Today)*

Men and women tend to deal with depression differently. According to an article by *"The National Institute of Mental Health"* men with clinical depression tend to act out in anger and irritability rather than sadness, while women tend to express their sadness. Male individuals with depression are more likely to suffer from insomnia than females and are less likely to get help for emotional symptoms. Feelings of anxiousness and restlessness are common symptoms in men facing depression. According to an article by *Medical News Today "Financial and career problems"* were more likely to cause depression in men, while in women it was *"lack of social support"* and *"relationship with parents".*

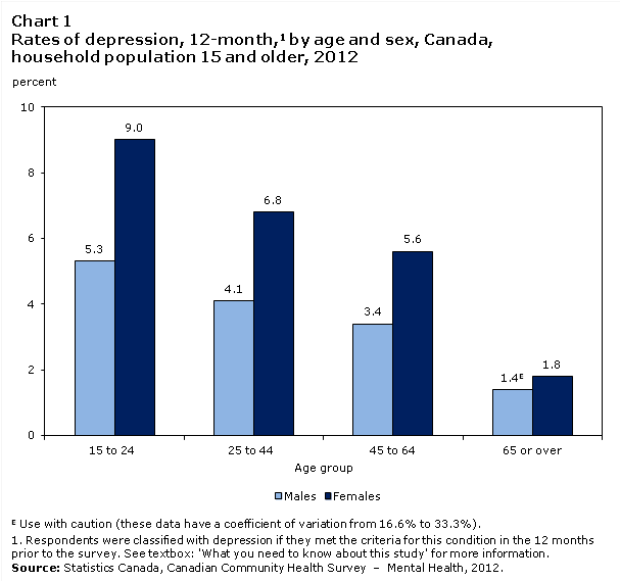


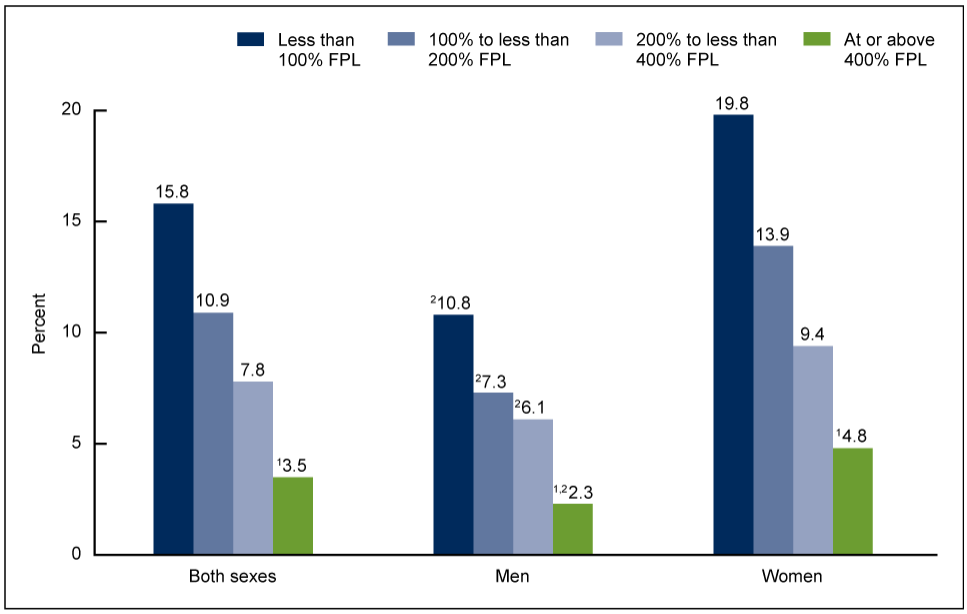
Figure 10 – Percentage of Canadians with depression (age group and gender). Retrieved from https://www150.statcan.gc.ca/n1/pub/82-624-x/2013001/article/c-g/11855-c-g-01-eng.htm

Age – The age group with the highest rate of depression were "15 to 24-year olds" according to *Statistics Canada* and *CAMH (Centre for Anxiety and Mental Health)*. According to Source: *(Krause et al., 2018)* "Rates of depression increase dramatically during the transition to adolescence with a sixfold increase in the prevalence of the disorder between ages 15 and 18 years."

Income Levels – The income levels of Canadians have been reported to have an effect on mental health. According to the *Centre for Anxiety and Mental Health "Canadians in the lowest income group are 3 to 4 times more likely than those in the highest income group to report poor to fair mental health"* – Article retrieved from https://www.camh.ca/en/driving-change/the-crisis-is-real/mental-health-statistics

The graph below shows the rate of depression by family income level. In 2020, 100% federal poverty level (FDP) is $34,590 annually for 6 people. 400% FPL for a family of 6 would be an income level of $140,640. Dark blue shows the rate of depression in people who make less than $34,590 annually. Green shows the rate of depression in people who have an income level of $140,640 and above. As shown below, the lower the income level the rate of depression increases. This could be due to financial and career problems, social status, and poor physical health/diet.

Figure 3. Percentage of persons aged 20 and over with depression, by family income level: United States, 2013–2016



[1]Significant decreasing linear trend.
[2]Significantly lower than women in same family income level.
NOTES: Family income levels are defined by the federal poverty level (FPL). Depression was defined as a score greater than or equal to 10 on the Patient Health Questionnaire. Access data table for Figure 3 at: https://www.cdc.gov/nchs/data/databriefs/db303_table.pdf#3.
SOURCE: NCHS, National Health and Nutrition Examination Survey, 2013–2016.

Figure 11 – Percentage of adults with depression (by family income level). Retrieved from https://www150.statcan.gc.ca/n1/pub/82-624-x/2013001/article/c-g/11855-c-g-01-eng.htm

VISIBLE MINORITIES IN ONTARIO

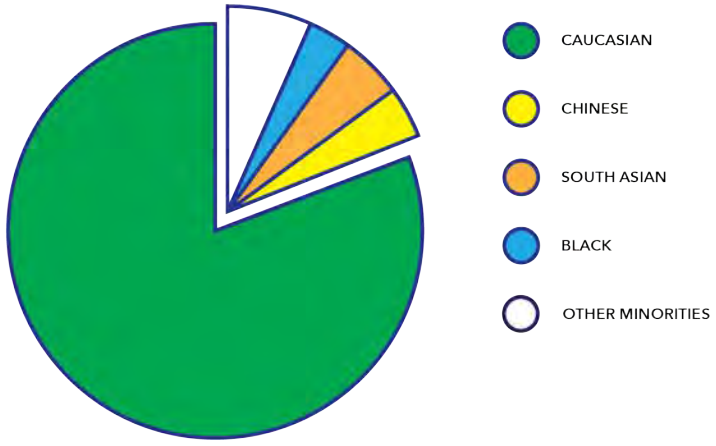
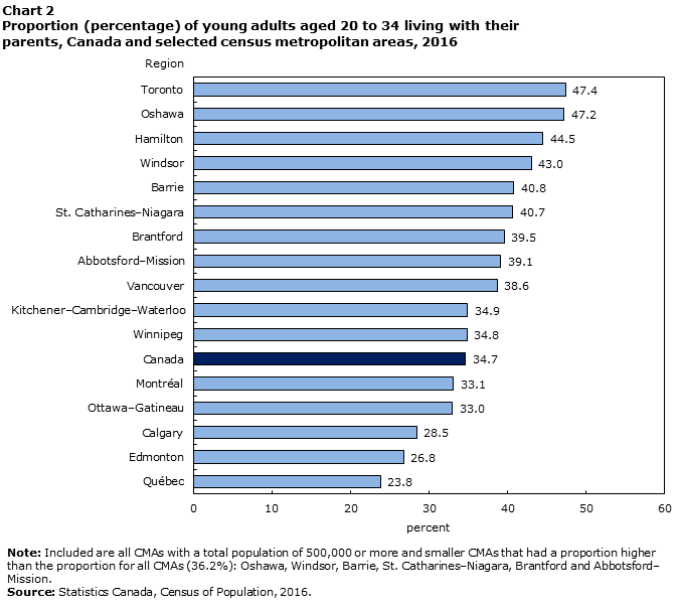


Figure 12 – Visible Minorities of Ontario. Info retrieved from https://en.wikipedia.org/wiki/File:Visible_Minorities_of_Ontario.png*. Made with Adobe Illustrator.*

Ethnicity - In other parts of North America and the world, the statistics vary. However, a recent study was done in 2018 on the 4 largest ethnic groups in Ontario, Canada (South Asian, Chinese, White, and Black). The study was to see which ethnic group reported the most mood and anxiety disorders. It was found that the rate of self-reported physician diagnosed mood and anxiety disorders were lower in Chinese, South Asian, and Black participants compared to White participants. (Chiu et al., 2018) However according to the pie chart above this could be due to the predominant ethnicity in Ontario being Caucasian. It could also be due to many other various reasons (cultural shame about the topic, etc.)



Physical/Social Isolation - According to a graph by *"Statistics Canada, 2016"* almost 50% of young adults in Toronto between the ages of 20 – 34 still live with their parents.

Figure 13 – Percentage of young adults living with their parents. Retrieved from https://www12.statcan.gc.ca/census-recensement/2016/as-sa/98-200-x/2016008/98-200-x2016008-eng.cfm

Summary

The amount of female reported cases of depression are significantly higher than the amount of male reported cases in every age group. However, this could be due to the fact that

more male cases are unreported/undiagnosed. Males with clinical depression tend to act out in anger and irritability, while females tend to display sadness. *"Financial and career problems"* were more likely to cause depression in men, while in women it was *"lack of social support"* and *"relationship with parents"*.

15 - 24-year old's have the highest rate of depression compared to any other age group. Canadians in lower income groups were more likely to have depression than those with a higher income. In Ontario Caucasian individuals reported more mood and anxiety disorders than South Asian, African American, and Chinese ethnic groups. Almost 50% of young adults in Toronto ages 20-34 still live with their parents.

User Behaviours

Some insight into user behaviours were taken from an article written by Natasha Tracy called "A Day in the Life of Living with Depression". Videos and personal interviews with friends were also used. With the information discovered a user persona was created. https://www.shepellfgi.com/understandingmentalillness/article.aspx?title=ADayintheLifeofLivingwithDepression&a=69&lang=US

2.1.1.4 USER PERSONA

2 fictional user personas were created to show how males and females cope with depression. Keep in mind these are not the same for every male or female dealing with depression, and that these user personas were made in order to get a better understanding.

FEMALE PERSONA

Name: Emily Williams

Age: 19

Diagnosis: Mild Clinical Depression

Gender: Female

Ethnicity: African-American

Location: Richmond hill, Ontario, Canada

Income Level: Mid income

Home life: Lives at home with parents

Occupation: full time student

Hobbies: Tennis, baking

Figure 14 – Female User Persona. Retrieved from https://www.byrdie.com/natural-hair-in-corporate-america

User Behaviour

Emily is a 19-year-old female that lives in Richmond hill, Ontario, Canada. She is a full-time first year student at Ryerson University, who lives at home with her mom. Her parents are divorced. Emily used to love baking with her mom and playing tennis on weekends, but lately

she's had no joy in playing or in any of her hobbies. Since about 4 years ago, she has stopped going to tennis practice and has since quit.

Emily feels exhausted, hopeless and she's had thoughts about death. Her friends have been busy and haven't had the time to answer her calls as frequently as she needs. This causes her to think her friends don't care about her, causing her to feel isolated. Excessive overthinking and emotional numbing have been the ways she's been coping with it.

She tried speaking to her mom, but her mom told her to stop being dramatic and to stop thinking about it. This causes Emily to feel isolated and shameful for feeling this way.

She spends her days in bed and lately she has been overeating, with dishes piled up in her room, not having the energy or motivation to clean up, or even leave her bed. She's been prescribed medication, which helps her with attending classes and getting by, but she feels fatigued and numb.

Emily's Relationship with Exercising:

Emily used to be very active in sports, but ever since her depression took hold of her life she stopped going to practice. She has since lost all interest and energy for tennis which she once used to love.

MALE PERSONA

Name: Matthew Wright

Age: 23

Diagnosis: Mild Clinical Depression

Gender: Male

Ethnicity: Caucasian

Location: Etobicoke, Ontario, Canada

Income Level: Low – mid income

Home life: Lives at home with parents

Occupation: part-time student at Humber College, part-time minimum-wage employee

Hobbies: Use to love playing guitar, music

Figure 15 – Male User Persona. Retrieved from https://unsplash.com/@brokenlenscap

User Behaviour

Matthew Wright is a 23-year-old Caucasian male young adult that lives in Etobicoke, Ontario, Canada. He used to love playing the guitar and singing, but for the past 2 years he has lost all passion for music. He currently lives at home with his parents and works a part time job to help with the expense of school. He attends Humber College as a part time student.

Lately David has not been doing too well in school. He finds it hard to focus on schoolwork, and simple school assignments seem to take him forever. When he asks his friends in class, they seem to finish the assignments in an hour, while it takes him several. This makes

him feel even more lousy and worthless. He finds it hard to concentrate on work as these persistent negative thoughts keep filling his head. Like he is not worth anything, and that school and life are hopeless. Although he has many good traits, he fails to see any of them.

He's been feeling quite restless and can't seem to sleep well at night. In the mornings he is tired and has no energy to get out of bed. On days he has school he has to force himself to get out of bed, barely having the energy to get up and brush his teeth. At school he seems to find everything irritable, even simple jokes his friends make. Lately he has been growing more and more distant from his friends and having no energy to show up to hang outs as much. At work his boss is fed up, as it takes him longer to do tasks than his coworkers. He is trying his best though he just does not have the energy.

He lays in bed most days when he doesn't have school, only getting up to eat once a day, cooking himself a simple mac and cheese meal just to sustain himself. The food tastes bland, and he has no appetite, even though mac and cheese use to be his favourite meal. Lately he has lost a lot of weight, and making lunch seems like such a tough task for him to do. Ever since a year ago David has been clinically diagnosed with mild depression and anxiety.

David's Relationship with exercising:

He heard exercising helps with depression, but because David is falling behind in school, he feels he has no time and energy for exercising.

2.1.2 USER OBSERVATION – CURRENT USER PRACTICE

Based on the personal survey done in 2.1.1.1, some user observations were discovered, such as what they found the best coping methods were, what methods have they tried using, and how can existing products/coping methods be improved.

COPING SURVEY QUESTIONS

1. **What is your age?**
2. **Are you living alone, on campus, with parents, or with roommates?**
3. **Are you a student or working?**
   - Full time student
   - Part time student
   - Working
   - Not in school or working
   - Other
4. **Have you ever struggled with any form of depression and anxiety?**
   - Yes
   - No
5. **If so, were you clinically diagnosed with any of these? Please state diagnosis.**
6. **How old were you when you started feeling this way?**
7. **Have you ever used one of these maladaptive coping methods?**
   - Excessive overthinking
   - Emotional numbing
   - Both
   - None
8. **Did any of the following have a role to play?**
   - Feeling like you had no one to talk to
   - Not getting enough exercise
   - Not eating well
   - Not having a schedule or a daily routine
   - Nope
   - Other (please specify)
9. **What time of the day is the worst for you?**
10. **Have you used any of the following options? Tally all that you use.**
    - Weighted Blanket
    - Aroma Diffuser
    - Stress Ball
    - Antidepressants
    - Anxiety Medication
    - Therapy Groups
    - 1 on 1 Therapy
    - Meditation
    - Gym/Exercise
    - Talking to a friend or loved one
    - Other
11. **Which of these options would you say helped the most?**
12. **Is there room for improvement in these products? If so how?**

2.1.2.1 PERSONAL SURVEY COPING RESULTS

The participants were asked to choose which methods they have used to cope with depression (Question 10)

1. 100% said they used **"***Talking to a friend or loved one"*
2. 80% have used *"Exercising/going to the gym"*
3. 60% have used *"Meditation"*

When asked which coping method was the best, *"talking to a friend or loved one"* had the most significant number of votes in those with clinical depression.

Extended Info on Survey Results –

When taking into account all 29 participants that answered, the results for "the most often used methods" were similar:

- 90% said *"Talking to a friend or loved one"*
- 72% said *"Exercising/going to the gym"*
- 41% said they have used *"Meditation"*
- 28% said they have used "*Aroma Diffusers"*

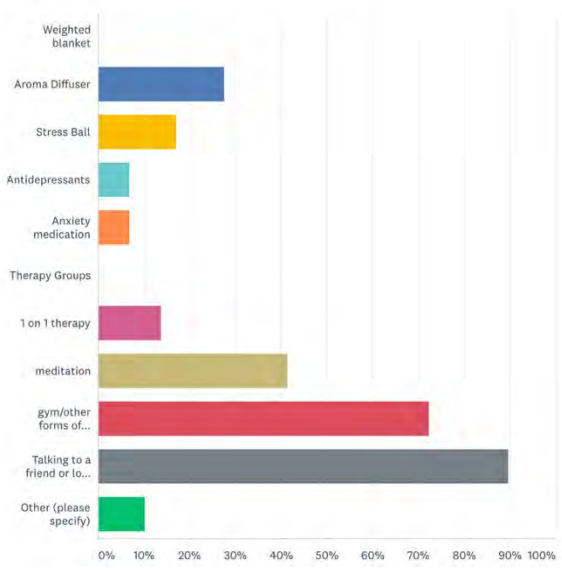


Figure 16 – Created using "SurveyMonkey.com"

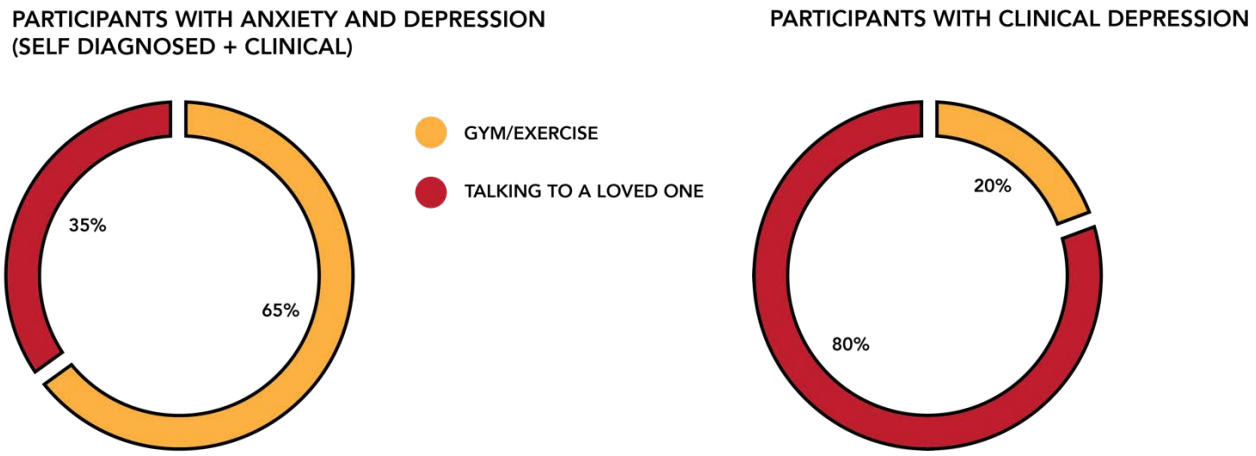
All Participants – 12 out of 28 participants said gym/exercise was the best method, and 12 out of 28 participants said talking to a friend was the best method. 2 participants said journaling, and 2 answered meditation.

Participants with Anxiety and Depression (Self-Diagnosed + Clinical) – When removing participants that dealt solely with anxiety and focusing on participants dealing with both depression and anxiety, results were different. Out of 10 participants:

- 6 people voted for gym as the best method
- 3 people voted for talking to a loved one as the best method.
- 1 person put both gym and talking to a loved one as being the best method.

Participants with Clinical Depression and Anxiety – However, when further removing the self-diagnosed, and narrowing the results down to the votes of the 5 clinically depressed participants, 4 out of 5 said talking to a friend or loved one was the best method. None put antidepressants as the best method for any category.

Which ***coping method*** helped the most?



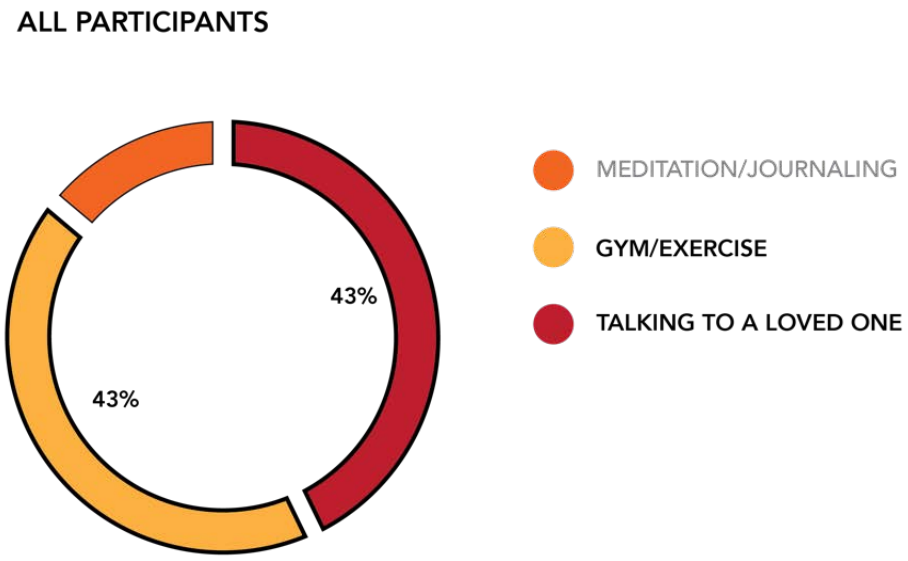


Figure 17 – Pie Charts of best coping methods. Created using "RapidTables.com" and Adobe Illustrator.

Only 2 participants out of the 29 put meditation as the best method of coping, even though almost half of the 29 participants had used it before. One participant who was clinically depressed even stated that it was very temporary, and once the meditation was done, she went back to feeling depressed.

SUMMARY FROM SURVEY

The needs of the clinically depressed young adult participants were very similar. They needed **better accessibility to therapists**, and **better listening/empathy**. One participant stated that even after he/she was diagnosed, the medical professional would not refer him/her to any therapy or group therapy and told the participant to come back in a month even though the user was extremely suicidal at the time. Providing individuals with better resources when seeking help from medical professionals can be much improved.

Apart from talking to a friend or loved one, **going to the gym/exercising** also had a high number of votes for being the best coping method.

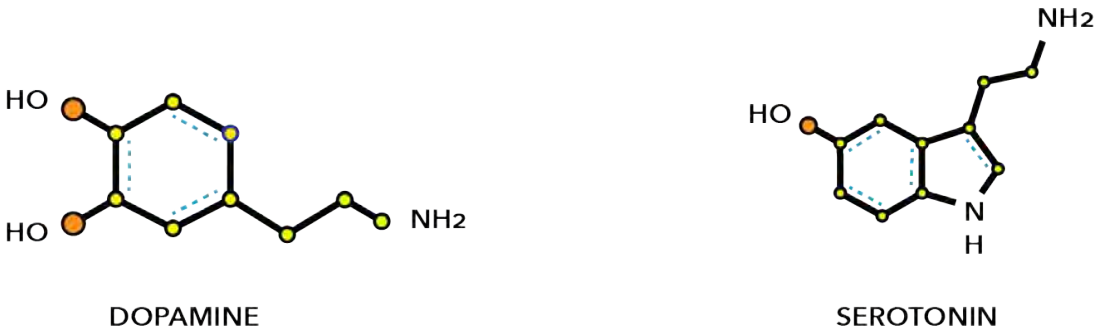


Figure 20 –Dopamine and Serotonin. Made using Adobe Illustrator

2.1.2.2 RESEARCH ON SEROTONIN AND DOPAMINE

Serotonin and Dopamine are two chemicals in the brain that are often dubbed as ***"happy chemicals"***. Many antidepressants such as *Prozac*, *Zoloft* and *Celexa*, help balance out these chemicals, as both serotonin and dopamine imbalances have been proven to affect moods. Depending on the individual, some people need antidepressants to "jumpstart" their serotonin and dopamine levels to at least get them to be motivated to get out of their bed and get help.

Although pharmaceutical medication is needed in many cases, these antidepressants can come with many negative side effects. Due to this, research has been done to look at natural ways to balance out serotonin and dopamine.

Serotonin Levels – According to *Medical News Today* Serotonin is described as a *"neurotransmitter that helps regulate many bodily functions… In addition to aiding digestion, serotonin regulates the sleep-wake cycle, emotions, metabolism/appetite, cognition/concentration, hormonal activity, body temperature, and blood clotting."* In the same

article it states that *"having low levels of serotonin can increase a person's risk of developing depression."*

According to (Young, 2007) Serotonin plays a role not only in the treatment of depression but also in susceptibility to depression and suicide.

The majority of the user's serotonin is located in the users gut rather than the brain. The following activities below improve serotonin levels naturally.

1. Healthy balanced diet - eating foods with tryptophan (Young, 2007 And *Medical News Today*)
2. Exposure to bright light (Young, 2007)
3. Exercise (Young, 2007)

Dopamine Levels - According to *Medical News Today* Dopamine is also a neurotransmitter that affects the user's moods. Dopamine regulates the user's mood, sleep, learning, movement, and alertness. This neurotransmitter affects the brains pleasure and reward center. Serotonin is known to restrain impulsive behaviour, while dopamine enhances it.

Short term addictive activities that releases the brains pleasure and reward system (like eating certain foods, smoking cigarettes, taking drugs, gambling, and pornography) all have an effect and cause dopamine levels in the brain to lower if done excessively. The more often an individual does an addictive activity, the less dopamine the brain releases. This causes the individual to seek a stronger high (smoking more cigarettes, taking stronger drugs, etc.).

2.1.3 USER OBSERVATION – ACTIVITY MAPPING

The next step was to create a user journey map showcasing the key points in the day that an individual with depression faces on an everyday basis. By doing this, the hardest parts of the day will be discovered. In order to do this, a second personal survey was sent out asking participants to rate the difficulty of each activity. 5 participants suffering from mild clinical depression volunteered. What they found difficult during the day were different, but there were some similarities. Adding onto the survey, two video observations were also used in understanding the difficulties throughout the day.

Every individual suffers from different levels of depression and have different daily routines and struggle more with different activities. The below observation should be viewed as a general example.

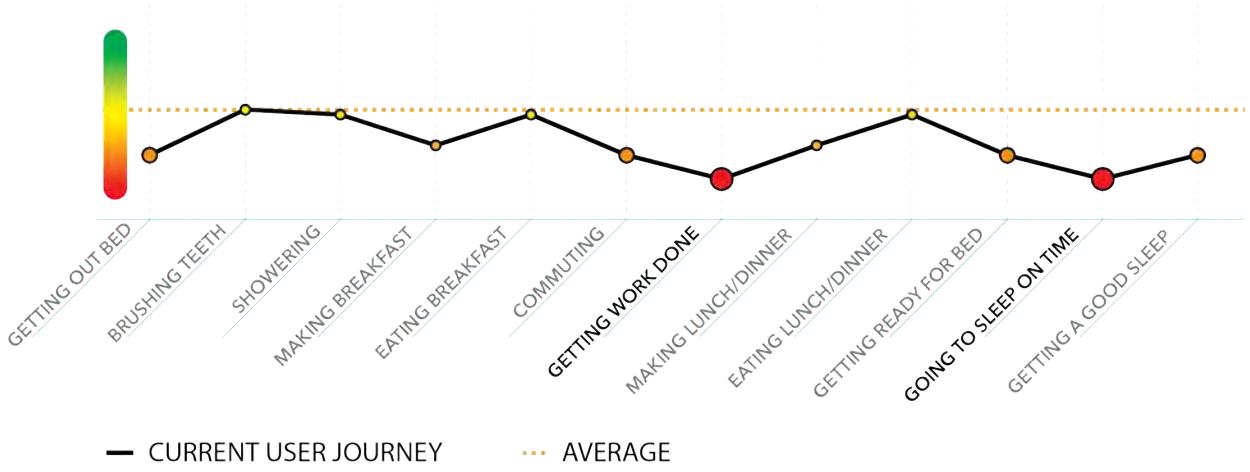


Figure 22 – Activity Mapping. Made using Adobe Illustrator

HARDEST PARTS OF THE DAY

DIFFICULT

- Getting out of bed
- Making breakfast
- Getting ready for bed
- Getting a good sleep

VERY DIFFICULT

- Getting work done
- Going to sleep on time

2.1.4 ADVISOR INTERVIEW

Although a lot of information was discovered through research and surveys, there was still a lot of information missing. On October 27 2020 a meeting was set up with an advisor studying in the field of psychotherapy. The following is a recap of the conversation using the *Otter App* with Advisor Christine Kim.

The full conversation transcription can be found on page 143 under Appendix B. The full transcription goes into further detail on the subject.

SUMMARY OF CONVERSATION

Benjamin: With the research discovered, the core needs of individuals suffering from depression were sorted into 3 main categories:

1. Emotional wellbeing:
    - Journaling
    - Group therapy with people going through similar issues
    - Talking to friends and family that are empathetic
2. Increasing Serotonin Levels:
    - Eating habits – good breakfast foods to eat that are high in tryptophan. Something that is easy to eat.
    - Exercise
    - Exposure to bright light
3. Stabilizing Dopamine imbalances:
    - Stopping addictions and reducing impulsive habits.

Is there any key information that is missing, or anything to add on?

Christine's Response:

Christine mentioned that anxiety is very different from depression, and that what was being described sounded more focused on depression.

Christine spoke on a technique used, called *focusing:*

"It is a mindfulness technique where we get the client to sort out everything they are dealing with in their life and to write it on pieces of paper. The clients then put it into boxes. The boxes are then put on a shelf. All the issues that the clients are dealing with on a daily basis which can be very overwhelming, are put on a shelf. Then we will ask the client to take one box from the shelf, that they want to deal with right there."

Christine also spoke on Dopamine and Serotonin:

"Dopamine and Serotonin is hard, because what people find pleasure in is all different right? So like, *PERSON ONE* likes food. When she sees food dopamine rushes to her head. I love food but I don't love it as much as *PERSON ONE*, so in that sense its very subjective."

When asked about addictions and dopamine, Christine further went into detail about the subject and dopamine levels. (View full transcription)

Benjamin: So exercise increases serotonin levels and is great for treating depression, but how do you get an individual with depression to be motivated to exercise if they aren't even motivated to get out of bed?

Christine's Response:

Christine response was to start off small, and to set little goals:

“That’s a great question. I think where I would start is getting them to set little goals throughout the day. So as someone who struggles with depression myself, like getting out of bed is so hard. Just even brushing your teeth is so hard. But, I think what I would do with my clients is to set little goals throughout the day. Just because you don’t achieve all the goals doesn’t mean you have failed. So depending on the client it could start really small. It can be as simple as taking off your blanket. Just take it off. Because you are using the blanket because its safe and comfortable. It’s almost like a hug. So take that off, and most clients feel very exposed. Now, just sit up. That could be the next step. And the third goal could be to put your feet on the floor. Fourth goal could be standing up, and fifth goal could be stretching. And that’s all you can do for today, and that’s okay…”

Benjamin: Out of the products below which of these products have you found to be the most effective?

- Meditation Apps
- Self Help Books
- Antidepressants
- Aroma Diffusers
- Stress Balls
- Weighted Blankets
- Journaling
- Light therapy

Christine’s Response:

Christine describes how people with depression have different needs.

“For depression? I don’t know if I can give you most effective, because not everybody who has depression needs antidepressants, and not everybody who has depression needs therapy. And not everybody needs both. We as therapist say that the best combination is therapy and medication, because your serotonin levels in your brain diminish very quickly. And so your brain doesn’t

have the capacity to make it on its own, and that's why you need antidepressants at least to restabilize/jump start it. So most people there levels can be low, but with depression you are extremely low on serotonin, how could you even want to go to therapy. The meds help you "serotonin wise", go back to normal, and then you can deal with it. So our philosophy is that having therapy and meds is the best combination, but it doesn't mean it's the best for the individual. Because some people they just need antidepressants, and some people just need therapy. I would say therapy is the best though, just having a therapist to talk too."

Christine goes into depth about the various ways depression could look like:
"Depression comes in so many different ways. One example is someone just lost there mother to cancer. Now you're grieving, and you've fallen into depression because you start thinking about death a lot, you start thinking about things like "what is the point of me moving forward". And so exercise, while its great to help you feel better, its not going to help you cope or process the grief that you're going through. And so you need a person to help you go through that. Someone who may even be willing to cry with you. Like a stress ball is not going to like hug you, or like be empathetic with you. So that's one example."

"Another example is you're from an Asian family and you've been told you're not good enough your whole life. And now you're in your mid-twenties and you think that you can't achieve anything because of what you've been told your whole life. And so you need someone to realize your strengths and help magnify those, rather than you focusing only on your weaknesses. Someone like that even though they have nine good things and one bad thing, that one bad thing is what is going to be overexaggerated and what is going to rule their life. And so you need a

person to help you with your distorted thinking, like yeah sure that is a reality but you also have to accept the reality that there is nine other good things. There are many very different reasons why people are depressed."

Benjamin: Do you think journaling helps with distorted thinking?

Christine's Response:

"I think it depends on the person. For me, I love journaling, journaling really helps me process things, but not everybody is a writer. But I would say for a lot of people (and we recommend it to a lot of clients), journaling and putting it on paper is good. And sometimes it's just for you to see, and then sometimes you can take what you journaled, and you can bring it to your therapist and work it through together. But I would say that seeing it and writing it out instead of holding it in is good. Because you are going to carry "it" wherever you go, and it is not that once you write it out it's not a problem anymore, but once you write it, its out there. Its visible. Its tangible almost. For some people it's all they think about, but once you've written it, you've done it. And now I can focus on my assignment for school, or now I can meet up with my friend, and I'll give it an appointment/time and place to talk about it."

Benjamin: Could you describe what CBT is?

Christine's Response:

Christine also mentions CBT (Cognitive Behavioral Therapy):

“It is just a therapy that addresses your thoughts. You take those thoughts and with a therapist you usually address them in different ways. So an example is, in CBT there are the ten most known distortions that people have. One is *“black and white thinking”* (all or nothing, ex: “I am always not good enough”), another is *“should statements”* (ex: “I should have done this”), and there are ten of these.”

Benjamin: Are there any digital/physical products that have come out recently that you think are helpful in relieving symptoms of depression?

Christine’s Response:

Christine gave insight into some existing digital products such as “Woebot” and “Intellect”: “There is one app called “Intellect”. A friend said this one has fun puzzles, but its also a self-development app. The other app was called “Woebot, your selfcare expert”.

“For Woebot, it primarily uses CBT. Cognitive Behavioural Therapy for anxiety and depression. So with Woebot, its good because it is very accountable, so every day it will message you right around the same time: “Hey Christine, how are you doing today?” Or like “Hey check out this new fun fact” to start a conversation, and it gives you like options to press. So it will ask you how do you feel right now, and then it will give you all these different emojis. Happy, sad. And it tracks all of those things. So the more you use it the more it will integrate what you said before. And it will run you through certain CBT methods.”

2.1.5 HUMAN FACTORS – RESEARCH OF EXISTING PRODUCTS

There are a few existing products that target depression, anxiety or stress, but very few incorporate the user's full body. Some of these are apps, which have zero ergonomic design in them. Physical products such as weighted blankets, aroma diffusers, stress balls, and exercise products (such as treadmills, and weight machines) could be improved to target individuals with depression. Weight machines could be less intimidating in their appearance. Less sharp edges, warmer/softer materials, and lighter colours could be used.

2.1.6 SAFETY AND HEALTH – RESEARCH OF EXISTING PRODUCTS

The safety and health of depressed individuals are key when creating a product. Products should be non-threatening and should not have anything that reminds them about death, or something that could potentially cause any physical/mental harm. According to the *Government of Canada* website adults between the ages of 18-64 should "be active at least 2.5 hours a week. They should focus on moderate to vigorous aerobic exercises throughout the week, broken into 10-minute sessions" (Physical Activity Tips for Adults 18-64 years, 2018).

There is not much information provided in terms of guidelines a physical product must follow. Since the topic of depression is quite vague, there is no one guideline all apps must follow. Not all apps are the same, and therefore should not be assessed the same. Depending on the risk factor, the apps are judged accordingly. However, an article written by the Mental Health Commission of Canada created a general framework to assess mental health apps. According to the "mental health commission website" the apps should meet the following criteria:

- **“User-centred:** Apps that are designed with and for the intended end user are more likely to meet their needs and expectations.
- **Risk-based:** The level of risk to a person’s health must be taken into account. Ex: An interventional app like a drug-dosing calculator, for example, has more risk and needs a more detailed assessment than a fitness tracker.
- **Innovation-friendly:** Should not stifle innovation. Encourage the ongoing development and advancement of effective apps.
- **Open, transparent and fair:** Providing clarity about the nature of the assessment and its outcomes is essential to ensuring its integrity and usefulness.
- **Consistent with ethical norms:** If an app is part of a research study, it’s necessary to ensure that the guidelines for ethical research involving humans are followed.
- **Internationally informed:** With so many apps developed and distributed globally, the assessment process should be aligned with international frameworks to promote greater use.”

  (Mental Health Apps – Mental Health Commission of Canada, 2018)

According to a peer reviewed article by BMC Medicine on Suicide prevention and depression apps’ suicide risk assessment, “six evidence based clinical guideline recommendations” were also proposed. They were:

- “Mood and suicidal thought tracking
- Safety plan development
- Recommendation of activities to deter suicidal thoughts
- Information and education
- Access to support networks

- Access to emergency counseling”

(Martinengo et al., 2019)

2.2 PRODUCT RESEARCH

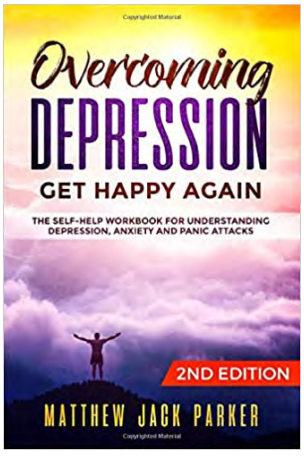
The following research is on current products on the market for individuals dealing with depression, anxiety or stress. These products will be compared, and benefits and features will be listed to show where there is room for innovation and improvement. There was a very limited number of physical products in the market specifically targeting depression. Due to this, digital products including apps, and exercise products were also looked at.

1.2.1 TABLE

The full table with researched data can be found on page 151 under Appendix C. Below is a shortened version.

Product Name	Product Image	Product Reference
Woebot: your self-care expert		*Figure 24 – Woebot. Retrieved from* https://woebothealth.com/

Lovot		*Figure 25 – Lovot. Retrieved from https://lovot.life/pricing/*
BUDDY: The Emotional Robot		*Figure 26 – Buddy. Retrieved from https://www.eastersealstech.com/2016/08/09/buddy-companion-robot/*
Tonal: The worlds most intelligent home gym		*Figure 27 – Tonal. Retrieved from https://www.menshealth.com/fitness/a23339994/tonal-workout-review/*

Therapeutic Weighted Blanket		*Figure 28 – Weighted Blanket. Retrieved from https://www.amazon.ca/Gravity-Original-Weighted-Blanket-Science/dp/B07BN75Z3R*
Light Therapy Lamp		*Figure 29 – Light Therapy Lamp. Retrieved from https://www.cnn.com/2020/09/30/cnn-underscored/best-light-therapy-lamps/index.html*
Oil Aroma Diffuser		*Figure 30 – Aroma Diffuser. Retrieved from https://www.marthastewart.com/1532640/best-selling-essential-oil-diffusers-according-thousands-five-star-amazon?utm_source=pinterest.com&utm_medium=social&utm_campaign=marthastewartliving_marthastewart_13893569&utm_content=standard&utm_term=homedecor_201810*
Self Help Book "Overcoming Depression" by Matthew Jack Parker		*Figure 31 – Self Help Book. Retrieved from https://www.amazon.ca/Overcoming-Depression-Self-Help-Workbook-Understanding/dp/1077042418*

Stress Ball		*Figure 32 – Stress Ball. Retrieved from https://relaxusonline.com/products/neoflex-stress-balls*

Several apps were looked at which help users deal with emotional support. Apps such as *Better Help* and *Woebot* are some examples. Physical robots such as Lovot were also looked at as there are several that focus on helping users deal with loneliness and accountability/getting work done. Many of the products that were looked at did not specifically target depression but could be used for depression. For example, the Phillips SmartSleep Light therapy lamp glows and changes colours according to the time of day, simulating the sunrise and sunset. This can help with seasonal depression and insomnia. Tonal is a digital home gym. Although Tonal is also not specifically made for depression, exercise can help with increasing serotonin levels. Digital weights were used in Tonal. Tonal used magnets and electricity to create resistance allowing for a lightweight device, that carries heavy weights for working out.

2.2.1 BENCHMARKING – BENEFITS AND FEATURES

By looking into the description and specifications of each of the products, the benefits and features were highlighted. Below is a compilation of what stood out and the key benefits and features of all the products.

Key Benefits	Key Features
- Emotional Support - Copes and process grief/problems	- Detects/Understands users emotional state - Identifies distortions in thinking - Offers insight and helps user learn - Remembers patterns
- Self-reliant	- Sensors: (Avoids obstacles, facial recognition) - Watches over home
- Boost Serotonin levels	- Large range of weights (Digital weight system uses magnets and electricity) - Versatile Weights (exercise for anyone, no matter your size) - Perfect carrying weight (product is not too heavy)
- Wake up refreshed - Light helps with mood and sleep	- Light therapy (glows when needed – simulates sunset and sunrise)
- Alleviates Insomnia - Reduces stress and anxiety levels	- 20lbs weighted product for hugging

The listing of the main benefits and features of the product pool gave insight into some new areas. Detecting and understanding the users emotional state, offering insight to help the user learn, remembering patterns, using digital weights, and light therapy to simulate the sunrise and sunset were some new information discovered. Compiling the data into a chart helped to create a clear understanding of what is already out there in the market.

2.2.2 BENCHMARKING – FUNCTIONALITY

After weighing the benefits and features of each product, the products were then put on a graph to see where they ranked in terms of functionality.

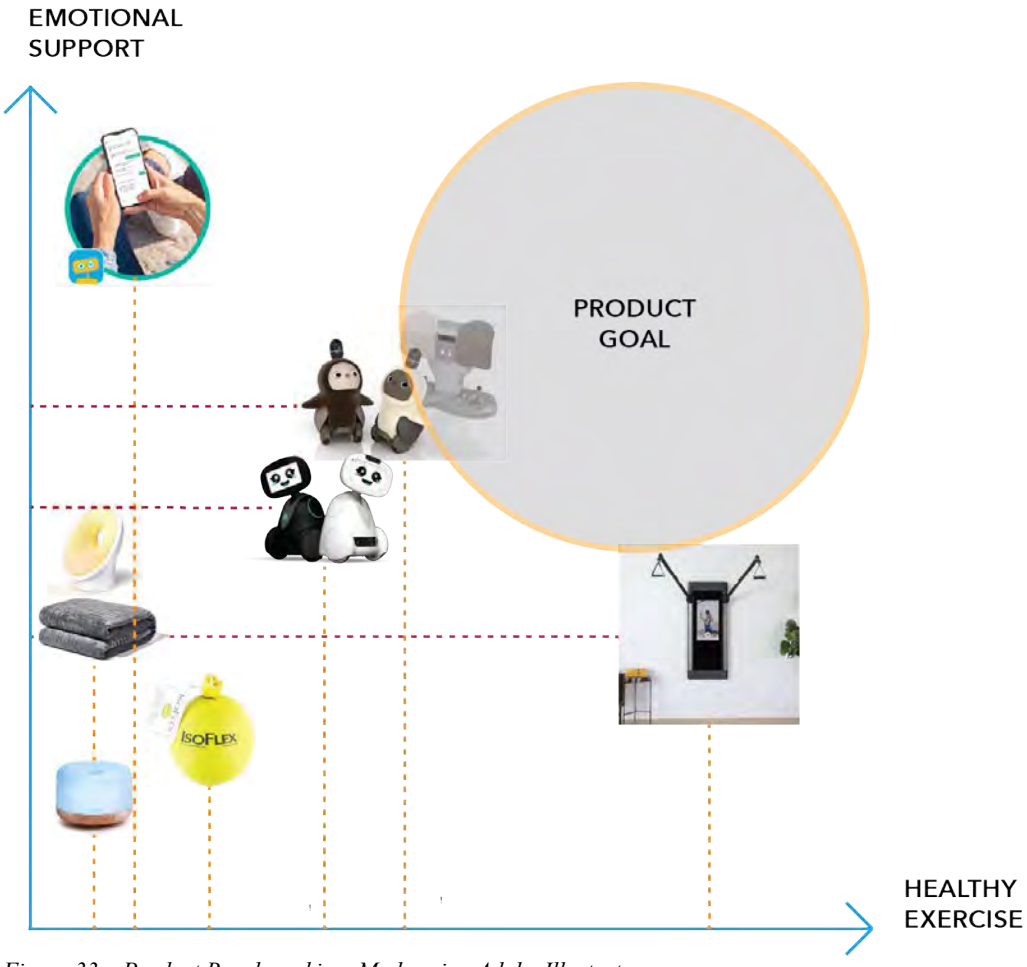


Figure 33 – Product Benchmarking. Made using Adobe Illustrator

Sorting the information into a graph showcases which products lean more towards emotional wellbeing, and which products help with exercise. Tonal does an amazing job for exercise, and Woebot does a great job for keeping a good mental wellbeing. The physical robotic products seemed the most versatile, doing a mediocre job of targeting both areas of emotional support and exercise. In the products listed there are none that focus on both problems thoroughly.

2.2.4 BENCHMARKING - MATERIALS AND MANUFACTURING

Due to the final physical product being a smart chair, materials of current office chairs/workout benches were looked at.

Current Materials:

According to ("How Office Chairs Are Made: Surprising Facts" 2021) the standard current materials used in office chairs are: steel, foam, and either leather, fabric, or mesh.

1. **Steel:** Steel is used for the frame of the chair rather than other metals. This allows for stronger support. It is used to support the base and the backrest of the chair.
2. **Foam:** Foam is used for the cushioning in the upholstery of the seat and the backrest.
3. **Leather, Mesh or fabric:** For the upholstery of the seat and the backrest, an outer material (either leather, mesh or fabric) is used to cover the foam.

In workout benches the current materials used are aluminum, plywood, foam, and vinyl. According to "How to build a GYM Bench" by DIY Creators on YouTube, a workout bench can be made entirely out of plywood instead of using metal. A 1" – 2" thick foam can be used around the plywood to create the upholstery (just like a regular chair). Vinyl, leather, or any sort of durable material that can be easily wiped clean should be used around the foam.

1. **Carbon Steel or Aluminum:** These “metals are preferred because they are both light and durable.” According to Materials & Supply Chain Logistics (Encyclopedia.com) and are used for the frame of the workout bench.
2. **Plywood Base and Back:** Plywood is used in conjunction with the frame to create support for the back and seat when working out.
3. **Foam:** Foam is used around the plywood, to act as a cushion for the seat and the backrest.
4. **Vinyl Leather:** Vinyl leather is used for the outer material as it is easy to clean. Workout benches often need to be wiped down/sanitized after a workout.
5. **Bar:** Barbells and dumbbells are made out of iron, Kevlar or steel. These metals are durable and will not distort or bend when weights are added.

New Materials:

New sustainable materials were used to replace less sustainable materials in the current office chairs. A survey was sent out on what material would not only look the best but would be the most practical. The materials that were most voted were vegan leather for the seat and back, and matte black metal for the legs and spine of the chair. With this in mind, sustainable alternatives were looked at. This includes the manufacturing process of how the metals and fabrics are made, as well as the physical material.

1. **Upholstery - Outer Material: Pi*ñ*atex by ananas anam**

Pi*ñ*atex is a vegan leather made from pineapple leaves, a by-product of the fruit industry. Pi*ñ*atex leather was selected over traditional leather because of the sustainable cradle to cradle approach the company uses to create the material. In the company’s website it advertises that the material contains no animal products or toxic chemicals. Not only is the material completely

sustainable and biodegradable, but the process the company uses to manufacture the product is actually beneficial to the environment. Pineapple leaves were traditionally discarded or burned, which further adds to the pollution of our world. The information was obtained from Piñatex's website on "responsibility" (https://www.ananas-anam.com/responsibility/)

2. **Upholstery – Interior Material: High density polyurethane Foam**

High density polyurethane foam is used in the interior of the upholstery for comfort. *"High density means less air, higher quality and longer life."* - Natural Upholstery.com

According to (Upholstery Foam Product Guide – by the Online Fabric Store) *"Density correlates to the foams durability. High and medium density foam feel the same when you sit on them, but high density foam has greater longevity."*

This greater longevity makes it a more sustainable material, rarely needing to be replaced.

3. **Supporting structure: Steel**

Steel is used for the support of the chair to allow for extra durability and stability. The chair will be quite heavy and will have to be durable enough to support the weights used.

4. **Seat and Backing: Plywood**

1" thick plywood for seat and backing. According to (clarifygreen.com) the sustainability of plywood is largely dependent on where the wood was sourced and what type of adhesive was used. Plywood made from locally sourced wood and FSC certified manufacturers are more sustainable. The plywood should also be using "adhesives with a low VOC that do not contain formaldehyde."

2.2.5 BENCHMARKING – SUSTAINABILITY

Benchmark Sustainable Initiatives

Companies like Herman Miller that produce office chairs have set out some sustainability efforts. Herman Miller builds chairs to last, which in itself keeps the chairs from being thrown out often. This reduces waste.

Herman Miller fabric scraps are donated to other places (such as the Gift of Hope Program) where the seamstresses use the scraps. This not only keeps the scraps from the landfill but allows these programs to use these materials for free. (https://www.hermanmiller.com/stories/why-magazine/sustainability-snapshot/)

Companies like Herman Miller give away fabric scraps to second parties. This is great for wastage, however the fabric themselves are not the most sustainable. Although they are durable and last long, the materials used can be improved in terms of sustainability.

2.3 SUMMARY

This chapter gave great insight into the user's needs. Research into the target demographic data gave further insight into who the user was. According to the data discovered, the most common target demographic user would be a young adult aged 15-24, female, lower income, and a Caucasian ethnicity.

An initial preliminary survey was taken, which helped categorize the needs of the users into to 3 areas. Emotional wellbeing (journaling, talking to a friend or loved one, etc.), increasing

serotonin levels (good eating habits, exercise etc.), and decreasing dopamine imbalances (accountability, stopping bad habits/addictions).

The next area of research was discovered through an interview with advisor Christine Kim. In the interview Christine spoke about techniques such as focusing (where the patient puts all his/her problems in boxes and focuses on one problem at a time).

It was also discovered why antidepressants are so important. Since individuals with depression vary in needs, most therapists give clients a combination of antidepressants and therapy. The antidepressants boost serotonin and dopamine levels so that the individual has the motivation to get out of bed and see a therapist. When asked about what to do when an individual doesn't even want to get out of bed to see a therapist or exercise, Christine's response was to start off small, and to set little goals.

The next area of research was the safety and health guidelines of products in the field of depression. An article written by the Mental Health Commission of Canada created a general framework to assess mental health apps. According to the "mental health commission website" the apps should meet the following criteria: User-centred (focus on the target audience), risk-based (the level of risk to a person should be taken into account), innovation-friendly, open, transparent and fair, consistent with ethical norms, and internationally informed.

The final area of research was the product research. This area gave insight into the existing products in the market, and what is currently lacking. It was discovered that there are great products that focus either on exercise/working out (tonal, etc.) or the emotional wellbeing aspect (Woebot, other apps). However, in the products researched, none focus on both areas of emotional wellbeing and exercise.

In all, the research helped pave the way to discover the key needs of the user.

CHAPTER 3:

Analysis

Figure 34 – Retrieved from https://www.iotworldtoday.com/2020/01/03/iot-developers-may-need-time-series-data-analysis-skills/

3.1 ANALYSIS - NEEDS

> *"We as therapist say that the best combination is **therapy** and **medication**, because your serotonin levels in your brain diminish very quickly."*
>
> Advisor, Christine Kim

There are two main needs for individuals facing depression today. The first need is to create a better mental wellbeing by helping the user cope and process their grief/problems. This can be done mainly through therapy, but alternatives include having someone to talk too, journaling, and having better listening/empathy. The second need is increasing serotonin and dopamine levels. Apart from antidepressants (which are still needed in some cases), boosting

serotonin levels can be done through exercise, light therapy, and getting better sleep. Depending on the individual, their needs vary greatly. Some users have the social aspect, and are able to process their grief/problems, but lack in serotonin and dopamine production. Some have the opposite problem and don't have anyone to talk too/help them cope/process their grief. Failure to have any of these needs met may result in depression.

3.1.1 NEEDS/BENEFITS NOT MET BY CURRENT PRODUCTS

When conducting research on current products, it was discovered that there are not many physical products that specifically target depression. This is because the topic is such a broad one with many social stigmas, and each scenario requires different needs. However, when talking to advisor Christine Kim, it was discovered that psychotherapists recommend both antidepressants and therapy to clients. This allows users to have both the social empathetic aspect (understanding problems, processing grief, etc.) and increasing/stabilizing the serotonin and dopamine levels with antidepressants.

When looking into current products in the market, not many targeted both these areas. On one end there were products that were great at increasing serotonin levels through exercise and light therapy. On the other end there were products that helped with understanding problems and processing grief, such as apps like Woebot (that uses Cognitive Behavioural Therapy). However there seemed to be an opportunity for a product that targeted both areas.

3.1.2 LATENT NEEDS

Latent needs are the hidden needs that the user might be unaware of. In recent years awareness on mental health such as depression has grown exponentially. This has allowed the needs of people dealing with depression to be less concealed as they once were, providing less stigma and less shame around the topic. With that said there are still many latent needs that users may face. According to Mazlow's Hierarchy of Needs the fundamental needs of humans are as follows: Self-actualization, esteem, love/belonging, safety, and physiological needs. Failure to have any of these needs met can result in depression.

Figure 35 – Retrieved from https://www.cruxfit.com/personal-training-and-wellness-advice-from-crux-fitness-fitness-and-maslows-hierarchy-of-needs/

Mazlows hierarchy of fundamental human needs were then compared with the benefits from existing products.

Benefit	Fundamental Human needs	Relationship with Benefit
Emotional Support	love/belonging	**Strong**
Cope and process Grief/Problems effectively	love/belonging, esteem, self/actualization, safety, physiological	**Strong**
Boost Serotonin levels naturally	Physiological, love/belonging, esteem	**Strong**
Working efficiently/productively	Esteem, Self-actualization	**Strong**
Aesthetics	Esteem	**Weak/Mediocre**

Cope and process grief/problems effectively:

A core need is knowing how to cope adaptively with depression. This includes sharing and opening up to an empathetic listener (this could be a friend, family member, or a therapist), and understanding negative thought patterns.

Journaling can also help with processing grief/problems and can help against excessive rumination.

"...seeing it and writing it out instead of holding it in is good. Because you are going to carry "it" wherever you go, and it is not that once you write it out it's not a problem anymore, but once you write it, it's out there. Its visible. Its tangible almost. For some people it's all they think about, but once you've written it, you've done it. And now I can focus on my assignment for school..." – Christine Kim

Emotional Support:

Learning to cope adaptively with depression leads to the next point. Having good emotional support is a key need for individuals with depression.

However, what happens when the user does not have anyone to talk too, or any money to see a therapist? Solo activities such as journaling can help, as well as free apps such as Woebot. These apps help the user to reflect on negative thought patterns such as excessive rumination/overthinking.

It was discovered that a *"lack of social support"* and *"relationship with parents"* were more likely to cause depression for women.

Boost Serotonin Levels:

Boosting serotonin levels is a latent need. This requires the user to exercise regularly, eat better, have human touch/social interaction and get better sleep.

Getting work done efficiently/productively:

Getting work done efficiently would help with the user's esteem. In men it was discovered that *"Financial and career problems"* were more likely to cause depression. Getting work done efficiently can include having small goals, and checklists throughout the day.

3.1.3 CATEGORIZATION OF NEEDS

Wishes/Wants

- Getting work done efficiently

Immediate Needs

- Emotional Support
- Cope and process grief/problems effectively

Latent Needs

- Boost Serotonin Levels naturally
    - Sunlight
    - Exercise
    - Hugging

3.1.4 NEEDS ANALYSIS DIAGRAM

Figure 36 – Created using Adobe Illustrator.

3.2 ANALYSIS - USABILITY

The usability analysis will help make a connection with the research and the physical product the person will be using. Through the research done in the previous chapter it was discovered that for many people, the hardest part of the day was getting work done efficiently. Depression has been known to cause individuals to feel foggy, and out of it, which in turn makes them have trouble focusing and getting tasks done. Many regular activities were difficult and took much longer, due to fatigue and having no energy. Through peer reviewed articles it was discovered that higher levels of emotional support led to reduced depressive symptoms such as overthinking and emotional numbing. In the preliminary survey many wrote they needed better listening/empathy and going to the gym/exercising more frequently as the best coping methods.

3.2.1 ACTIVITY – WORKFLOW MAPPING

Through product benchmarking it was discovered that there is a lack of physical products in the market pertaining to depression. Creating a product that helps with both emotional support and boosting serotonin levels through exercise was an unexplored area. Adding onto the product benchmarking, when observing users, the toughest part was getting work done and going to sleep on time.

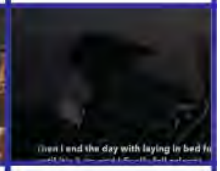
	STEP 1	STEP 2	STEP 3	STEP 4	STEP 5
	GETING OUT OF BED	EATING BREAKFAST	COMMUTING	GETTING WORK DONE	GOING TO SLEEP ON TIME
USER GOALS	To get out of bed and not waste time.	To have an appetite and eat a healthy portion.	To have energy and comfort leaving the house	To have motivation, and concentration to finish work fast.	Going to sleep on time, to get a good amount of sleep.
USER ACTIONS	User takes a long time to get out of bed, spending hours on phone.	User eats food, while watching videos of people eating (so it is less lonely)	User sits in car, calms herself down, and drives.	User works on laptop from home, at her own pace.	User lays in bed and spends a long time on phone. By the time she falls asleep it is 3 A.M
STORYBOARD					
PROBLEMS	Hard to get out of bed, usually lies in bed for hours scrolling through social media	Can be lonely eating alone, user can also have no appetite.	Fatigue, and no energy to leave house. Scared to leave safe space.	Focus/concentration lowered, intrusive thoughts, lack of motivation, no energy etc.	Anxious thoughts, intrusive thoughts, spending time on phone, etc.
IDEAS/ TAKE-AWAYS	Accountability and encouragement to get out of bed. Force to get out of bed.				Have a strict bed time routine. Go to bed at a certain time. Have no blue light (phone) before bed.

Figure 37 – User Workflow Map. Made using Adobe Illustrator

3.2.2 ACTIVITY – EXPERIENCE MAPPING

The user experience should focus on making the following tasks easier:

- Getting out of bed
- Getting Work done
- Going to sleep on time

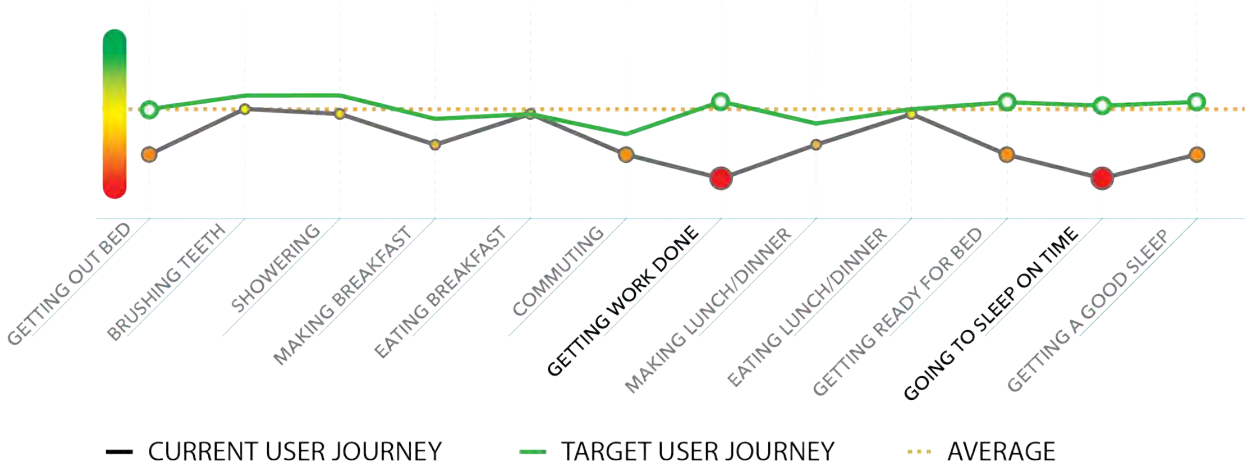


Figure 38 – Activity Experience Map. Made using Adobe Illustrator

3.3 HUMAN FACTORS

Introduction

Finding out the ergonomic dimensions for the largest and the smallest young adult users is crucial in designing a product. Through user research it was discovered that one of the hardest parts of the day for young adults struggling with depression was getting work done. Exercising was also shown to boost serotonin levels and was one of the most common coping methods along with talking to a friend or loved one. Due to these findings' dimensions will include various exercising positions and sitting positions. Through the ergonomic testing's, many issues were discovered. The product will use different movements using arms, hands and legs for exercising. This creates several problems around where parts should be placed, to avoid blocking the user from carrying out certain exercises. Weights are also heavy, which creates more issues regarding placement and balance.

Through the ergonomic buck, the key findings that are needed are:

- The back support of chair has to be wide enough to be both comfortable while studying and narrow enough for the elbows to extend backwards in cable rows.
- Support weight of chair in various positions (laying down, and sitting upright)
- Creating comfortability in different user positions
- Figuring out the measurements and workability of the chair.

Literature Review

Before jumping into the ergonomic buck, some key information was sought after. The measurements of the largest male and the smallest female were first looked at. According to the charts below a 5th percentile adult female is 153cm (5ft 1in), and 95th percentile adult male is 187cm (6 ft 1 in). Using both the chart and Henry Dreyfuss' "The Measure of Man and Woman", the dimensions of a full-grown 5th percentile female and a full grown 95th percentile male will be used.

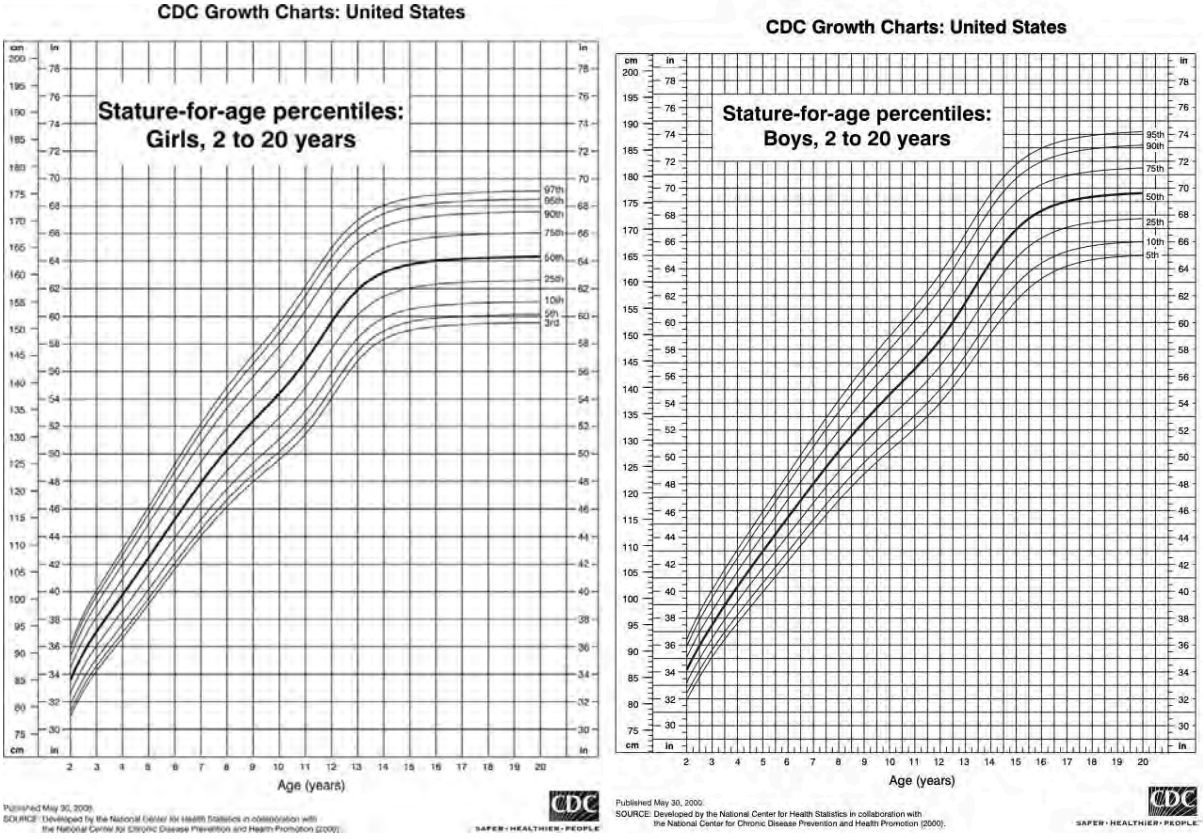


Figure 39 – Growth Chart. Retrieved from https://www.cdc.gov/growthcharts/data/set2/chart-07.pdf

The next size that needed to be researched was the length of the largest male size foot. This was to allow for room in the foot plate during leg press and cable rows. In the chart below a US male size 13 is about 11.25". To allow for room the foot plate has to be at least 12".

Men's Shoe Size Chart					
IND	UK	US	EUR	Inches	Centimeters
6	6	7	40	9.90	25.10
7	7	8	41	10.15	25.70
8	8	9	42	10.25	26.00
9	9	10	43	10.50	26.70
10	10	11	44	11.00	27.90
11	11	12	45	11.15	28.30
12	12	13	46	11.25	28.90

Figure 40 – Mens Shoe Size Chart.

The next measurement to find out was the height from the ground to the waist of a 5th percentile female to allow comfortable space for tricep and bicep curls. According to the graph below the waist height of a 5th percentile female would be 30 inches. For a 95th percentile male the waist height is 38 inches from the ground.

Buttock Height

FEMALE N = 2208			MALE N = 1774		
Centimeters		Inches	Centimeters		Inches
83.83	**Mean**	33.01	88.74	**Mean**	34.94
4.52	**Std Dev**	1.78	4.71	**Std Dev**	1.85
102.20	**Maximum**	40.24	111.40	**Maximum**	43.86
65.30	**Minimum**	25.71	71.50	**Minimum**	28.15
	Percentiles			**Percentiles**	
73.89	1st	29.09	78.43	1st	30.88
75.02	2nd	29.53	79.71	2nd	31.38
75.73	3rd	29.81	80.48	3rd	31.68
76.69	5th	30.19	81.48	5th	32.08
78.18	10th	30.78	82.98	10th	32.67
79.20	15th	31.18	83.99	15th	33.07
80.01	20th	31.50	84.79	20th	33.38
80.72	25th	31.78	85.49	25th	33.66
81.36	30th	32.03	86.13	30th	33.91
81.96	35th	32.27	86.74	35th	34.15
82.54	40th	32.50	87.32	40th	34.38
83.10	45th	32.72	87.89	45th	34.60
83.66	50th	32.94	88.47	50th	34.83
84.23	55th	33.16	89.06	55th	35.06
84.81	60th	33.39	89.66	60th	35.30
85.42	65th	33.63	90.30	65th	35.55
86.07	70th	33.88	90.99	70th	35.82
86.77	75th	34.16	91.75	75th	36.12
87.57	80th	34.48	92.61	80th	36.46
88.51	85th	34.85	93.62	85th	36.86
89.71	90th	35.32	94.93	90th	37.37
91.50	95th	36.02	96.89	95th	38.14
92.67	97th	36.48	98.15	97th	38.64
93.53	98th	36.82	99.06	98th	39.00
94.86	99th	37.35	100.46	99th	39.55

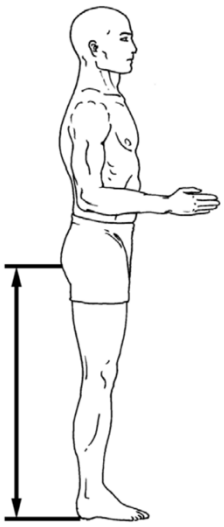


Figure 41 – Buttock Height. Retrieved from https://multisite.eos.ncsu.edu/www-ergocenter-ncsu-edu/wp-content/uploads/sites/18/2016/06/Anthropometric-Detailed-Data-Tables.pdf

Figuring out the extended leg length of a 99th percentile male was crucial, to accommodate for the leg space of the largest male during leg press and cable rows. 39.5” is the length from waist to foot for a 99th percentile male.

Methodology

Objectives:

The objective of this study is to evaluate the full body human interaction design and full-bodied ergonomic challenges for a smart chair. The study seeks to discover how the user will interact with different areas of the smart chair. This will include various positions such as the seating position, bench press position, leg press position, cable row position, bicep curl position and the laying down position.

One of the thesis criteria is to involve 3 major parts of the body. These 3 touchpoints will be observed, in a 3-dimensional mock-up. This allows for a better understanding of measurements, and interaction with the human body.

Decisions to be made:

The interactions with five major body part areas were investigated to minimize the negative experiences of:

1. The leg press position (legs)
2. Cable row position (body, feet, hands and arms)
3. Armrests (arms and hands)
4. Bench press position (arms and hands)
5. Bicep and tricep curl position (arms and hands)

6. Headrest, and hugging function (body and head)

Description of Users Targeted by Product:

The target demographics are teens to young adults aged 15-24 who suffer from depression both clinically and those who are self-diagnosed. Both male and females are the target users. This chapter gave great insight into the user's needs.

Evaluation Process:

The evaluation process consisted of building a full scale 1:1 ergonomic buck of the smart chair. This allowed for critical observation of:

1. Observing how the user pulls cables in cable row position.
2. Observing angle of legs for leg press
3. Measuring height of the armrests to the seat.
4. Observing size needed for foot plate
5. Observing length needed for 99th percentile male for the leg press.
6. Observing and measuring the human dimensions while using bench press.
7. Observing touchpoints of a hug, so that chair can mimic the feeling of being hugged.

Description of User Observation Environment Used in this Study:

Due to Covid-19 restrictions, the study took place at home. The study uses an office chair to build off of, using a 25th percentile male as an example. The ergonomic buck uses materials such as ¼" foam core and clear tape.

Location and Timeframe:

Date of Observation: January 7 2021

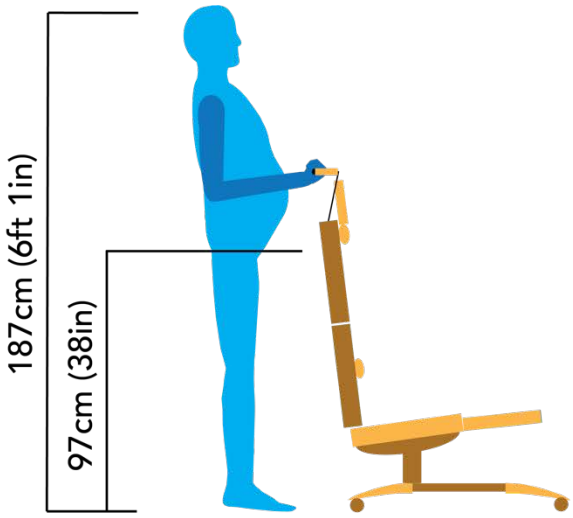
Location of Observation: Thornhill, Ontario

Results

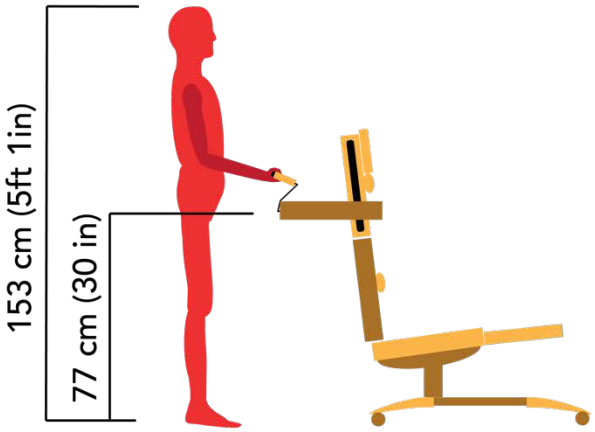
The results show the ergonomic measurements for the various positions during the ergonomic testing. Photographs of a 1:1 ergonomic buck in the sitting positions were used to find the correct measurements. Extensive research was also done on finding the measurements of both the 95th percentile male and the 5th percentile female. Due to the target market being young adults, a full-grown adult for both the female and male were used.

MEASUREMENTS

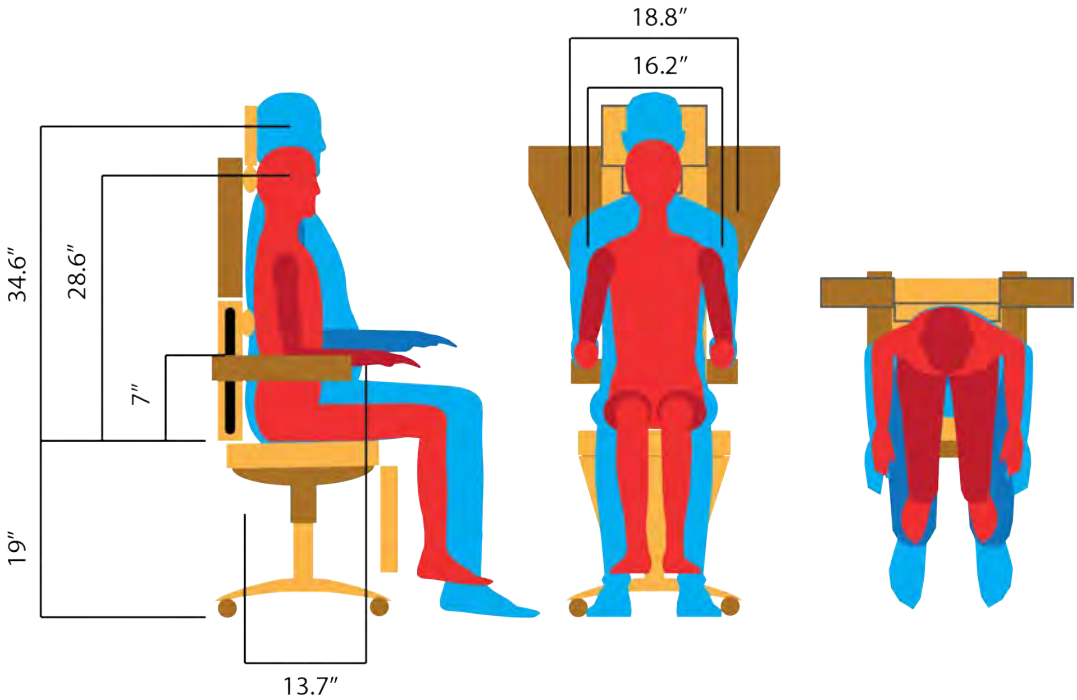
Ergonomic Drawings



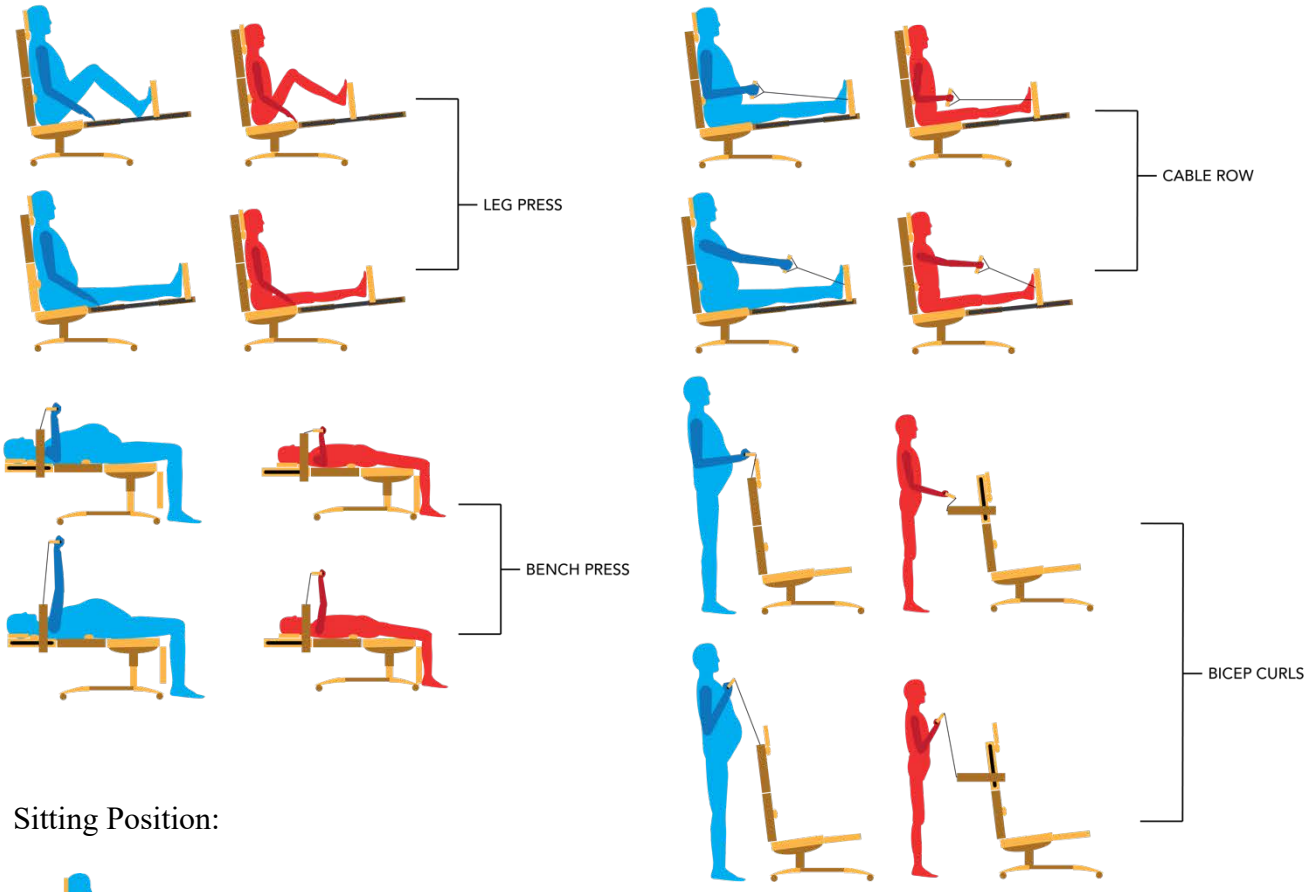
95th Percentile Male



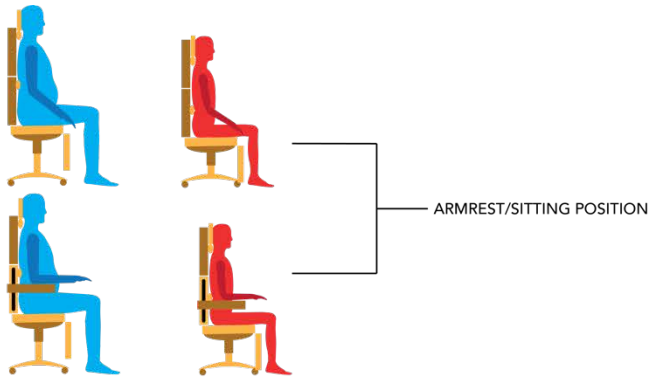
5th Percentile Female



Exercise Positions:



Sitting Position:

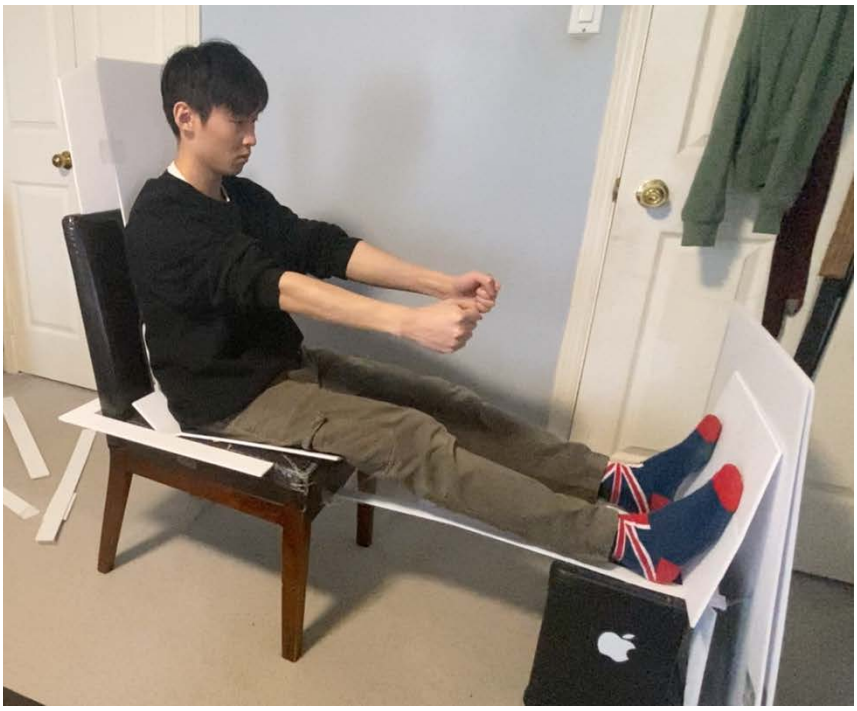


A.I. Emotional Support:

Final Mock-up:

Sitting Position:

Cable Row Position:



Bench Press Position:

Analysis

Sitting Position:

https://www.roguecanada.ca/ab-2-adjustable-bench?gclid=Cj0KCQiA3Y-ABhCnARIsAKYDH7vRRdIy-9HhIQQWlDRnmg0xulIY_qqG-gYXLCOC8AEPHsUsn2SEqDUaAhQWEALw_wcB

The measurements of the office chair and the measurements of the workout bench helped to create the measurements for the smart chair. The width of the workout bench shows how wide the chair should be in order for the cable row and bench press to work.

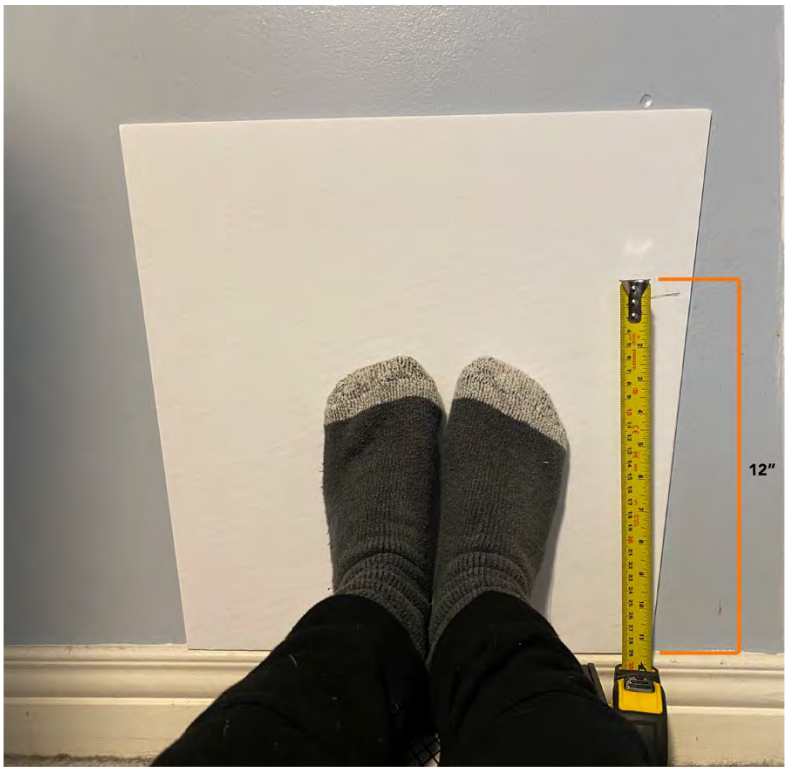
Cable Rows:

The model used in the photograph is a 5'7" - 25th percentile male

1. Needs support under feet to allow user to rest their weight on it.
2. Needs kick out legs to support overall weight of user and system.
3. Back support needs to be less wide to allow for arms to pull back.

Note: Chair Swivels. The chair need something to stop chair from swiveling when working out.

Leg Press:



According to the Men's Shoe Size Chart, a US Male foot size 13 is 11.25". To accommodate for this the largest length the foot press has to be is around 12".

1. Needs strong support for back, because when pushing with feet, more pressure will be applied to back area.

Bench Press:

For the bench press, the length should be long enough to support the back, head, and backside. However, it should not be too long so that the bend between the legs and the thighs are not caught on the seat for the 5th percentile female.

The chest height needs to be adjustable for different sized people. People who are larger need the bar height higher.

Touchpoints of a hug:

Figure 42 – Touchpoints of a hug. Retrieved from https://www.webmd.com/lung/news/20200615/how-to-cope-when-covid-steals-loving-touch-hugs

The touchpoints of a hug are the back, sides of arms, and front. To simulate this, a cushiony squeeze on all four sides is needed.

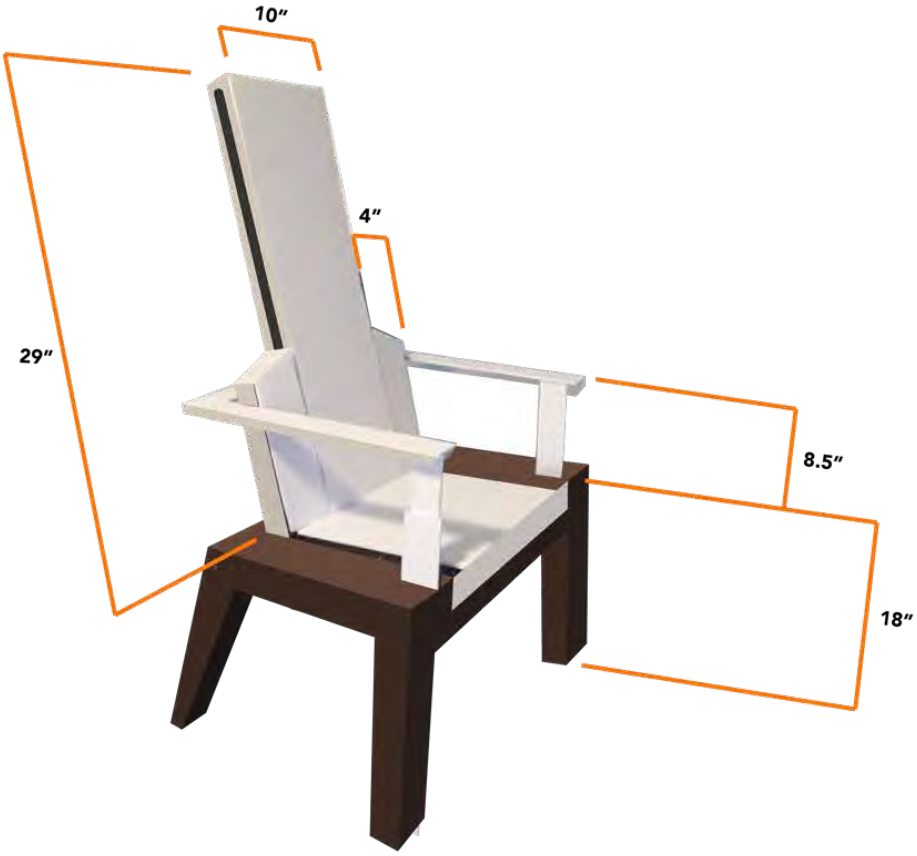
Limitations and Conclusion

The major findings were:

1. Middle backrest should be 10” in width to allow for cable row and bench press.
2. Not enough space for flip out armrest. Bench Press sliders need more space. Armrests can instead come out from bottom.
3. Needs support under feet to allow user to rest their weight on it.

4. Needs kick out legs to support overall weight of user and system.
5. Back support needs to be less wide to allow for arms to pull back.
6. In the cable row position, the back support needs to be strong as pressure will be applied when extending legs.

The ergonomic issues were resolved, and the dimensions were used in the new design below.



There were several changes made. The armrest now comes out from the bottom. This allows for more room for the sliders beside the backrest. Giving the sliders more room allows for adjustability for bicep curls. It also gives space for cable rows. The swivel bottom part was also changed into legs. This allows for stability when working out, as well as support for the leg press when expanded.

3.4 AESTHETICS AND SEMANTIC PROFILE

The Aesthetic design should evoke certain emotions. The design should be warm and comforting. According to “empower-yourself-with-color-psychology.com” a website on colour psychology, yellow helps *“create enthusiasm for life”. “…the color psychology of yellow is uplifting and illuminating, offering hope, happiness, cheerfulness and fun.”*

Happy colours also include pastel colours such as peach, light pink and lilac. These colours are bright and warm.

In terms of aesthetics, the timeless and personal designs were in. Adding “more colour” was also in, replacing neutral colours.

According to the blog “New Décor Trends” natural materials and round shapes were in.

Materials that were handmade and sustainable were also much more popular.

According to the website “Homes and Gardens” the interior design trends of 2021 include yellow and grey, vintage, and cottagecore. (https://www.homesandgardens.com/news/interior-design-trends-2021)

Insider states that “the age of minimalistic, all white interiors may be coming to an end.” And “Gray kitchen interiors can look cold and lack distinction. Instead, I foresee bolder colours gaining popularity.” (https://www.insider.com/best-and-worst-interior-design-trends-for-2021#the-mid-century-modern-furniture-trend-may-finally-be-over-4)

From the research a moodboard was created.

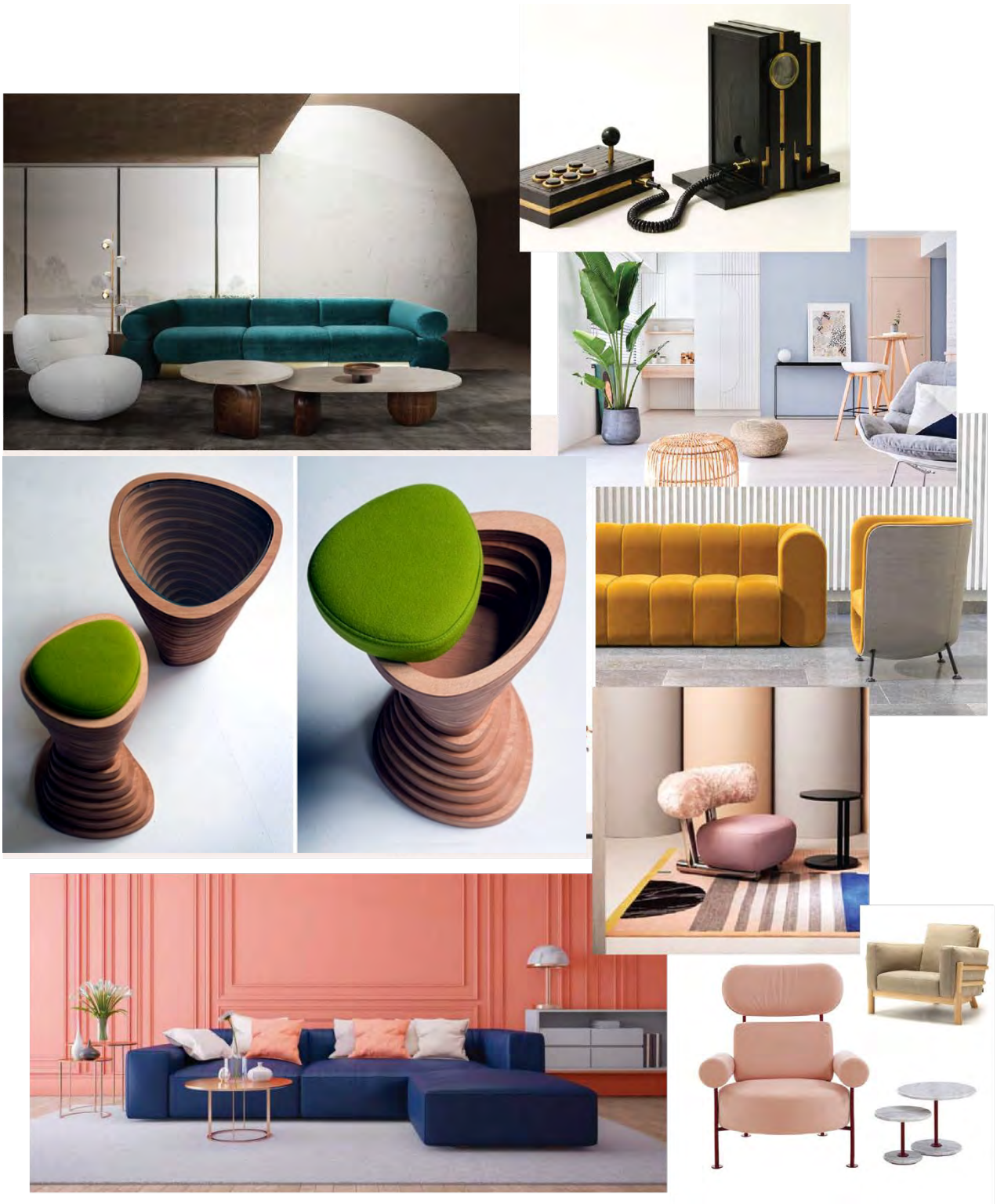


Figure 43. Styling Mood Board

3.5 SUSTAINABILITY – SAFETY, HEALTH AND ENVIRONMENT

> *"Sustainable design is the approach to creating products and services that have considered the environmental, social, and economic impacts from the initial phase through to the end of life."* – Medium.com, Quick Guide to Sustainable Design Strategies

Sustainability is an important aspect in designing a product. Sustainability and a circular economy go hand in hand. A sustainable design considers the environment and seeks to reduce the negative impacts of the product in every process. This means not only the materials are sustainable, renewable, biodegradable, or recyclable, but the whole manufacturing process has been thoughtfully considered.

Through looking at office chairs and workout benches being manufactured today, and the materials used in them, improvements were made. Looking into current office chairs would determine what needed to be changed to create a more sustainable chair.

Using new materials such as Pi*ñ*atex (a vegan leather made from pineapple leaves) helps the pineapple industry reduce their waste and create a new biodegradable vegan leather for the chair.

Pi*ñ*atex leather was selected over traditional leather because of the sustainable cradle to cradle approach the company uses to create the material. In the company's website it advertises that the material contains no animal products or toxic chemicals. Not only is the material completely sustainable and biodegradable, but the process the company uses to manufacture the product is actually beneficial to the environment. Pineapple leaves were traditionally discarded

or burned, which further adds to the pollution of our world. (Responsibility. Retrieved from https://www.ananas-anam.com/responsibility/).

High density polyurethane foam is also used in the upholstery for a longer lasting product. Durability and longevity are key in sustainability, allowing the product to have a longer life cycle. The plywood used for the seat and backing will be made from locally sourced wood and using FSC certified manufacturers. The plywood would also be using eco-friendly adhesives

The final design seeks to create a chair that is both sustainable, while maintaining its durability for the safety and health of the user.

CHAPTER 4:

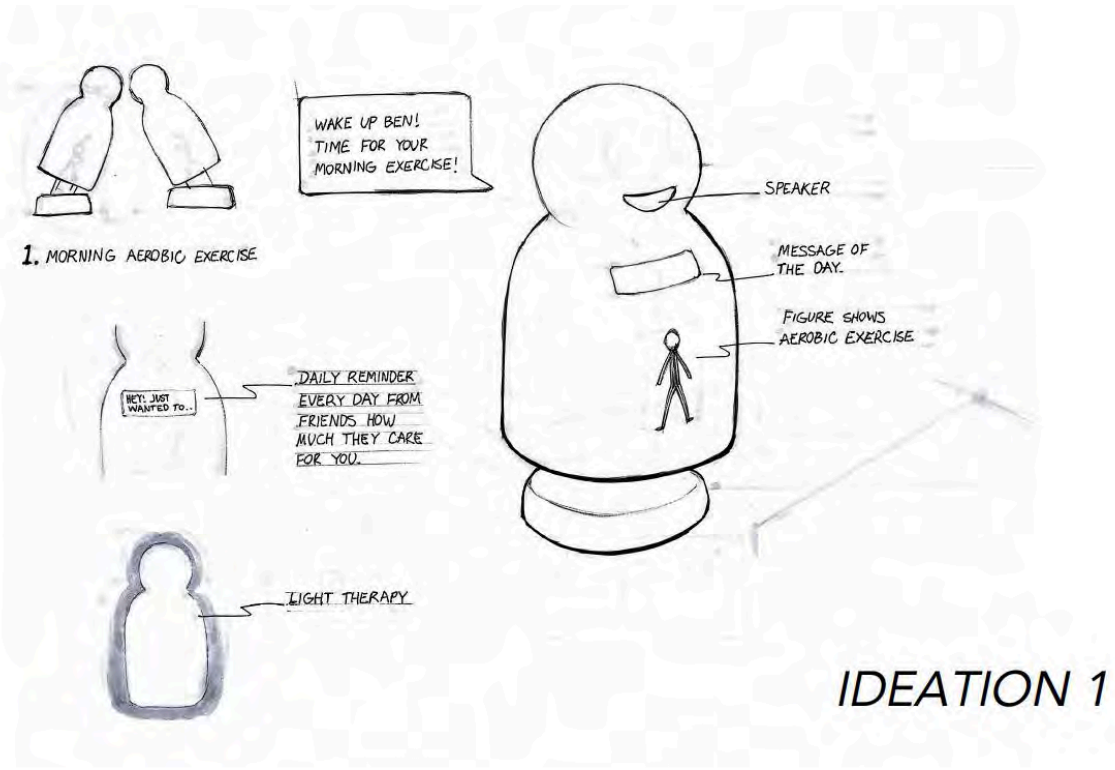
Design Development

Figure 44 – Designing. Photo taken by Benjamin Chew on March 3 2021

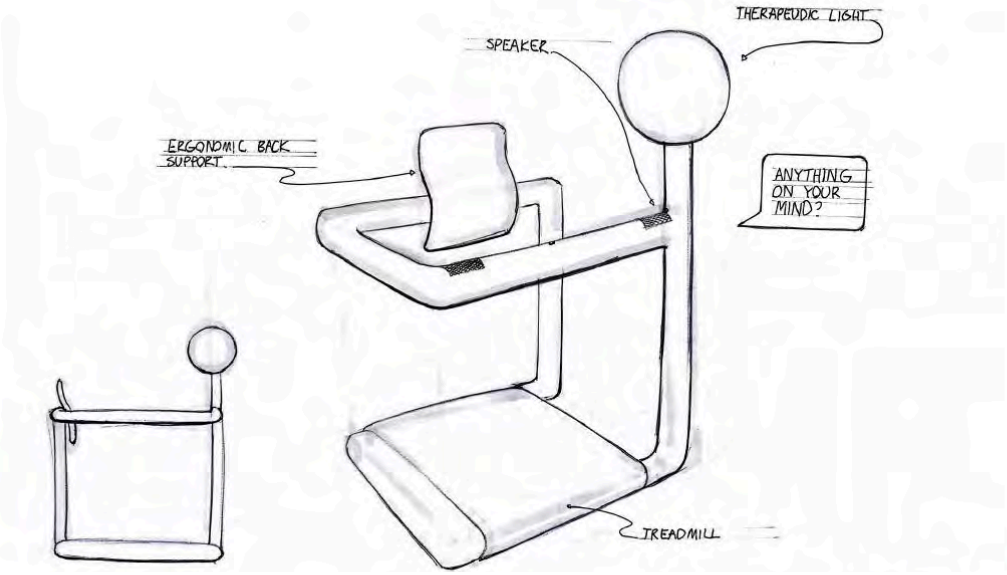
This chapter will showcase the design process and how the final design of Salus came about. The chapter will go through the ideation process, the refinement process, and finally the CAD development and physical model fabrication.

4.1 IDEA GENERATION

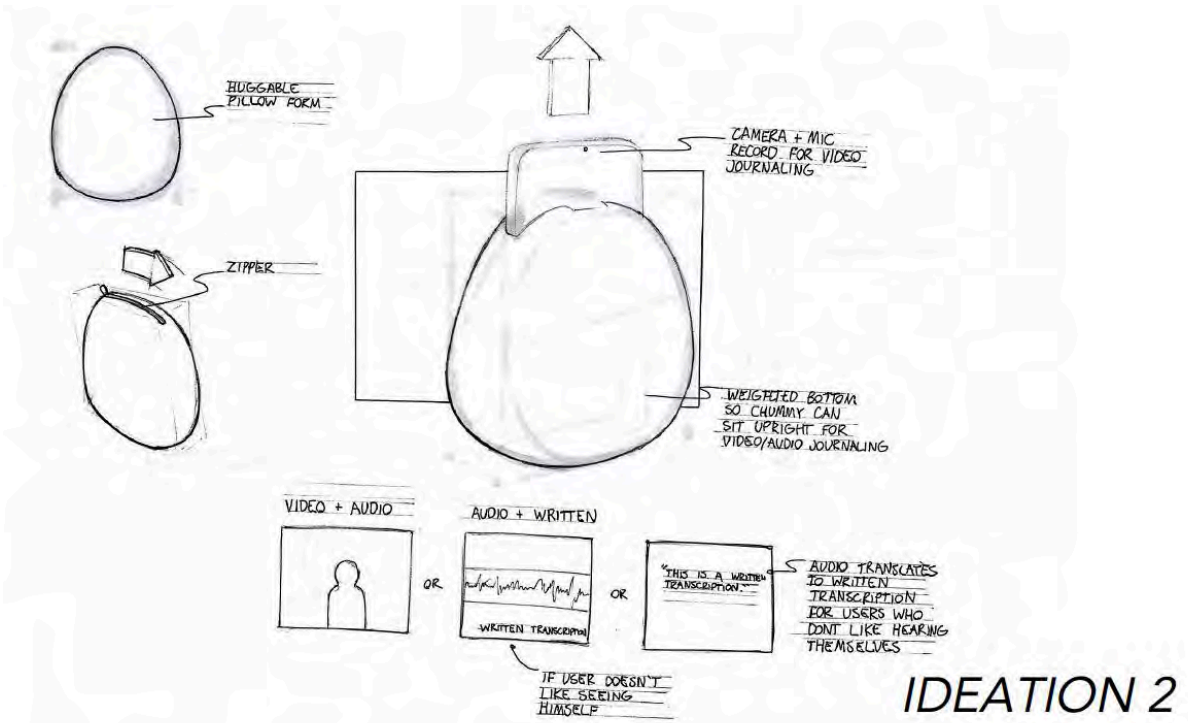
With the information discovered in the previous chapters, the needs were: Having someone to talk too, exercise, and other forms of natural serotonin boosting activities. Based on these needs, several ideations were drawn up. The sketches below showcase 3 different ideas.



Concept 1



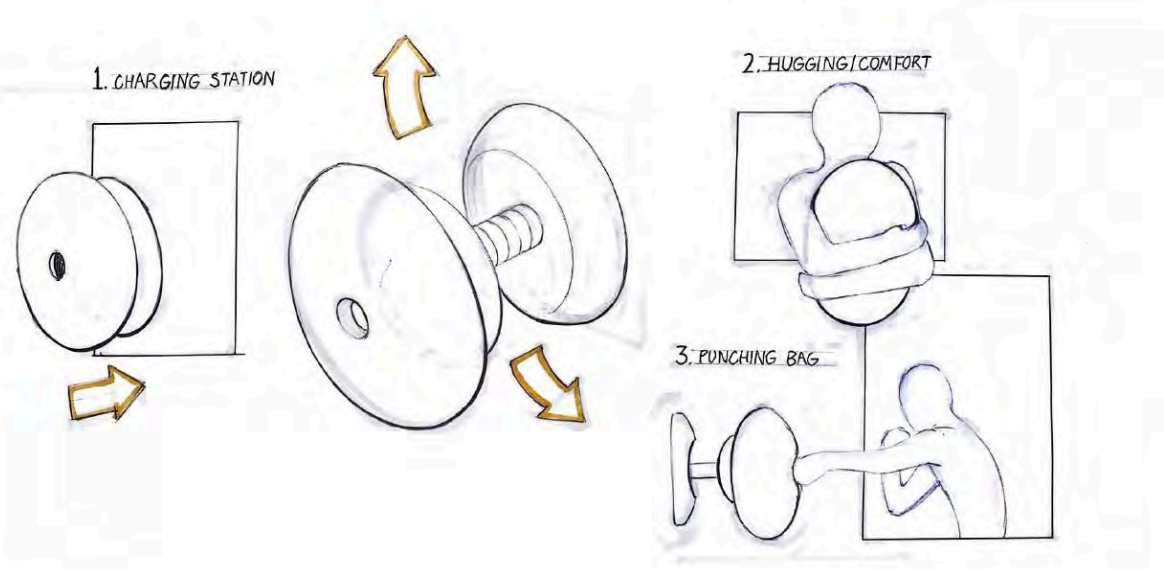
Concept 2



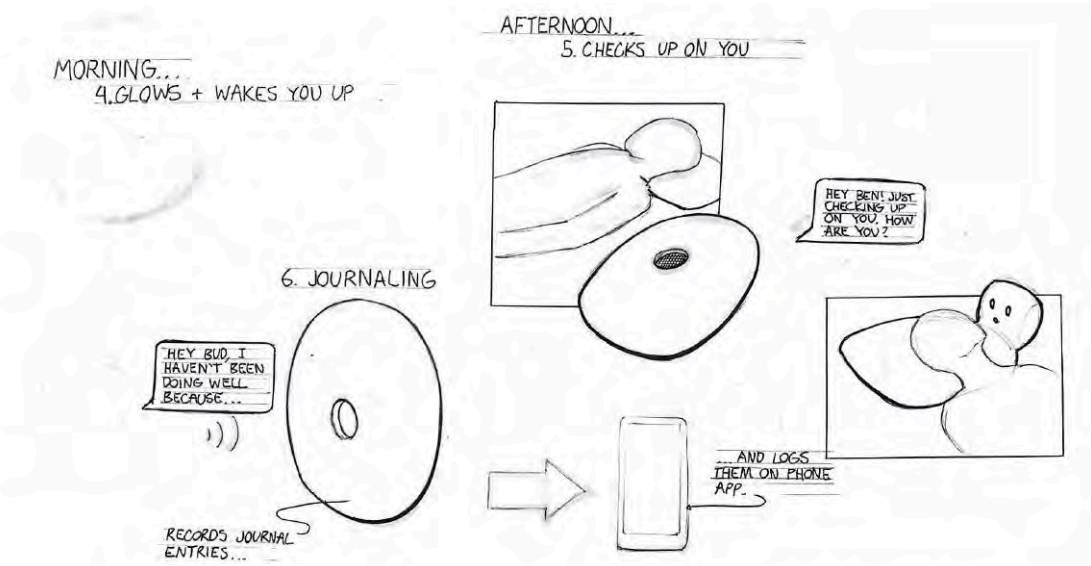
Concept 3

4.2 PRELIMINARY CONCEPT EXPLORATION

The feedback was to combine both concept 1 and concept 3, and to incorporate some exercise. Due to this, a punching bag was added for exercise. The three touchpoints were the head when laying down, the arms when punching (for exercise), and body for hugging.



Concept 3 – Hugging & Therapy Robot pt. 1

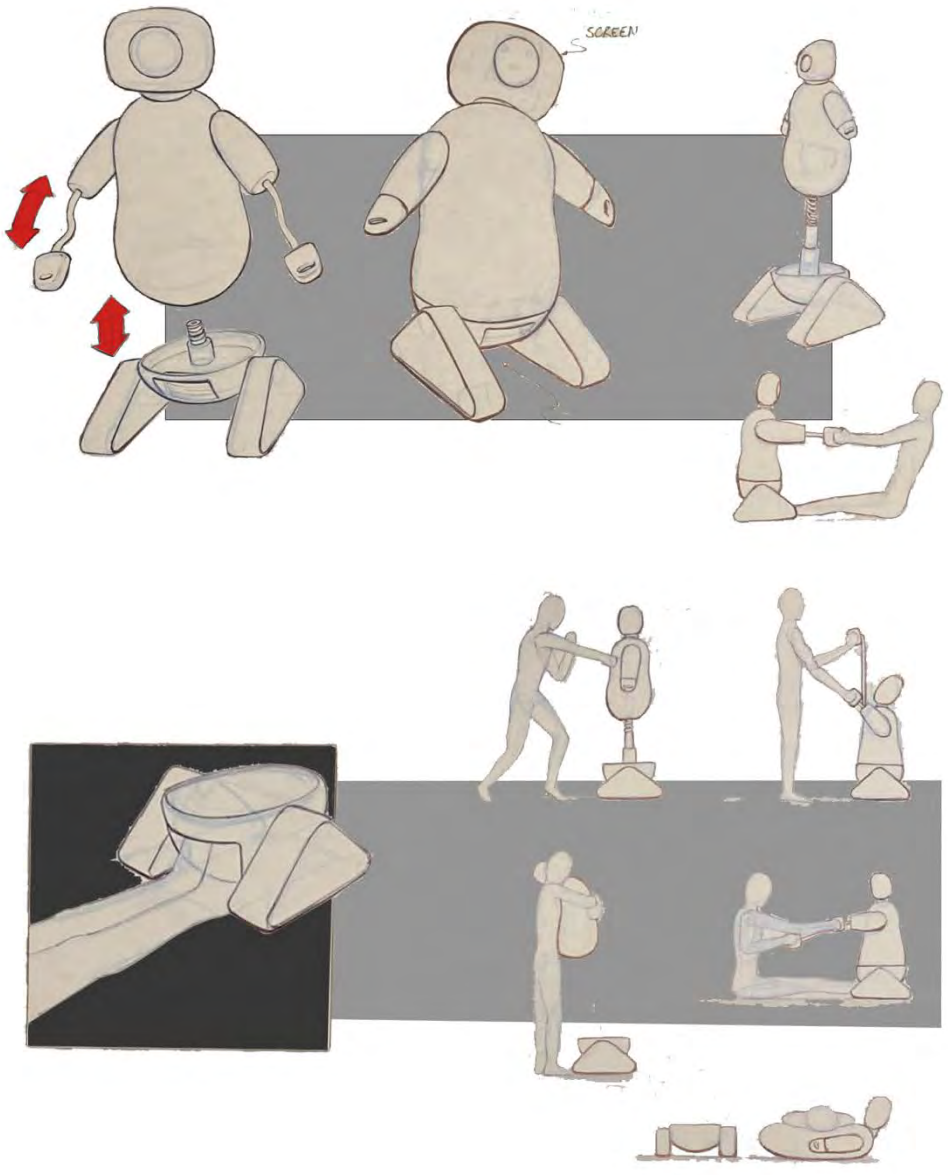


Concept 3 – Hugging & Therapy Robot pt. 2

The feedback for this concept was that it was too rudimentary and needed more intelligence. The feedback on these designs was that using the punching bag was not enough exercise, and the product needed more parts of the body to be utilized.

4.3 CONCEPT STRATEGY

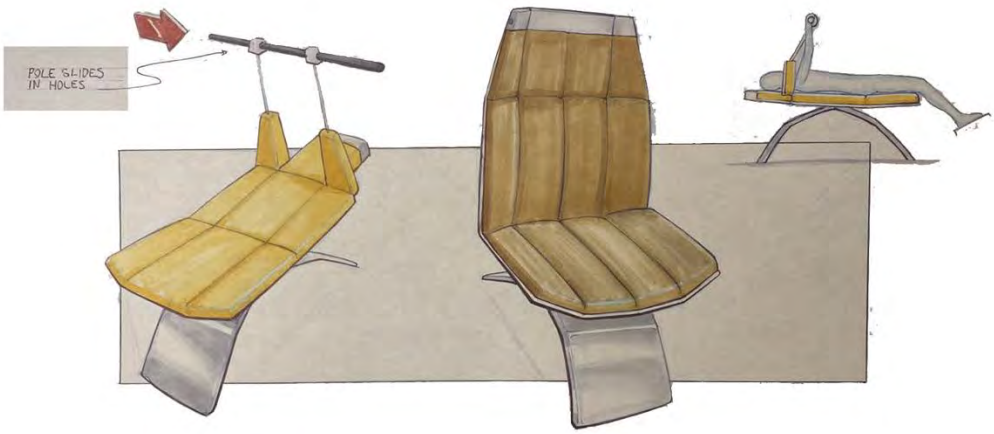
A refined version of the concept was sketched out. A more intelligent robot was designed, and an additional two more concepts were added. A smart chair and a smart desk were designed to help get work done as getting work done was one of the hardest parts of the day.



Concept 3

New Concept – Concept 4 – Smart Desk

A smart desk was created. The smart desk duals as a virtual window. With the smart desk the user would be able to interact with a virtual therapist.



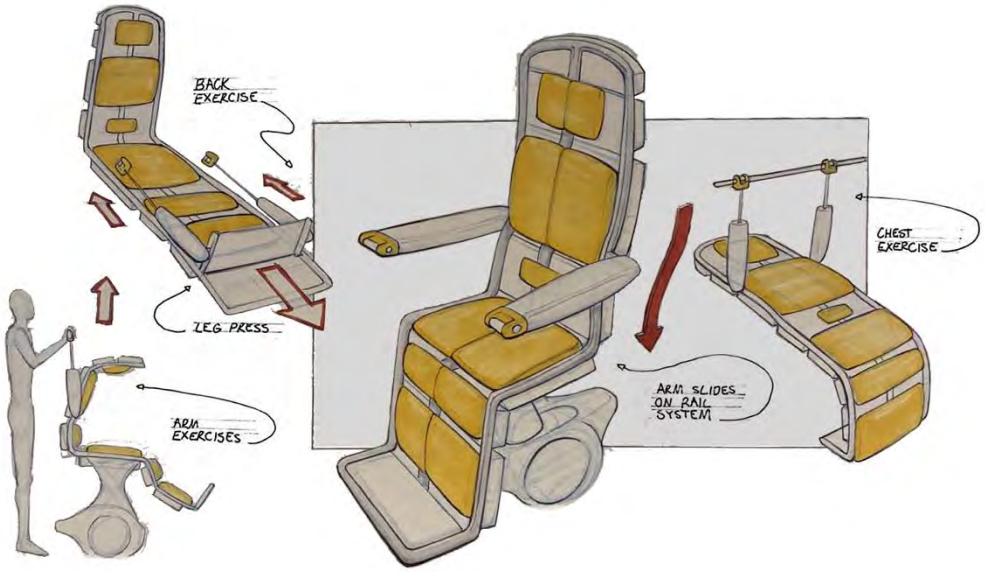
New Concept – Concept 5 – Smart Chair

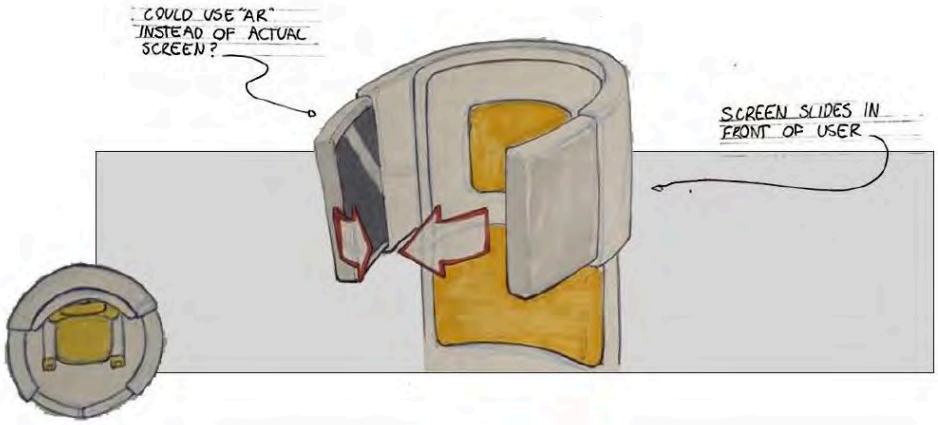
With the smart desk, a smart chair was made. The smart chair would allow the user to work out and exercise.

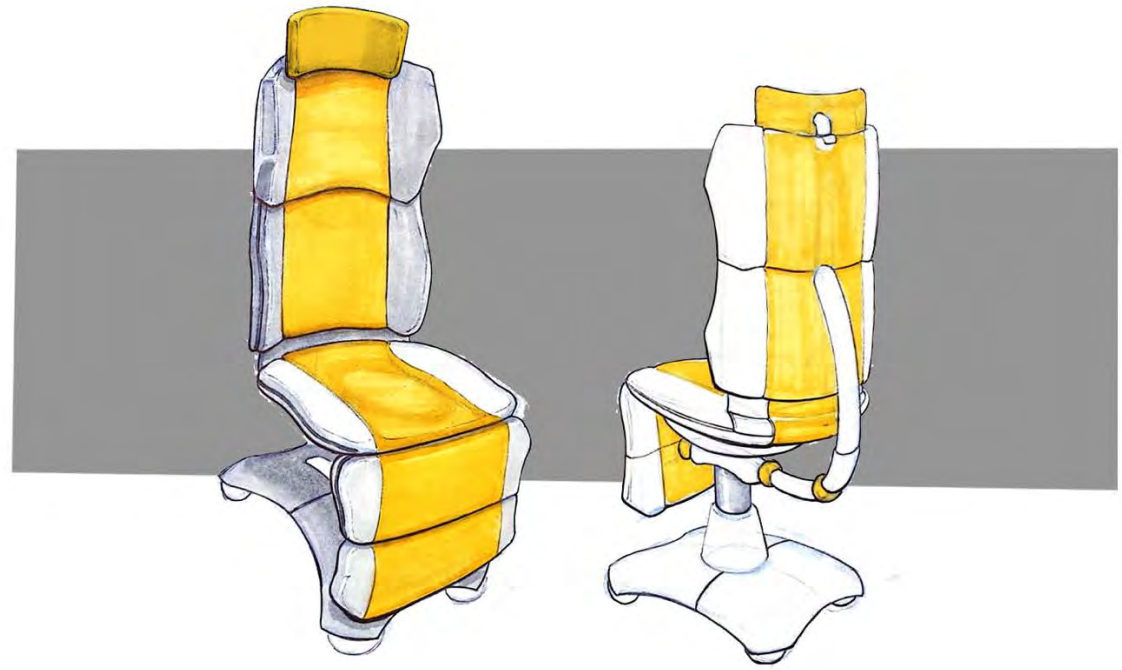
4.4 CONCEPT REFINEMENT

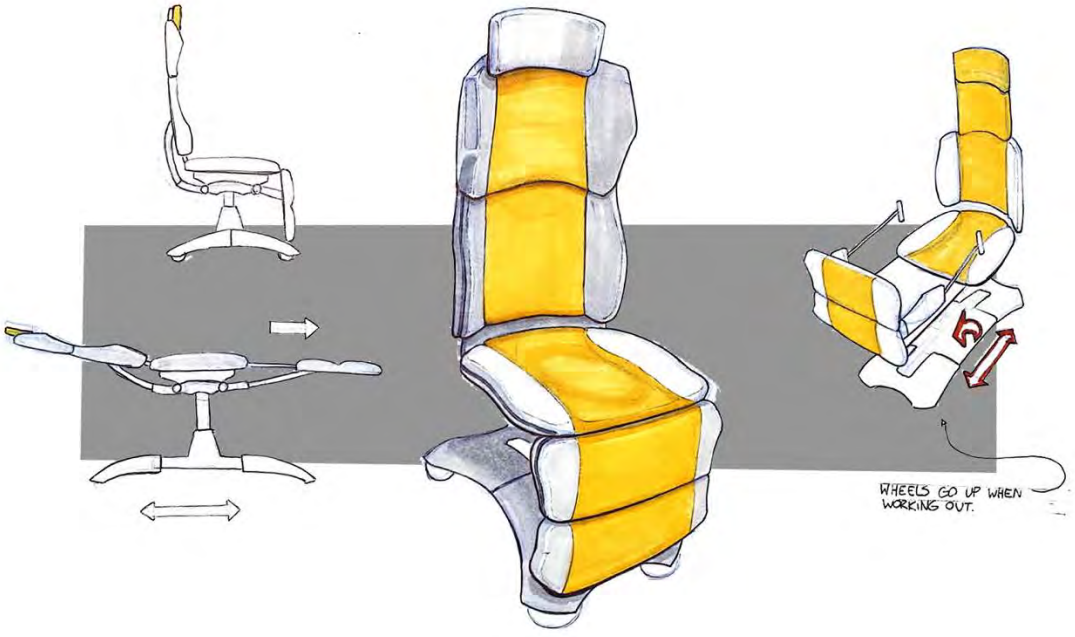
The selected concept was the smart chair. Now it was just about making the concept more intelligent and more refined. The refined concept combined both the A.I. (Artificial Intelligence) therapy of the smart desk and the exercise portion of the smart chair.

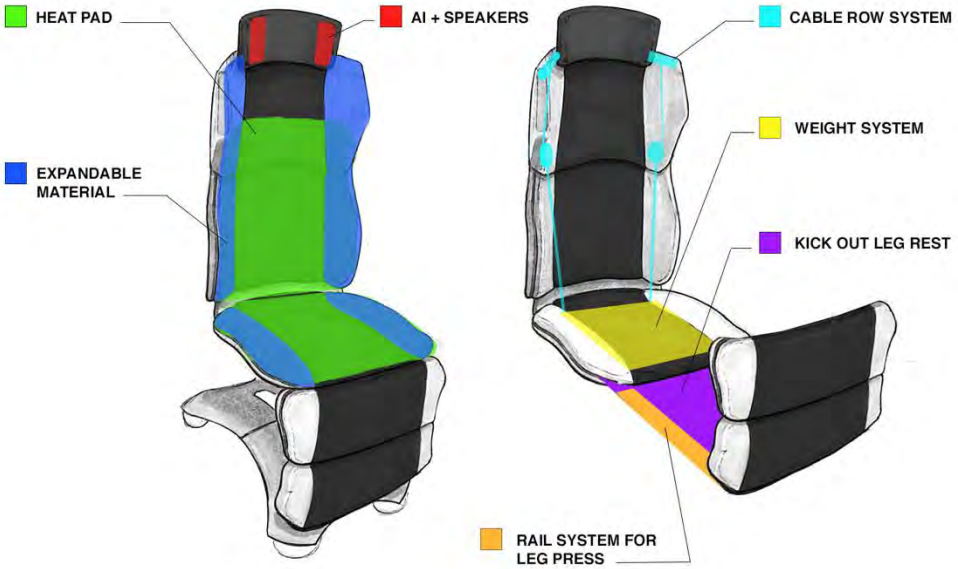
A focus on making the concept more intelligent, more refined, all-in one compact design. To help understand the exercise routine and help with workflow thinking, investigation and research into body exercises that utilizes a sit/bench position was done.

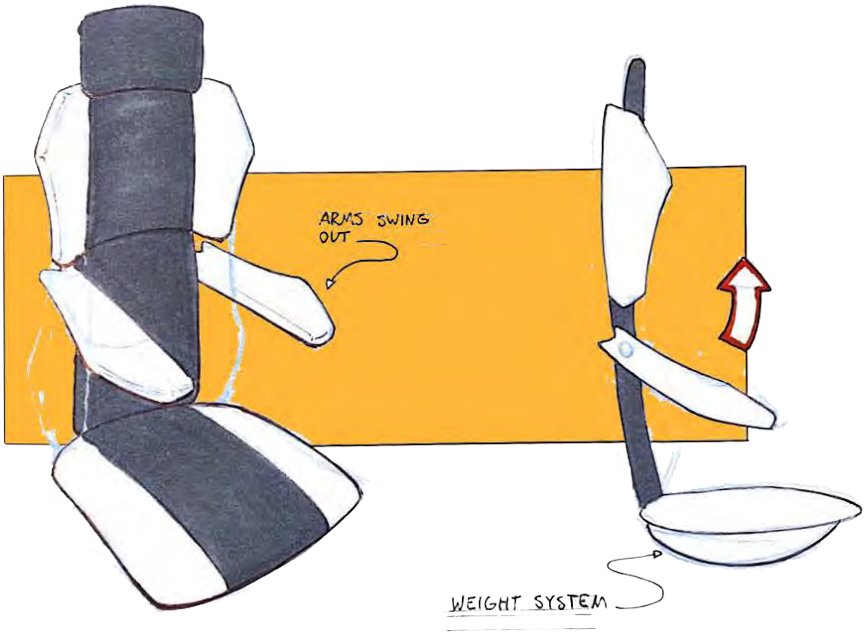


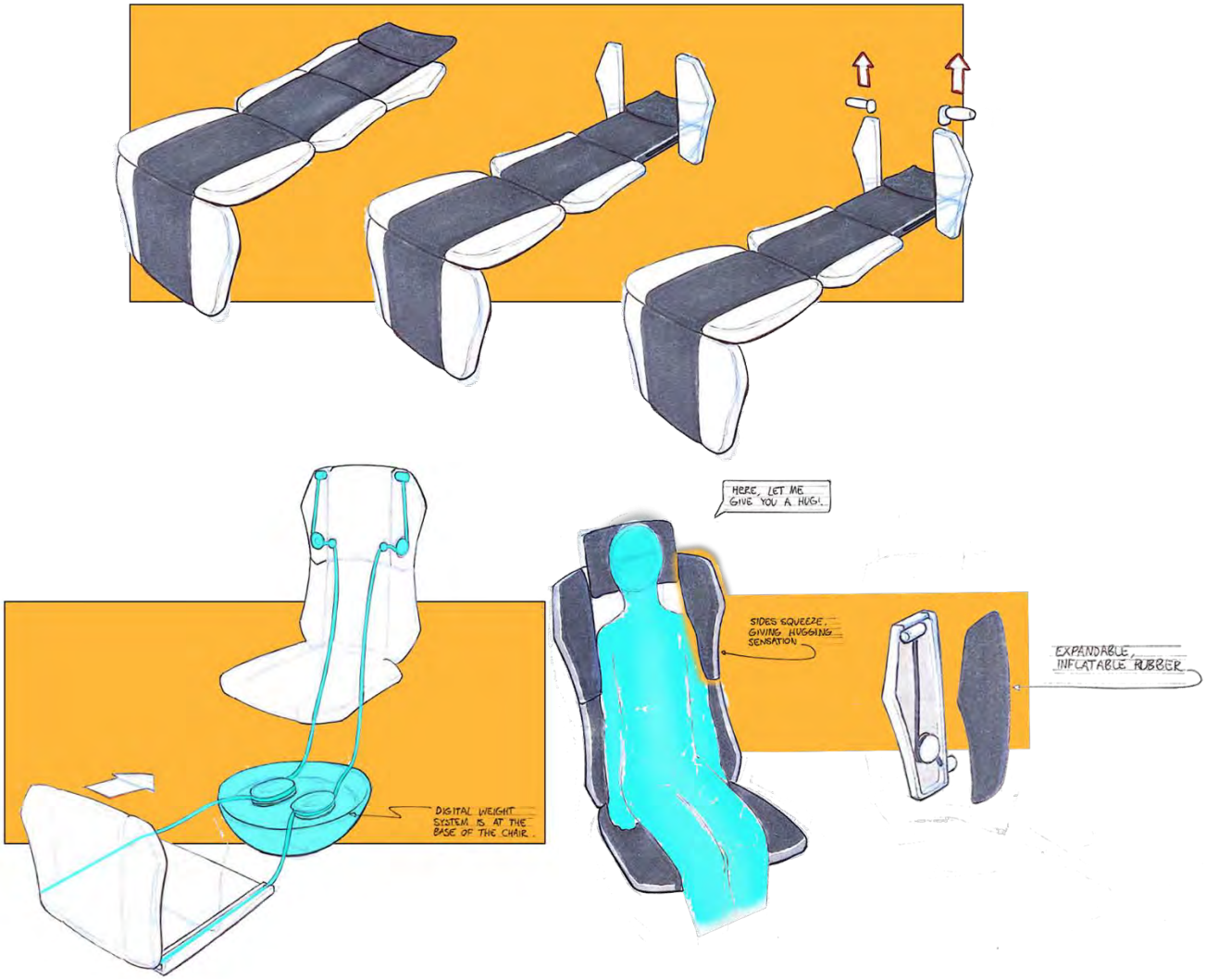




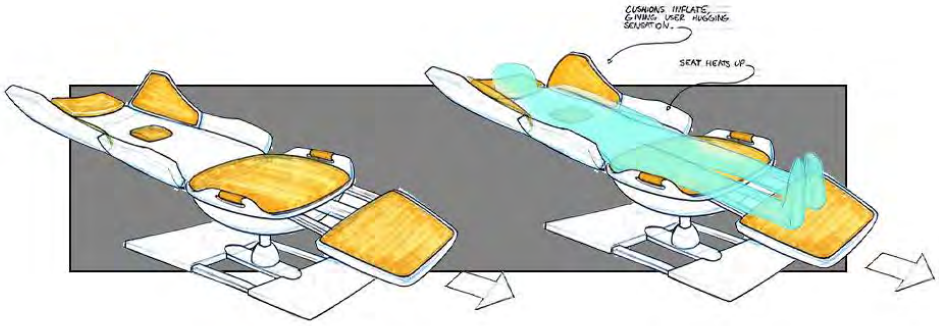

WHEELS GO UP WHEN
WORKING OUT.

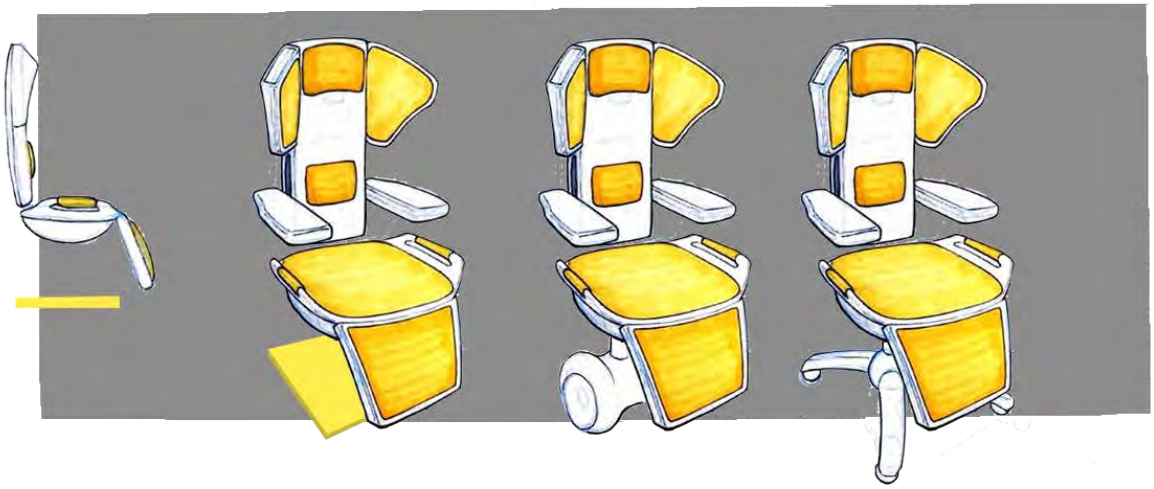

HEAT PAD
AI + SPEAKERS
CABLE ROW SYSTEM
WEIGHT SYSTEM
EXPANDABLE MATERIAL
KICK OUT LEG REST
RAIL SYSTEM FOR LEG PRESS


ARMS SWING OUT
WEIGHT SYSTEM



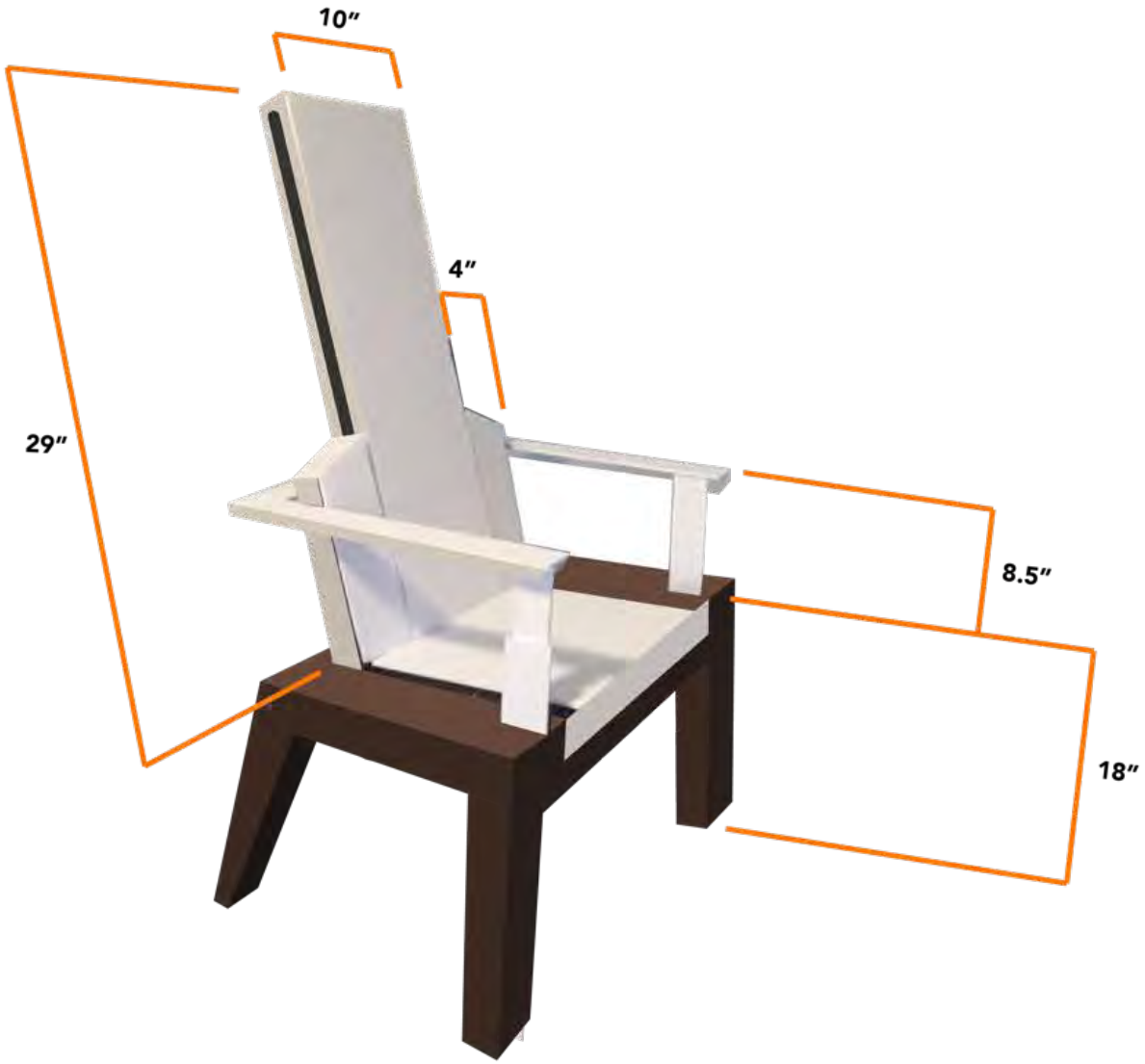
DESIGN: There are sensors on the seat that sense when user is sitting on it. When user is sitting on it for too long, it asks user if it is stressed. If user responds yes, the chair will apply therapeutic pressure simulating a hug. The smart chair can also play study music to help the user focus on work.

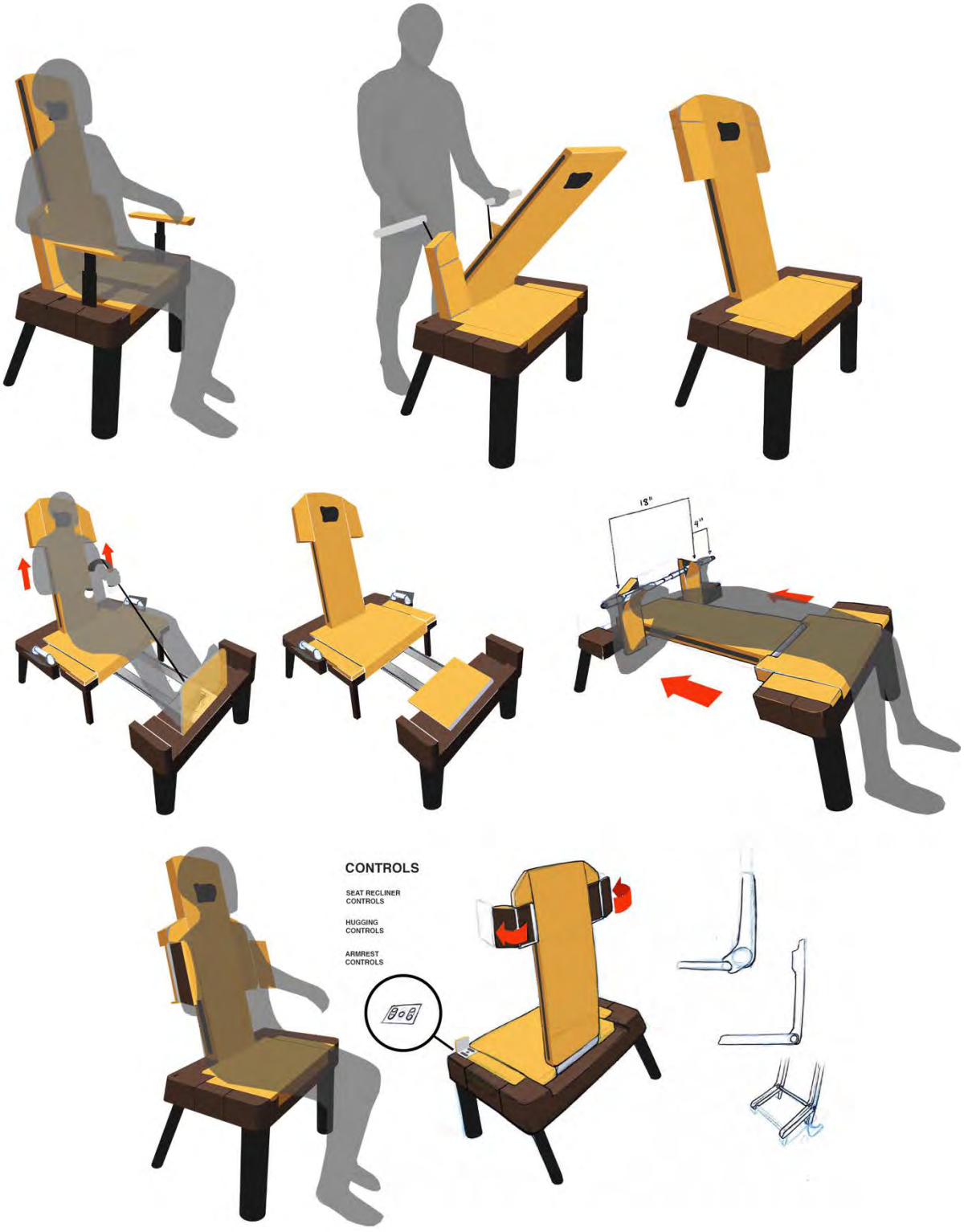

CUSHIONS INFLATE & MIMIC USER HUGGING SENSATION.
SEAT HEATS UP



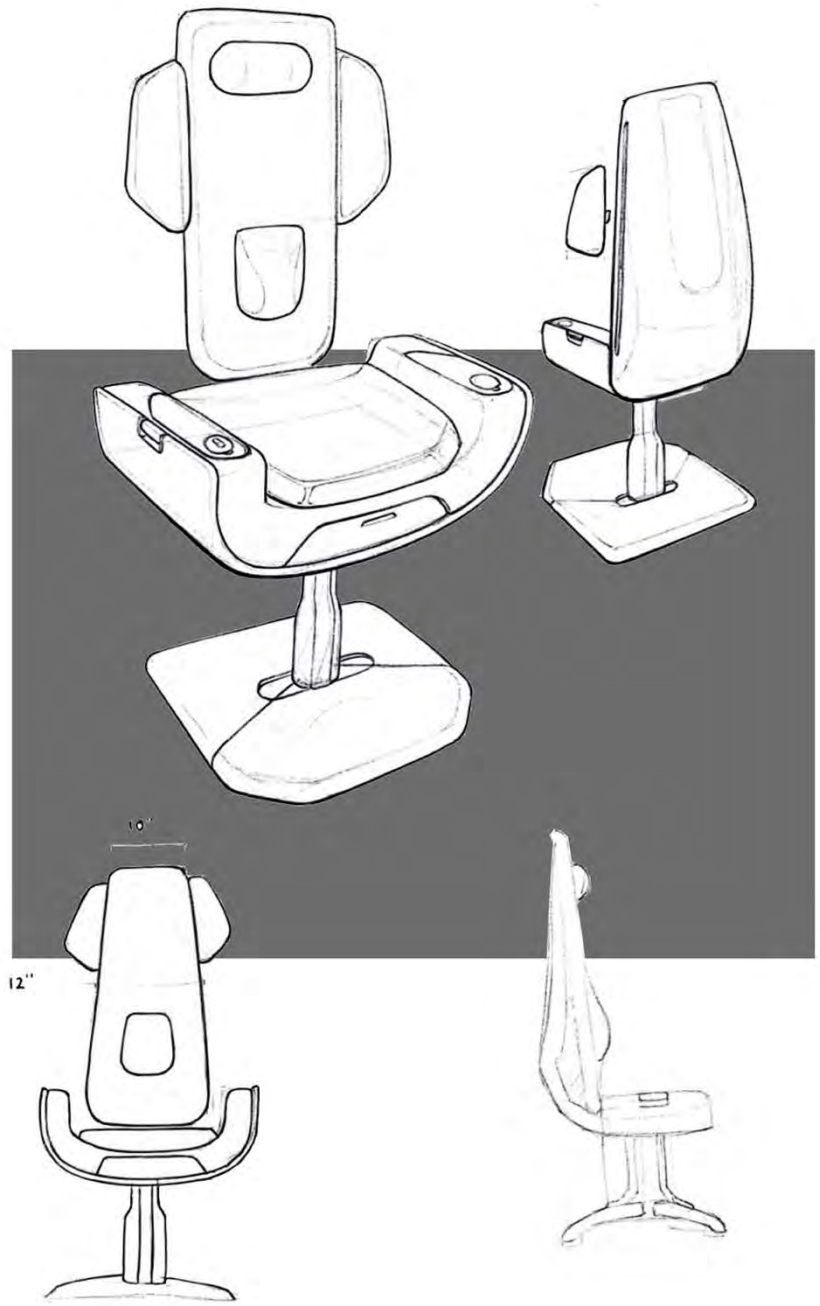
4.5 DESIGN REALIZATION

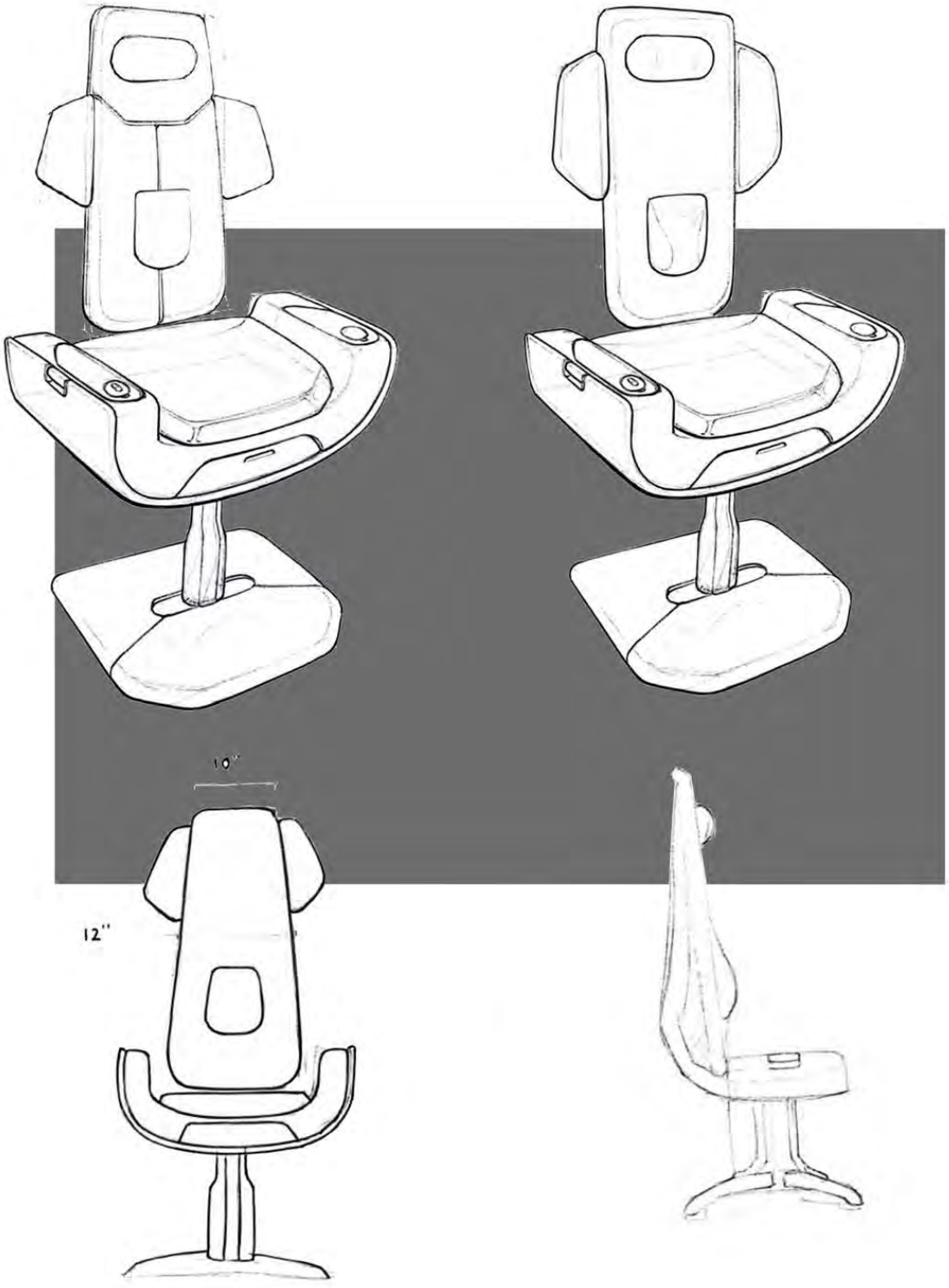
After doing the ergonomic assignment, some key aspects were changed. The first realization was that the flip out armrests were not ideal. Rather than having the armrests flip out, they instead extend from the bottom allowing for more space for the bench press sliders to move up and down for various exercises. The foot plate was also placed inside the chair, rather than outside.




15"
4"
CONTROLS
SEAT RECLINER CONTROLS
HUGGING CONTROLS
ARMREST CONTROLS

Now that the workability of the chair was finalized, the new goal was to focus on the aesthetics. The aim was to make the chair more futuristic, rounder/friendlier, and less rudimentary.

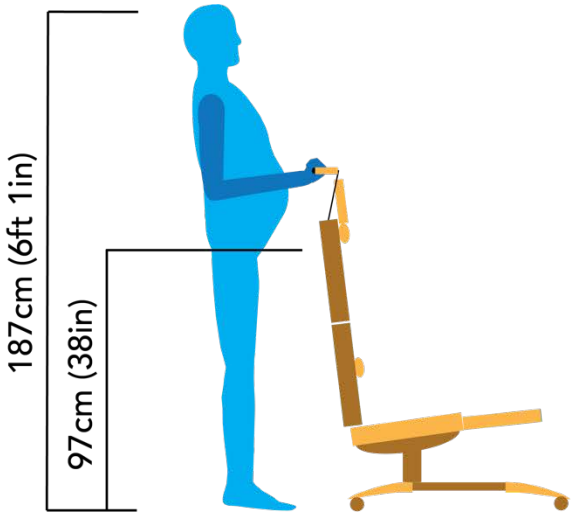



10"
12"

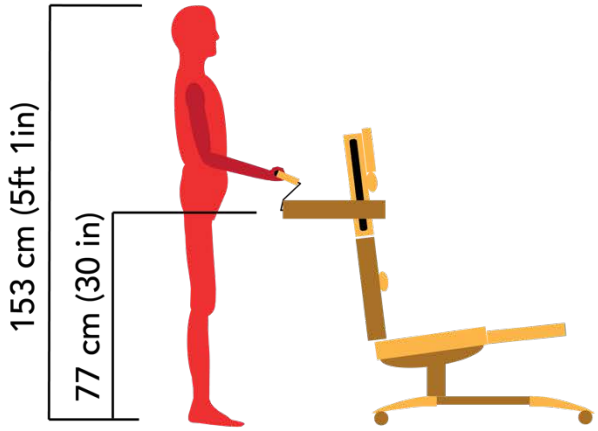
4.5.1 PHYSICAL STUDY MODELS

A 1:3 scale sketch model was created using foam core and pink foam.

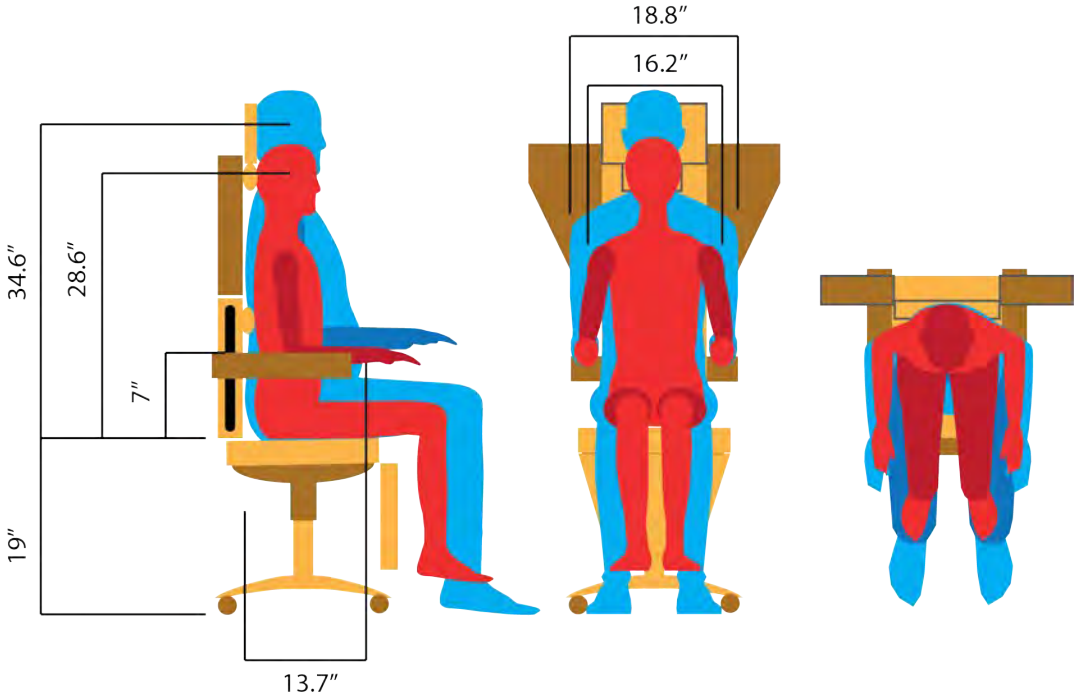
4.5.2 PRODUCT SCHEMATIC



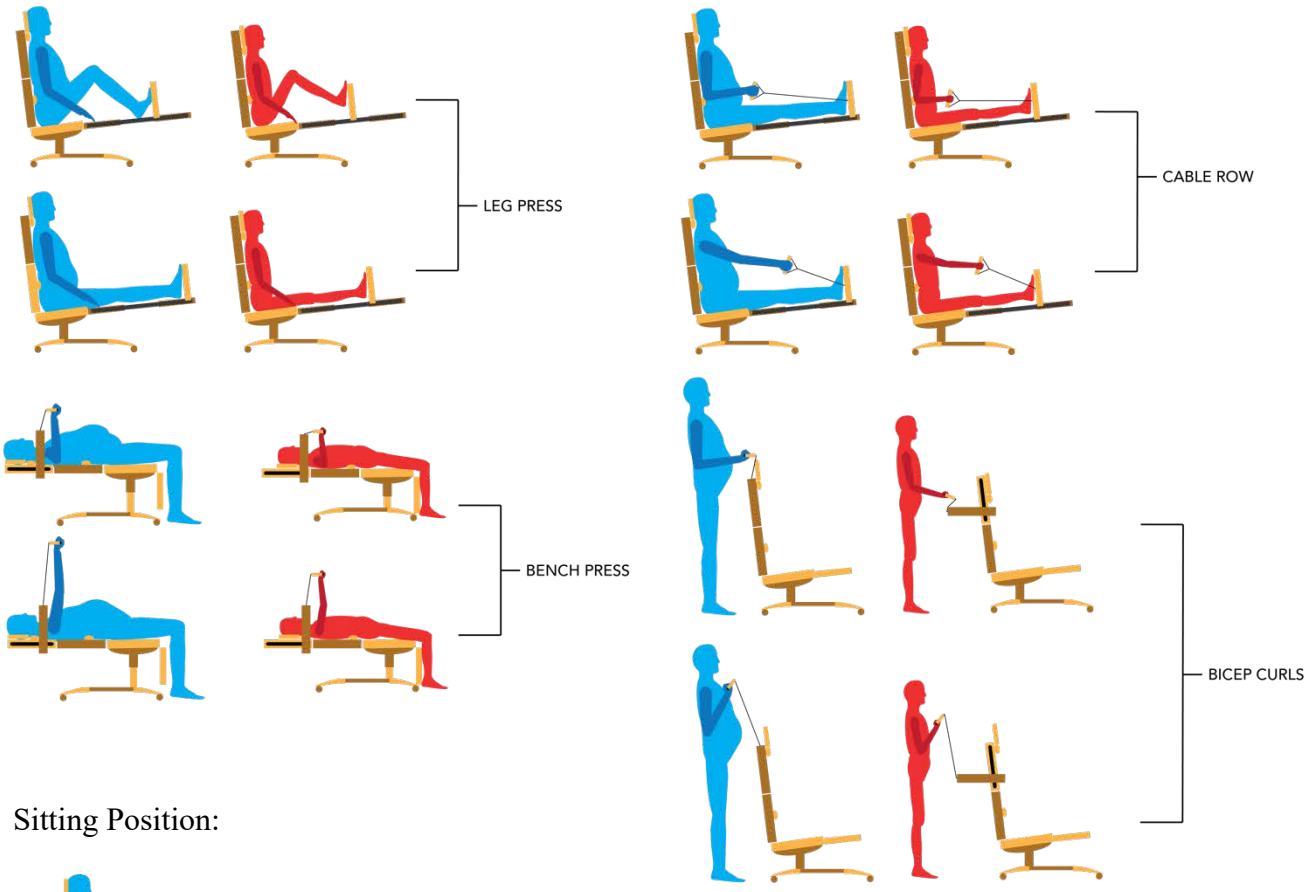
95th Percentile Male



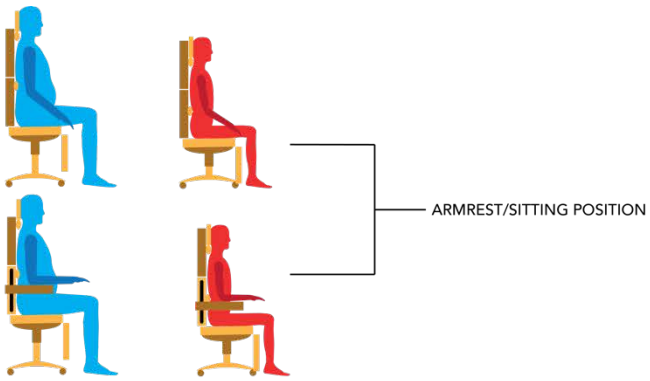
5th Percentile Female



Exercise Positions:

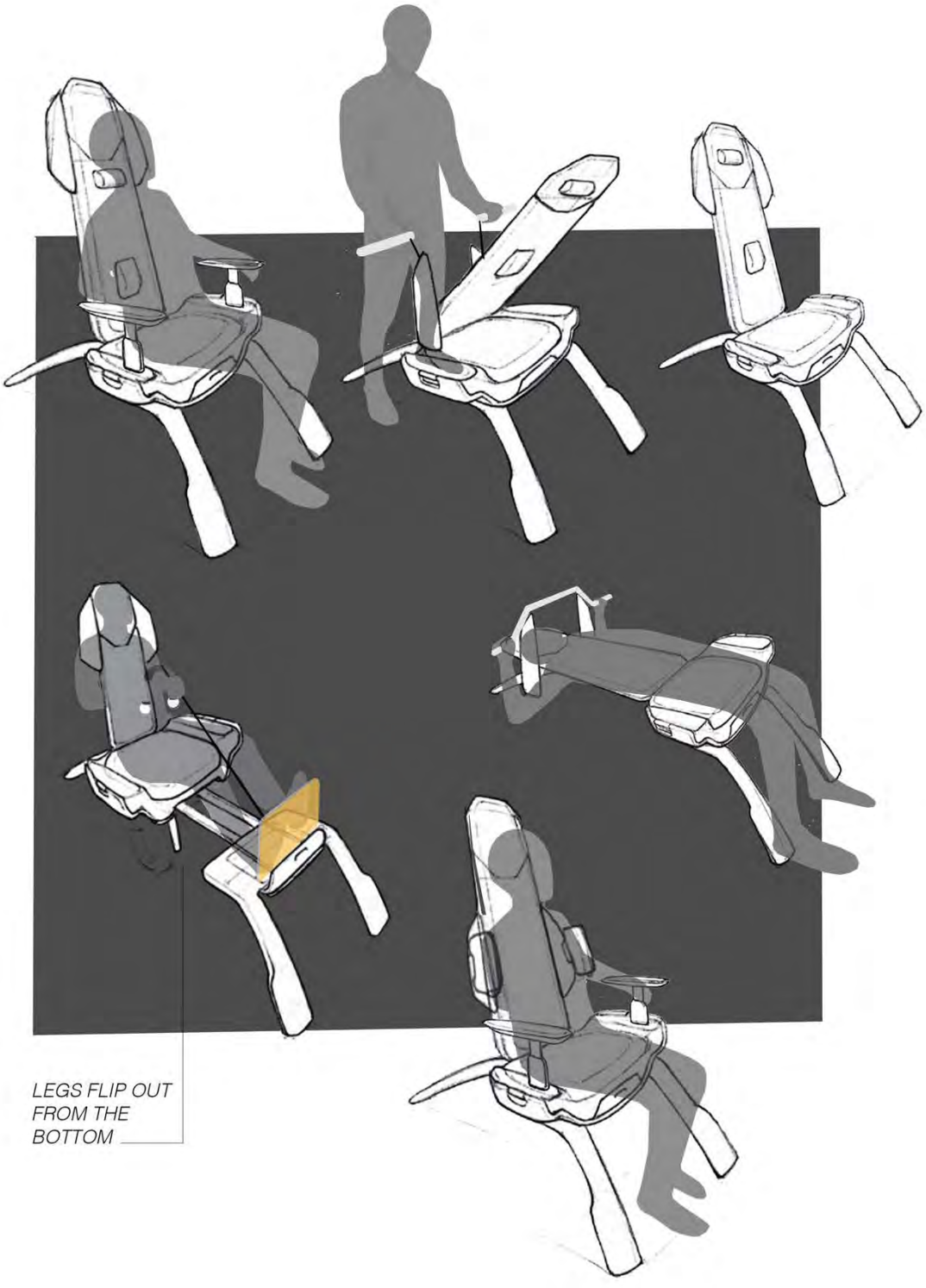


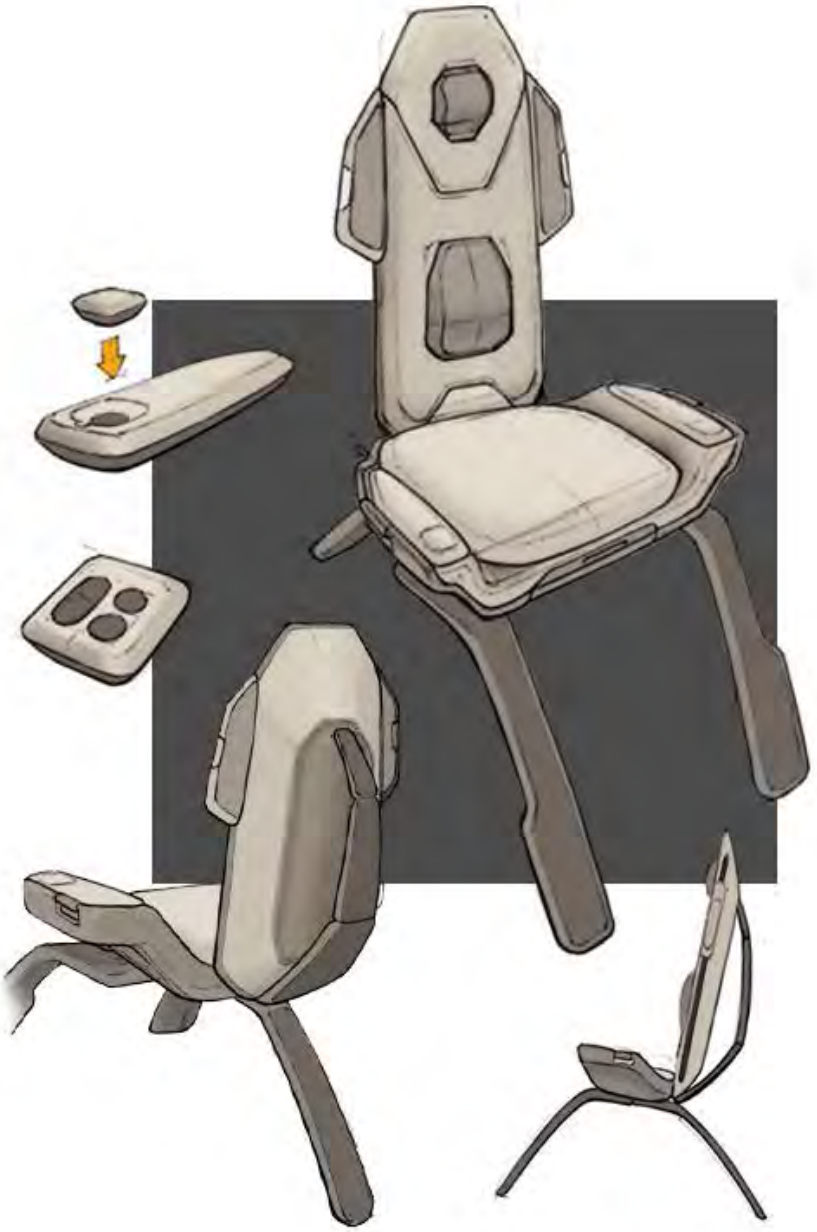
Sitting Position:



A.I. Emotional Support:

4.6 DESIGN RESOLUTION

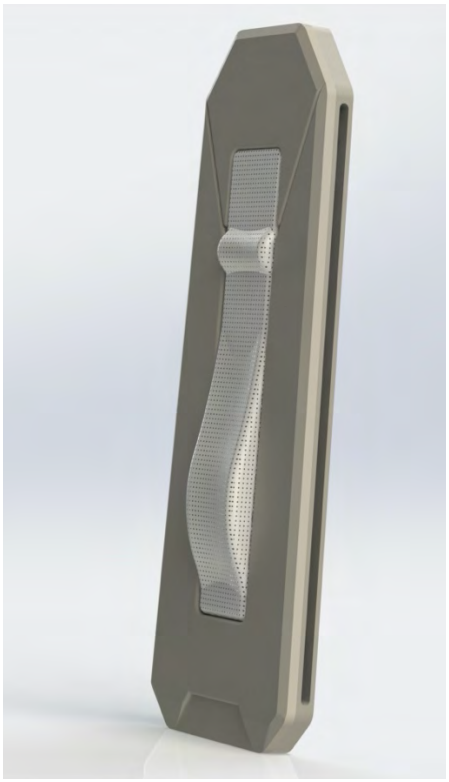


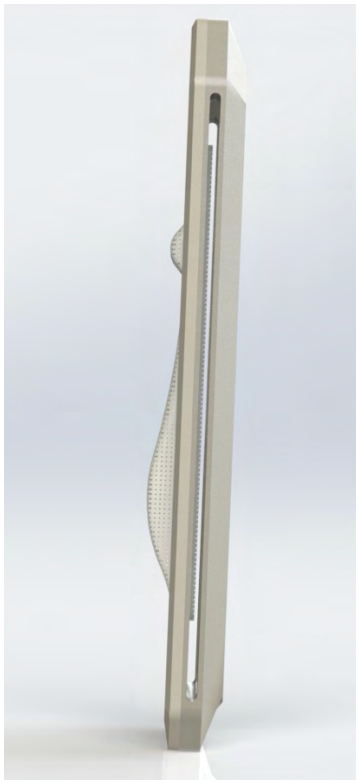


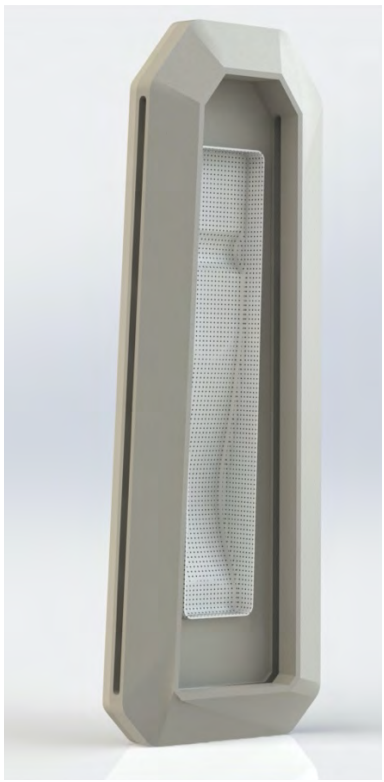
The final design incorporates rounder features, as well as a sleek modern look to appeal to the young adult audience.

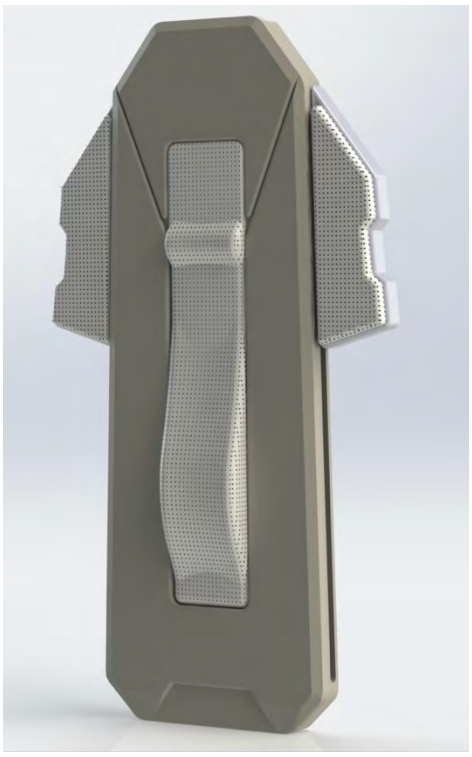
4.7 CAD DEVELOPMENT

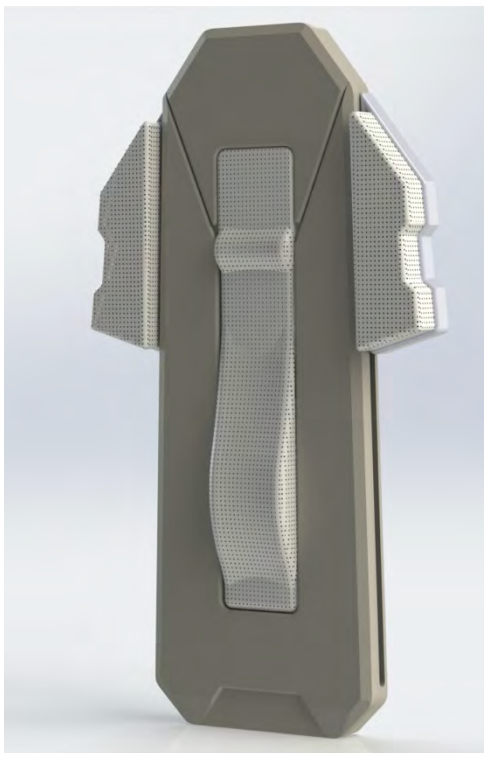
The CAD began first with the backseat development. In CAD the lumbar support and neck support design were reworked. Instead of the magnetic pillows that was showcased in the final design, a new mechanism was used. Using a similar mechanism to massage chairs, 6 balls are behind a fabric material, and pushes forward to morph into the shape of the users back. The shape can be adjusted, which allows for the backseat to be flat for bench-press and other exercises.

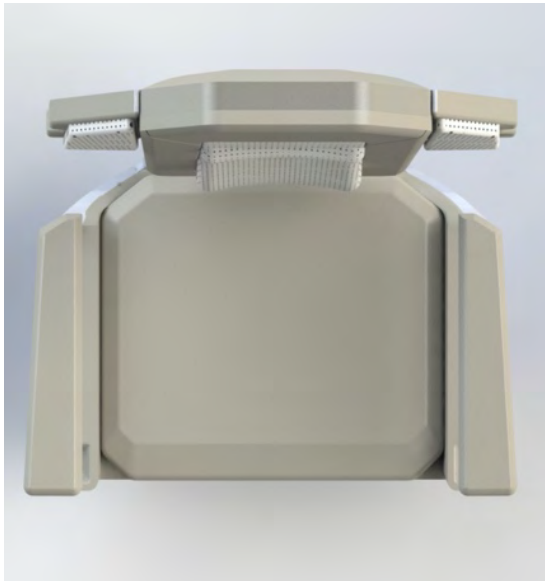












CHAPTER 5:

Final Design

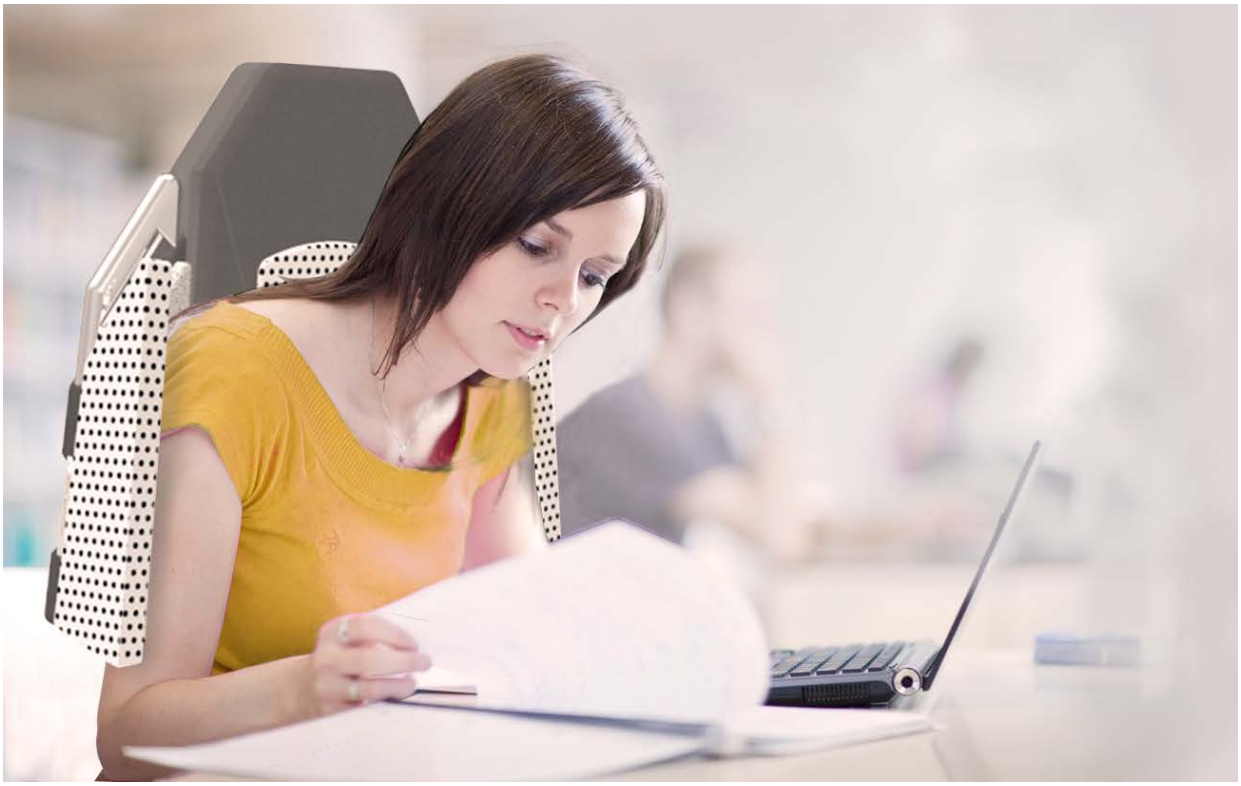


Figure 45 – Salus in-situ hugging photo. Photo retrieved from https://img.dtcn.com/image/digitaltrends/best-college-laptops-header.jpg

This chapter will showcase and go into detail about the final design and all of the features of Salus.

5.1 SUMMARY

Salus is a smart chair that boosts serotonin levels naturally through therapeutic pressure simulating a hug and incorporating various full body exercises throughout the day. Salus can also connect the user to a therapist, and help the user get work done.

5.2 DESIGN CRITERIA MET

5.2.1 FULL BODIED INTERACTION DESIGN

Salus meets the design criteria by interacting with more than three major external body-part areas. By helping the user exercise, Salus utilizes the users' arms, back, chest and legs. Salus allows the user to work out their entire body all from the comfort of their own smart chair.

Figure 46 – Leg press.

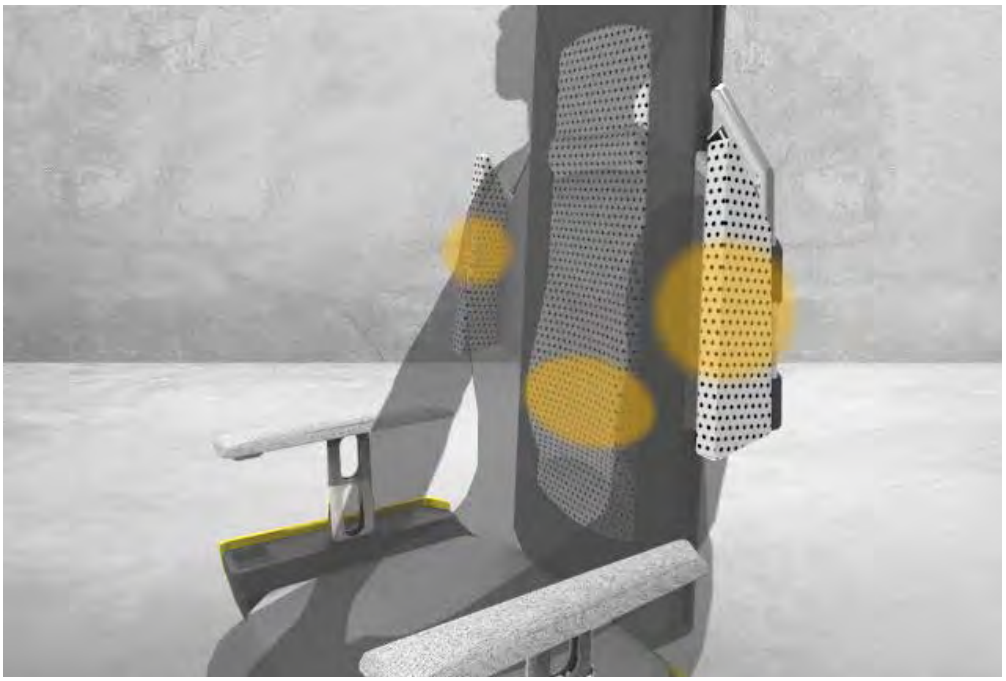
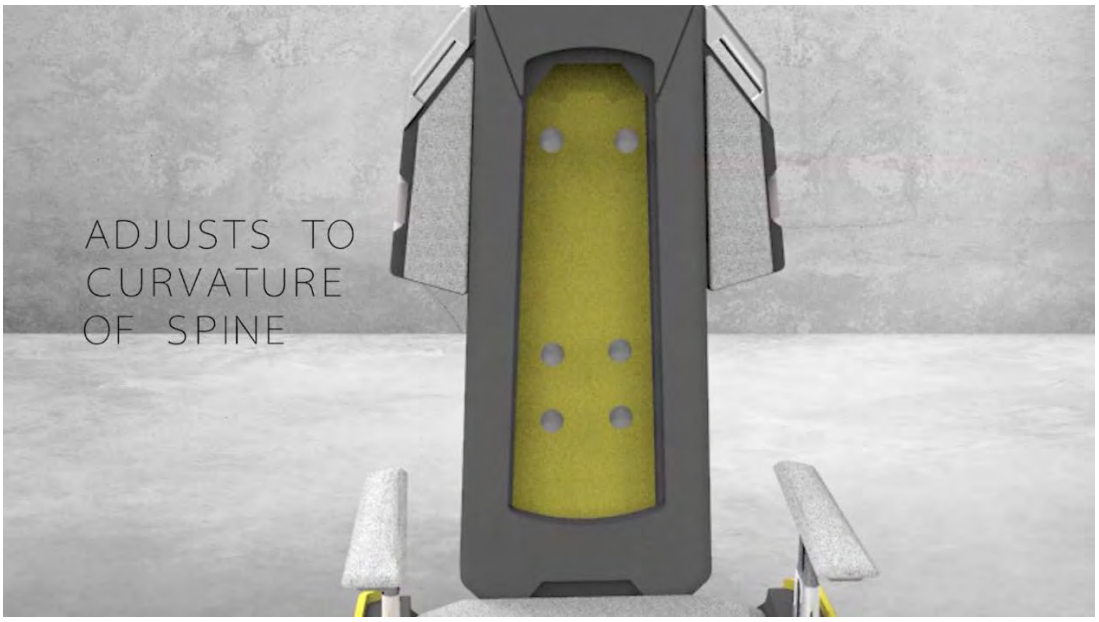


Figure 47 – Therapeutic pressure simulating a hug.

5.2.2 MATERIALS, PROCESSES AND TECHNOLOGY

Technology

The lumbar support and neck support design incorporate smart technology similar to massage chairs. 6 rubber balls are located behind a fabric material and pushed forward to morph into the shape of the user's spine. The shape can be adjusted, which allows for the backseat to be flat for bench-press and other exercises.


ADJUSTS TO
CURVATURE
OF SPINE

Adjustable armrests were also designed. Using automated controls, the armrests raise and lower according to need.

Many other features are automated in the chair, such as the side parts that slide up and down the backrest, and the hugging function.

Materials

With the new technology incorporated into the design, several materials were added. The materials used in the final design are:

1. **Steel:** The chair legs will be made out of steel. Steel is used due to its durability and strength, as stated in section 2.2.4 “Benchmarking - Materials and Manufacturing”. The frame and the base must have strong support as the chair must not only support the users weight, but also the digital weights for the exercise portion. The handles used for the exercises will also be made of steel.

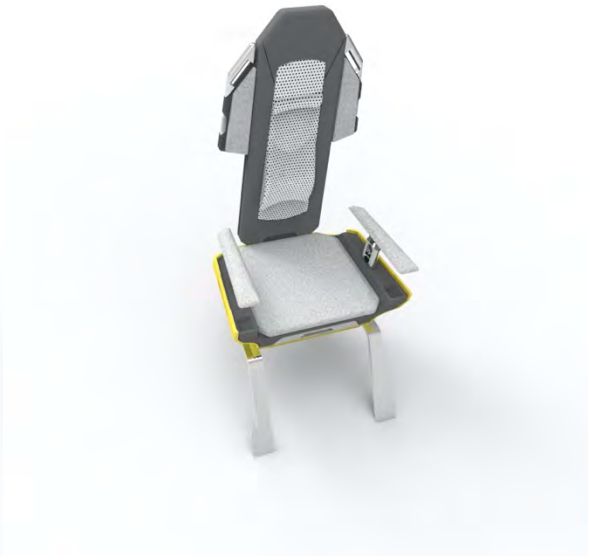
2. **High density polyurethane foam:** Chosen for its durability and longevity.
3. **Pinatex (Vegan Leather):** Easy to clean, and sustainable.
4. **Rubber:** Rubber will be used for the robotic balls. These balls are used for the lumbar support that move up, down, forward, and back, and need to be soft, yet maintain its shape.
5. **Polypropylene:** This plastic is often used in furniture, and other products for its versatility. According to “stratafurniture.com” polypropylene does not absorb water, does not mold, deteriorate in the presence of bacteria, mold or other elements, and is lightweight and durable. These properties make it the perfect material for the base of the chair (that holds the foam seat), and the sidepieces that slide up and down.

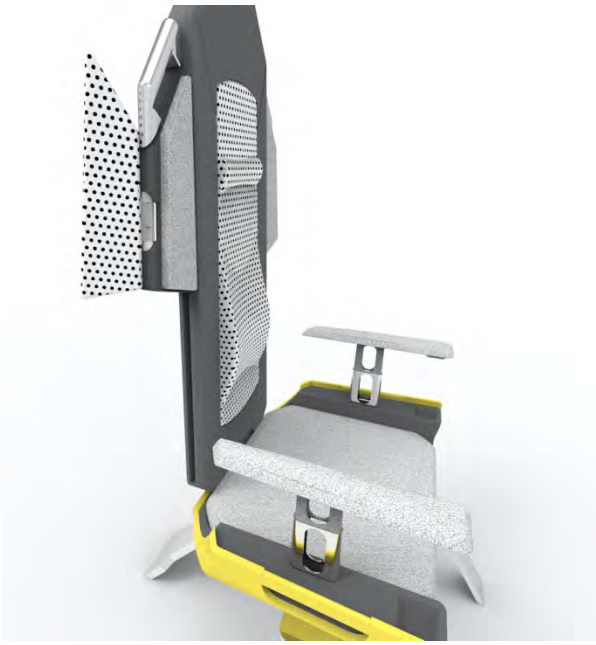
5.2.3 IMPLEMENTATION – FEASABILITY & VIABILITY

The projected cost of Salus would depend largely on the technology used. The majority of the expense would go to the electronic components, such as the digital weights, and electronic lumbar and neck support. Similar exercise products such as tonal, massage chairs, and smart products were looked at for a general price point. Looking at the smart devices and products, the combined cost of everything included should be around 2270$ - 3340$.

	BILL OF MATERIALS	
Item	**Estimated Cost**	**Similar Market Product**
Digital Weights and pulley system	1,500$ - 2,000$ (no A.I., or handles included)	Tonal, Pelaton
Built in microphone, A.I., and speakers	40$	Amazon Alexa, Google Home
Adjustable Electronic Lumbar and Neck support	300$ - 600$	Exogun Dream Pro Massager
Motorized sliding and rotating mechanism + Rails	150$ - 350$	Motorized camera sliders
Side parts (attached to sliding mechanism)	100$	
Steel Handles	10$	
Polypropylene components (outer casing of chair)	50$ - 100$	
Steel legs and framework	80$ - 100$	Etsy Metal Furniture Legs
Chair Cushions (polyurethane foam)	40$	Gelpro Newlife Anti-Fatigue Complete Comfort Seat Cushions
TOTAL COST	2,270$ - 3340$	

5.2 FINAL CAD RENDERING

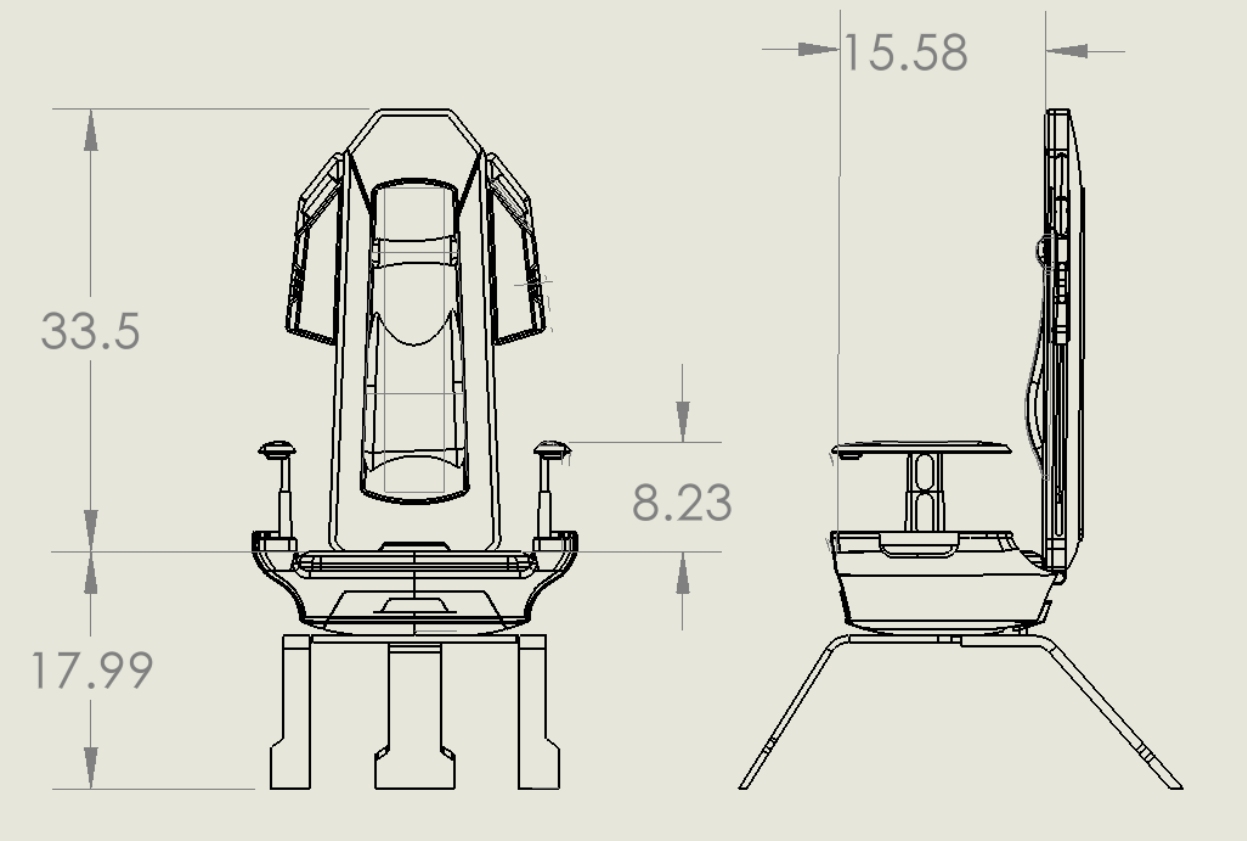




5.4 PHYSICAL MODEL

A 1:4 scale model was created using 3D printing to print the parts. Once the parts were printed, they were then sanded, and spray painted.

5.5 TECHNICAL DRAWINGS



The following measurements are in inches.

5.6 SUSTAINABILITY

Sustainability in the design was implemented by using new materials such as Pi*ñ*atex (a vegan leather made from pineapple leaves), durable polyurethane foam, and steel. Pi*ñ*atex helps the pineapple industry reduce their waste and create a new biodegradable vegan leather for the chair.

Pi*ñ*atex leather was selected over traditional leather because of the sustainable cradle to cradle approach the company uses to create the material. In the company's website it advertises that the material contains no animal products or toxic chemicals. Not only is the material completely sustainable and biodegradable, but the process the company uses to manufacture the

product is actually beneficial to the environment. Pineapple leaves were traditionally discarded or burned, which further adds to the pollution of our world. (Responsibility. Retrieved from https://www.ananas-anam.com/responsibility/).

High density polyurethane foam is also used in the upholstery for a longer lasting product. Durability and longevity are key in sustainability, allowing the product to have a longer life cycle.

There is a lot of steel used in the chair. The base frame and the legs of the chair will be made out of steel. The handles used for the exercises will also be made out of steel. According to *Wiley.com*'s article *"Discover the Sustainable Characteristics of Metal"*, Steel is one of the most sustainable building materials. *"As far as building materials go, steel is one of the most sustainable. It is not only environmentally conscious but economically strategic in its inherent longevity and durability. Steel is the most recycled material in the world."* (Discover the Sustainable Characteristics of Metal. Retrieved from https://www.wiley.com/network/professionals/sustainability/discover-the-sustainable-characteristics-of-metal#:~:text=As%20far%20as%20building%20materials,paper%2C%20glass%20and%20plastic%20combined.)

CHAPTER 6:

Conclusion

Figure 48 – Salus Cover Photo.

There are not many current products in the market that target people with depression. With physical products such as light therapy lamps and weighted blankets, there are not many products that provide long term alternative coping solutions for a user with mild depression. This is because people have different things that work for them, and also need a real human being to talk too. This is why therapy and medication are needed. However, with COVID 19 not only is

there a lack of access to therapists, but a lack of gyms open. Many young adults physical and mental health have gone down.

Salus is a full-body interactive chair, that helps the user cope more adaptively with mild depression. The chair boosts the user's serotonin levels naturally through therapeutic pressure and 4 different body exercises. Salus can also connect the user to therapists and can record the user's voice. This allows the user to vent out his/her problems and can act as a recorded journal for when a therapist is available. *"...seeing it and writing it out instead of holding it in is good. Because you are going to carry 'it' wherever you go, and it is not that once you write it out it's not a problem anymore, but once you write it, its out there. Its visible. Its tangible almost. For some people it's all they think about, but once you've written it, you've done it. And now I can focus on my assignment for school, or now I can meet up with my friend, and I'll give it an appointment/time and place to talk about it." – Christine Kim*

Salus targets the people with mild depression, who just need that push to exercise, and provides a listening ear for people who hate writing/written journaling and prefer to talk it out.

REFERENCES

Peer Reviewed Articles:

Jihan Saber Raja Mahmoud, Ruth "Topsy" Staten, Lynne A. Hall & Terry A. Lennie (2012) The Relationship among Young Adult College Students' Depression, Anxiety, Stress, Demographics, Life Satisfaction, and Coping Styles, Issues in Mental Health Nursing, 33:3, 149-156, DOI: 10.3109/01612840.2011.632708

Thompson, R. J., Mata, J., Jaeggi, S. M., Buschkuehl, M., Jonides, J., & Gotlib, I. H. (2010). Maladaptive coping, adaptive coping, and depressive symptoms: Variations across age and depressive state. *Behaviour research and therapy*, *48*(6), 459-466.

Krause, E. D., Vélez, C. E., Woo, R., Hoffmann, B., Freres, D. R., Abenavoli, R. M., & Gillham, J. E. (2018). Rumination, Depression, and Gender in Early Adolescence: A Longitudinal Study of a Bidirectional Model. *The Journal of Early Adolescence*, *38*(7), 923–946. https://doi.org/10.1177/0272431617704956

Chiu, M., Amartey, A., Wang, X., & Kurdyak, P. (2018). Ethnic Differences in Mental Health Status and Service Utilization: A Population-Based Study in Ontario, Canada. *Canadian journal of psychiatry. Revue canadienne de psychiatrie*, *63*(7), 481–491. https://doi.org/10.1177/0706743717741061

Young S. N. (2007). How to increase serotonin in the human brain without drugs. *Journal of psychiatry & neuroscience : JPN*, *32*(6), 394–399.

Martinengo, L., Galen, L. V., Lum, E., Kowalski, M., Subramaniam, M., & Car, J. (2019).

Suicide prevention and depression apps' suicide risk assessment and management: A systematic assessment of adherence to clinical guidelines. *BMC Medicine, 17*(1). doi:10.1186/s12916-019-1461-z

Websites:

Addressing Stigma. (n.d.). Retrieved November 23, 2020, from https://www.camh.ca/en/driving-change/addressing-stigma

Canada, H. (2009, February 09). Government of Canada. Retrieved November 23, 2020, from https://www.canada.ca/en/health-canada/services/healthy-living/your-health/diseases/mental-health-depression.html

Canada, P. (2018, October 01). Government of Canada. Retrieved November 22, 2020, from https://www.canada.ca/en/public-health/services/publications/healthy-living/physical-activity-tips-adults-18-64-years.html

Depression. (n.d.). Retrieved September 28, 2020, from https://www.who.int/health-topics/depression

Depression. (n.d.). Retrieved October 13, 2020, from https://www.camh.ca/en/health-info/mental-illness-and-addiction-index/depression

Dopamine vs. serotonin: Similarities, differences, and relationship. (n.d.). Retrieved November 23, 2020, from https://www.medicalnewstoday.com/articles/326090

Laderer, W., Laderer, A., & Swaby, S. (2018, September 28). The Stigma of Depression. Retrieved November 23, 2020, from https://www.talkspace.com/blog/the-stigma-of-depression/

Men and Depression. (n.d.). Retrieved October 16, 2020, from https://www.nimh.nih.gov/health/publications/men-and-depression/index.shtml

Mental Health Commission of Canada, & Canadian Institutes of Health Research. (2016, November). Mental Health Apps: How to Make an Informed Choice. Retrieved November 22, 2020, from https://www.mentalhealthcommission.ca/sites/default/files/2018-01/eMH_app_eng.pdf

Mental Illness and Addiction: Facts and Statistics. (n.d.). Retrieved October 15, 2020, from https://www.camh.ca/en/driving-change/the-crisis-is-real/mental-health-statistics

Perigo, S. (2018, October 08). A Day in the Life with Major Depression. Retrieved November 23, 2020, from https://medium.com/@sashaperigo/a-day-in-the-life-with-major-depression-9cdf85786a7d

Tracy, N. (n.d.). A Day in the Life of Living with Depression. Retrieved October 16, 2020, from https://www.shepellfgi.com/understandingmentalillness/article.aspx?title=ADayintheLifeofLivingwithDepression

What does depression feel like? (n.d.). Retrieved October 16, 2020, from https://www.medicalnewstoday.com/articles/314071

What is Weighted Blanket Therapy? (2019, August 20). Retrieved November 17, 2020, from https://hushblankets.ca/blogs/sleep/what-is-weighted-blanket-therapy

Zahner, L. W. (2020, September 16). *Discover the Sustainable Characteristics of Metal*. Wiley. https://www.wiley.com/network/professionals/sustainability/discover-the-sustainable-characteristics-of-metal#:~:text=As%20far%20as%20building%20materials,paper%2C%20glass%20and%20plastic%20combined.

8 foods that boost serotonin naturally. (n.d.). Retrieved November 23, 2020, from https://www.medicalnewstoday.com/articles/322416

APPENDIX

APPENDIX A – DISCOVERY

Key Article 1

Method

A key article for this topic was sourced and selected. Required article content (Abstract, Introduction, and Conclusion sections) was copied and highlighted.

- Search Engine: Humber Library Discover
- Key Words Used in Search: “depression and anxiety young adults”

Findings

Citation: Jihan Saber Raja Mahmoud, Ruth “Topsy” Staten, Lynne A. Hall & Terry A. Lennie (2012) The Relationship among Young Adult College Students’ Depression, Anxiety, Stress, Demographics, Life Satisfaction, and Coping Styles, Issues in Mental Health Nursing, 33:3, 149-156, DOI: 10.3109/01612840.2011.632708

Key Content: is reproduced below.

Abstract

Recent research indicates that young adult college students experience increased levels of depression, anxiety, and stress. It is less clear what strategies college health care providers might use to assist students in decreasing these mental health concerns. In this paper, we examine the relative importance of coping style, life satisfaction, and selected demographics in predicting undergraduates' depression, anxiety, and stress. A total of 508 full-time undergraduate students aged 18–24 years completed the study measures and a short demographics information questionnaire. Coping strategies and life satisfaction were assessed using the Brief COPE Inventory and an adapted version of the Brief Students' Multidimensional Life Satisfaction Scale. Depression, anxiety, and stress were measured using the Depression Anxiety and Stress Scale-21 (DASS-21). Multiple regression analyses were used to examine the relative influence of each of the independent variables on depression, anxiety, and stress. Maladaptive coping was the main predictor of depression, anxiety, and stress. Adaptive coping was not a significant predictor of any of the three outcome variables. Reducing maladaptive coping behaviors may have the most positive impact on reducing depression, anxiety, and stress in this population.

Introduction

Approximately 40 million American adults suffer from anxiety and 75% of them experience their first episode by age 22 (Anxiety Disorder Association of America, 2010). Unmanaged anxiety may contribute to substance abuse (Schmidt, Buckner, & Keough, 2007) and depression (Kessler, Berglund, Borges, Nock, & Wang, 2005). The rate of college students diagnosed with depression increased from 10% in 2000 to 15% in 2006 (American College Health Association [ACHA], 2008). Depression may lead to suicide, the second-leading cause of death among college students, resulting in 1,100 lives lost each year (Floyd, Mimms, & Yelding, 2007). With increasing concerns about college students' mental health, the ACHA (2009) challenged concerned professionals to use evidence-based approaches in planning college health strategies. Thus, this paper aims to investigate the main predictors of three mental health conditions—depression, anxiety, and stress—in young adult college students and determine their relative contribution to each of these three conditions.

From a developmental perspective, young adult college students' age group (age 18–24 years old) has been described as "emerging adulthood," which is a transitional developmental stage between late adolescence and adulthood (Arnett, 2004). This transition, which requires developing skills for maintaining the independence and self-sufficiency an individual gains through adolescence, and for managing new tasks with regard to developing and maintaining intimate relationships, is considered stress-arousing and anxiety-provoking (Meadows, Brown, & Elder, 2006; Zirkel, 1992; Zirkel & Cantor, 1990). Failure to accomplish these developmental tasks may result in life dissatisfaction (Newman & Newman, 2008). Based on the quality of life model of life satisfaction (Campbell, Converse, & Rodgers, 1976; Erikson, 1994), Frisch (2006) proposed that while pleasant emotions stem from the satisfaction that accompanies the perception that important needs have been met or fulfilled, anxiety and depression are associated with low life satisfaction, which may result from the inability to meet needs in valued areas of life.

Additionally, young adult college undergraduates face numerous academic, financial, and social stressors that may negatively alter their mental health (Dusselier, Dunn, Wang, Shelley, & Whalen, 2005). Depression and anxiety are not directly caused by stressors; rather, it is a state that results from an individual's perception and reaction to those stressors (Beck & Clark, 1997). The impact of stressors experienced is mediated by the individual's ability to effectively cope with stressful situations. The transactional model of coping (Lazarus & Folkman, 1984) differentiated between two main stress-coping mechanisms, adaptive and maladaptive. Through these two mechanisms an individual displays certain behaviors that are thought to moderate the effect of stressful stimuli. Adaptive coping behaviors involve defining the stressful situation, actively seeking support, reflecting on possible solutions, and taking actions to resolve the situation. Such actions resolve the stressful situation and result in positive psychological and emotional adjustment. Conversely, maladaptive coping behaviors include efforts to withdraw from the stressful situation or avoid seeking solutions; this may result in a failure to resolve the stressful situation and can be associated with anxiety. Even though some studies show that individuals progress in their utilization of the adaptive coping across their life span, several studies have indicated that adolescents and young adults used more maladaptive coping strategies, such as escape-avoidance, as compared to other age groups (Blanchard-Fields, Sulsky, & Robinson-Whelen, 1991; Irion & Blanchard-Fields, 1987).

College students' use of certain maladaptive coping strategies was found to be related to certain cultural or demographic characteristics such as belonging to a fraternity or sorority (The National Center on Addiction and Substance Abuse (CASA) at Columbia University, 2003), being self-identified as not religious (Khavari & Harmon, 1982), and being female (Devonport & Lane, 2006). Moreover, students' levels of depression and anxiety may vary by gender (Chapell et al., 2005; Grant et al., 2002; Hankin et al., 1998; Howley & Dickerson, 2009; Misra & McKean, 2000), age (Rosenthal & Schreiner, 2000), classstanding (Rawson, Bloomer, & Kendall, 1994), residency (living off-campus versus on-campus) (Eisenberg, Gollust, Golberstein, & Hefner, 2007), and academic performance (Eisenberg, Golberstein, & Hunt, 2009; Hysenbegasi, Hass, & Rowland, 2005). Helping such a diverse population of students manage these mental health conditions is one of the major challenges facing college counselors (Kitzrow, 2003).

In sum, young adult students are faced with numerous developmental challenges and tasks related to their college lives. Their life satisfaction and the strategies they use to cope with challenges may affect their mental well-being. Understanding how these factors are related to students' depression, anxiety, and stress may provide important information for college health professionals regarding the most promising mental health promotion strategies. Thus, this paper has two specific aims. The first is to examine the relationship of three mental health factors—depression, anxiety, and stress—with selected demographics, life satisfaction, and coping strategies among young adult college students. The second is to determine the main predictors of depression, anxiety, and stress and their relative influence on each of these three mental health factors.

Conclusions

Sample Description

The total number of undergraduates who participated in this study was 508; of these, 66% (n = 335) were female and 90% (n = 409) were Caucasian. The mean age of students was 20 years (SD = 1.6), and their mean GPA was 3.2 on 4-point scale
(SD = .60). The mean scores of students' depression, anxiety, and stress were found to be normal and equal to 5.2 (SD = 7), 8 (SD = 9), and 11 (SD = 9), respectively. However, 29% of the students were depressed, 27% were anxious, and 24% were stressed. About 67% of students who were anxious were also depressed and 61% of the anxious students were also stressed.

Higher depression scores were reported by sophomores or those 18–19 years old than students in other class standing levels and the older students. Students who lived with someone or belonged to a social organization were less depressed, anxious, and stressed than those who did not. Students who identified themselves as religious were less depressed and anxious than those who were not religious. Female students were more anxious and stressed than male students (Table 1).

A significant positive association between stress and coping strategies, both adaptive and maladaptive, was detected (Table 2). Students who used maladaptive coping strategies more frequently reported significantly higher levels of depression and anxiety. However, neither anxiety nor depression was significantly related to adaptive coping. Students with greater dissatisfaction with life indicated higher levels of depression, anxiety, and stress. In addition, students with lower GPA were more depressed ($r = –.13$, $p < .05$). Other demographics such as ethnicity and the place of residency were not significantly related to any of the three mental health factors.

Independent Predictors of Depression, Anxiety, and Stress

Life satisfaction, adaptive coping, maladaptive coping, and demographics were entered together as predictors of the three dependent variables in a three separate multiple regression analyses. Selected demographics included age, gender, class standing, GPA, living status, belonging to a social organization, and religious self-identification (religious or not).

The significant independent predictors of depression were maladaptive coping and life satisfaction (Table 3). The overall model $F(10, 324) = 46.2$, $p < .0001$, accounted for 60% of the variance of depression. Likewise, for anxiety, maladaptive coping and life satisfaction were the only significant predictors (Table 4) with the overall model $F(10, 324) = 24$, $p < .0001$, accounting for 43% of the variance of anxiety.

The significant predictors of stress were maladaptive coping, life satisfaction, gender, and GPA (Table 5). The overall model $F(10, 324) = 29$, $p < .0001$, accounted for 50% of the variance of stress.

The Relative Influence of Predictors

Maladaptive coping had the strongest influence on the three mental health factors, depression, anxiety, and stress ($\beta = .54, .60, .53$, $p < .0001$, respectively). For every one score increase in maladaptive coping, each of the three mental health factors increased by one score. Adaptive coping was not a significant predictor of any of the three mental health factors. As compared to maladaptive coping, life satisfaction had a relatively low influence on the three mental health factors ($\beta = –.40, –.15, –.30$, $p < .0001$, respectively). For every one score increase in life satisfaction, depression, anxiety, and stress decreased only by .36, .11, and .30 of a score.

Most demographics were non-significant predictors. Even though gender and GPA were significant predictors of stress, they had very low influence ($\beta = .09$ for each).

Limitations

The cross-sectional design and use of one setting were limitations in this study. Future longitudinal studies would strengthen our understanding of how students' use of maladaptive coping strategies may affect their levels of depression, anxiety, and stress. Also, most of the students in this study were Caucasian; thus, caution should be used when extending these results to other racial or ethnic groups. The use of multiple analyses in this study increased the chance of a Type 1 error. However, because all p values of the major predictors in the regressions were at $p < .01$ or less, it is likely that the findings do not reflect a Type 1 error and therefore, are not spurious.

Discussion

We studied young adults' mental well-being within the context of the campus culture. The use of the shortened version of the BSMLSS facilitated our understanding of how students' satisfaction with their college and social lives can be related to their mental well-being. Certain psychosocial and cultural characteristics, such as belonging to a fraternity or sorority, living with someone, being religious, and being more satisfied with the college life, need to be taken into account when assessing students' levels of depression, anxiety, and stress. Based on a similar conclusion, previous studies recommended implementing strategies and programs that support students' networks and enhance their satisfaction with their college and social lives (Coffman & Gilligan, 2002; Misra & McKean, 2000).

Summary Statements

1. Young adult college students experience increased levels of depression, anxiety and stress
2. Maladaptive coping was the main predictor of depression, anxiety and stress
3. Reducing maladaptive coping behaviours might have the most positive impact on reducing depression, anxiety and stress in this population.
4. 40 million American adults suffer from anxiety and 75% experience their first episode in young adulthood (age 22)
5. Unmanaged anxiety can lead to substance abuse and depression
6. Increase in depression within college students from 10% in 2000 to 15% in 2006
7. Depression is second leading cause of death among college students resulting in 1,100 lives lost each year.
8. Young adults (18-24) are “emerging adulthood”, and are in a transitional developmental stage, requiring them to develop skills for maintaining independence, developing and maintain intimate relationships (which can be stress-arousing and anxiety provoking). Failure to accomplish these developmental tasks may result in life dissatisfaction.
9. Anxiety and depression are associated with low life satisfaction, which results from the inability to meet the needs in valued areas of life.
10. Depression and anxiety is not directly caused by stressors. It is a state that results from an individuals perception and reaction to those stressors. The impact of stressors experienced is determined by the individuals ability to effectively cope with stressful situations.
11. 2 stress-coping mechanisms: adaptive and maladaptive
12. Adaptive coping behaviours: defining the stressful situation, actively seeking support, reflecting on possible solutions, and taking actions to resolve the situation

13. Maladaptive coping behaviours: withdrawal from the stressful situation or avoid seeking solutions (this may result in failure to resolve and is associated with anxiety).
14. Young adults use more maladaptive coping strategies (like escape-avoidance) compared to other ages.
15. Maladaptive coping strategies in college students depends on cultural or demographic characteristics (fraternities/sororities, religion, gender, residency, academic performance)
16. Higher depression scores within sophomores (18-19 years old) than older students (Being in new unfamiliar situations can cause a lot of stress)
17. Students who lived with someone or belonged to social organization were less depressed, anxious and stressed. (having a support group, or people to talk to > loneliness)
18. Students who identified as religious were less depressed and anxious than those who were not religious. (religion allows for hope and belief, and a purpose)
19. Female students were more anxious and stressed than male students
20. Students who used maladaptive coping strategies had significantly higher levels of depression and anxiety.
21. Students with greater dissatisfaction with life indicated higher levels of depression, anxiety, and stress.
22. Students with lower GPA were more depressed
23. Out of maladaptive coping, life satisfaction, gender and GPA, Maladaptive coping had the strongest influence on depression, anxiety and stress.

Key Article 2

Method

A key article for this topic was sourced and selected. Required article content was copied and highlighted.

- Search Engine: Google
- Key Words Used in Search: “maladaptive coping mechanisms depression”

Findings

Citation: Thompson, R. J., Mata, J., Jaeggi, S. M., Buschkuehl, M., Jonides, J., & Gotlib, I. H. (2010). Maladaptive coping, adaptive coping, and depressive symptoms: Variations across age and depressive state. *Behaviour research and therapy*, *48*(6), 459-466.

Key Content: is reproduced below.

Abstract
Rumination has consistently been found to be associated with the onset and duration of major depressive episodes. Little research, however, has examined factors that may weaken the association between maladaptive coping, such as rumination, and depressive symptoms. In three samples of participants, including 149 never-depressed adolescent girls, 41 never-depressed women, and 39 depressed women, we examined whether generally adaptive forms of coping interacted with generally maladaptive forms of coping to predict depressive symptoms. Age-appropriate measures of coping and depression were administered to participants in each sample. In never-depressed females, maladaptive coping/rumination were more strongly related to depressive symptoms in the presence of lower levels of adaptive coping. The relation between depression and maladaptive coping/rumination was weaker in the context of higher levels of adaptive coping. In contrast, for the depressed females, we found main effects for rumination and adaptive coping, with higher levels of rumination and lower levels of adaptive coping being associated with higher levels of depressive symptoms. The present findings highlight how adaptive coping and maladaptive coping, including rumination, differentially relate to each other and depressive symptoms depending on individuals' current depressive state.

Introduction

Virginia Satir, a prominent clinical therapist, said, "Problems are not the problem; coping is the problem." This statement illustrates that individuals can respond to stressful experiences in both adaptive and maladaptive ways. In fact, people utilize a variety of strategies in responding to stress. It is not clear, however, how adaptive and maladaptive ways of coping interact to predict negative outcomes associated with stress, such as depression (e.g., Brown & Harris, 1989; Monroe, Slavich, & Georgiades, 2009).

There is a long history of theory and research concerning the nature of coping (Endler & Parker, 1990; Fabes & Eisenberg, 1997; Lazarus & Folkman, 1984). Investigators differ in how they categorize various forms of coping (e.g., emotionfocused vs. problem-focused coping; approach vs. avoidance; see Skinner, Edge, Altman, & Sherwood, 2003, for a review). Skinner et al. (2003) argue that it is useful to distinguish among different forms of coping based on whether they are harmful or helpful.

Apart from examining the use of alcohol and illicit substances, research on harmful or maladaptive coping has focused largely on rumination. Almost 30 years of research has documented the adverse effects of rumination, defined as persistent and recurring thoughts focused on one's depressive symptoms and on the implications of those symptoms (Joormann, Dkane, & Gotlib, 2006; Nolen-Hoeksema, 2000). Rumination has been found to be a relatively stable trait in numerous samples, including college students, community residents, and inpatient populations (see Bagby, Rector, Bacchiochi, & McBride, 2004, for a review). Rumination has been found to prospectively predict changes in depressive symptoms (e.g., Abela, Aydin, & Auerbach, 2007).

Rumination has been found to be related to a variety of maladaptive cognitive styles (e.g., negative attributional style). In fact, rumination is sometimes considered to be an exemplar of a broader range of reactions to stressful events, or what Compas and his colleagues (e.g., Connor-Smith, Compas, Wadsworth, Thomsen, & Saltzman, 2000) refer to as involuntary responses to stress (see also Eisenberg, Fabes, & Guthrie, 1997). In addition to rumination, other examples of maladaptive coping include emotional numbing, escape, and intrusive thoughts. Not surprisingly, these forms of maladaptive coping have been found to be associated with high levels of psychological distress, such as symptoms of anxiety and depression, in both adolescents (e.g., Jaser et al., 2005; Marcks & Woods, 2005) and adults (e.g., Morillo, Belloch, & García-Soriano, 2007; Sarin, Abela, & Auerbach, 2005).

Although many individuals report experiencing at least mild levels of rumination (e.g., Treynor, Gonzalez, & Nolen-Hoeksema, 2003), most people do not develop diagnosable depression. Only a few studies have examined factors that may interact with maladaptive coping to decrease the likelihood that they will lead to or exacerbate symptoms of depression. For example, Olson, Hugelshofer, Kwon, and Reff, (2005) found that among undergraduate students, affiliative and self-enhancing forms of humor interacted with rumination to predict dysphoria: among participants with high rumination, those with high adaptive humor had significantly lower levels of dysphoria than did those with low adaptive humor. Nolen-Hoeksema and Davis (1999) found that after the loss of a loved one, higher levels of emotional support were significantly related to reduced depressive symptoms in high, but not in low, ruminators.

In this context, it is important to note that several other forms of coping (e.g., cognitive restructuring, problem-solving coping) have been found to be associated with decreases in psychological distress and better physical health (e.g., Connor-Smith & Compas, 2004; Hong, 2007). Moreover, a number of cognitive-behavioral interventions focus on teaching depressed individuals specific forms of adaptive coping. For example, in the Depression Prevention Course, depressed individuals are taught to identify negative or destructive thoughts and replace them with positive or constructive thoughts (i.e., cognitive restructuring; Muñoz, 1984/1998). Similarly, Problem-Solving Therapy focuses on helping depressed patients learn to identify and resolve problems (D'Zurilla & Nezu, 2006; Nezu, Nezu, & Perri, 1998). It is possible, therefore, that these other forms of adaptive coping will diminish the association between maladaptive coping and symptoms of depression.

The present study was designed to examine whether forms of adaptive coping interact with maladaptive coping, including rumination, to predict levels of depressive symptoms. To address this question, we examined the associations among forms of adaptive coping, maladaptive coping, and depressive symptoms in three samples of females: one sample of neverdepressed girls, one sample of never-depressed adult women, and one sample of currently depressed adult women. We examined samples of adolescents and adults in part because of evidence that the tendency to ruminate increases with age

(Hampel & Petermann, 2005). Moreover, because depressed mood have been found to be associated with changes in rumination (e.g., Kasch, Klein, & Lara, 2001; Kuehner & Weber, 1999), we assessed adolescents and adults with no history of Major Depressive Disorder (MDD). Finally, we also included a sample of currently depressed women in order to examine our hypotheses in a clinical sample. We hypothesized that regardless of age or depressive state, maladaptive coping, such as rumination, would be less strongly related to depressive symptoms in the context of higher levels of adaptive coping.

Discussion

In this study we examined whether adaptive coping in the presence of maladaptive coping was associated with lower levels of depressive symptoms in three distinct samples of participants: nondepressed adolescent girls, nondepressed women, and depressed women. Our central hypothesis was supported in both nondepressed samples: the associations between depressive symptoms and maladaptive coping (adolescent sample) / rumination (adult sample) depended on the level of adaptive coping, such that the relation between maladaptive coping / rumination and depression was stronger when levels of adaptive coping were low. This pattern was evident for both forms of adaptive coping in both the nondepressed adolescents and the nondepressed adults. High levels of adaptive coping appeared to act as a protective factor in the presence of maladaptive coping such as rumination.

Our results indicate that adaptive coping is important for nondepressed adolescent girls, independent of familial risk for depression, extending work by Hampel and Petermann (2005), who compared levels of coping in children and adolescents. Although children and adolescents in that study did not differ in their use of the form of coping that was most reflective of primary control coping (i.e., situational control), adolescents reported higher levels of rumination than did children. The present investigation demonstrates that in both adolescents and adults, adaptive coping functions to reduce depressive symptoms in the presence of such maladaptive coping as rumination.

Previous findings concerning the associations between psychological distress and adaptive forms of coping across adolescent and adult studies have been mixed. Similar to our findings with our adolescent sample, other investigators have not obtained a significant relation between psychological distress and either primary control (Jaser et al., 2007; Langrock, Compas, Keller, Merchant, & Copeland, 2002; Silk, Steinberg, & Morris, 2003) or secondary control (Silk et al., 2003; Connor-Smith & Compas, 2004). Thus, these forms of generally adaptive coping may be related to depressive symptoms only in the context of higher levels of rumination, as we found in the adolescent sample. And similar to our findings in the adult samples, problemsolving coping is not always associated with decreased psychological distress in the adult literature (Skinner et al., 2003). Other researchers, however, have reported a significant relation between primary control and psychological distress (e.g., Connor-Smith & Compas, 2002; Connor-Smith et al., 2000) as well as between secondary control and psychological distress, as we found in the depressed adults (e.g., Connor-Smith & Compas, 2002; Langrock et al., 2002). It is clear, therefore, that much more work needs to be done to elucidate the nature of the relations among adaptive and maladaptive coping and psychological distress.

The present finding that adaptive coping appears to interact with rumination and maladaptive coping is relevant to Nolen-Hoeksema's response styles theory (e.g., Nolen-Hoeksema, 1991; Nolen-Hoeksema et al., 2008). One of the mechanisms through which Nolen-Hoeksema theorized that rumination exacerbated depression was by interfering with effective problemsolving; indeed, Morrow and Nolen-Hoeksema (1990) and Watkins and Baracaia (2002) provided empirical support for this formulation. The results of the present study complement these findings by indicating that in the presence of adaptive forms of coping, the relation between rumination and depressive symptoms is weakened for individuals without diagnosable MDD. As noted earlier, rumination has been found to be a relatively stable trait; thus, identifying mechanisms that reduce the expression of this trait is a promising step toward decreasing risk of depression. To test the direction of causality, however, future research will have to use an experimental or longitudinal design, perhaps utilizing experience sampling methodologies, which would also minimize biases inherent with retrospective reports of adaptive coping (e.g., Stone et al., 1999).

The central hypothesis of this study was supported in two samples of nondepressed females. In both nondepressed

samples, findings were stronger when examining the form of adaptive coping that included problem-solving than for the form that included cognitive restructuring. The strength of the two interactions of adaptive coping and rumination were more similar in the nondepressed adults then they were in the nondepressed adolescents. Generalizability of the findings may be limited because of the relatively small size of the nondepressed adult sample.

In contrast with the results from the two nondepressed samples, our central hypothesis was not supported in our sample of depressed women. Instead, for depressed women, higher levels of both forms of adaptive coping were associated with lower levels of depressive symptoms, and higher levels of rumination were associated with higher levels of depressive symptoms. Future research is needed to examine why, for depressed women, the relation between adaptive forms of coping and depressive symptoms were not contingent on rumination, and why the relation between rumination and depressive symptoms were not contingent on adaptive forms of coping.

Although not examined specifically in this paper, it is possible that the differences we obtained between depressed and nondepressed participants are due to the strength or the temporal nature of coping. For example, individuals without MDD may realize that they are ruminating and switch to a more adaptive form of coping. This switch may be sufficient to improve their mental state and keep them from exacerbating their negative affect. In contrast, when depressed individuals ruminate, it is likely that they have difficulty engaging more adaptive forms of coping, either because the intensity of their rumination is stronger than it is in nondepressed persons, or because they have fewer adaptive coping resources. In fact, investigators have found that depressed individuals cannot easily inhibit negative thoughts and remove negative material from working memory (e.g., Joormann & Gotlib, 2008; Joormann et al., in press), making it difficult for them to disengage with rumination and cope more adaptively.

Other aspects of this study also warrant attention. First, whereas we examined a broad range of maladaptive coping in the adolescent sample, we assessed a specific form of maladaptive stress response, rumination, in the adult samples. Although findings in both nondepressed samples were similar regardless of the specificity of our measure of maladaptive coping, future research should examine whether the results replicate when examining other forms of maladaptive coping (e.g., emotional numbing, escape) in adult samples. Second, as we noted earlier, although some researchers (e.g., Connor-Smith et al., 2000; Hartlage, Alloy, Vázquez & Dykman, 1993) have conceptualized such maladaptive coping as rumination as 'involuntary,' other investigators have ignored the degree to which coping might be involuntary or automatic (e.g., Carver et al., 1989). Consequently, the automaticity of adaptive and maladaptive coping remains an empirical question. Third, because we assessed only females in this study; we do not know, therefore, whether these results generalize to boys and/or men. This is a particularly important question because investigators have documented gender differences in coping (e.g., Kelly, Tyrka, Price, & Carpenter, 2008; Matud, 2004) and rumination (e.g., Nolen-Hoeksema, Larson, & Grayson, 1999). It remains for future research, therefore, to examine the nature of the association between adaptive coping and rumination in males. Finally, although investigators have distinguished between two factors of rumination, brooding and reflective pondering (e.g., Treynor et al., 2003), we found that these two factors interacted similarly with adaptive coping to predict depressive symptoms. It will be important in future studies to examine whether these two rumination factors are more strongly distinguishable in predicting other forms of psychopathology.

In sum, the present study builds on and expands both theoretical and empirical work examining adaptive coping, maladaptive coping, and depression. The findings of this study highlight how rumination and coping are differentially related to each other depending on individuals' current depressive state, and how this pattern appears to be stable from adolescence to adulthood. Indeed, lower levels of maladaptive coping, in combination with higher levels of adaptive coping, may explain the resilience of our nondepressed participants.

Summary Statements

1. “Problems are not the problem, coping is the problem” – Virginia Satir
2. Rumination (obsessively thinking about something, repetition of the same thought in your head over and over, overthinking) along with substance abuse and alcohol abuse is one of the more researched in maladaptive coping.
3. Other maladaptive coping:
    a. emotional numbing
    b. escape
    c. intrusive thoughts
4. Higher levels of emotional support led to reduced depressive symptoms in high ruminators (overthinkers), but not in low ruminators (people who don’t overthink).
5. Individuals without MDD (mild depressive disorder) may realize they are overthinking and switch to a more adaptive form of coping. This switch can improve their mental state.
6. Individuals with depression may have difficulty using more adaptive coping mechanisms, either because:
    a. Intensity of rumination is stronger
    b. Fewer adaptive coping resources (loneliness, no one to talk to, etc.)
7. Individuals with depression have trouble restraining negative thoughts and removing negative material from their memory. This makes it difficult for them to disengage with rumination (overthinking).

APPENDIX B – USER RESEARCH

OBJECTIVE OF THE USER OBSERVATION:

To understand the user better, and to find the main pain points throughout the day.

USER (INDIVIDUAL & GROUP):

2 videos were found on YouTube of a day in the life with depression. The users were 2 female young adults. 1 survey was conducted on the reddit group “Social Anxiety”. 4 of the participants were clinically depressed and were young adults.

METHOD:

Type of User Observation

2. Video Observation
3. Survey

METHOD

ADVISOR INTERVIEW

On October 27 2020 a meeting was set up with an advisor studying in the field of psychotherapy. The following is a recap of the conversation using the *Otter App* with Advisor Christine Kim.

VIDEO URL

Video #1

URL: https://youtu.be/zQsq5TMKEsQ

Title: A day in the life of someone with depression

Summary: The video is about 11 minutes long and goes through a day in the life of someone with depression. This person was at one of her lowest points.

Video #2

URL: https://www.youtube.com/watch?v=ekLYagBeJV0

Title: A day in the Life of Someone with Depression and Anxiety

Summary: The video is about 3 minutes long and goes through a day in the life of someone with depression and anxiety.

SURVEY

A survey was sent out and posted on various Reddit Groups. The majority of answers came from the “Social Anxiety” Reddit Group. However only the results from individuals diagnosed with clinical depression were used.

RESULTS

SURVEY RESULTS

Participant #1: 19 years old, mild clinical depression

Rank the difficulty of doing each of these activities:

Getting out of bed	Easy
Brushing teeth	Easy
Showering	Very Easy
making breakfast	Very Easy
commuting to school or work	Easy
getting work done	Hard
making lunch	Easy
eating lunch	Very Easy
getting ready for bed	Very Easy
going to sleep on time	Medium
having a good sleep	Very Easy

Participant #2: 25 years old, mild clinical depression

Rank the difficulty of doing each of these activities:

Getting out of bed	Hard
Brushing teeth	Very Easy
Showering	Very Easy
making breakfast	Medium
commuting to school or work	Easy
getting work done	Hard
making lunch	Medium
eating lunch	Medium
getting ready for bed	Hard
going to sleep on time	Very Hard
having a good sleep	Very Hard

Participant #3: 23 years old, mild clinical depression

Rank the difficulty of doing each of these activities:

Getting out of bed	Very Easy
Brushing teeth	Medium
Showering	Easy
making breakfast	Very Easy
commuting to school or work	Very Hard
getting work done	Very Hard
making lunch	Very Easy
eating lunch	Very Easy
getting ready for bed	Medium
going to sleep on time	Very Hard
having a good sleep	Medium

Participant #4: 33 years old, mild clinical depression

Rank the difficulty of doing each of these activities:

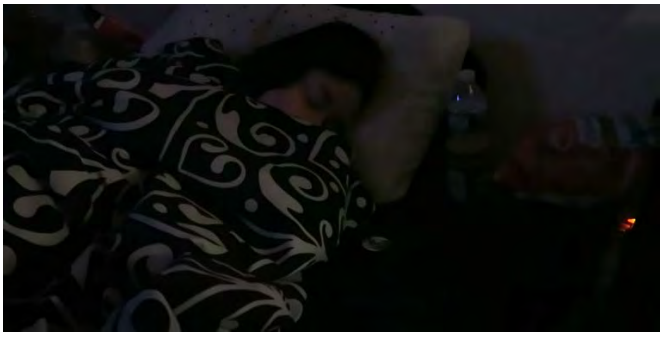
Getting out of bed	Medium
Brushing teeth	Very Easy
Showering	Medium
making breakfast	Hard
commuting to school or work	Medium
getting work done	Very Hard
making lunch	Hard
eating lunch	Medium
getting ready for bed	Hard
going to sleep on time	Hard
having a good sleep	Easy

Different people deal with depression differently. Every person has different reasons for depression and different pain points. In order to address this, all the pain points of the participants were taken into account. The hardest parts of the day:

- Getting out of bed was hard for 1 person
- Making breakfast was hard for 1 person
- Commuting to school or work was very hard for 1 person
- Getting work done was hard/very hard for all 4 people
- Making lunch was hard for 1 person
- Getting ready for bed was hard for 2 people
- Going to sleep on time was hard/very hard for 3 people
- Having a good sleep was very hard for 1 person

IMAGES FROM VIDEO

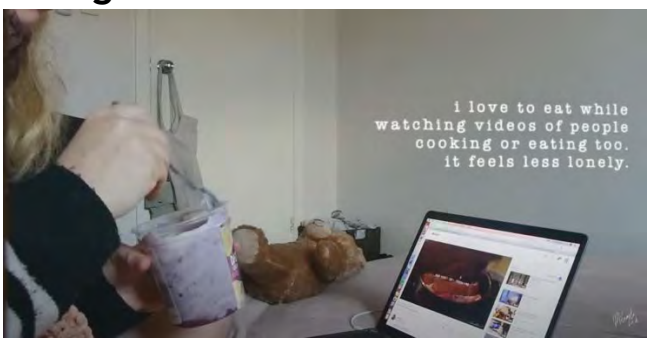
Getting out of bed:



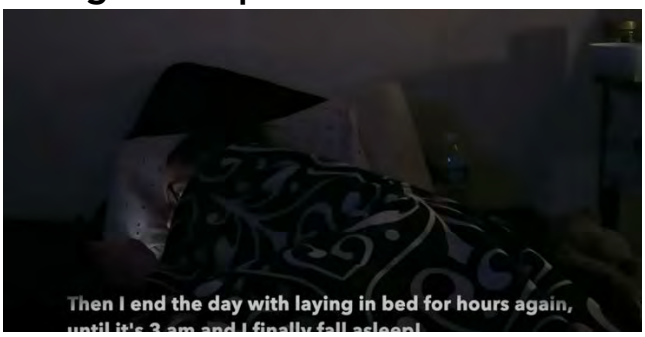
Commuting to School or Work:

Getting work done:

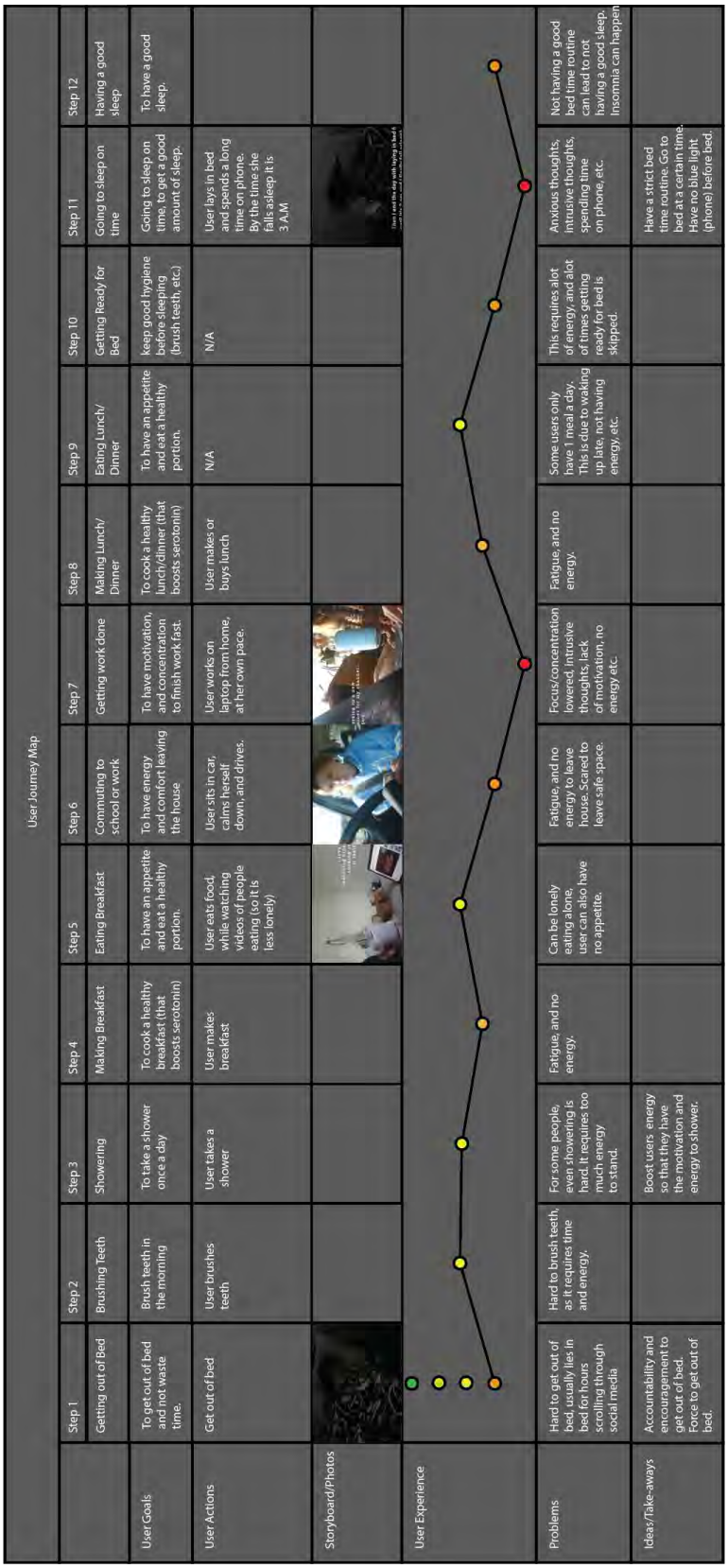
Eating Breakfast:



Going to sleep on time:



USER JOURNEY MAP



ADVISOR - FULL TRANSCRIPTION

Benjamin: Could you tell me a little bit about your field and how it relates to depression and anxiety?

Christine: Currently I'm finishing my master's in clinical counseling. It is a program where it meets the criteria for CRPO (College of Registered Psychotherapist in Ontario). My field is to become a psychotherapist. I am currently an intern at Rock of Peace Counseling in Richmond hill. What we do is therapy in all different fields whether its couples' therapy, depression, anxiety, trauma, borderline personality, life transitions, things like that.

Benjamin: I wanted to show you the ideations I had, and maybe I could get your thoughts on them? So the first Idea I had was a little accountability partner. So sort of like a little robot that would wake you up in the morning, you could do exercises with him, there would be daily reminders every day from friends.

Christine: Does it have to be a tangible physical product?

Benjamin: yes.

Christine: Because I was thinking… do you know what Woebot is? It's an app, it is a little robot and it's programmed to help you with your anxiety and depression and things like that. Obviously, an app is different from a product, but like if you wanted to look into that.

Benjamin: Yeah that is really helpful. Because the product I am going to design is probably going to have a combination of UX and a physical product.

Benjamin: From my research, I sorted the core needs out into 3 main categories.

4. Having someone to talk too:
    - Journaling
    - Group therapy with people going through similar issues
    - Talking to friends and family that are empathetic

5. Increasing Serotonin Levels:
    - Eating habits – good breakfast foods to eat that are high in tryptophan. Something that is easy to eat.
    - Exercise
    - Exposure to bright light
6. Decreasing Dopamine imbalances:
    - Stopping addictions and being held accountable. Reducing impulsive habits.

Do you have any tips, or anything to add on?

Christine: For having someone to talk too, how would that look like? So if we took the "little robot ideation" example, how would the little robot help with you feeling loved or accepted? Was it when the friends text you?

Benjamin: Yes.

Christine: Well, anxiety is very different from depression. I would say the things you categorized lean more towards depression. Not that those things can't help with anxiety, but anxiety is very different. So for anxiety, have you ever heard of grounding techniques? There is this one technique called square breathing. So there's 4 sides to a square, basically you breathe in for 4 seconds, you hold it for 4 seconds, you breathe out for 4 seconds, and you hold that for 4 seconds. So as they're doing it, they are visualizing the square so they are not thinking about other thoughts (not anxious). So maybe that could be incorporated into a product.

Benjamin: So that would be like meditation and breathing techniques?

Christine: Yes, like mindfulness.

Benjamin: Okay yes. I am focusing more on depression.

Benjamin: What are some techniques you use in your therapy sessions?

Christine: There is something called focusing. It's a mindfulness technique, where we get the client to sort out everything they're dealing with in their life and put it into boxes. And

then you put it on a shelf. All the issues that you are dealing with on a daily basis which can be very overwhelming, you put it on a shelf. Then you ask the client to take one box from the shelf, that they want to deal with right here right now.

Benjamin: I think most of the ideas I have right now is centered around exercise. It is so hard to create a physical full body solution.

Christine: Dopamine and Serotonin is hard, because what people find pleasure in is all different right? So like, PERSON ONE likes food. When she sees food dopamine rushes to her head. I love food but I don't love it as much as PERSON ONE, so in that sense its very subjective.

Benjamin: I guess I was focussing more on addictions. What I researched so far is that more men tend to cope with depression by turning to addiction. So I was focusing more on addiction and its relation to dopamine.

Christine: Ah yes. This is why addicts find it so difficult to stop being addicts. Even though they want to stop, their brain doesn't want to associate anything else with dopamine. So nothing will satisfy the same dopamine levels as your addiction does.

Benjamin: Ah I see. Because I was reading, the more you do that addictive pattern, then your brain releases less dopamine each time you do it. So that's why your dopamine levels would be low and has a part to play in depression.

Christine: Did you read an example other than drugs?

Benjamin: They said gambling, drugs, and they said pornography too. So I think accountability for those 3 things as well as accountability for exercising would be helpful.

Christine: I see. Yes that is actually true, because that's why… okay we will take pornography for example. If you are a heterosexual male, heterosexual sex eventually isn't

pleasing enough. This is really extreme, but some people would dive into BDSM, or sleeping with other males. And it is not necessarily because they are homosexual, but it is because they are not satisfied with regular sex. Those are extreme cases but it can get like that.

Benjamin: Do you think that's also the same with drug addiction too? Like that's why certain drugs are gateway to harder drugs? For example needing a stronger kick?

Christine: Oh yes, for sure.

Benjamin: So exercise increases serotonin levels and is great for treating depression, but how do you get an individual with depression to be motivated to exercise if they aren't even motivated to get out of bed?

Christine: That's a great question. I think where I would start is getting them to set little goals throughout the day. So as someone who struggles with depression myself, like getting out of bed is so hard. Just even brushing your teeth is so hard. But, I think what I would do with my clients is to set little goals throughout the day. Just because you don't achieve all the goals doesn't mean you have failed. So depending on the client it could start really small. It can be as simple as taking off your blanket. Just take it off. Because you are using the blanket because its safe and comfortable, its almost like a hug. So take that off, and most clients feel very exposed. Now, just sit up. That could be the next step. And the third goal could be to put your feet on the floor. Fourth goal could be standing up, and fifth goal could be stretching. And that's all you can do for today, and that's okay. That is for someone who is stuck to their bed. Some people with depression, its not that hard to get out of bed, but its hard to get out of the house. So you could be like, make the bed, brush your teeth, get a glass of water, but you don't have to leave the house. Its depending on the client but setting goals would really help, because what people with depression eventually realize is that after months or weeks of depression they haven't done

anything and that adds further more to their shame or guilt. So allowing you to see that yes, you have it, but you are able to do all these things. So when you look back at this past week, look at all the things you've achieved. Even though you may have depression. So whose to say you can't eventually, (as you continue on these goals), get out of the house. If its someone who cant get out of the house, it could be just stepping outside for a breath of fresh air, or getting into the car. You don't have to turn it on.

Benjamin: That was really helpful. I didn't know it could be that extreme. Like even taking off your blanket.

Christine: Yep. Because being in it is like a safe haven, and you don't want to be part of anything outside of that blanket. And so taking that blanket off could be a huge step for somebody.

Benjamin: Out of the products below which of these products have you found to be the most effective?

7. Meditation Apps
8. Self Help Books
9. Antidepressants
10. Aroma Diffusers
11. Stress Balls
12. Weighted Blankets
13. Journaling
14. Light therapy

Christine: For depression? I don't know if I can give you most effective, because not everybody who has depression needs antidepressants, and not everybody who has depression needs therapy. And not everybody needs both. We as therapist say that the best combination is therapy and medication, because your serotonin levels in your brain diminish very quickly. And so your brain doesn't have the capacity to make it on its own, and that's why you need antidepressants at least to restabilize/jump start it. So most people there levels can be low,

but with depression you are extremely low on serotonin, how could you even want to go to therapy. The meds help you "serotonin wise", go back to normal, and then you can deal with it. So our philosophy is that having therapy and meds is the best combination, but it doesn't mean it's the best for the individual. Because some people they just need antidepressants, and some people just need therapy. I would say therapy is the best though, just having a therapist to talk too.

Depression comes in so many different ways. One example is someone just lost there mother to cancer. Now you're grieving, and you've fallen into depression because you start thinking about death a lot, you start thinking about things like "what is the point of me moving forward". And so exercise, while its great to help you feel better, its not going to help you cope or process the grief that you're going through. And so you need a person to help you go through that. Someone who may even be willing to cry with you. Like a stress ball is not going to like hug you, or like be empathetic with you. So that's one example.

Another example is you're from an Asian family and you've been told you're not good enough your whole life. And now you're in your mid-twenties and you think that you can't achieve anything because of what you've been told your whole life. And so you need someone to realize your strengths and help magnify those, rather than you focusing only on your weaknesses. Someone like that even though they have nine good things and one bad thing, that one bad thing is what is going to be overexaggerated and what is going to rule their life. And so you need a person to help you with your distorted thinking, like yeah sure that is a reality but you also have to accept the reality that there is nine other good things. There are many very different reasons why people are depressed.

Benjamin: Do you think journaling helps with that?

Christine: I think it depends on the person. For me, I love journaling, journaling really helps me process things, but not everybody is a writer. But I would say for a lot of people (and we recommend it to a lot of clients), journaling and putting it on paper is good. And sometimes it's just for you to see, and then sometimes you can take what you journaled, and you can bring it to your therapist and work it through together. But I would say that seeing it and writing it out instead of holding it in is good. Because you are going to carry "it" wherever you go, and it is not that once you write it out it's not a problem anymore, but once you write it, its out there. Its visible. Its tangible almost. For some people it's all they think about, but once you've written it, you've done it. And now I can focus on my assignment for school, or now I can meet up with my friend, and I'll give it an appointment/time and place to talk about it.

Benjamin: Are there any digital/physical products that have come out recently that you think are helpful in relieving symptoms of depression? You mentioned one already, Woebot?

Christine: There is one app called "Intellect". A friend said this one has fun puzzles, but its also a self-development app. The other app was called "Woebot, your selfcare expert". For Woebot, it primarily uses CBT. Cognitive Behavioural Therapy for anxiety and depression.

Benjamin: I read about CBT but I don't exactly know what it is. Could you explain?

Christine: It is just a therapy that addresses your thoughts. You take those thoughts and with a therapist you usually address them in different ways. So an example is, in CBT there is the ten most known distortions that people have. One is *"black and white thinking"* (all or nothing, ex: "I am always not good enough"), another is *"should statements"* (ex: "I should have done this"), and there's ten of these. So with Woebot, its good because it is very

accountable, so everyday it will message you right around the same time: “Hey Christine, how are you doing today?” Or like “Hey check out this new fun fact” to start a conversation, and it gives you like options to press. So it will ask you how do you feel right now, and then it will give you all these different emojis. Happy, sad. And it tracks all of those things. So the more you use it the more it will integrate what you said before. And it will run you through certain CBT methods.

Benjamin: Could video journaling work?

Christine: Yes, that could be interesting. But what would you do if the person doesn’t like seeing themselves or hearing their voices?

Benjamin: Well, it could be like the Otter app, where it transcribes what the user is saying into written words. There could be several options, one being video recording, another is voice recording, and another option is written journaling through voice. On top of that, the robot could be like a little therapist asking questions.

Christine: Well that could go either way. Have you thought about what types of questions you will be asking?

Benjamin: I was thinking simple questions. For example, “How are you doing today?” Or “How are you feeling today?”

Christine: Questions like that could work.

APPENDIX C – PRODUCT RESEARCH

Product Image	Product Name:	WOEBOT: Your self-care expert
	Description:	Woebot, our chat-based tool, is the delivery mechanism for a suite of clinically-validated therapy programs that address many of today's mental health challenges, from generalized anxiety and depression to specific conditions like postpartum depression, adult and adolescent depression, and substance abuse. Technically speaking, Woebot is an AI-powered, personalized emotional support platform that detects users' symptoms and delivers clinically-validated psychological interventions to achieve better outcomes. Woebot helps people cope with life's challenges by using brief

		conversations to ask people how they're feeling and what is going on in their lives, then delivers useful tools that are right for the mood and the moment. People can use Woebot on their own or in conjunction with traditional talk or medical therapy to get reliable and compassionate support, right when they need it most.
	Specifications:	- N/A - Price: Free
	URL:	https://woebothealth.com/ https://woebothealth.com/the-app/

Product Image	Product Name:	LOVOT
	Description:	"In recent years we've been seeing increasing efforts to create robots that show emotion or offer affection to people they interact with. Lovot is a new robot out of Japan with such an aim in mind. Created by Tokyo-based Groove X, Lovot — which comes from combining "love" and "robot" — is a cute companion robot that's been in development for the last three years. It's just over a foot tall and in many ways resembles a child's cuddly toy. But Lovot is trying to be something altogether smarter, as beneath its soft covering you'll find numerous sensors that detect human touch, though quite how it responds isn't entirely clear. There's also a less-hard-to-miss

		camera perched on its head for navigation.”
	Specifications:	- Sensors: Avoids Obstacles - Senses when someone is being hugged, and wants a hug - Facial Recognition - Price: 299,800 ¥ (3,750 CAD)
	URL:	- https://lovot.life/en/ - https://www.digitaltrends.com/cool-tech/lovot-is-a-cute-companion-robot-that-wants-to-give-you-affection/#:~:text=Lovot%20is%20a%20new%20robot,resembles%20a%20child's%20cuddly%20toy.
Product Image	Product Name:	BUDDY: The Emotional Robot
	Description:	“Behind this sweet name hides a robot with gentle curves, big sparkling eyes and a smile radiating the atmosphere, thus creating empathy and the desire to interact. As a real companion, BUDDY walks around your house like a pet. He is not just a friendly presence in the home, he is a real Swiss army knife that has many other really useful features. BUDDY connects, protects and interacts with every member of your family.

	Specifications: URL:	Behind his cheerful and sweet little face, BUDDY is your personal assistant, watches over your home, entertains your children and interacts with your smart home connected devices, among many other services." - 60cm tall - Price: - https://buddytherobot.com/en/buddy-the-emotional-robot/

Product Image	Product Name:	Tonal: The worlds most intelligent home gym
	Description:	"Tonal's patented digital weight system makes thousands of calculations a second to deliver you a smooth weight-lifting experience using magnets and electricity. By eliminating traditional metal weights Tonal can deliver 200 pounds of resistance in a device smaller than a flatscreen TV." - Get full body strength-building equipment and intelligent personal training for your most effective workout. - Lift up to 200 pounds of digital weights. Tonal learns from your workout and automatically adjusts to your body. - Accurately measure reps, sets, range of motion, time under tension, power, and volume to track gains over time. - Choose from 100s of expert-led workout programs to keep you motivated and help you feel your strongest. - Find efficient, effective, and engaging fitness programs tailored to your body and your fitness goals. - Work out without leaving your living room. Tonal saves on space and works on your schedule.

	Specifications:	- Width: 21.50" - Height: 50.9" - Max Tension: 100 lbs per arm - Wireless (uses Wi-Fi) - Bluetooth 4.2 wireless technology - Line voltage: 120V - Frequency: 60hz - Amps: 12 AMP - Recommended 7 feet of wall space and floor space during workouts. - Grounded outlet - Audio: 15W Stereo speakers - Price: $2,745
	URL:	- https://www.tonal.com/product/tonal/

Product Image	Product Name:	HUSH: Therapeutic Weighted Blanket
	Description:	"Like a much-needed hug, the Hush Weighted Blanket helps turn stress and anxiety into 100% CALM. But, if you're not feeling the calm after 100 nights, return it for a FULL refund. That's how confident we are that you'll love this science-backed, stress-reducing (lowering cortisol), happiness-inducing (upping serotonin) and sleep-initiating (hello, melatonin) weighted blanket! Simply get the blanket that's 10% of your body weight or 10% of you and your sleep partner's combined weight. And, if you're in-between weights, simply go for the heavier blanket."
	Specifications:	- 20 lbs or 15 lbs - Weight helps alleviate Insomnia - Reduces stress and anxiety levels - Deep Touch Pressure Therapy - Price: $279
	URL:	- https://hushblankets.ca/products/hush?gc_id=6483172467&gclid=Cj0KCQiAwMP9BRCzARIsAPWTJ_FBfeoE0zRtwF6ph-pXVvV_qvt89wt41_nX0mMfAbSkajncSBXcklgaAu4AEALw_wcB&variant=32468470825048

Product Image	Product Name:	PHILLIPS SmartSleep Wake-Up Light Therapy Lamp
	Description:	"For those who find themselves prone to oversleeping this time of year, the Philips SmartSleep Wake-Up Light Therapy Lamp could help. Once you set your wake-up time, the device will slowly emit light all around your room to mimic waking up with the sun rising. It's so effective that during an independent study, 92% of respondents found it made it easier to get out of bed." – CNN - **Simulate a natural sunrise to wake up refreshed** - **Sunset simulation prepares your body for sleep** - **Light-guided breathing helps you relax to sleep**
	Specifications:	- **1.98 lbs** - **LED Lamp** - **Smart Snooze** - **5 feet cord length** - **8.8" x 8.6" x 4.7"** - **Price: $179.95**
	URL:	- https://www.cnn.com/2020/09/30/cnn-underscored/best-light-therapy-lamps/index.html - https://www.philips.ca/c-p/HF3650_60/smartsleep-sleep-and-wake-up-light

Product Image	Product Name:	ASAKUKI Essential Oil Diffuser
	Description: Specifications: URL:	"For many Amazon shoppers, this diffuser was a top pick because it also acts as a humidifier and helps keep rooms at 50 percent humidity. With seven different lamp color options, three timers (60, 80, and 120 minutes), and an auto-off safety switch, this is a great diffuser for people new to essential oils." - 1000ml - 20.3 x 20.3 x 14 cm - Aromatherapy Diffuser - Multiple Mist Diffuse modes - Safety auto-switch that prevents overheating - Improves Air Quality - Air purifier and humidifier - Eco-friendly PP materials - Price: $46 CAD - https://www.marthastewart.com/1532640/best-selling-essential-oil-diffusers-according-thousands-five-star-amazon?utm_source=pinterest.com&utm_medium=social&utm_campaign=marthastewartliving_marthastewart_13893569&utm_content=standard&utm_term=homedecor_201810

		- https://www.amazon.ca/ASAKUKI-Essential-Ultrasonic-Aromatherapy-Humidifier/dp/B07C5P3V25/ref=sr_1_1_sspa?dchild=1&gclid=Cj0KCQiAwMP9BRCzARIsAPWTJ_ED4mjIhq5kSSHKBsoP92Uy54yB666agqVy7aZPipRqGzgh3kyNkRAaAkMIEALw_wcB&hvadid=232054704368&hvdev=c&hvlocphy=9000786&hvnetw=g&hvqmt=e&hvrand=4364658435112870564&hvtargid=kwd-307105818155&hydadcr=27231_10622065&keywords=asakuki+essential+oil+diffuser&qid=1605472019&sr=8-1-spons&tag=googcana-20&psc=1&spLa=ZW5jcnlwdGVkUXVhbGlmaWVyPUFNUzJSV0hNQVZHN0MmZW5jcnlwdGVkSWQ9QTAwMDI2NzYzVFpXUzQzWFJDMDNPJmVuY3J5cHRlZEFkSWQ9QTA1MDA3NjZTTDJLM0E4SVVNMFImd2lkZ2V0TmFtZT1zcF9hdGYmYWN0aW9uPWNsaWNrUmVkaXJlY3QmZG9Ob3RMb2dDbGljaz10cnVl

Product Image	Product Name:	ISOFLEX: Smiley Stress Ball
	Description: Specifications: URL:	"Gayla IsoFlex smiley stress ball for stress relief. Take your stress away with the famous IsoFlex Stress Ball. This yellow happy face version is sure to make you smile. The IsoFlex is double lined with natural latex for extra durability and is filled with micro beads for a unique soothing feel. Squeeze it to relieve stress and get a nice massage for your hands. The IsoFlex smiley stress ball will add some cheer to your day and liven up your workspace." - Use frequently as you desire to aid in stress reduction - Exerting pressure to the IsoFlex will help to displace aggression - This is a great way to help rebuild wrist and forearm muscles - 6.1 x 5.33 x 7.37cm - 157.94 grams - Double lined with natural latex for extra durability and is filled with micro beads for a unique soothing feel - 6-inch diameter - Price: $17.99 - https://www.amazon.ca/Gayla-IsoFlex-Smiley-Stress-1-Count/dp/B000S0D1W6/ref=sr_1_8?dchild=1&gc

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APPENDIX J – APPROVAL FORMS

IDSN 4002
SENIOR LEVEL THESIS ONE

Humber ITAL / Faculty of Applied Sciences & Applied Technology
Bachelor of Industrial Design / FALL 2020
Catherine Chong / Sandro Zaccolo

FTA-4 THESIS TOPIC APPROVAL (TEMPLATE)
This project/assignment constitutes 5% of total mark for the course

Start: Week #4 / Sep-28
Due: Week #5 / Oct-05

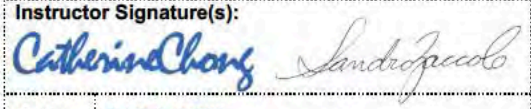
THESIS TOPIC APPROVAL:

Student Name:	Benjamin Chew
Topic Title:	How Might We Augment Depression and Anxiety Treatment for Young Adults?

Abstract

Mental illnesses such as depression and anxiety are prevalent in the young adults of today's western society. In recent years, the rate of depression has been increasing in young adults and continues to grow. Approximately 800,000 people lose their life to suicide every year, making it the second leading cause of death in 15 to 29-year olds. Substance abuse, major traumatic events, and changes in life stages are all common triggers for depression and anxiety. However, maladaptive coping methods such as excessive overthinking, withdrawal, and avoiding help are proven to be the primary causes. This is especially true in young adults where these traits are more common than any other age group. For these reasons, young adults are the primary target user for this project. With further research into the users' needs through interviews, user studies, and testing of current solutions, new ways of coping with depression and anxiety will be explored. These coping methods will be tested through surveys asking the target users to rate which coping methods are most helpful to them. With the information discovered, various coping methods will be combined to provide a full body solution that helps the user cope more adaptively with depression and anxiety.

Student Signature(s):	
Date:	12 / Oct / 2020

Instructor Signature(s):	
Date:	7 / Oct / 2020

Chong, Kappen, Thomson, Zaccolo

IDSN 4502
SENIOR LEVEL THESIS TWO

Humber ITAL / Faculty of Applied Sciences & Technology
Bachelor of Industrial Design / WINTER 2021
Catherine Chong / Sandro Zaccolo

CRITICAL MILESTONES: APPROVAL FOR CAD DEVELOPMENT & MODEL FABRICATION

Student Name:	Benjamin Chew
Topic / Thesis Title:	Physical & Mental Health Enhancing Smart Chair

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THESIS DESIGN APPROVAL FORM

Thesis design is approved to proceed for the following:	[X]	**CAD Design and Development Phase**
Comment: Initial CAD progress well as of week #7/March 1st, detailing to refine.		

Thesis design is approved to proceed for the following:	[X]	**Model Fabrication Including Rapid Prototyping and Model Building Phase**
Comment: Design development progress well as of week #7/March 1st, once CAD is completed, can move forward to model fabrication from week #9 onward.		

Instructor Signature(s):	Catherine Chong Sandro Zaccolo
Date:	10th March 2021

PANEL ON RESEARCH ETHICS
Navigating the ethics of human research

TCPS 2: CORE

Certificate of Completion

This document certifies that

Benjamin Chew

has completed the Tri-Council Policy Statement:
Ethical Conduct for Research Involving Humans
Course on Research Ethics (TCPS 2: CORE)

Date of Issue: **3 October, 2020**

APPENDIX K – ADVISOR MEETINGS & AGREEMENT FORMS

INFORMATION LETTER

Research Study Topic: How might we augment treatment for depression and anxiety in young adults

Investigator: Benjamin Chew / 4168014844 / ben_chew_sept@hotmail.com

Sponsor: Humber ITAL, Faculty of Applied Sciences & Technology (IDSN 4002 & IDSN 4502)

Introduction

My name is Benjamin, I am an industrial design student at Humber ITAL, and I am inviting your participation in a research study on various problems that young adults facing depression deal with. These problems include maladaptive coping methods, lack of emotional support and low levels of serotonin and dopamine. The results will be contributed to my Senior Level Thesis project.

Purpose of the Study

This study is being conducted as an aid in designing an office desk chair that is capable of boosting serotonin levels through exercise and hugs and provides emotional support through artificial intelligence. With your help, I plan to address problems that depressed young adults face on a regular basis. This study is primarily based on understanding ergonomics, human interaction design activities, and user experience aspects of the research area.

Procedures

If you volunteer to participate in this study, you will be asked a series of questions pertaining to depression and anxiety. Your methods and procedures and/or personal experiences will be documented.

Confidentiality

Every effort will be made to ensure confidentiality of any identifying information that is obtained during the study. In the case of being recorded visually, your face will be masked /blurred or hidden. The information and documentations (photographs) gathered are all subject to being used in the final presentation of the study.

Participation and Withdrawal

Your participation in this study is completely voluntary and you may interrupt or end the study and the session at any time without giving a reason or fear of being penalized.

If at any point during the session, you feel uncomfortable and wish to end your participation, please let the moderator know and they will end your participation immediately.

Humber Research Ethics Board

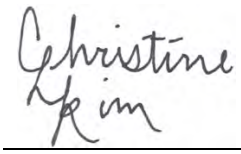
This research project /course has been approved by the Humber Research Ethics Board. If you have any questions about your rights as a research participant, please contact Dr. Lydia Boyko, REB Chair, 416-675-6622 ext. 79322, **Lydia.Boyko@humber.ca**

INFORMATION LETTER

Conditions of Participation

- ✓ I understand that I am free to withdraw from the study at any time without any consequences.
- ✓ I understand that my participation in this study is confidential. (i.e. the researcher will know but will not disclose my identity)
- ✓ My identity will be masked.
- ✓ I understand that the data from this study may be published.

☒ **I have read the information presented above and I understand this agreement. I voluntarily agree to take part in this study.**

Christine Kim		**January 1, 2021**
Participant's Name	Participant's Signature	Date

Project Information

Thank you very much for your time and help in making this study possible. If you have any queries or wish to know more about this Senior Level Thesis project, please contact me at the followings:

Phone: 4168014844
Email: ben_chew_sept@hotmail.com

My supervisors are:

Prof. Catherine Chong, **catherine.chong@humber.ca**
Prof. Sandro Zaccolo, **sandro.zaccolo@humber.ca**

PARTICIPANT INFORMED CONSENT FORM

Research Study Topic: How might we augment treatment for depression and anxiety in young adults

Investigator: Benjamin Chew / 4168014844 / ben_chew_sept@hotmail.com

Courses: IDSN 4002 & IDSN 4502

I, Christine Kim *(First Name/Last Name)*, have carefully read the Information Letter for the project How might we augment treatment for depression and anxiety in young adults, led by Benjamin Chew. A member of the research team has explained the project to me and has answered all of my questions about it. I understand that if I have additional questions about the project, I can contact Benjamin Chew at any time during the project.

I understand that my participation is voluntary and give my consent freely in voice recording, photography and/or videotaping; with the proviso that my identity will be blurred in reports and publications.

Consent for Publication: Add a (X) mark in one of the columns for each activity

ACTIVITY		YES	NO
Publication	I give consent for publication in the Humber Library Digital Repository which is an open access portal available to the public	☒	☐
Review	I give consent for review by the Professor	☒	☐

Privacy

All data gathered is stored anonymously and kept confidential. Only the principle investigator /researcher, Benjamin Chew and Prof. Catherine Chong or Prof. Sandro Zaccolo may access and analyze the data. All published data will be coded, so that visual data is not identifiable. Pseudonyms will be used to quote a participant (subject) and data would be aggregated.

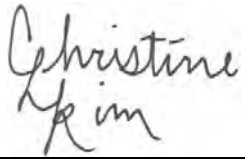
I also understand that I may decline or withdraw from participation at any time, without negative consequences.

I understand that I can verify the ethical approval of this study, or raise any concerns I may have by contacting the Humber Research Ethics Board, Dr. Lydia Boyko, REB Chair, 416-675-6622 ext. 79322, **Lydia.Boyko@humber.ca** or
Benjamin Chew / 4168014844 / ben_chew_sept@hotmail.com.

Verification of having read the Informed Consent Form:

☒ I have read the Informed Consent Form.

My signature below verifies that I have read this document and give consent to the use of the data from questionnaires and interviews in research report, publications (if any) and presentations with the proviso that my identity will not be disclosed. I have received a copy of the Information Letter, and that I agree to participate in the research project as it has been described in the Information Letter.

Christine Kim		**January 1, 2021**
Participant's Name	Participant's Signature	Date