

A PRODUCT SYSTEM TO AID PSYCHOTHERAPY OF DEPRESSED COLLEGE STUDENTS

PRODUCT DESIGN PROJECT III

BY
GOURAB SAHA
136130006

GUIDE: PROF. G.G.RAY



INDUSTRIAL DESIGN CENTRE
INDIAN INSTITUTE OF TECHNOLOGY BOMBAY
2015

DEGREE PROJECT 3 REPORT

A PRODUCT SYSTEM TO AID PSYCHOTHERAPY OF COLLEGE STUDENTS WITH MILD DEPRESSIVE DISORDERS

GUIDED BY
PROF. GG RAY
INDUSTRIAL DESIGN CENTRE
IIT-BOMBAY

COMPILED BY
GOURAB SAHA
MDES. (INDUSTRIAL DESIGN)
136130006

DECLARATION

I declare that this written document represents my ideas in my own words and where others' ideas or words have been included, I have adequately cited and referenced the original sources.

I also declare that I have adhered to all principles of academic honesty and integrity and have not misrepresented or fabricated or falsified any data/fact/source in my submission.

I understand that any violation of the above will be cause for disciplinary action by the Institute and can also evoke penal action from the sources which have thus not been properly cited or from whom proper permission has not been taken when needed.

Gourab Saha
136130006

Industrial Design Centre,
Indian Institute of Technology, Bombay
May, 2015.

APPROVAL SHEET

The project titled '**A PRODUCT SYSTEM TO REMEDY THE SYMPTOMS OF DEPRESSIVE DISORDERS IN COLLEGE STUDENTS**' by Gourab Saha, is approved for partial fulfillment of the requirement for the degree of 'Master of Design' in Industrial Design.

Guide:

A handwritten signature in blue ink, appearing to be 'Sant', written over a horizontal line.

Chairperson:

A handwritten signature in blue ink, appearing to be 'Ajay', written over a horizontal line.

Internal Examiner:

A handwritten signature in blue ink, appearing to be 'Rishi', written over a horizontal line.

External Examiner:

A handwritten signature in black ink, appearing to be 'Gourab', written over a horizontal line.

Date : 04-05-2015

ACKNOWLEDGEMENT

I would like to express my sincere gratitude to Prof.G.G.Ray for his support and guidance throughout the execution of the project.

Faculty and studio staff at Industrial Design Centre (IDC) have been very supportive and I thank them for that.

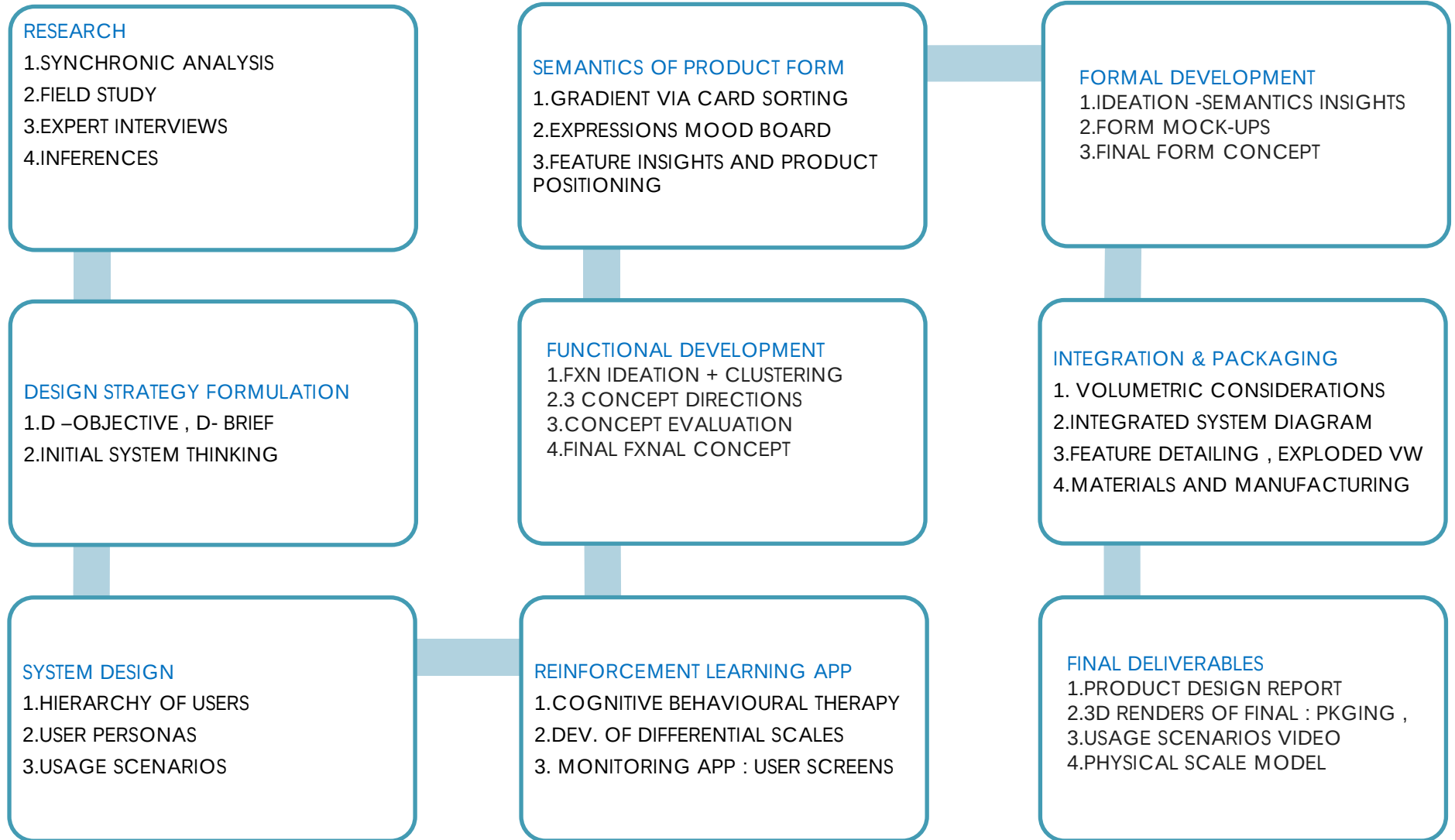
I also thank all the mentor health professionals and students interviewed at various stages of the project for guidance and feedback.

Last but not the least, I'd like to thank my friends at IDC for their support and suggestions during various discussions.

CONTENTS

1. INTRODUCTION
2. SECONDARY RESEARCH
3. PRIMARY RESEARCH
4. DESIGN STRATEGY
5. SYSTEM DESIGN
6. IDEATION AND CLUSTERING
7. CONCEPTUALISATION
8. SEMANTICS & FORM PERCEPTION
9. FORM DEVELOPMENT
10. USABILITY AND FEATURES
11. FINAL DESIGN PROPOSAL
12. REFERENCES

DESIGN METHODOLOGY FOLLOWED



1. INTRODUCTION

A study conducted in 2009 by the Bangalore-based National Institute of Mental Health and Neuro-Sciences placed the average age of the depressed Indian at 31 years.

Mental illness in India is high in the age group 30–40 and minor depression if not properly addressed could easily deteriorate into major depression.

This project aims to blend the design thinking process with Insights from behavioral psychology, to design a product system that remedies some of the core symptoms associated with mild depressive disorders in India's university students (18-30 year age group).

SYNTHESIS OF RELEVANT LITERATURE TO UNDERSTAND PRODUCT CATEGORY

2. DEPRESSION IN INDIA : STATISTICS

9 PERCENT

The percentage of of people in India reported having an extended period of depression within their lifetime.

3.5 PER MILLION

Percentage of Indians who had reported incidents of major depressive episodes (MDE).

35.9 PERCENT

No. of psychiatrists in India per million people

30 YEARS

The average age of the depressed Indian.

10 MILLION

Estimated number of depressed Indians.

**Statistics Ref : "INDIA: 10 Million Depressed – on the Optimistic Side" By K. S. Harikrishnan : Inter Press Service News Agency 2011*

3. UNDERSTANDING DEPRESSION

A. MAJOR TYPES OF DEPRESSIVE DISORDERS

MAJOR DEPRESSIVE DISORDER (MDD)

Is characterized by a pervasive and persistent low mood that is accompanied by low self-esteem and by a loss of interest or pleasure in normally enjoyable activities.

DYSTHYMIA

Is a mood disorder consisting of the same cognitive and physical problems as in depression, with less severe but longer-lasting symptoms.

MINOR DEPRESSIVE DISORDER

Is a mood disorder that does not meet full criteria for major depressive disorder but in which at least two depressive symptoms are present for two weeks.

CURRENT SCENARIO IN INDIA :

Mental illness is already high in the age group 30–40 , minor depression if not properly addressed could easily deteriorate into major depression.

B. SYMPTOMS OF DEPRESSIVE DISORDERS

- Fatigue or loss of energy almost every day
- Feelings of worthlessness or guilt almost every day
- Impaired concentration, indecisiveness
- Insomnia or hypersomnia almost every day
- Anhedonia: Markedly diminished interest or pleasure in almost all activities nearly every day
- Restlessness or feeling slowed down
- Recurring thoughts of death or suicide
- Significant weight loss or gain (a change of more than 5% of body weight in a month)

C. CAUSES OF DEPRESSIVE DISORDERS

1. Most likely, depression is caused by a combination of genetic, biological, environmental, and psychological factors.
2. The parts of the depressed person's brain involved in mood, thinking, sleep, appetite, and behavior appear different on MRI and brain imaging scans
3. Some genetics research indicates that risk for depression results from the influence of several genes acting together with environmental or other factors.
4. Trauma, loss of a loved one, a difficult relationship, or any stressful situation may trigger a depressive episode. Other depressive episodes may occur with or without an obvious trigger.

D. BRAIN NETWORK FUNCTIONS IN THE DEPRESSED

1. Brain regions, collectively known as the default mode network, behave differently in depressed people.
2. The default network typically is active when the mind wanders. It shuts down when an individual focuses on the job at hand.
3. Researchers found the network stays active in people who are depressed, even when they are concentrating on specific tasks.
4. Individuals with depression may not be able to "lose themselves" in work, music, exercise or other activities that enable most healthy people to get "outside" of themselves.

**Ref: Washington University Research Study 2009: news.wustl.edu/news/Pages/13649.asp*

E. TREATMENTS FOR DEPRESSIVE DISORDERS

PSYCHOTHERAPY :

Cognitive Behavioral Therapy (CBT)
Acceptance And Commitment Therapy (ACT)
Interpersonal Psychotherapy
Psychodynamic Psychotherapy

PHARMACEUTICAL DRUGS:

Selective Serotonin Reuptake Inhibitors (SSRIs)
Tricyclic Antidepressants

EXPERIMENTAL TREATMENTS:

Ketamine
Creatine
L-acetylcarnitine

MEDICAL DEVICES:

Electroconvulsive Therapy (ECT)
Deep Brain Stimulation
Transcranial Magnetic Stimulation (TMS)
Vagus Nerve Stimulation (VNS)
Cranial Electrotherapy Stimulation (CES)

OTHER TREATMENTS:

Bright Light Therapy
Music Therapy
Total/Partial Sleep Deprivation
Tryptophan And 5-HTP
Exercise, Sleep & Meditation
Smoking Cessation

4. SYNCHRONIC ANALYSIS

A. DAYBREAK HEADPHONES CONCEPT

INTENDED USERS:

Users that work in stressful work environments

WORKING PRINCIPLE:

A study published in the *Journal of Brain Stimulation* found that ultrasound waves applied to specific areas of the brain seemed to improve people's moods.

Participants who received ultrasound reported statistically significant improvements in mood 10 minutes and 40 minutes after the treatment, and a slight improvement in their pain, compared to those who received the placebo.

B. VALKEE , 2012

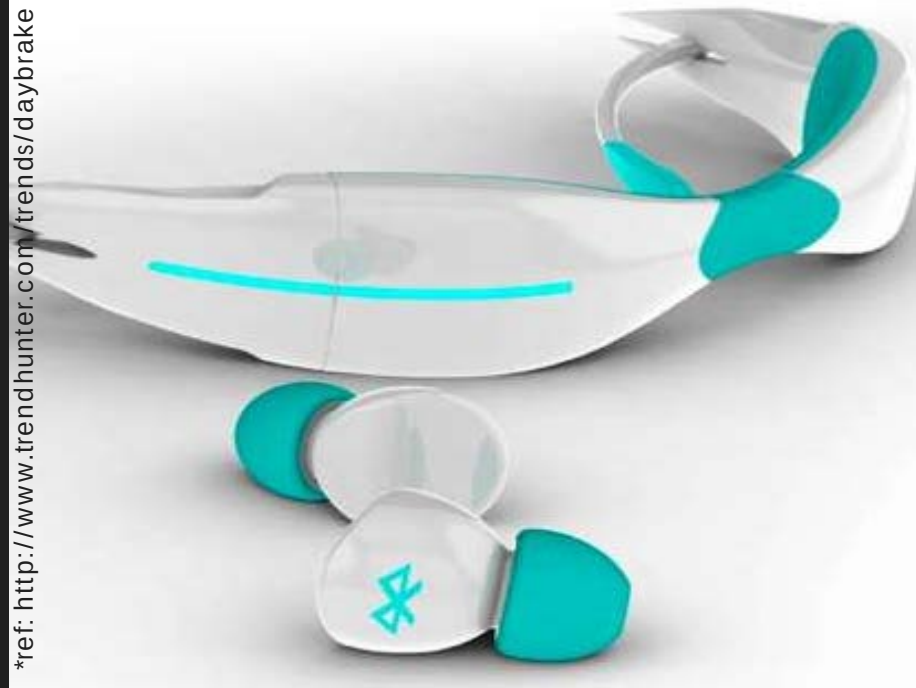
INTENDED USERS:

Users with Seasonal Affective Disorder

WORKING PRINCIPLE:

Valkee beams light directly onto the photosensitive areas of the brain. Worn like a pair of earbuds, Valkee emitters shine light on brain tissue through the ear canal, the thinnest part of the skull.

With only 6-12 minutes of use per day for a month, 92% of test subjects experienced increased energy, better mood and fewer carb cravings.



*ref: <http://www.trendhunter.com/trends/daybreak>

*ref: <http://www.thaimedicalnews.com/health-care-medical/valkee-brain-stimulation-device-improves-mood-and-reaction-time/>

C. MOODAGENT APP : MOOD MUSIC

INTENDED USERS:

Users who work in stress-induced situations

WORKING PRINCIPLE:

This new brand of application helps one overcome stress-induced situations by playing music that would normally help calm a person down and induce happiness.

The newest and most widely used 'happiness app' is MoodAgent, an app that knows your musical taste and can create the perfect playlist depending on how you are currently feeling.

D. THYNC : MOOD ALTERING ELECTRODES

INTENDED USERS:

Users that work in stressful work environments

WORKING PRINCIPLE:

Thync is based on is transcranial direct current stimulation, or tDCS, which uses a weak electrical current to change the sensitivity of neurons in the brain.

It targets specific cranial nerves with unique electric waveforms. A session using the device lasts around 10 minutes and the effects can last for anywhere up to about 45 minutes. The device is operated via a smartphone, which allows the user to control the amount of current and the strength of the effect.



E. SAM STRINGLEMAN'S MP3 PLAYER

INTENDED USERS:

General Population

WORKING PRINCIPLE:

Sam Stringleman's design invites users to experience it through touching it, which activates the emotional connection between the two.

Sam Stringleman's MP3 player senses the warmth of the user's hand and plays a song based on that information.

*ref: <http://www.trendhunter.com/trends/sam-stringleman>



<http://iq.intel.com/rooms-with-moods-built-in-emotional-awareness-is-changing-the-home-and-beyond/>

F. INTEL LABS :BUILT-IN EMOTIONAL AWARENESS

INTENDED USERS:

Home owners

WORKING PRINCIPLE:

The environment — lighting, temperature and acoustics, for example — has powerful effects on mood and relationships. Now, our devices, particularly our phones, can become a powerful intermediary between our environments and our psycho-social states. That is, they can potentially sense how we are doing and alter our environments accordingly.

By pairing data from bio sensing and communication with applications for modulating lighting, music and temperature, the phone has exciting potential for extending the continuity between internal and external.

5. EFFECT OF PHYSICAL STIMULUS ON MOOD & WELL-BEING

EFFECT OF LIGHT-THERAPY ON DEPRESSION

Light therapy has been suggested in the treatment of non-seasonal depression and other psychiatric disturbances.

Light therapy is an excellent candidate for inclusion into the therapeutic inventory available for the treatment of non-seasonal depression today, as adjuvant therapy to antidepressant medication, or eventually as stand-alone treatment for specific subgroups of depressed patients.

**Ref: Tuunainen, A; Kripke, DF; Endo, T (2004). Tuunainen, Arja, ed. "Light therapy for non-seasonal depression". Cochrane Database of Systematic Reviews (2): CD004050.*

EFFECT OF BINAURAL TONES ON ANXIETY

Binaural tones are auditory processing artifacts, or apparent sounds, caused by specific physical stimuli.

An uncontrolled pilot study of delta binaural beat technology over 60 days has shown positive effects on self-reported psychologic measures, especially anxiety. However only 15 people participated in this study. Of the few people that participated, there was reported a significant decrease in trait anxiety, an increase in quality of life, and a decrease in insulin-like growth factor-1 and dopamine, and it has been shown to decrease mild anxiety.

**Ref: Le Scouarnec RP, Poirier RM, Owens JE, Gauthier J, Taylor AG, Foresman PA. (2001). "Use of binaural beat tapes for treatment of anxiety: a pilot study of tape preference and outcomes". Altern Ther Health Med. (Clinique Psych in Montreal, Quebec.) 7 (1): 58-63.*

EFFECT OF AROMATHERAPY ON MOOD

In aromatherapy practitioners harness the healing properties of potent essential oils extracted from plants. By stimulating brain regions that influence emotion, for instance, essential oils may help calm your mind and lift your mood.

One of nature's cheeriest scents, lemon essential oil reliably enhances positive mood," according to a 2008 study of 56 healthy men and women. After breathing in the citrus fragrance, study members had an increase in their levels of norepinephrine (a brain chemical involved in mood regulation).

Known for its stress-easing abilities, lavender essential oil was found to lessen severity of depression in a 2006 study of 42 female college students. The study also showed that lavender-oil-based aromatherapy treatments helped ease the students' insomnia.

**Ref: http://altmedicine.about.com/od/aromatherapy/a/mood_aromatherapy.htm as seen on 30th Jan 2015*

ACUPRESSURE AND HEADACHE RELIEF

Headaches -- especially those brought on by anxiety, the common cold or menstruation -- are caused by a tightness and stiffness in the neck and face muscles that inhibit blood circulation.

Stimulating the pressure points by massaging them will help relax the tight muscles and increase blood circulation, thus relieving the headaches.

**Ref: <http://www.scientificamerican.com/article/tapping-natures-headache-remedies/> as seen on 30th Jan 2015*

GATHERING INSIGHTS FROM THE FIELD TO IDENTIFY DESIGN OPPORTUNIES

6. INSIGHTS FROM INTERVIEWS

CHARACTERISTIC TRAITS OF DEPRESSED STUDENTS

The following insights were compiled after after in-depth interviews with students & caregivers affected by depressive disorders (Names withheld):

- i. Most subjects interviewed complain of a sense of loss of control over their lives in general. Characteristic traits include an inability to concentrate on the task at hand and make simple decisions.
- ii. All subjects reported that they were unable to maintain healthy or regular sleeping and dietary patterns.
- iii. Depressed individuals characteristically withdraw from social interactions almost altogether, the outside world often becomes too much to deal with.
- iv. Affected individuals usually retreat to dark ,solitary places in order to avoid social interactions. Feelings of loneliness and exclusion are characteristic of depression.
- v. Interviewees complained of a recurring depressed mood and consequently a loss of interest in normally pleasurable activities.
- vi. A majority of the interviewees complained of headaches ,that feel like a recurring feeling of heaviness ,fuzziness in their head.
- vii. Some affected individuals that are prescribed anti-depressants feel that after the first couple of weeks of medication , some sort of dependence on the pills set –in .Depressive episodes escalate when pills are forgotten for example.

6. EXPERT INSIGHTS

EXPERT INTERVIEW 1 :

DR. RIMA MUKHERJEE

Consulting Psychiatrist , Kolkata

Affiliations:

- Woodlands Multi-Specialty Hospitals , Kolkata
- Crystal Wellness Clinic , Kolkata

1. Depressive disorders are complex to deal with because they are individualistic in nature.
2. In order to successfully develop a product that aids depression , a very tight user- group must be defined. (Similar diseases , age , client background etc.)
3. Treatment of major or severe depressive disorders require professional psychiatric / psychological assistance from trained medical professionals.(May not be replaced by a tangible product system)
4. Suggested Design Direction: A product system that alleviates Anxiety disorders in a specific user –group. (Eg. College Students)

EXPERT INTERVIEW 2 :

DR. JAYITA DEODHAR

Associate Professor (Psychiatry) & Physician ,Mumbai

Affiliations:

- Tata Memorial Hospital , HOD Clinical Psychology
- Indian Psychiatric Society

1. Depressive disorders are clinical disorders comparable to other diseases that affect the physical & mental well-being of patients.
2. Diagnosis of depressive disorders is criterion-based and depends on scientific determinants.
3. The lack of depression in a subject doesn't necessarily account for happiness.
4. As per medical regulatory body recommendations , medical devices should be designed for a control group in the general population before carrying over insights to extreme groups.
5. Suggested Design Direction : A product system that alleviates mild or moderate depressive disorders in the general population.

EXPERT INTERVIEW 3 :**Ms. DELICA D'SA**

Clinical Counsellor ,Mumbai

Affiliations:

•Holy Spirit Hospital ,Mumbai

1. It may be useful to design a device that monitors self harm for depressed patients.
2. Positive affirmations may help in re-building a sense of self in patients.
3. Suggesting a change in point of view usually helps subjects living with depressive disorders
4. Can there be a method to incorporate social inclusiveness into treating depression?
5. Group therapy scenarios may also be explored for useful insights based

EXPERT INTERVIEW 4 :**DR. S.V. PRABHUGAONKAR**

Consulting Psychiatrist , Mumbai

Affiliations:

•Lifeline Hospital , Mumbai
 •Bhakti Vedanta Hospital , Mumbai

1. Relapses in patients suffering from depressive disorders are quite common. Therapy sessions usually take between 6-9 months for moderately depressed subjects.
2. Reinforcement learning may be employed to affect behavioural change in subjects.
3. Cognitive Behavioural Therapy (CBT) involves equipping the patient with the skills required to deal with depressive disorders
4. Interesting smartphone apps like SAM App are available that are aimed at users with psychological issues.
5. Patients are encouraged to make small positive changes to their lifestyle one day at a time.

7. INSIGHTS FROM PSYCHOLOGY

COGNITIVE BEHAVIORAL THERAPY (CBT)

CBT is a short-term psychotherapy originally designed to treat depression, but is now used for a number of mental illnesses. It works to solve current problems and change unhelpful thinking and behavior.^[1]

This technique acknowledges that there may be behaviors that cannot be controlled through rational thought, but rather emerge based on prior conditioning from the environment and other external and/or internal stimuli.

POSITIVE REINFORCEMENT LEARNING

In behavioral psychology, reinforcement is a consequence that will strengthen a subject's future behavior whenever that behavior is preceded by a specific stimulus. This strengthening effect may be measured as a higher frequency of, longer duration, greater magnitude, or shorter latency.

Positive reinforcement occurs when an event or stimulus is presented as a consequence of a behavior and the behavior increases.



**Ref: <http://www.telegraph.co.uk/news/health/news/>*

**Ref : Reinforcement learning: An introduction AG Barto*

**Ref :Cognitive-behavioral therapy. - psycnet.apa.org*

IDENTIFYING DESIGN OPPORTUNITIES AT A SYSTEM LEVEL

8. FORMULATING DESIGN STRATEGY

DESIGN OBJECTIVE

To design a product system that is supportive to psychotherapy and aims to remedy symptoms of mild depressive disorders in college students.

DESIGN BRIEF

The following check-points are to be incorporated into the product system to be designed:

- I. Incorporate features derived from behavioral therapy.
- II. Monitor & encourage a healthy diet and sleep cycle.
- III. Incorporate multi-sensory stimuli to relieve stress ,aid sleep & relax.
- VI. Portable , Rechargeable & allow for synchronization to computers & smart phones.
- V. Encourage communication & social interactions by the user to support groups

9. IDENTIFYING THE SYSTEM

USERS:

1. PRIMARY : UNIVERSITY STUDENTS
2. SECONDARY : THERAPIST / COUNSELLOR
3. TERTIARY : TRUSTED FRIENDS/FAMILY

METHODS APPLIED:

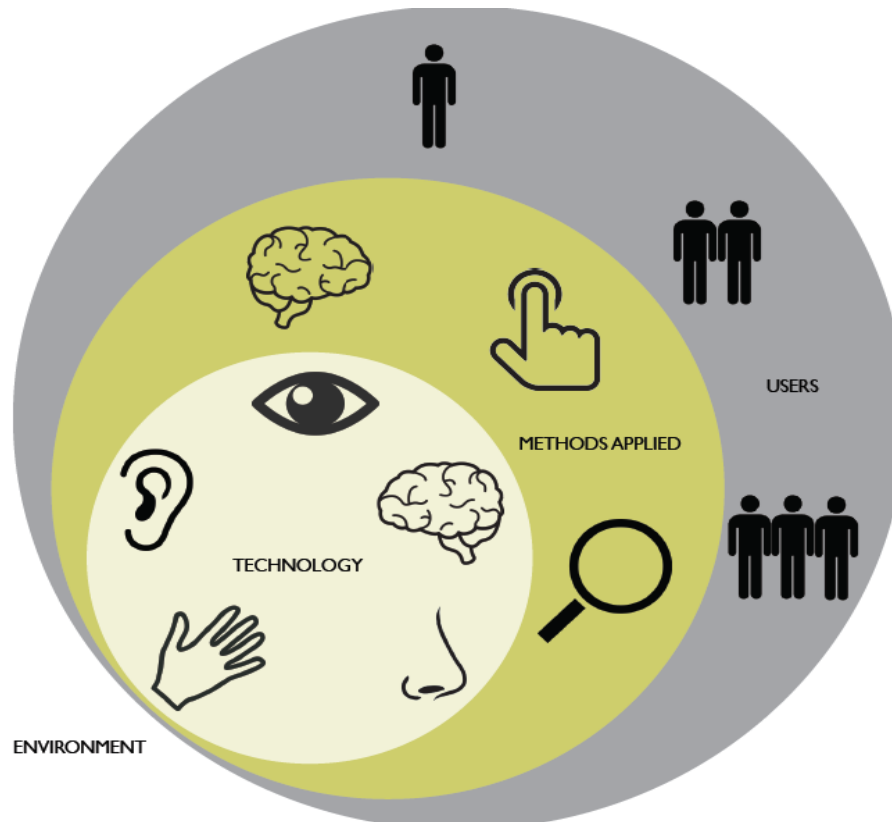
1. SEMANTIC THEORY
2. POSITIVE REINFORCEMENT LEARNING
3. EXPERT EVALUATION

APPLIED TECHNOLOGY:

1. VISUAL SUB-SYSTEMS
2. AUDITORY SUB-SYSTEMS
3. TACTILE SUB-SYSTEMS
4. OLFACTION SUB-SYSTEMS
5. POSITIVE REINFORCEMENT APP

ENVIRONMENT:

1. PRIVATE SPACES : HOME / HOSTEL
2. PUBLIC SPACES : COLLEGE / CLASS
3. INSIDE BAGS - TO CARRY AROUND



9. IDENTIFYING THE SYSTEM

USERS:

1. PRIMARY : UNIVERSITY STUDENTS
2. SECONDARY : THERAPIST / COUNSELLOR
3. TERTIARY : TRUSTED FRIENDS/FAMILY

METHODS APPLIED:

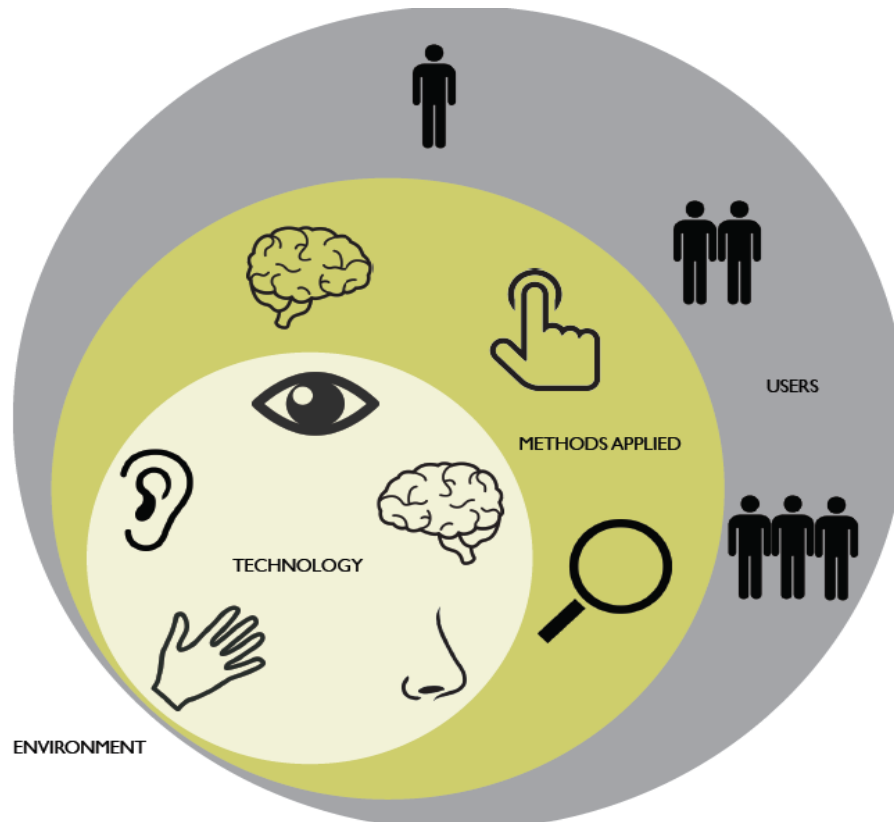
1. SEMANTIC THEORY
2. POSITIVE REINFORCEMENT LEARNING
3. EXPERT EVALUATION

APPLIED TECHNOLOGY:

1. VISUAL SUB-SYSTEMS
2. AUDITORY SUB-SYSTEMS
3. TACTILE SUB-SYSTEMS
4. OLFACTION SUB-SYSTEMS
5. POSITIVE REINFORCEMENT APP

ENVIRONMENT:

1. PRIVATE SPACES : HOME / HOSTEL
2. PUBLIC SPACES : COLLEGE / CLASS
3. INSIDE BAGS - TO CARRY AROUND



DEVELOPING A FRAMEWORK TO TRIGGER BEHAVIOUR CHANGE THROUGH REINFORCEMENT LEARNING

1. DEVELOPING A FRAMEWORK FOR BEHAVIOR CHANGE THROUGH REINFORCEMENT LEARNING

After completing the research phase of the project, it became apparent that the design solution would have to incorporate a framework to affect behavior change. After in-depth discussions with psychologists, it was concluded that by reinforcing activities associated with a balanced life-style, we may be able to affect a more positive outlook on life.

A) DIFFERENTIAL SCALES FOR REINFORCEMENT STIMULUS

Based on expert insights, 5 differential scales were developed to monitor and score the user's progress in depressive episodes on a daily basis. The scales are based on daily activities that have a positive effect on our outlook and lifestyle.

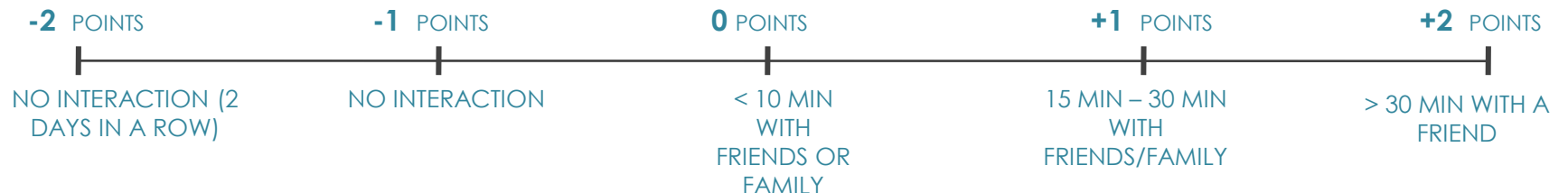
The scales focus on reinforcing positive behavior by assigning point based scores for each activity. The scores could be assigned by a closed group (5 people max) of trusted family/friends of the depressed student.

EXERCISE & WELL-BEING SCALE

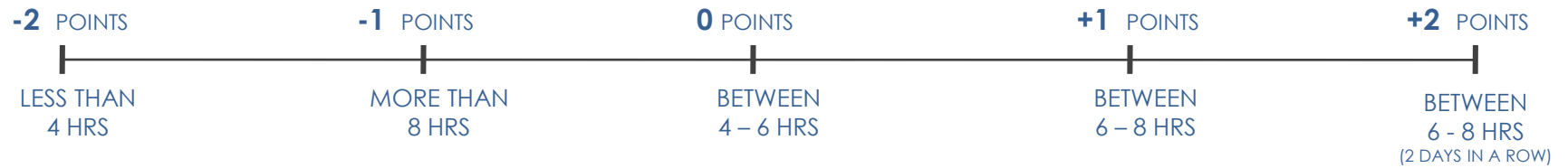


Max. Positive Scores are assigned to activities that involve social interactions.

SOCIAL INTERACTIONS SCALE



SLEEP PATTERNS SCALE

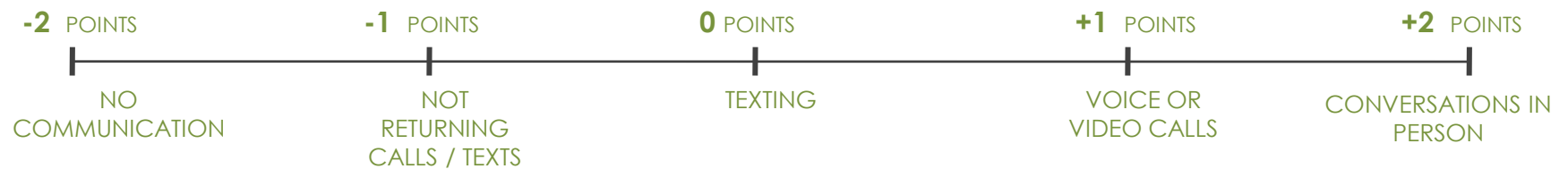


Negative Scores are assigned to concerning behaviour

DIETARY PATTERNS SCALE



COMMUNICATION SCALE



B) A DEVICE TO GENERATE MULTI-SENSORY STIMULUS FOR POSITIVE REINFORCEMENT

A device may be developed that generates multi-sensory stimulus around reinforcing a behavior that is indicative of a balanced Lifestyle. The following stimulus was selected to reward based on user & expert inputs :

i)	Rewarding Visual Stimuli :	Ambient Glows , Mood Lighting ,Serene Visuals .
ii)	Rewarding Audio Stimuli:	Ambient Home Noises , Binaural Waves to Relax & Aid Sleep , Guided Meditation, Audiobooks
iii)	Rewarding Olfaction Stimuli:	Aroma diffusion based on Aromatherapy
iv)	Rewarding Tactile Stimuli:	Massaging Vibrations , Tactile Play Value

C) LINKING POSITIVE SCORES TO TIME-BASED REWARDS

	DAILY SCORE	< 0 POINTS	0-5 POINTS	5 POINTS	5-10 POINTS
i)	Visual Stimuli activated for	+ 0 hrs	+1 hr	+2 hrs	+3 hrs
ii)	Audio Stimuli activated for	+0 hrs	+1 hr	+2 hrs	+3 hrs
iii)	Olfaction Stimuli activated for	+0 hrs	+1 hr	+2 hrs	+3 hrs
iv)	Tactile Stimuli activated for	+0 hrs	+1 hr	+2 hrs	+3 hrs

The device would function based on the user's control for a threshold value of 1 hr a day , after which its operation would be based on the positive scores attained over a period of time (eg. 2 Days).

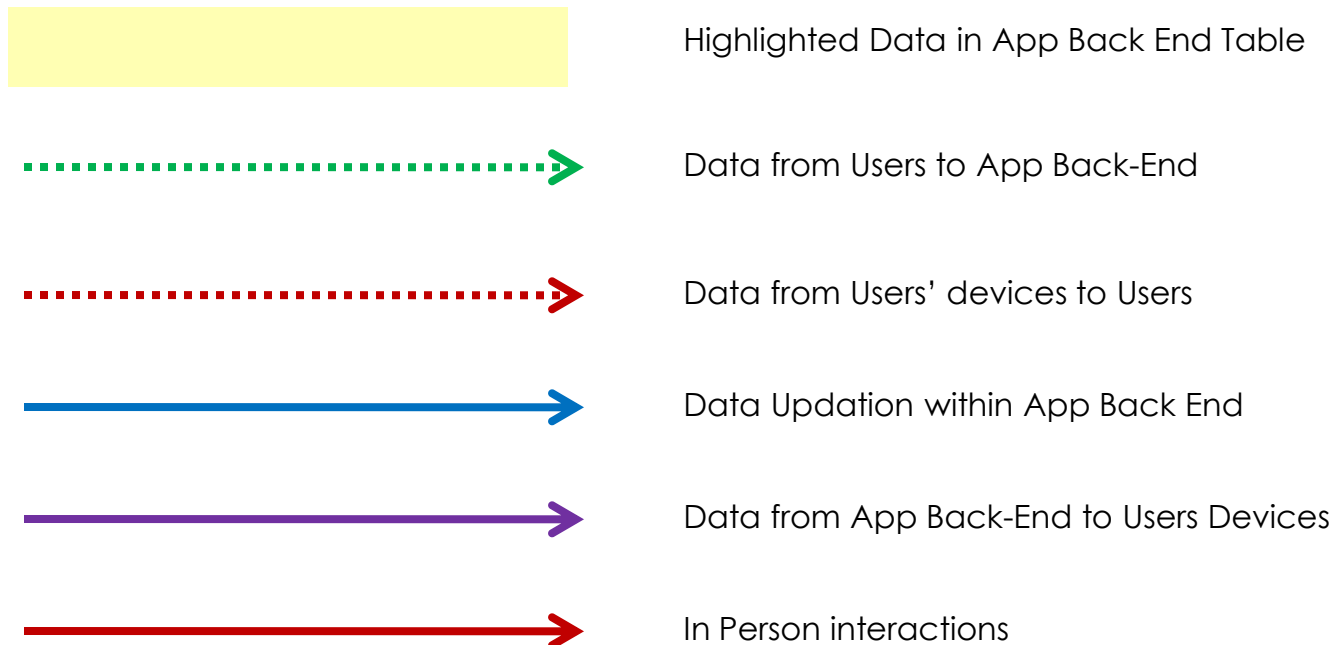
2. DESIGNING AN APP TO REINFORCE A BALANCED LIFESTYLE

After in-depth discussion with stakeholders it was concluded that a smartphone application may be designed to reinforce positive lifestyle changes & behaviour in the depressed user using the differential scales developed earlier to score the users daily activities that inherently affect the mental outlook.

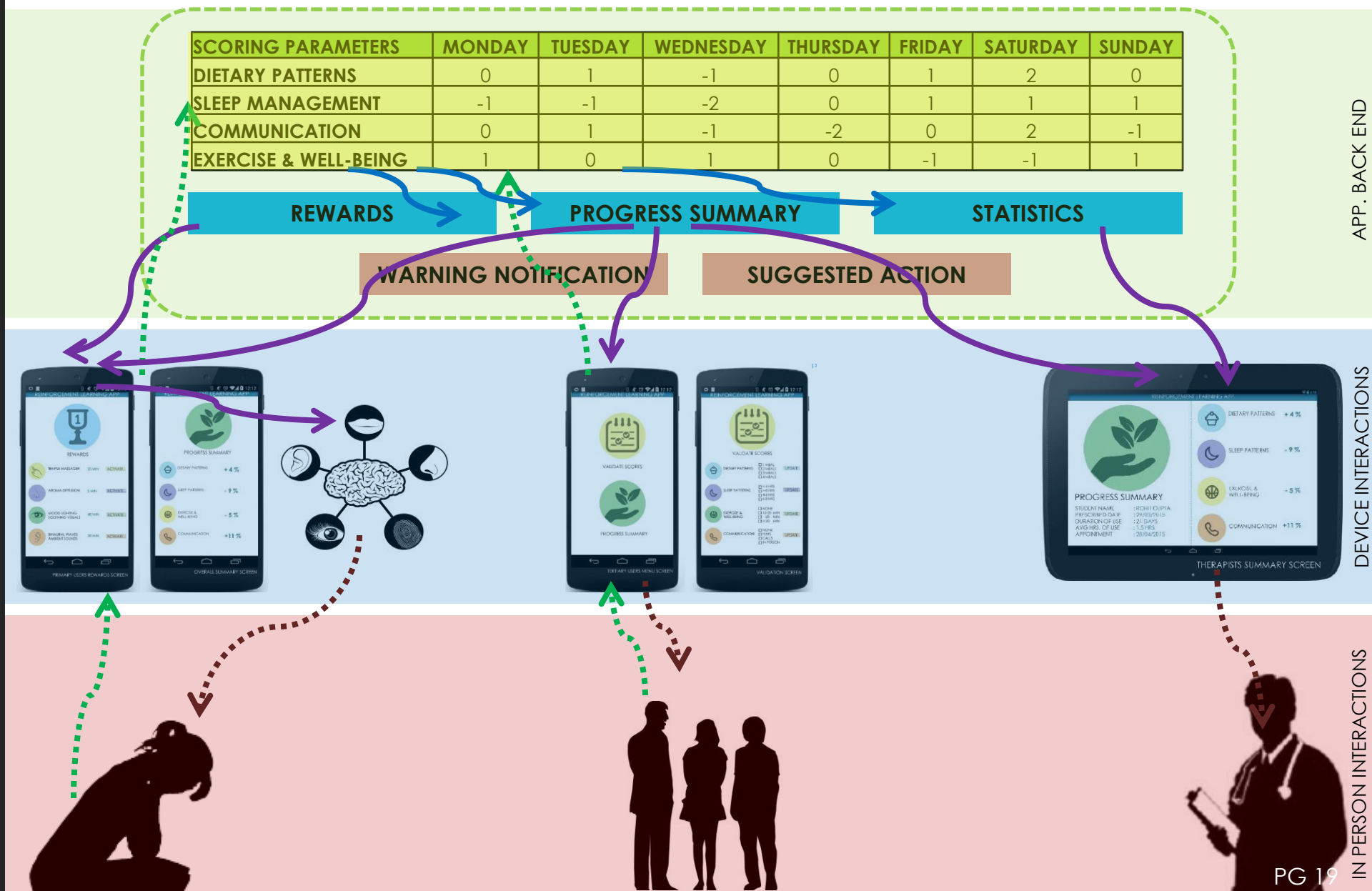
The app to be designed must fulfill the following objectives:

1. Allow for daily scoring of the depressed users activities by a trusted support group (3 family members/close friends)
2. Generate data to allow for monitoring of these activities by the therapist and support group members.
3. Calculate the multi-sensory rewards (reinforcement stimuli) based on the time.
4. Allow for activation of these multi-sensory rewards from the primary users smart phone.
5. Notify the support group and therapist to take action when concerning behavior(of the depressed user) is observed.

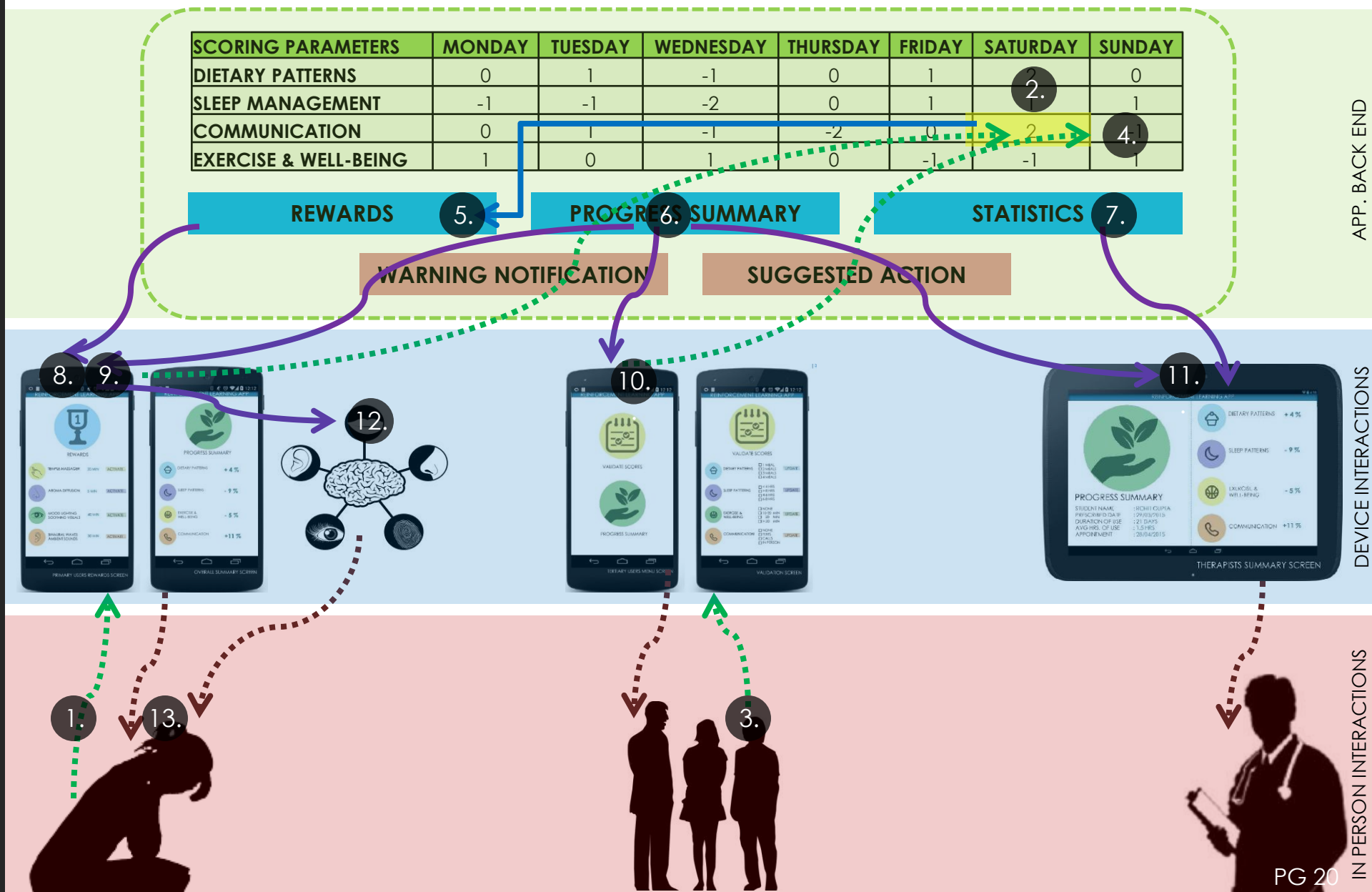
3. SYSTEM DIAGRAM LEGEND



FRAMEWORK FOR REINFORCEMENT LEARNING APP



SCENARIO 2 : USER GAINED +2 POINTS FOR EFFECTIVE COMMUNICATION



APP ALGORITHM SEQUENCE TABLES

SCENARIO 1 : USER DOWNLOADS & ACTIVATES THE REINFORCMENT LEARNING APP

SEQUENCE	USER	OPERATION /ACTIVITY
1	USER	USER DOWNLOADS APP FREE AFTER VALIDATING THE PRODUCT CODE
2	USER	USER TAPS ON SUPPORT GROUP SCREEN , ADDS PHONE NUMBERS OF 3 TRUSTED FRIENDS AND FAMILY & 1 THERAPIST
3	APP BACK END	SENDS THE 4 NUMBERS NOTIFICATION REQUESTING THEIR ASSISTANCE IN SCORING
4	SUPPORT GRP	CASE1: ACCEPTS REQUEST & DOWNLOADS APP FOR FREE ; CASE2:REJECTS REQUEST
5	APP BACK-END	CREATES WEEKLY SCORING TABLE AND SYNCHRONISES USER + SUPPORT GRP + THERAPISTS APP SCREENS
6	APP BACK-END	NOTIFIES USER THAT WEEKLY SCORING & THE REINFORCEMENT LEARNING APP IS NOW ACTIVE

SCENARIO 2 : USER GAINED +2 POINTS FOR EFFECTIVE COMMUNICATION

SEQUENCE	USER	OPERATION /ACTIVITY
1	USER	HAVING SPENT THE EVENING WITH A CLOSE FRIEND , USER TAPS "VALIDATE SCORES" BUTTON
2	APP BACK END	APP BACK-END SENDS NOTIFICATION TO SUPPORT GRP TO SCORE THE USER
3	SUPPORT GRP MEMBERS	SCORE THE USER +2 ON THE COMMUNICATION SCALE TO VALIDATE THE ACTIVITY
4	APP BACK END	SYSTEM UPDATES SCORING TABLE WITH NEW SCORES
5,6,7	APP BACK END	CALCULATES REWARDS BASED ON POSITIVE SCORES ,UPDATES PROGRESS SUMMARY MODULE AND STATISTICS MODULE
8,9,10,11	APP BACK END ->DEVICES	UPDATES REWARDS SCREEN , PROGRESS SUMMARY AND STATISTICS SCREENS ON THE 3 USERS DEVICES
12	USER	USER TAPS ON REWARDS SCREEN & ACTIVATES REWARD EG. "ROTARY TEMPLE MASSAGER ACTIVATED FOR 20 MIN"
13	MULTI-SENSORY HEADGEAR	USES BLUETOOTH TO SYNCH TO USER'S PHONE AND ACTIVATES THE ROTARY MASSAGE HEADS FOR 20 MIN

SCENARIO 3 : USER IS UNRESPONSIVE TO APP FOR 1 DAY

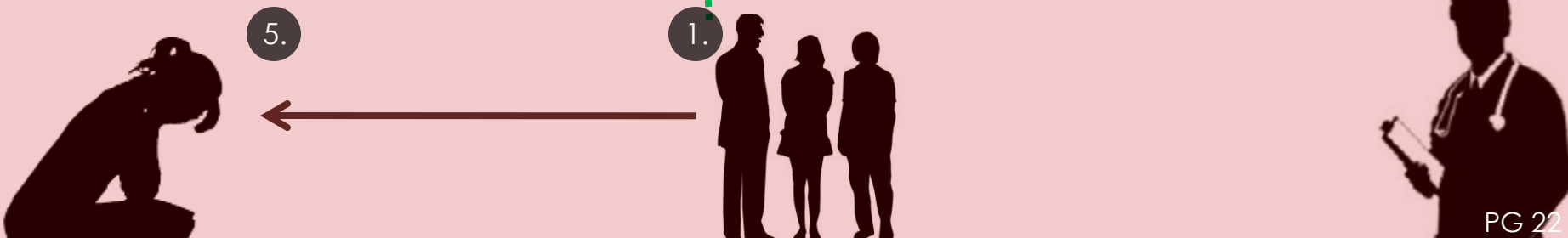
SCORING PARAMETERS	MONDAY	TUESDAY	WEDNESDAY	THURSDAY	FRIDAY	SATURDAY	SUNDAY
DIETARY PATTERNS	0	1	-1	0	1	2	0
SLEEP MANAGEMENT	-1	-1	2	0	1	1	1
COMMUNICATION	0	1	-1	-2	0	2	-1
EXERCISE & WELL-BEING	1	0	1	0	-1	-1	1



APP. BACK END

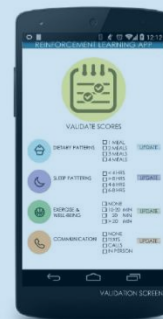
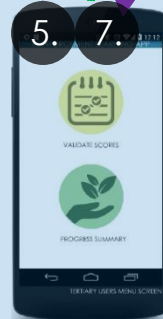
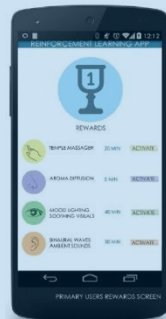
DEVICE INTERACTIONS

IN PERSON INTERACTIONS



SCENARIO 4 : USER IS UNRESPONSIVE TO APP FOR 2 DAYS

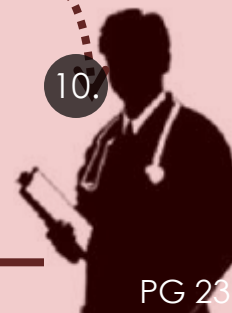
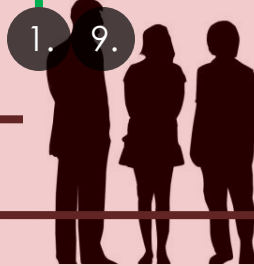
SCORING PARAMETERS	MONDAY	TUESDAY	WEDNESDAY	THURSDAY	FRIDAY	SATURDAY	SUNDAY
DIETARY PATTERNS	0	1	-1	2.	1	2	0
SLEEP MANAGEMENT	-1	-1	-2	3.	1	1	1
COMMUNICATION	0	1	-1	-2	4.	2	-1
EXERCISE & WELL-BEING	1	0	1	0	-1	-1	1



APP. BACK END

DEVICE INTERACTIONS

IN PERSON INTERACTIONS



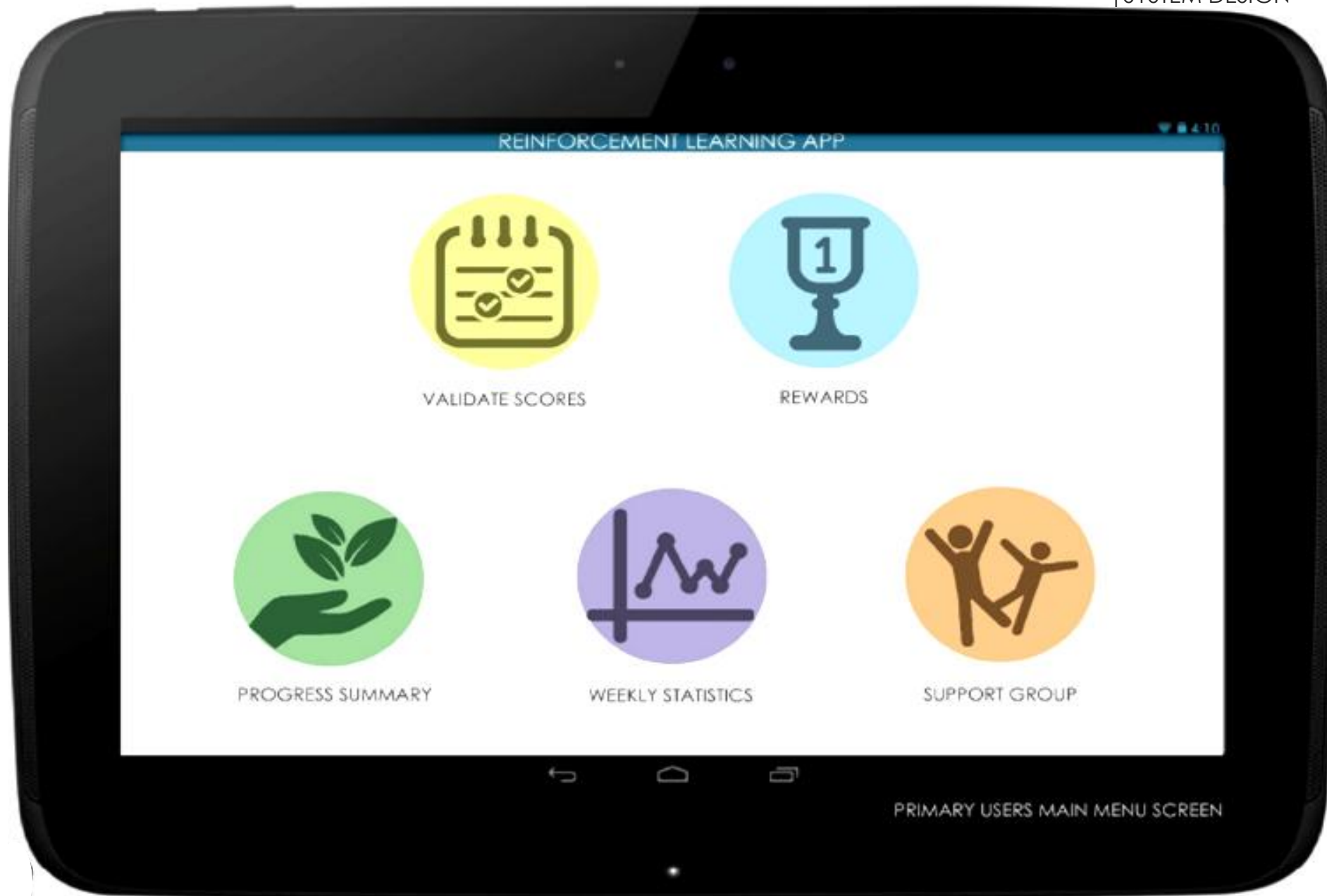
APP ALGORITHM SEQUENCE TABLES

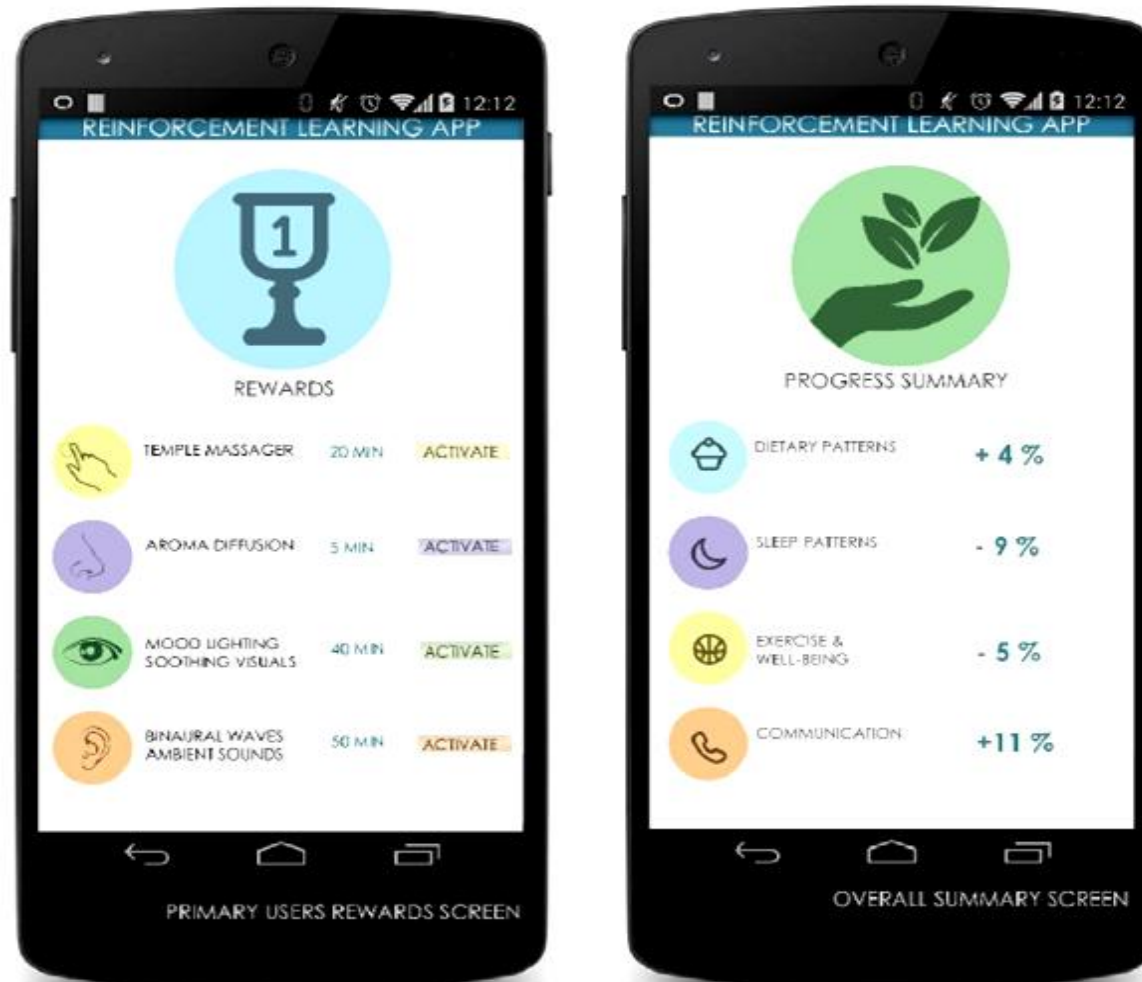
SCENARIO 3 : USER IS UNRESPONSIVE TO APP FOR 1 DAY

SEQUENCE	USER	OPERATION /ACTIVITY
1	SUPPORT GRP	NOTICES THAT USER HAS NOT CONTACTED HIM/HER FOR DAILY SCORES, SCORES USER -1 ON COMMUNICATION SCALE
2	APP BACK END	UPDATES DAILY SCORING TABLE IN THE SYSTEM
3	APP BACK END	SENDS WARNING NOTIFICATION TO USER & ALL SUPPORT GROUP MEMBERS "NO CONTACT BY USER_NAME FOR # HRS"
4	APP BACK END	SENDS SUGGESTED ACTION TO USER AND ALL SUPPORT GROUP MEMBERS : "CONTACT USER_NAME FOR STATUS UPDATE"
5	USER,SUPPORT GRP	CASE1:USER RESPONDS TO WARNING NOTIFICATION ; CASE2 : SUPPORT GRP MEMBERS CALL/PHYSICALLY SHOW UP

SCENARIO 4 : USER IS UNRESPONSIVE TO APP FOR 2 DAYS

SEQUENCE	USER	OPERATION /ACTIVITY
1	SUPPORT GRP	NOTICES THAT USER HAS NOT CONTACTED/UPDATED SYSTEM FOR 2 CONSECUTIVE DAYS, SCORES USER -2 ON COMMUNICATION SCALE
2	APP BACK END	UPDATES DAILY SCORING TABLE IN THE SYSTEM
3	APP BACK END	SCORING TABLE UPDATES WARNING NOTIFICATION IN SYSTEM
4	APP BACK END	SCORING TABLE UPDATES SUGGESTED ACTION IN SYSTEM
5	APP BACK END	SENDS WARNING NOTIFICATION TO USER & ALL SUPPORT GROUP MEMBERS "NO CONTACT BY USER_NAME FOR ## HRS"
6	APP BACK END	SENDS WARNING NOTIFICATION TO THERAPIST "NO CONTACT BY USER_NAME FOR # HRS"
7	APP BACK END	SENDS SUGGESTED ACTION TO USER AND ALL SUPPORT GROUP MEMBERS : "CONTACT USER_NAME FOR STATUS UPDATE"
8	APP BACK END	SENDS SUGGESTED ACTION TO THERAPIST : "CONTACT USER_NAME FOR STATUS UPDATE"
9,10	SUPPORT GRP ,THERAPIST	SUPPORT GROUP MEMBERS & THERAPIST RESPONDS TO WARNING NOTIFICATION
11,12	USER,SUPPORT GRP,THERAPIST	CASE1:USER RESPONDS TO WARNING NOTIFICATION ; CASE2 : SUPPORT GRP MEMBERS + THERAPIST CALLS/PHYSICALLY SHOWS UP





4. FRAMEWORK FOR REINFORCEMENT LEARNING APP

DEFINING MODULES

- A. SCORING
- B. REWARDS
- C. SUMMARY GENERATION
- D. STATISTICS
- E. BROWNIE PTS. & CONCERNS

SCORING MODULE

Scoring is done based on the five differential scales discussed. Each activity is scored based on validation (in person/ photos) from the selected trusted group of friends/family.

REWARDS MODULE

Based on output from the scoring module (tally of positive points), the rewards module generates the activation time-value for each of the sensory rewards

SUMMARY & STATISTICS

Was included to aid therapists get a bigger picture of the depressed students current lifestyle and patterns.



5. APP SCREENS FOR TRUSTED GROUP

VALIDATION OF SCORES

Scoring is done based on preset scoring parameters. The trusted friend is required to validate each activity based on their physical presence or photographic proof.

OVERALL SUMMARY

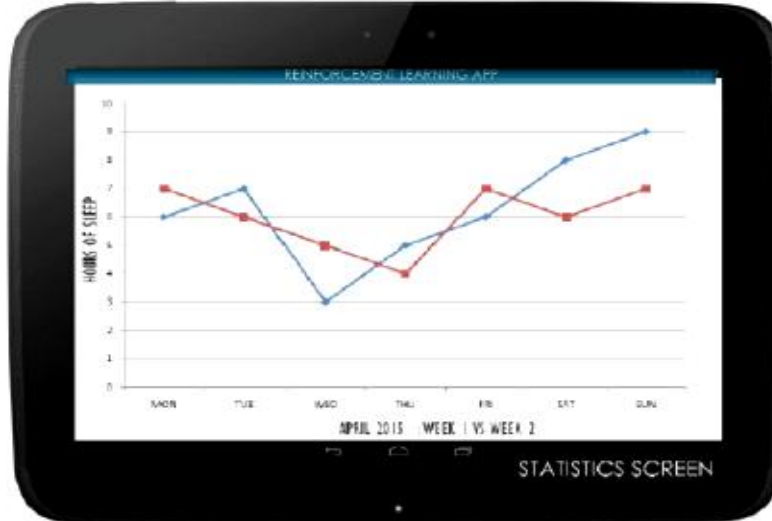
The trusted group continue to get updates regarding the students progress.

NOTIFICATIONS

Whenever the overall tally for any of the preset parameters falls below zero, a notification is sent to the trusted friend to prompt / remind the user.

BROWNIE POINTS

Brownie points worth +5 may be assigned to behavior that suggests a defined improvement. (Eg. +5 brownie points for playing music with friends)



6. APP SCREENS FOR PSYCHOLOGISTS / THERAPISTS

OVERALL SUMMARY

Was added to allow for a single screen to display an overview of the students progress towards a more balanced and wholesome lifestyle

STATISTICS

Weekly statistics in the form of line graphs would give therapists and psychologists an overview of the week before scheduled therapy sessions.

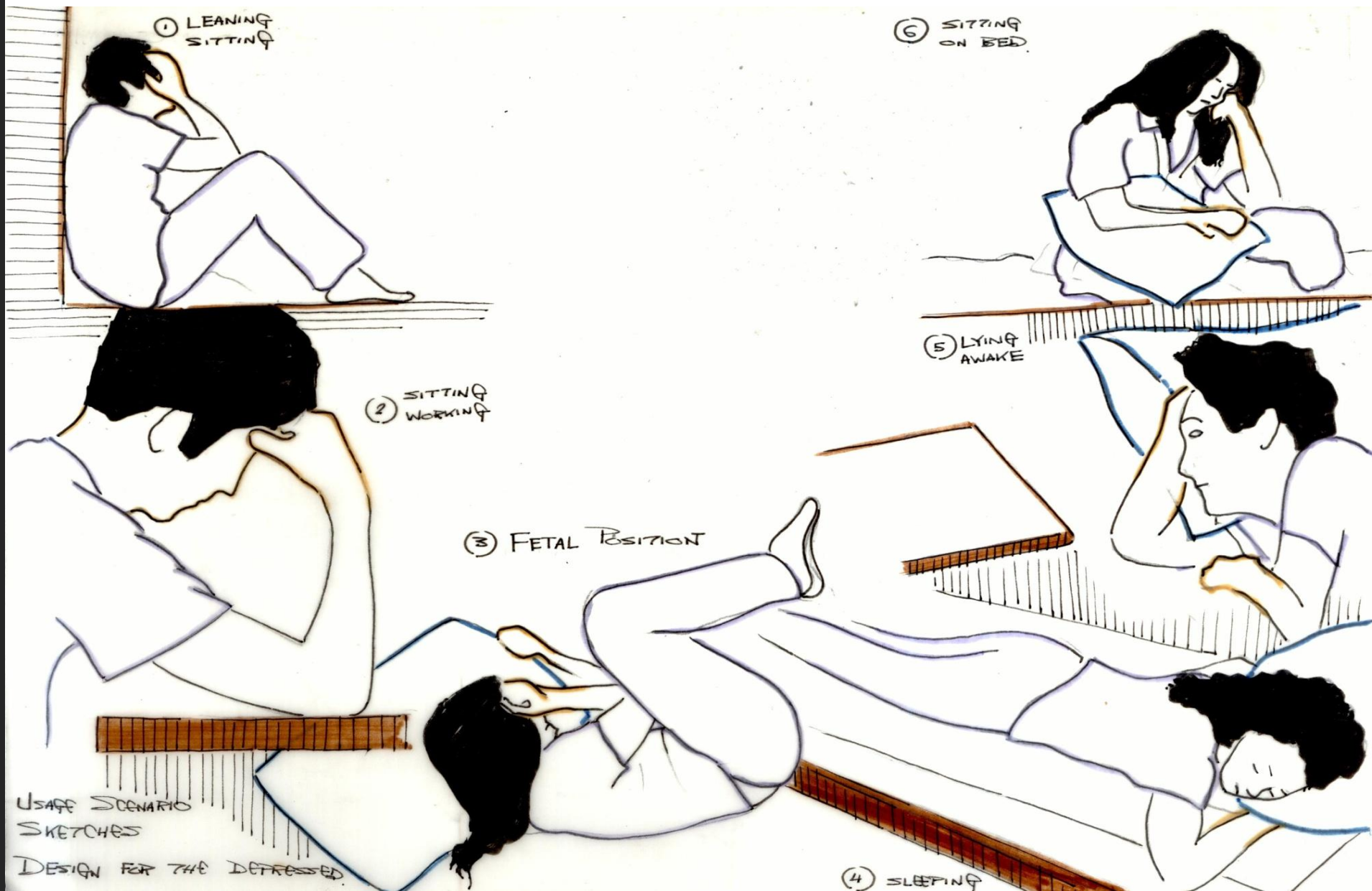
NOTIFICATIONS

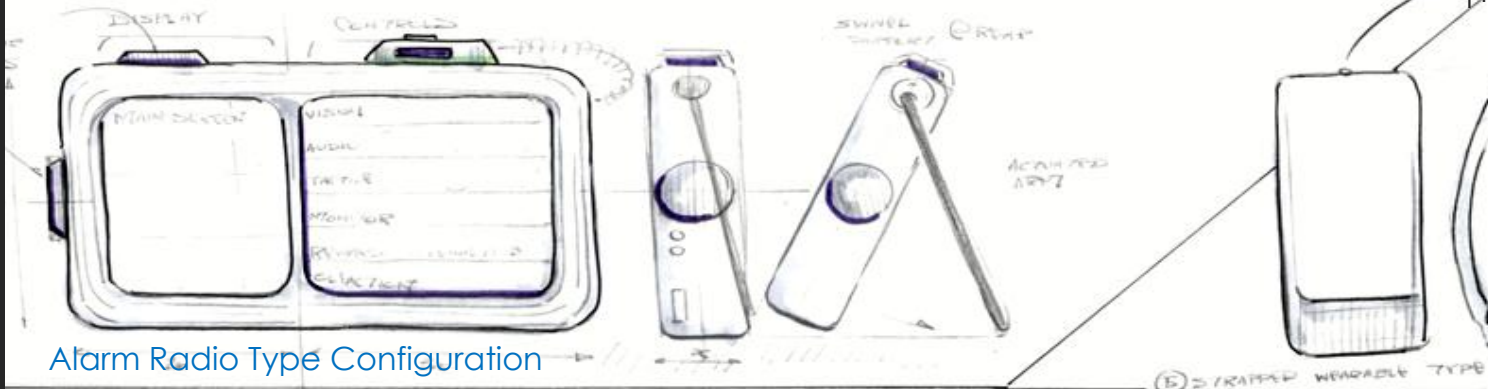
Whenever the scores for any activity fall below a preset threshold value for 2 days in a row , a notification is automatically sent to the therapist to get involved.

EXPERT FEEDBACK

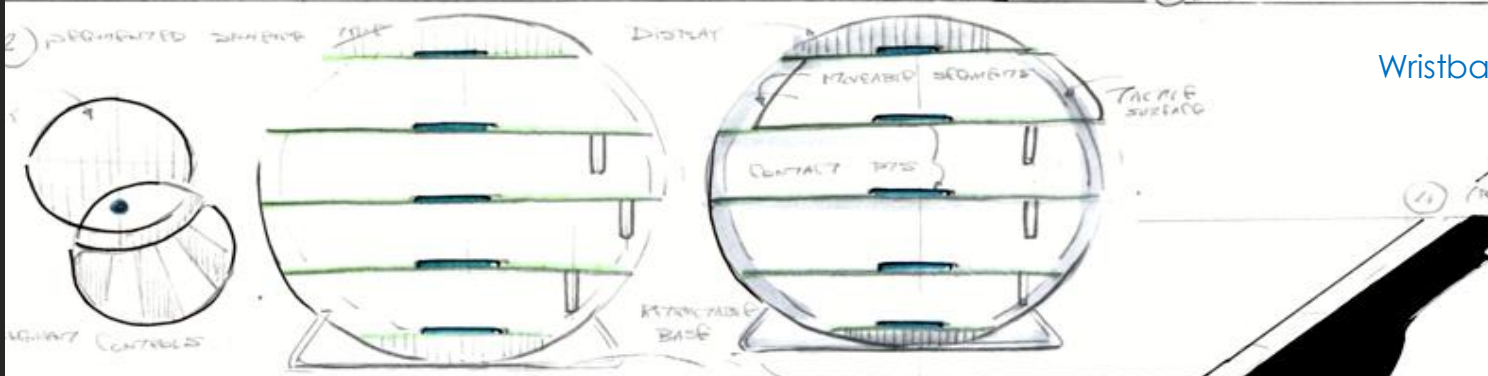
The system as well as the app framework was well- received by 3 experts who unanimously agreed that it would aid their clients and save time

EXPLORATION OF POSSIBLE PRODUCT CONFIGURATIONS TO ACCOMMODATE MULTI-SENSORY REWARD SYSTEM

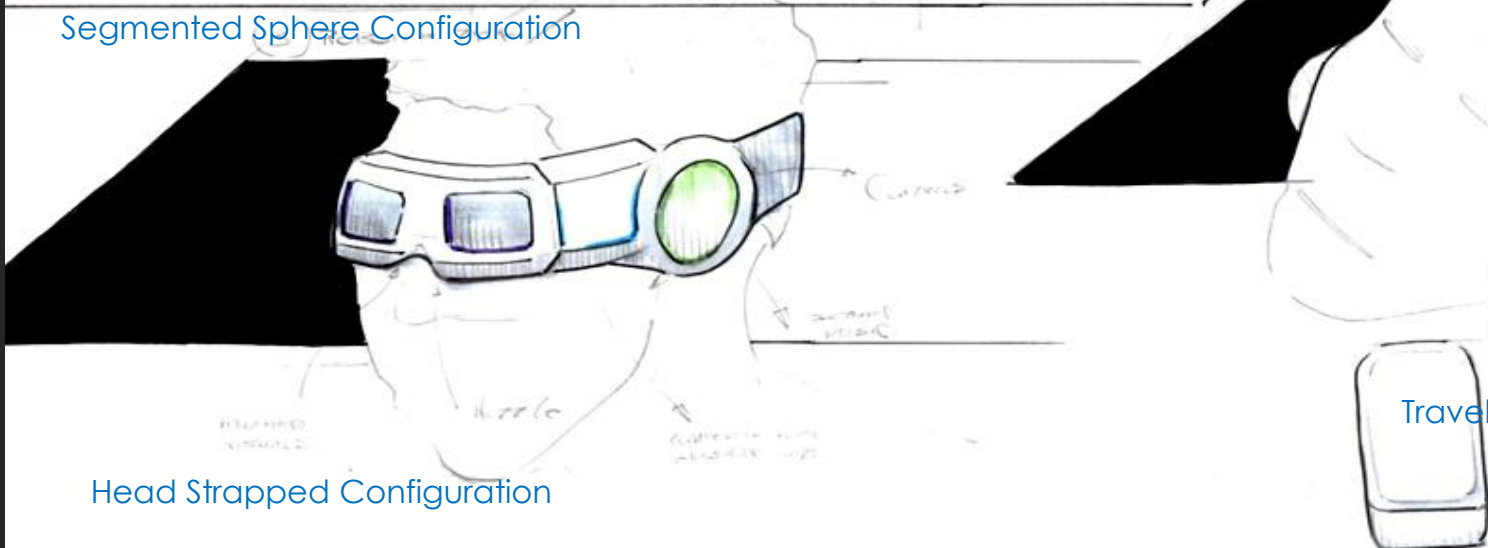




Alarm Radio Type Configuration



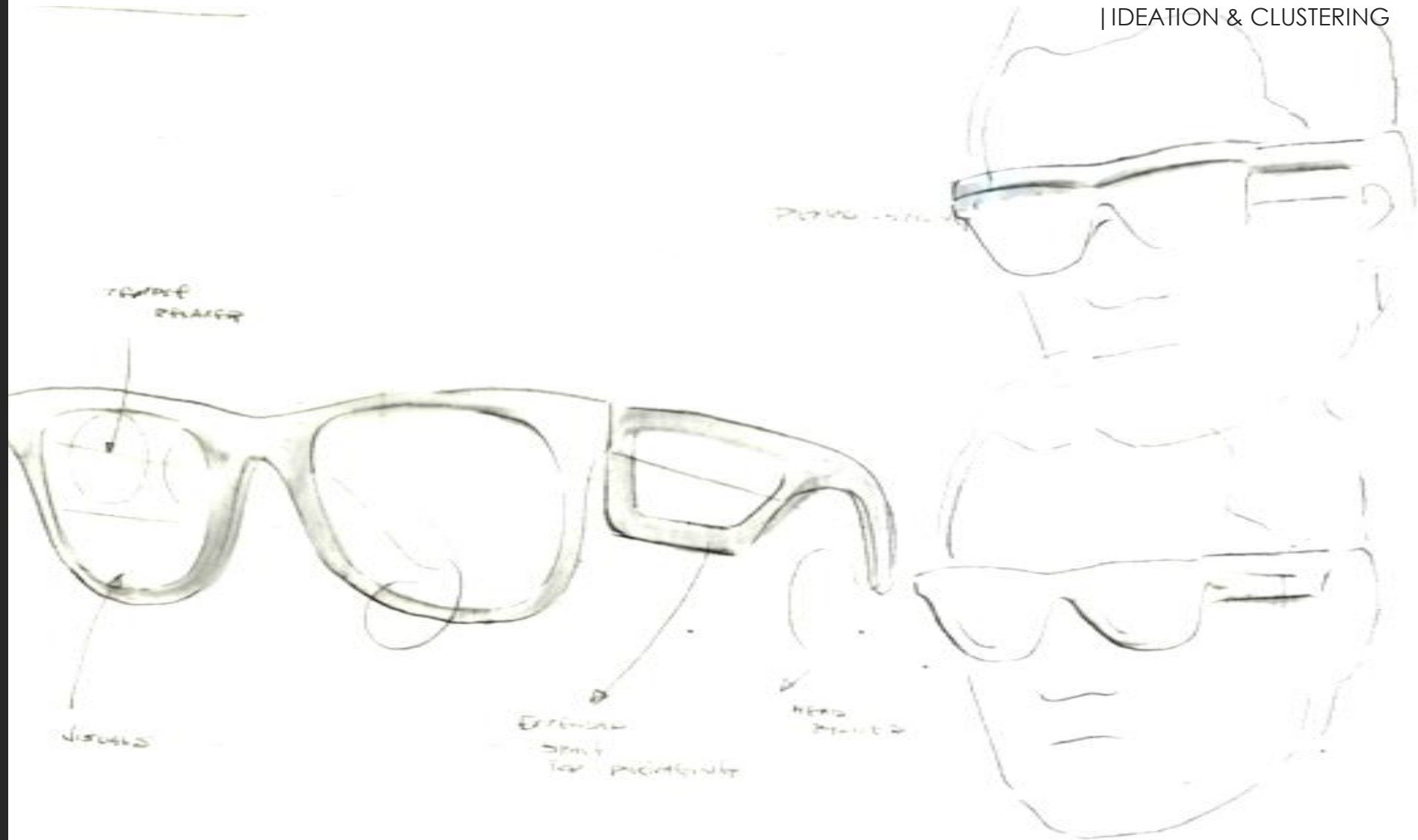
Segmented Sphere Configuration



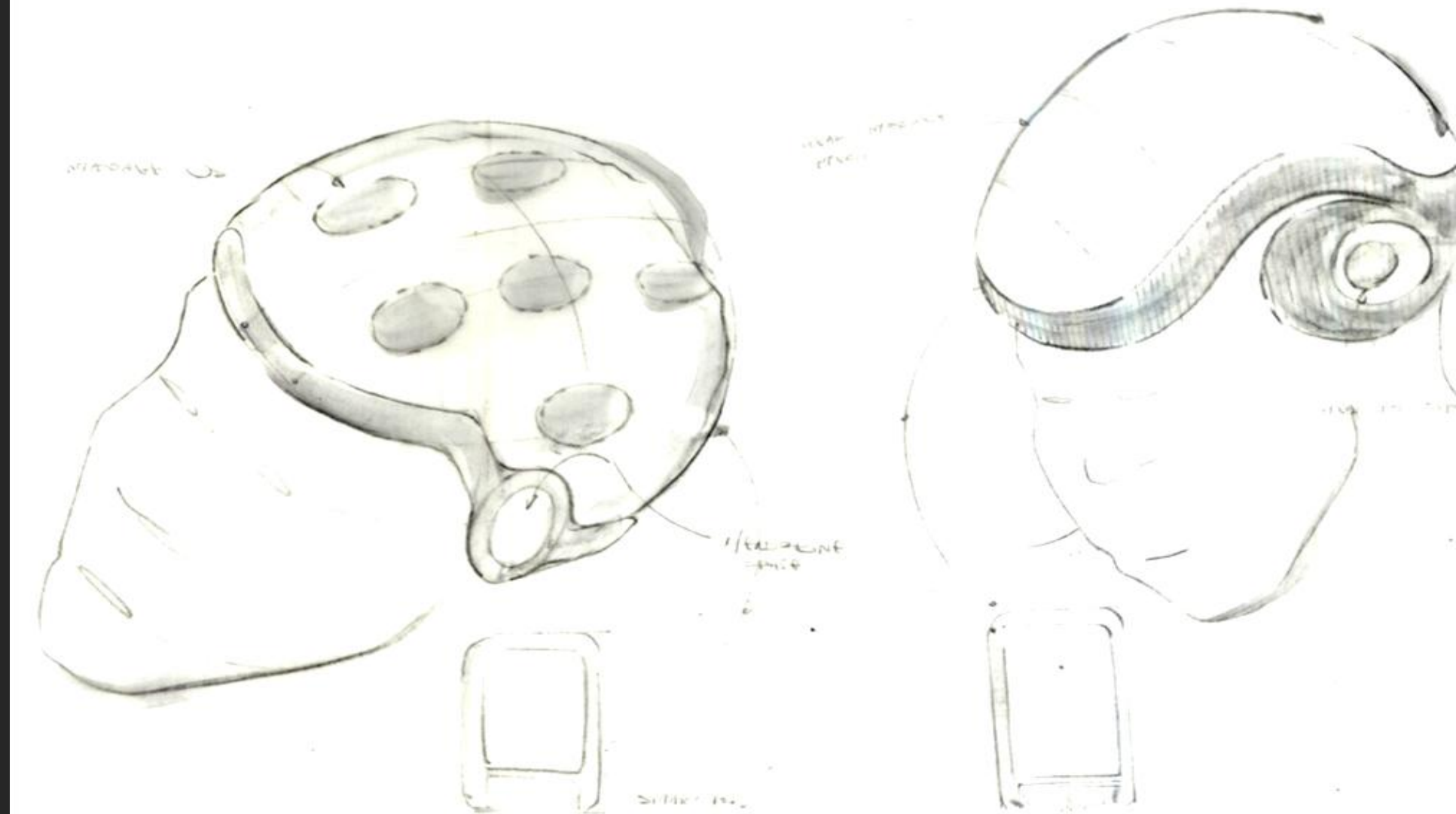
Head Strapped Configuration

Wristband-App Configuration

Travel Pillow Configuration

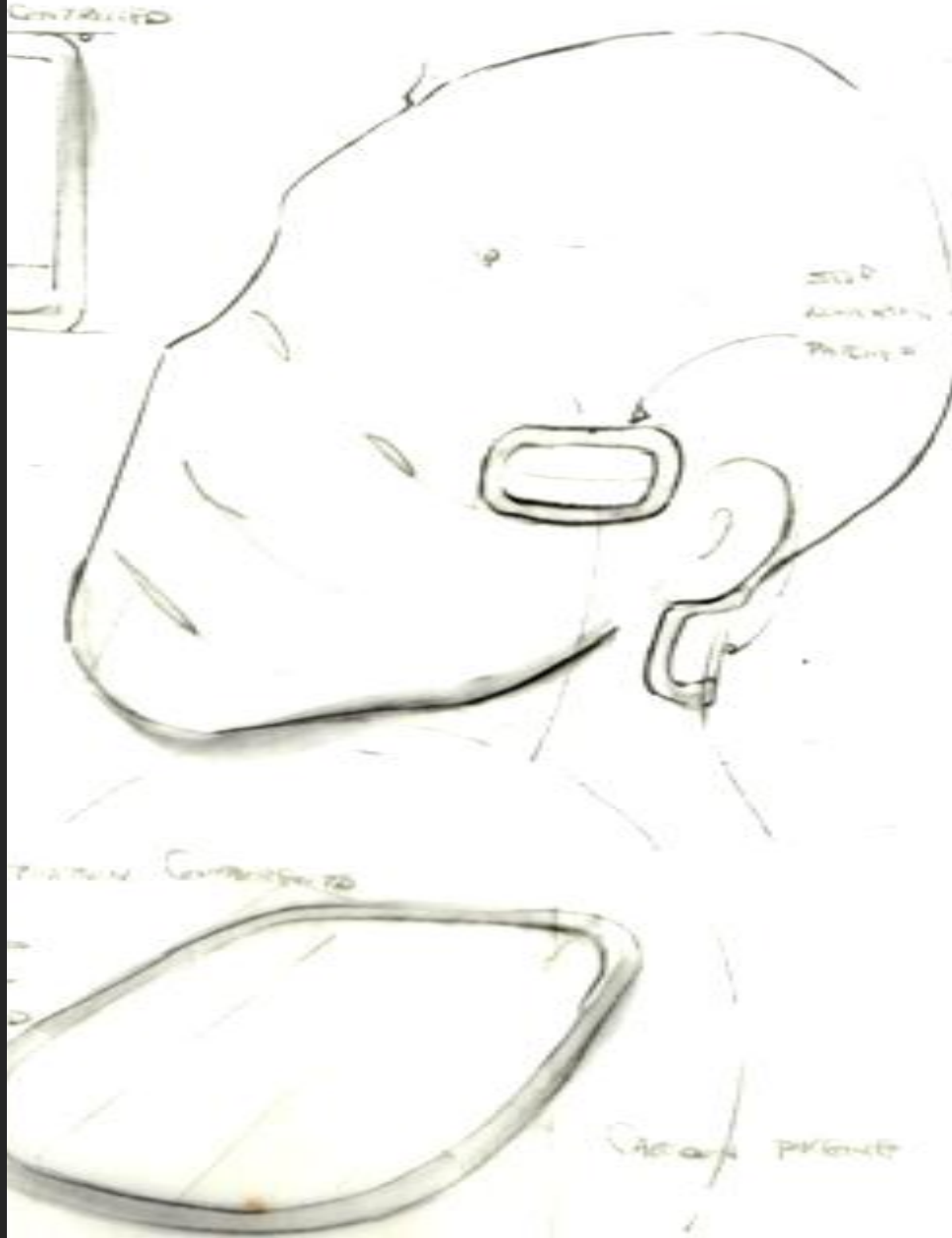


Retro-styled Eyewear



Massage-helmet configuration

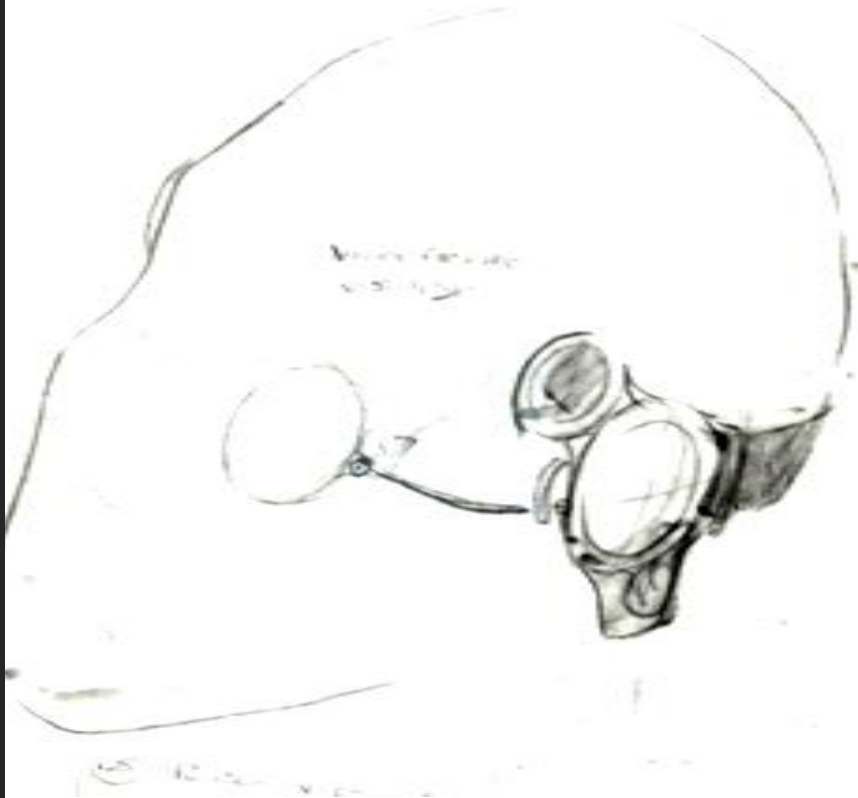
Nicotine-patch inspired configuration



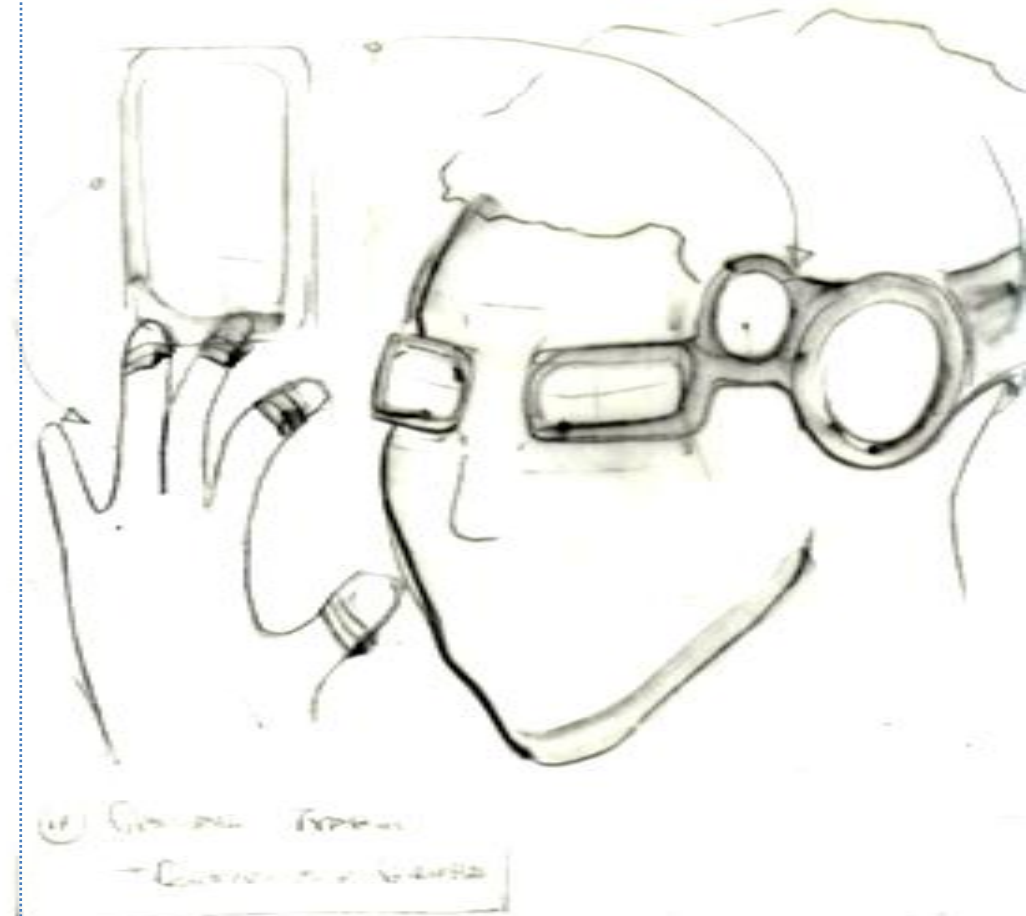
3 segment head worn configuration



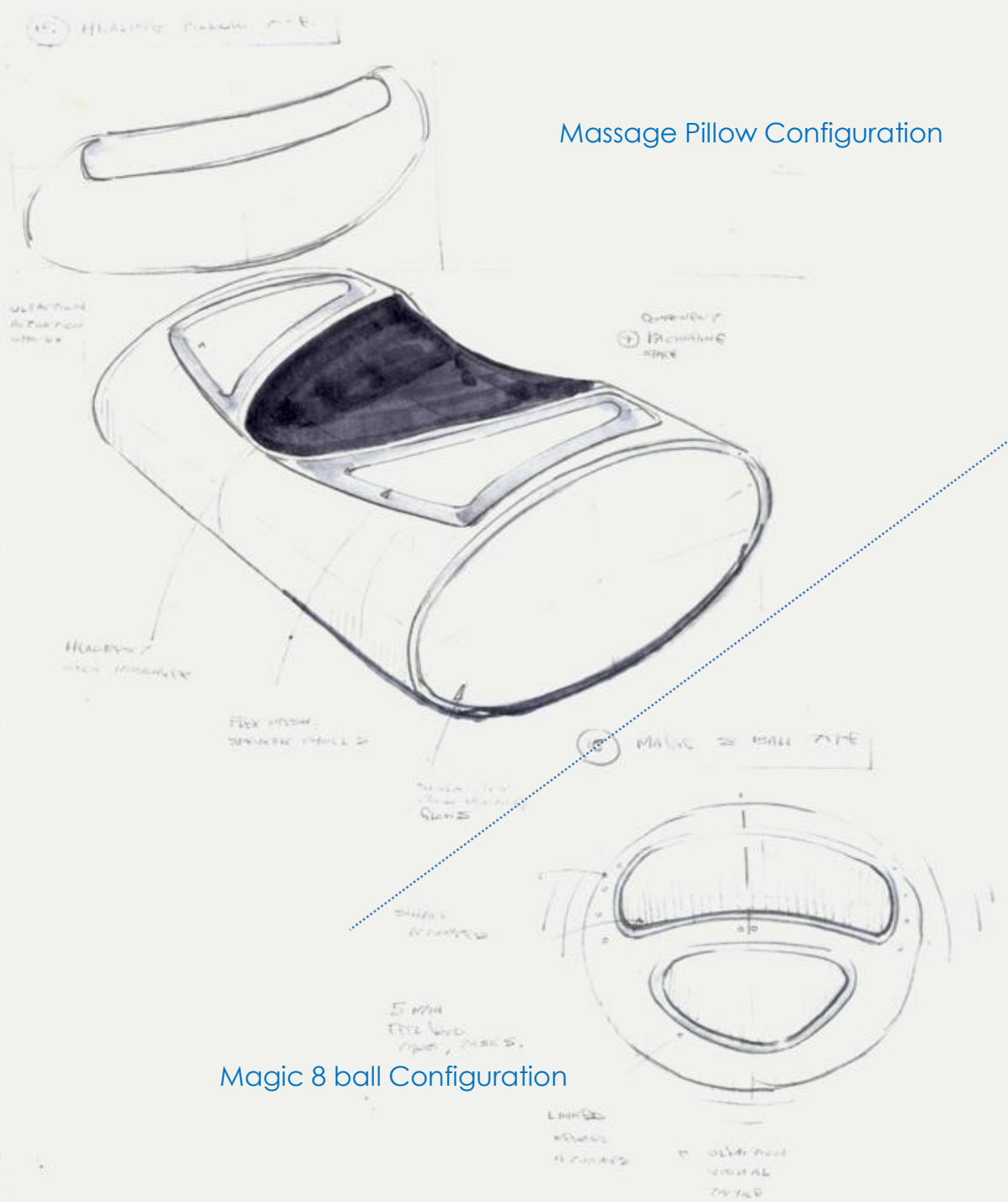
Head Worn Variant



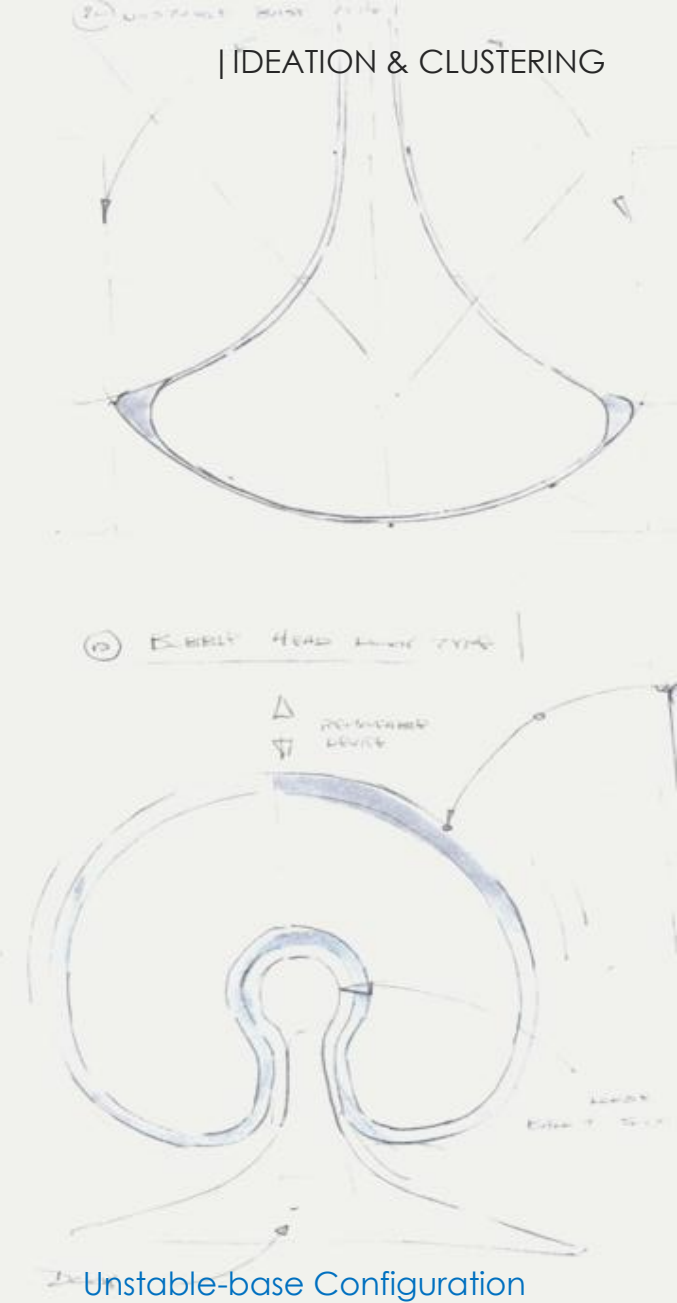
Head-worn Gestural Configuration



Massage Pillow Configuration

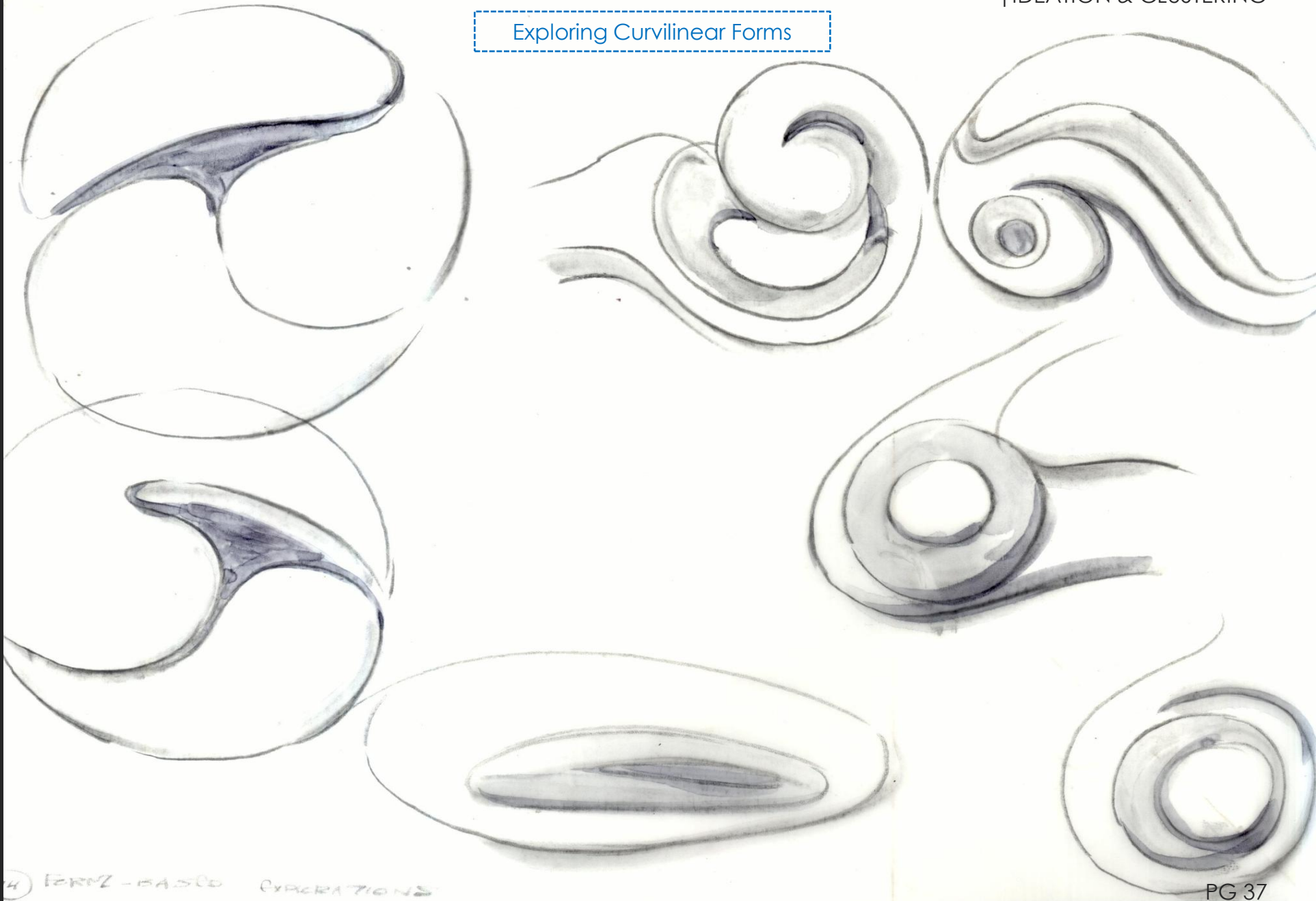


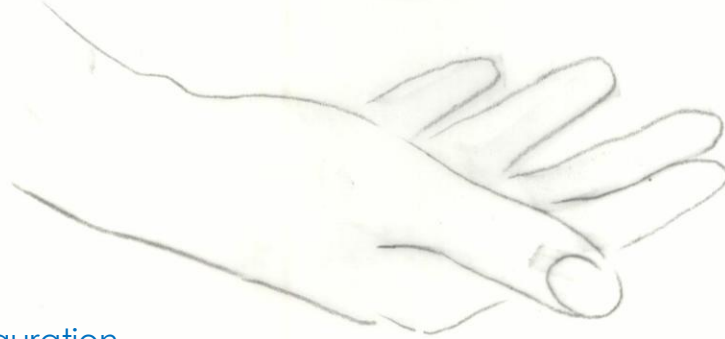
Magic 8 ball Configuration



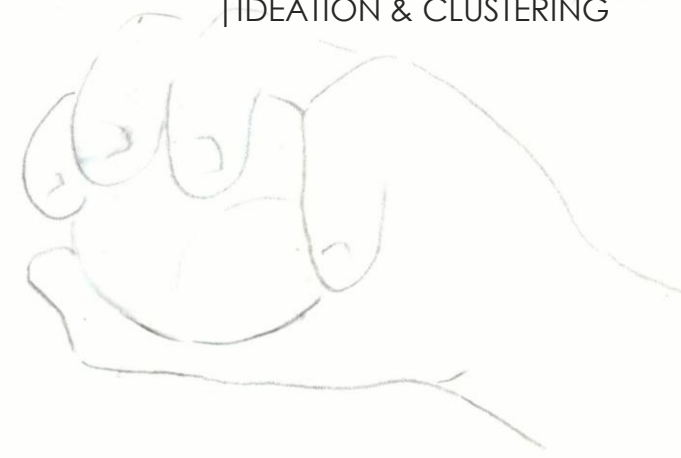
Unstable-base Configuration

Exploring Curvilinear Forms





Bouncy ball Configuration

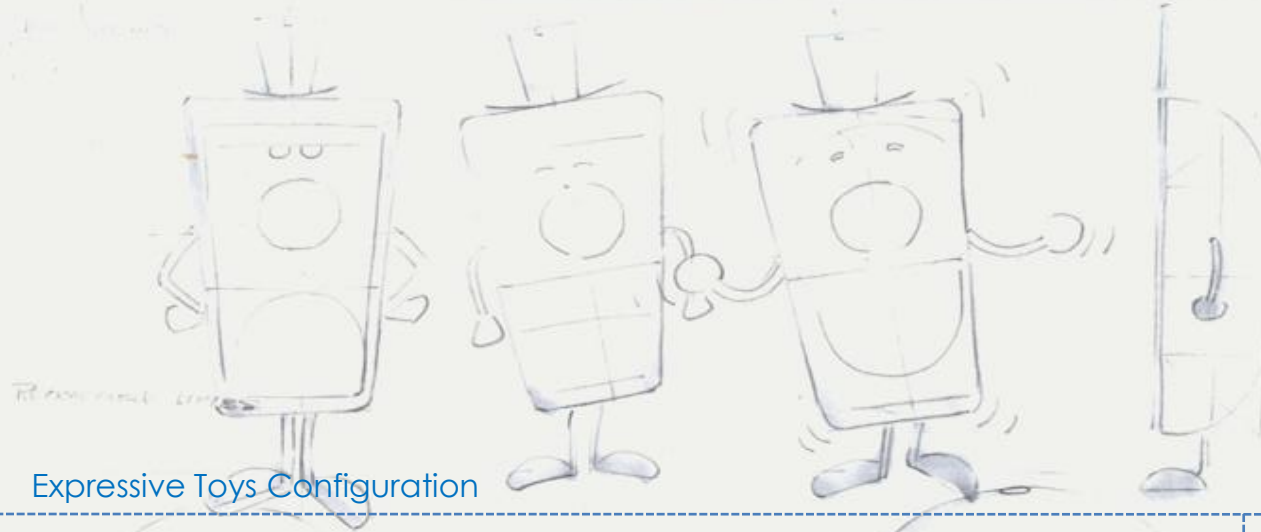


Tactile Light & Sound Configuration

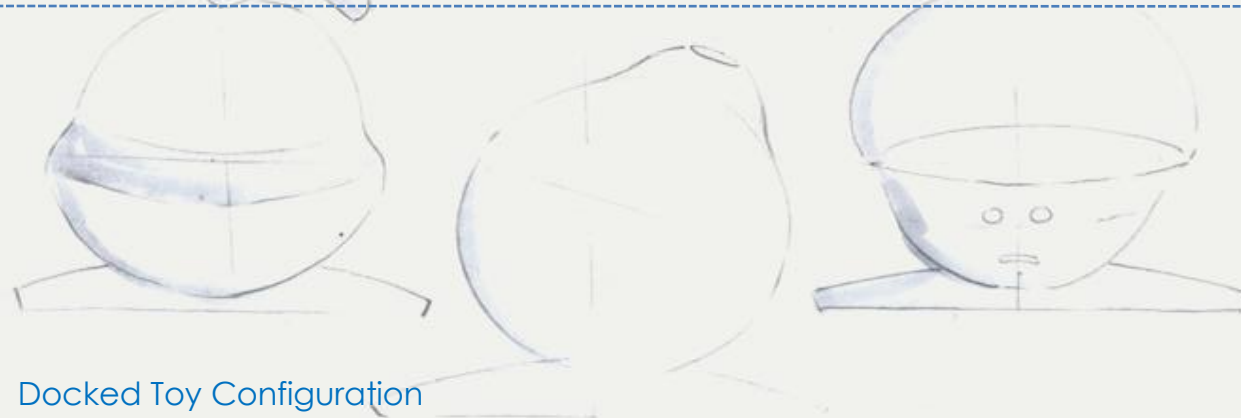


Tactile Surfaces Configuration





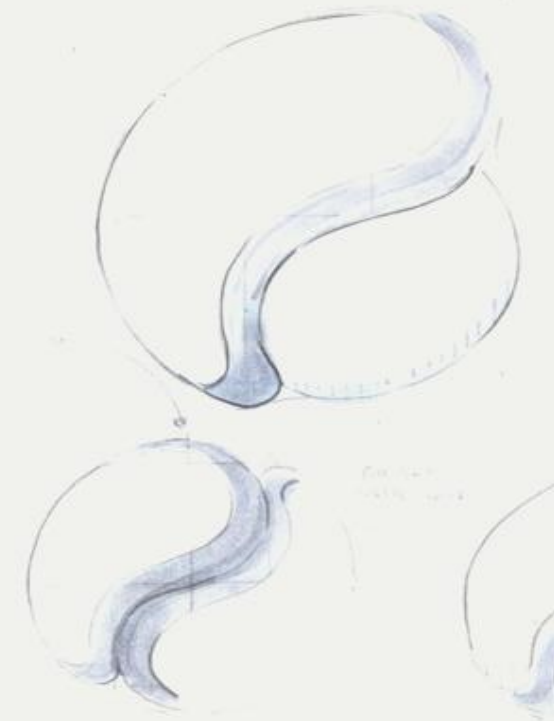
Expressive Toys Configuration

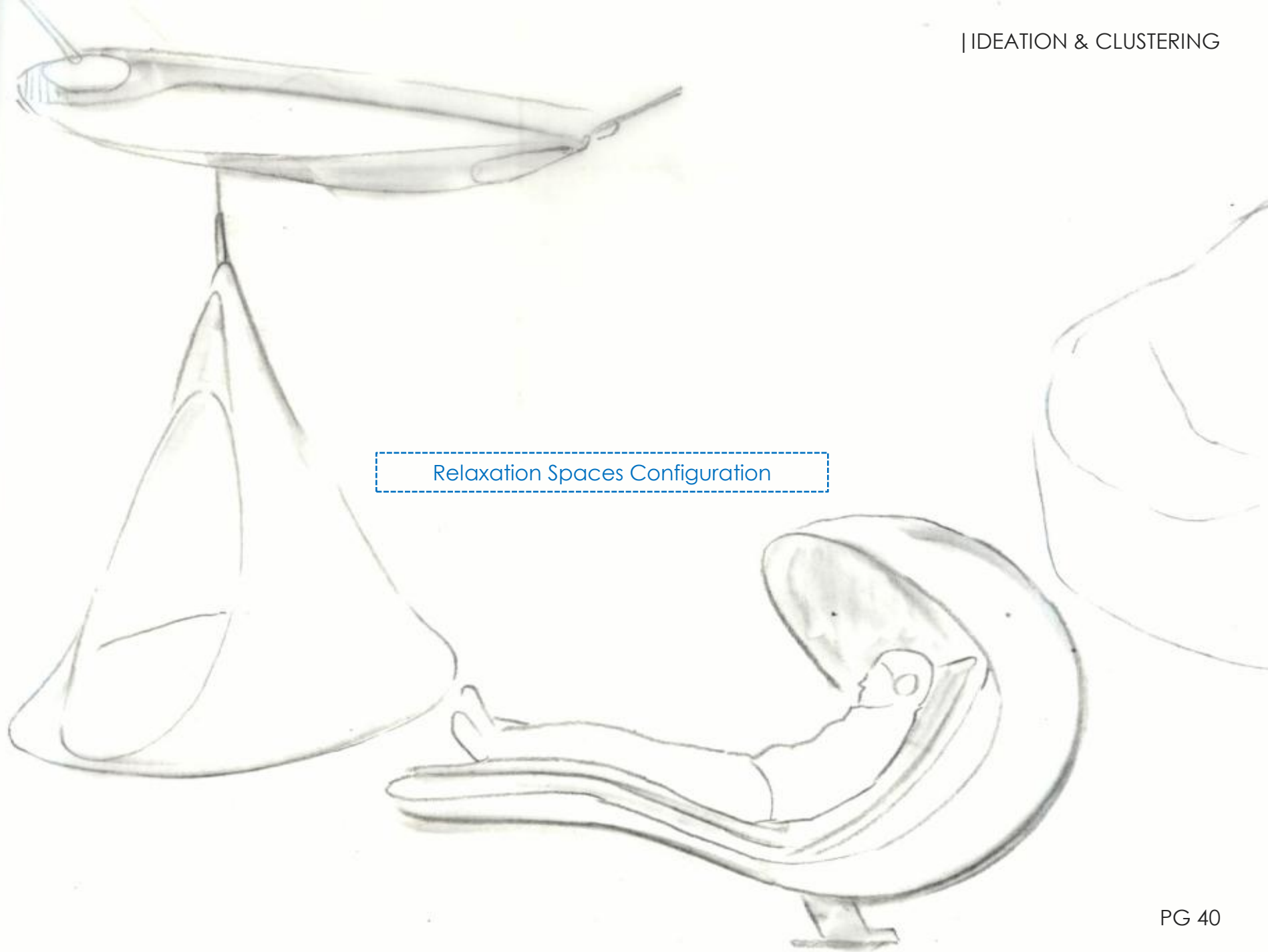


Docked Toy Configuration



App + Tactile Toy Configuration





Relaxation Spaces Configuration

C1 DOCKED TACTILE ELEMENT

PLAYFUL TOYS FOR ADULTS
EXPRESSIVE FUN CHARACTERS
TACTILE LIGHT & SOUND
GUITAR HERO
BOBBLE HEAD TYPE
PLAYFUL FORMS
CONSTRUCTIVE GAME PLAY
NOSTALGIC ELEMENTS

C2 HEAD-MOUNTED TYPE

ROBOCOP HEAD-MOUNT
MASSAGE HELMET TYPE
ORGANIC PATCH
3 CIRCLE CLUSTER TYPE
HEALING PILLOW TYPE
HUGGABLE PILLOW TYPE
TRAVEL PILLOW TYPE
RETRO AVIATOR SHADE VARIANT

CLUSTERING PRODUCT CONFIGURATIONS

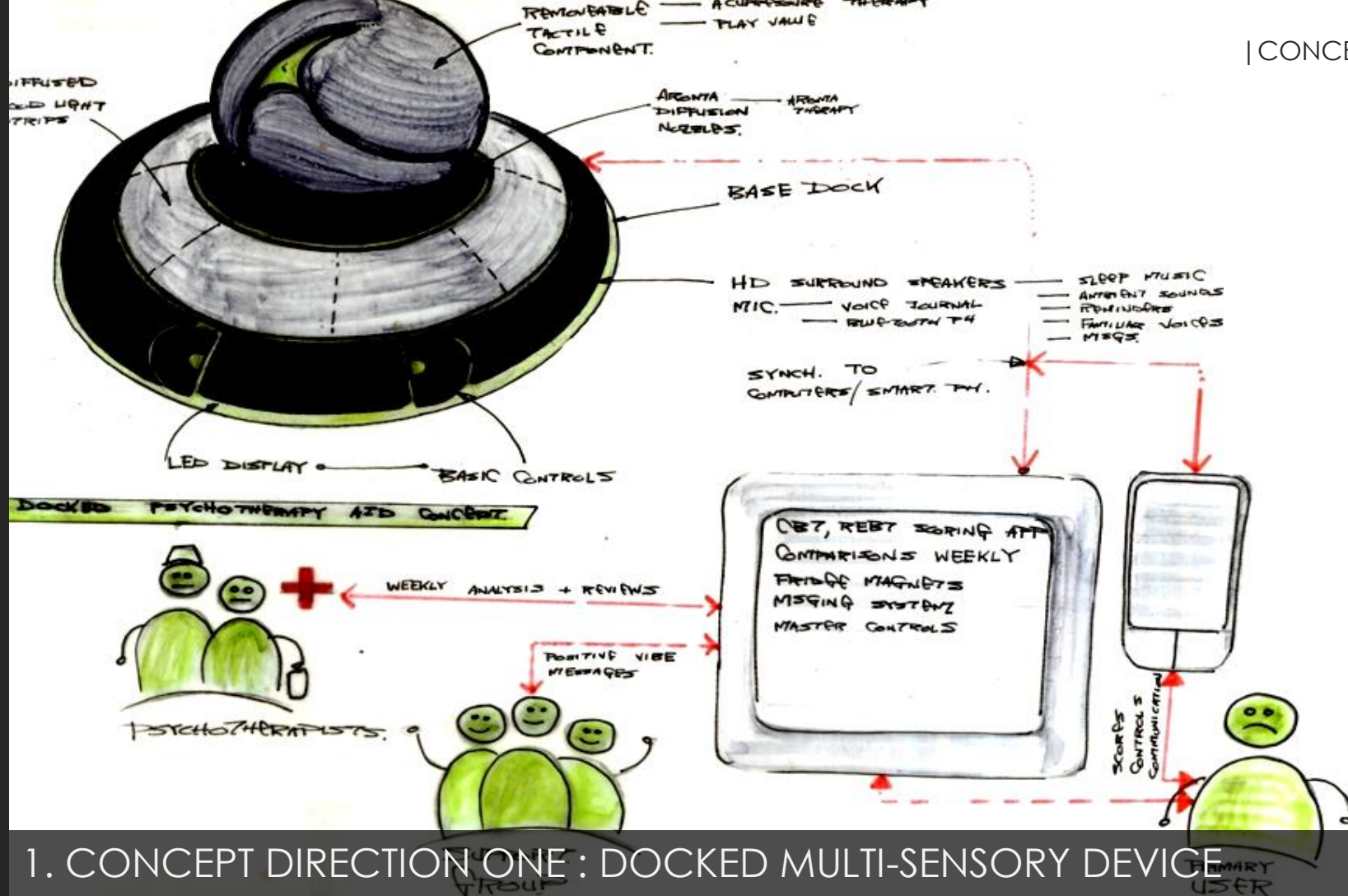
PSYCHOLOGY BASED

CBT & REBT INSIGHTS
ACCUPRESSURE THERAPY
MUSIC THERAPY
AROMA THERAPY
LIGHT THERAPY
SLEEP WAVES
AMBIENT HOME SOUNDS
REINFORCEMENT LEARNING
PETS AND COMPANIONS
NATURAL ENVIRONMENT
ALWAYS WIN GAMES
DAILY AUDIO DIARIES
POSITIVE AFFIRMATIONS

C3 SAFE SPACE SCREEN

SLEEPING / RELAXING POD CONFIG.
HAMMOCK TYPE
PERSONAL WORKSPACE TYPE
WORKSPACE SEPARATION SCREENS
EXPERIENCE DESIGN TYPE

GENERATING THREE CONCEPT DIRECTIONS BASED ON PRODUCT CONFIGURATION CLUSTERING



1. CONCEPT DIRECTION ONE: DOCKED MULTI-SENSORY DEVICE

The concept was developed to function as a docked multi-sensory device. It features ambient mood lighting, audio output, aroma diffusion and acupressure vibrations.

This concept was developed with an emphasis on incorporating play value into the multi-sensory device.

This could be achieved by packaging the outer surface in a layer of rugged elastomer with filled air pockets.

The air pockets would serve a dual purpose:

Protect components from impact force due to tactile play. (eg. Bouncing, squeezing, juggling) & allow for more effective bouncing/squeezing.

The lighting, sound and aroma diffusion circuitry could be synchronized with the tactile pressure on the surface.

This would create an interesting multi-sensory toy / wireless speakers for adults.



CONCEPT DIRECTION ONE : DOCKED MULTI-SENSORY DEVICE

PROS

1. Tactile Play Value
2. Stress Relief ball features
3. Well disguised as speakers
4. Multiple usage scenarios

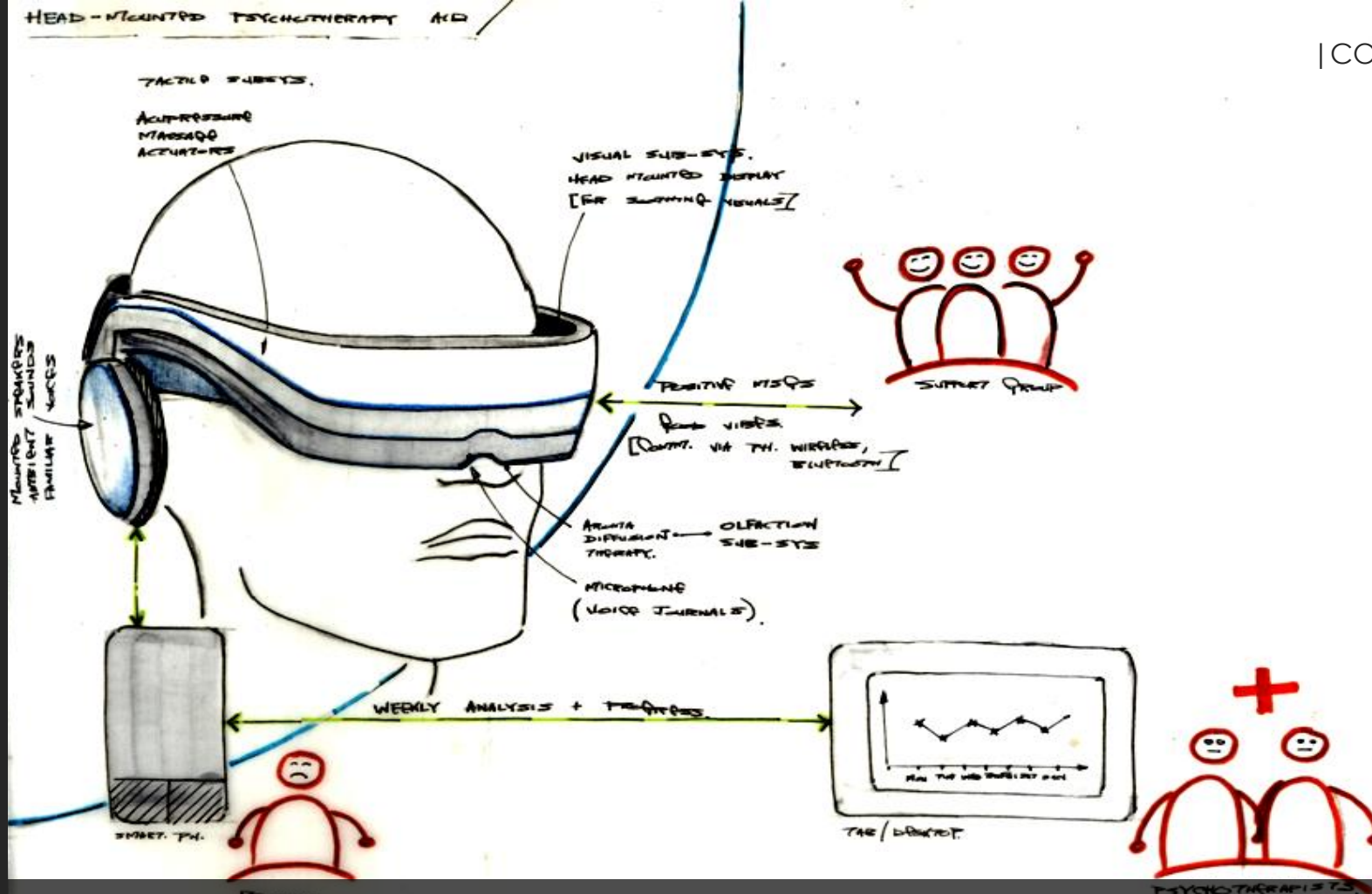
CONS

1. Complex product packaging and integration is required to house all reward sub-systems.
2. Hygiene issues arising from incorrect usage of product.

USAGE SCENARIOS

Docked :
Hostel , Home (Indoors)

Undocked:
Inside bag, can carry it to college etc.



2. CONCEPT DIRECTION TWO : MULTI-SENSORY HEAD-GEAR

CONCEPT OVERVIEW

The concept features head gear that incorporates a head mounted display for soothing visuals and audio along with aroma diffusion nozzle on nose. Contours & temporal massage for a sort of 4D user experience.

PROS

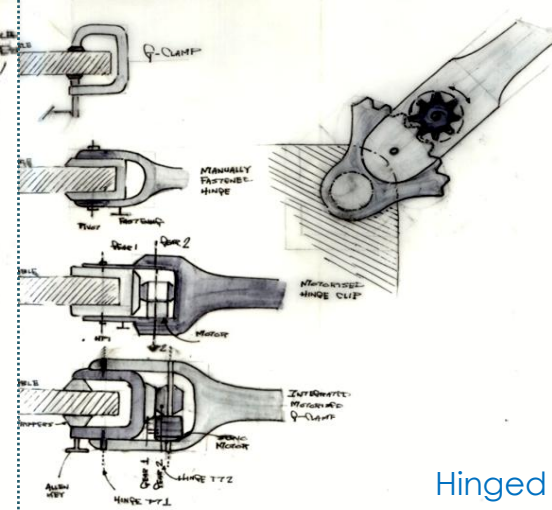
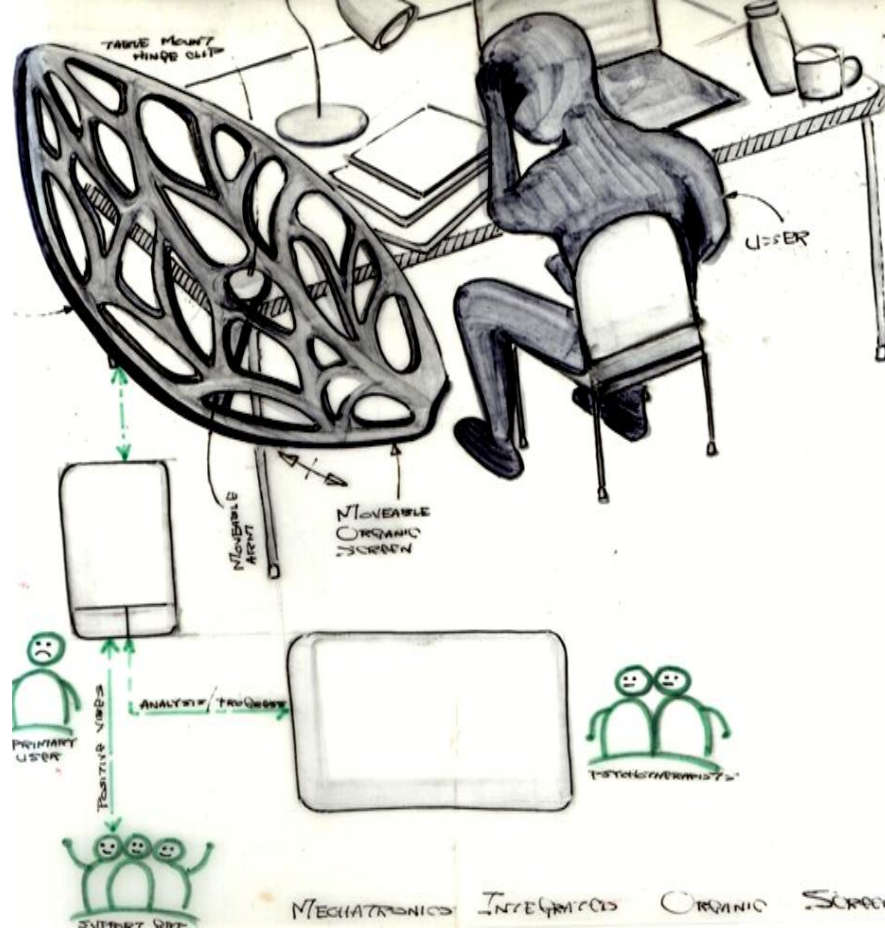
1. Close Sensory Association
2. Temporal Massage
3. Use can be extended
4. More Volume for to Integrate reward sub-systems
5. Funky, Hi-Tech Aesthetics

CONS

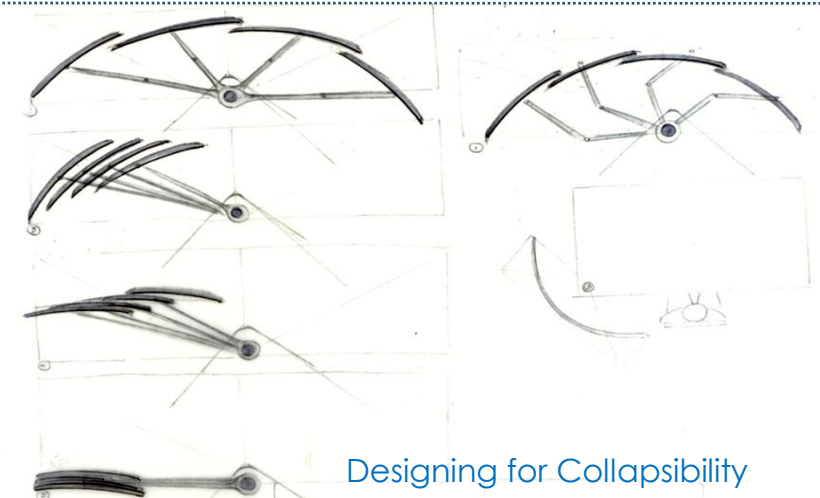
1. Not as portable
2. Perspiration & stuffiness
3. When not worn on the head, no particular use
4. Constrains posture required to lie down.

USAGE SCENARIOS

Home (Indoors)
Hostel (Indoors)
College (Indoors)



Hinged Table Clamp Details



Designing for Collapsibility

3. CONCEPT DIRECTION THREE : MULTI-SENSORY SAFE SPACE SCREEN

CONCEPT OVERVIEW

The concept allows for the user to withdraw to a safe space. It features all the reward mechatronics incorporated into a collapsible screen that can be clamped onto the students table & moved.

PROS

1. Directly affects the environment in the user's room.
2. Helpful when user want to get away , provides privacy.

CONS

1. Empowers withdrawal as an escape strategy.
2. Manufacturing complexity of form.
3. Very bulky for cramped hostel rooms.

USAGE SCENARIOS

1. Home (Indoors)
2. Hostel (Indoors)

SL	CONCEPT EVALUATION CRITERIA	CONCEPT 1: DOCKED TACTILE TYPE			
		PSYCHIATRIST	COUNSELLOR	PSYCHOLOGIST	SCORE
1	APPROPRIATENESS FOR CONTEXT	3	4	4	3.67
2	POTENTIAL FOR USE IN THERAPY / COUNSELLING	3	4	5	4.00
3	EFFECTIVENESS OF FEATURES	4	5	4	4.33
4	EXPECTED USER ACCEPTANCE	3	5	5	4.33
5	RECOMMENDED FOR UNIVERSITY STUDENTS	3	5	5	4.33
					20.67

SL	CONCEPT EVALUATION CRITERIA	CONCEPT 2: HEAD MOUNTED TYPE			
		PSYCHIATRIST	COUNSELLOR	PSYCHOLOGIST	SCORE
1	APPROPRIATENESS FOR CONTEXT	3	5	5	4.33
2	POTENTIAL FOR USE IN THERAPY / COUNSELLING	4	5	5	4.67
3	EFFECTIVENESS OF FEATURES	4	5	5	4.67
4	EXPECTED USER ACCEPTANCE	4	5	5	4.67
5	RECOMMENDED FOR UNIVERSITY STUDENTS	3	5	4	4.00
					22.33

SL	CONCEPT EVALUATION CRITERIA	CONCEPT 3 : SAFE SPACE TYPE			
		PSYCHIATRIST	COUNSELLOR	PSYCHOLOGIST	SCORE
1	APPROPRIATENESS FOR CONTEXT	5	2	3	3.33
2	POTENTIAL FOR USE IN THERAPY / COUNSELLING	3	4	3	3.33
3	EFFECTIVENESS OF FEATURES	5	5	4	4.67
4	EXPECTED USER ACCEPTANCE	4	3	3	3.33
5	RECOMMENDED FOR UNIVERSITY STUDENTS	5	3	4	4.00
					18.67

4. CONCEPT EVALUATION BY EXPERTS

EVALUATION CRITERIA

The concepts were evaluated by 3 experts, a psychiatrist, a clinical counsellor and a psychologist.

Scores were based on the following criterion:

- I. Appropriateness for Context
- II. Potential for use in therapy
- III. Effectiveness of features
- IV. Expected User Acceptance
- V. Would recommend for university students

SCORING LEGEND

Scores were based on the following legend:

- 1 = STRONGLY DISAGREE
- 2 = DISAGREE
- 3 = NEUTRAL
- 4 = AGREE
- 5 = STRONGLY AGREE

OVERVIEW OF INSIGHTS

Features in concept 1 and 2 were both well received by the experts. Concept 3 was rejected due to its inherent cons.

1.Assembled Head Set

2.Unmating ½ sphere ear pieces

3.Mating the two ½ spheres

4.Use sphere as secondary device

5. FINALISING PRODUCT CONFIGURATION

Based on discussions with the product design faculty at IDC , it was decided that features of concept 1 and concept 2 could be integrated into a single device in order to allow for better usability of the device. The final product configuration features a Multi-sensory head – set device that allows the user to unmate the 2 half-sphere like ear pieces from the headset and assemble them with each other to create a singular sphere like device.

When assembled as a sphere the device works similar to a spherical wire-less speaker with ambient lighting and a tactile surface for squeezing like a stress ball.The product is intended to be used in sphere mode as a stress ball , when portability is required (eg fits in college bag) or user wants to use it while lying down.

Aroma diffusion nozzles , soothing visuals display and temporal acupressure massage sub-systems are incorporated in the headset.

UNDERSTANDING THE TARGETTED USER GROUPS PERCEPTION OF PRODUCT FORM LANGUAGE

SEMANTICS & FORM PERCEPTION

- A semantic study was undertaken to gauge target user group's (university students) perception of devices closely associated with multi-sensory head gear and wireless audio devices.
- Users were asked to arrange de-contextualized images into 5 groups based on which they associated most to multi-sensory head gear and wireless speakers.
- Keeping the column contents unchanged, the subjects were asked to rearrange within each group, images they found most strongly associated with expressions of happiness : Joyful, Proactive, Serene.
- Subjects were interviewed to understand their card-sorting strategy for deeper insights pertaining to form language.

OVERVIEW OF SEMANTIC STUDY

- TARGETED USER GROUP : 15 UNIVERSITY STUDENTS (18 – 25 YRS)
- TARGETED KEYWORDS :
1. MULTI-SENSORY HEAD GEAR
2. SPHERICAL WIRELESS SPEAKERS
- METHODS: SEMANTIC GRADIENT : CARD SORTING INTERVIEWS
- TEST TIME: 20 MIN /USER
- EXPRESSIONS: SET1 : JOYFUL, PROACTIVE, SERENITY
SET2 : CLINICAL, PASSIVE, STRESS









FEATURES

- Form contours to accommodate max. no. of senses Nose grooves , eye contours ,head fastening straps ,ear elements.
- Emphasis on eye contour element.
- Well integrated form – good transitions between different form elements.
- Clearly visible control elements like buttons and dials.

- Head enveloping form – shutting out from the world feel.
- Representation of spectacle frame form. (B shape)
- Looks like its packed with features for each sense.
- Dynamic ,agile form language.

EXPRESSIONS

- Use of bright ,warm colours evokes a sense of youthfulness ,play value.
- Multiple textures ,materials & trim highlights makes the product I look sporty ,proactive.
- Agile forms blending into each other give a sense of movement.
- Form styling is more towards cool , funky and casual.
- Chunky , toy-like forms are reminiscent of childhood.

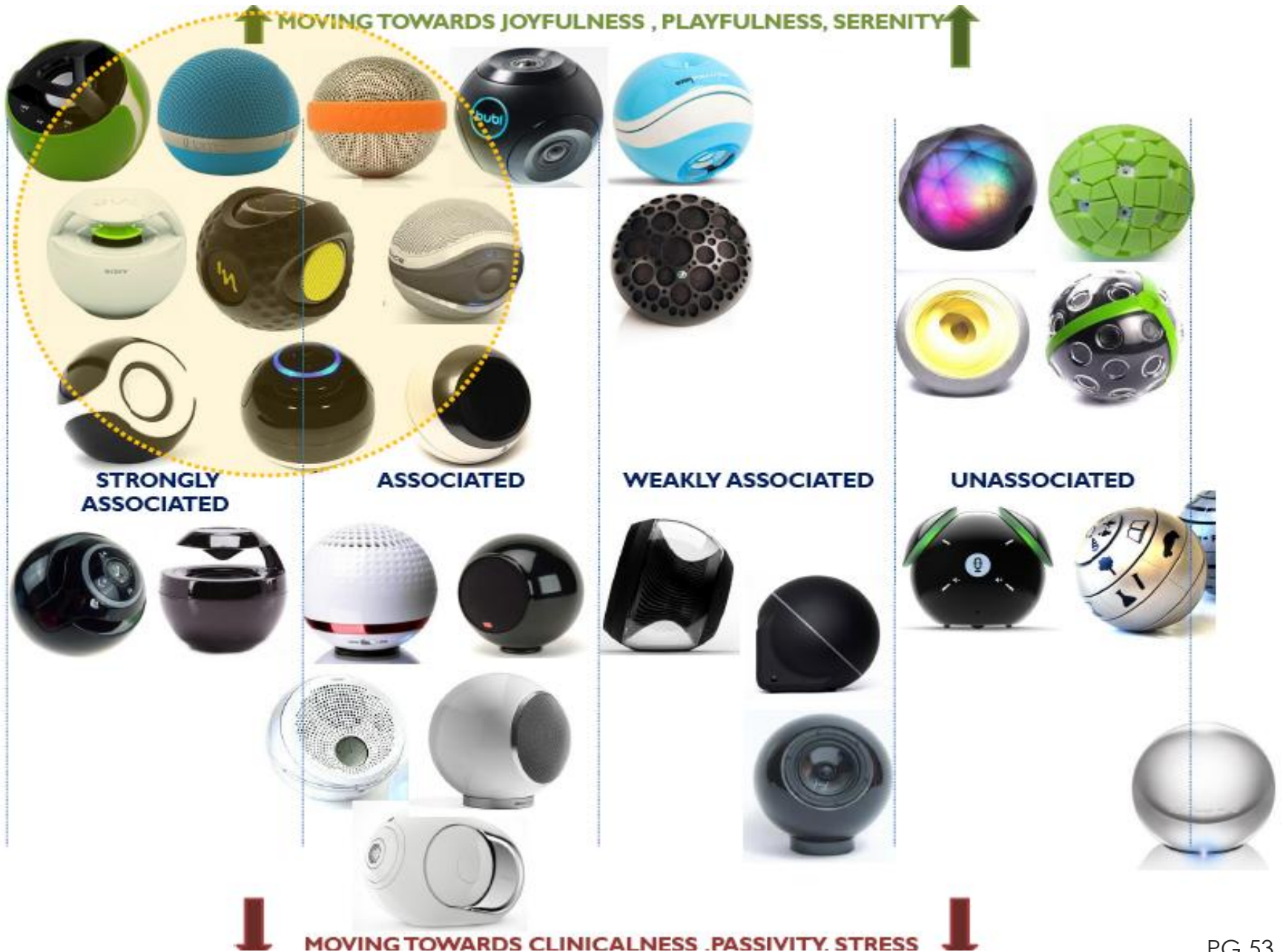
- Product expression is more towards personal use , casual ,friendly and unintimidating.
- Curvilinear form contours express warmth ,approachability.
- Form elements that indicate the product is comfortable to use.
- Simple and intuitive control and display clusters



CLINICAL
DOCILE
TENSED



SEMANTICS OF SPHERICAL WIRELESS SPEAKERS





FEATURES

- Emphasis on circular elements and concentricity
- Slots & features for IP OP jacks and charging ports.
- Concave cut-outs from the spherical form.
- Perforated mesh for sound output .
- Clearly visible stop , play ,pause and volume control elements and icons.

- Well integrated form – good transitions between different form elements.
- Clearly visible control elements like buttons and dials.
- Head enveloping form – shutting out from the world feel.
- Dynamic ,agile form language.

EXPRESSIONS

- Use of bright ,warm colours & glows evokes a sense of youthfulness ,play value.
- Multiple textures ,materials & trim highlights makes the product I look sporty ,proactive.
- Agile forms blending into each other give a sense of movement.
- Form styling is more towards cool , funky and casual.
- Product expression is more towards personal use , casual ,friendly and unintimidating.

- Soft ,Curvilinear form contours express warmth ,approachability.
- Chunky , toy-like forms are reminiscent of childhood.
- Form elements that indicate the product is comfortable to use eg. Padding
- Simple and intuitive control and display clusters.
- Common –man feel (not elite) can withstand a little bit of rough use.
- Looks like it can be touched , played with ,bounced etc.

MOOD BOARD : JOYFUL, PROACTIVE, SERENE



EXPLORATION OF THE PRODUCTS FORMAL FEATURES BASED ON INPUTS FROM SEMANTICS STUDY

SPEAKER SEMANTICS

EXPRESSIONS

HEAD-GEAR SEMANTICS



Form styling is more towards cool ,
funky and casual.

Chunky , toy-like forms are
reminiscent of childhood.

Representation of spectacle frame
form.
(B shape)

Concave cut-outs from the
spherical form.

Well integrated form – good
transitions between different form
elements.

Dynamic ,agile form language.

Product expression is more
towards personal use , casual
,friendly and unimimidating.



Representation of spectacle frame
form.
(B shape)

Clearly visible control elements like
buttons and dials.



Emphasis on circular elements and concentricity

Concave cut-outs from the spherical form.

Clearly visible stop , play ,pause and volume control elements and icons.

Slots & features for IP OP jacks and charging ports.

SPEAKER SEMANTICS

Curvilinear form contours express warmth ,approachability.

Form styling is more towards cool , funky and casual.

Chunky , toy-like forms are reminiscent of childhood.

EXPRESSIONS

Form contours to accommodate max. no. of senses Nose grooves , eye contours ,head fastening straps ,ear elements.

Emphasis on eye contour element.

Looks like its packed with features for each sense.

HEAD-GEAR SEMANTICS

Clearly visible control elements like buttons and dials.

Perforated mesh for sound output .

Concave cut-outs from the spherical form.

Slots & features for IP OP jacks and charging ports.

SPEAKER SEMANTICS

Product expression is more towards personal use , casual ,friendly and unimtimidating.

Multiple textures ,materials & trim highlights makes the product I look sporty ,proactive.

Chunky , toy-like forms are reminiscent of childhood.

Form styling is more towards cool , funky and casual.

Form elements that indicate the product is comfortable to use.

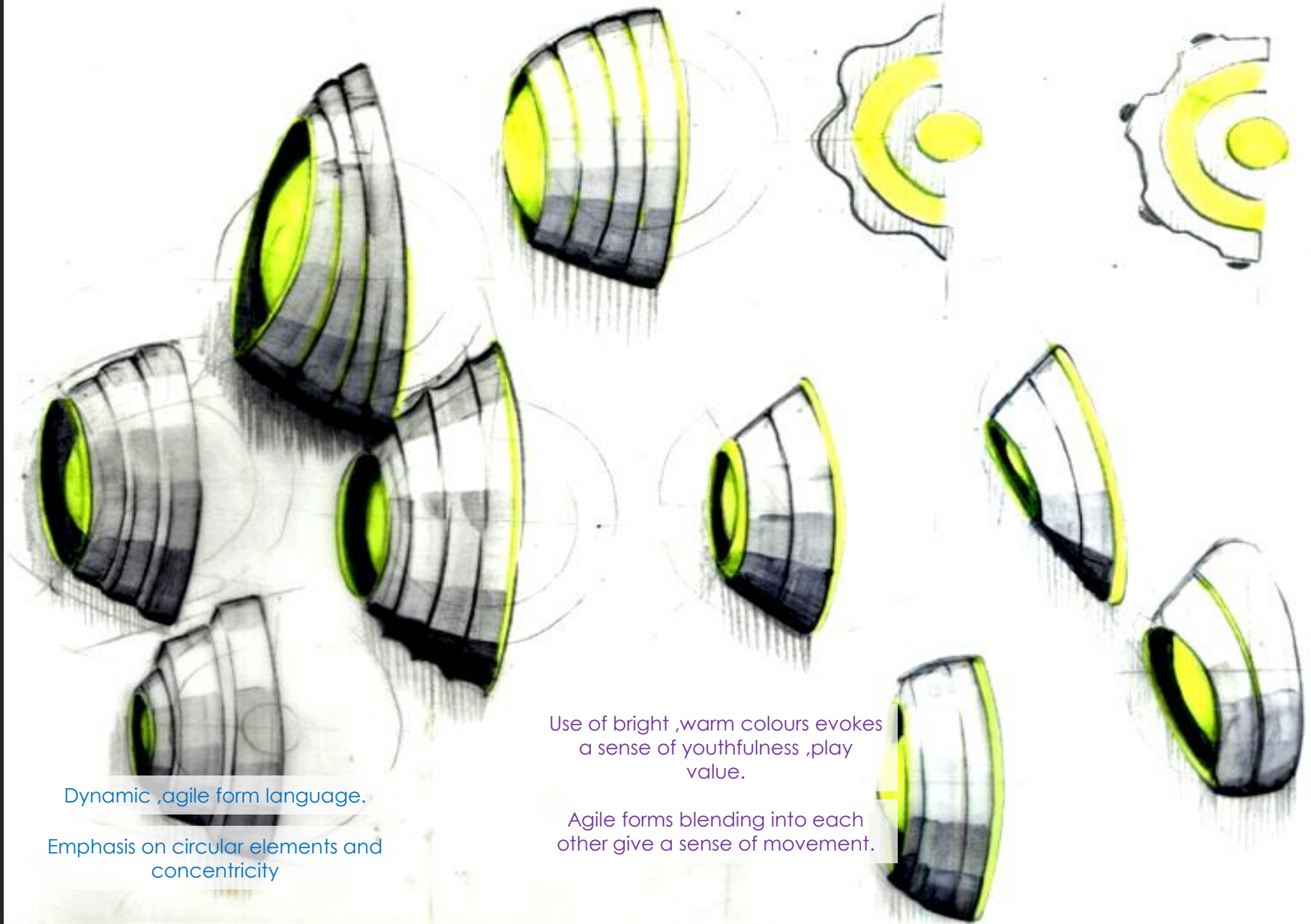
EXPRESSIONS

Form contours to accommodate max. no. of senses Nose grooves , eye contours ,head fastening straps ,ear elements.

Representation of spectacle frame form.
(B shape)

Clearly visible control elements like buttons and dials.

HEAD-GEAR SEMANTICS



Dynamic ,agile form language.

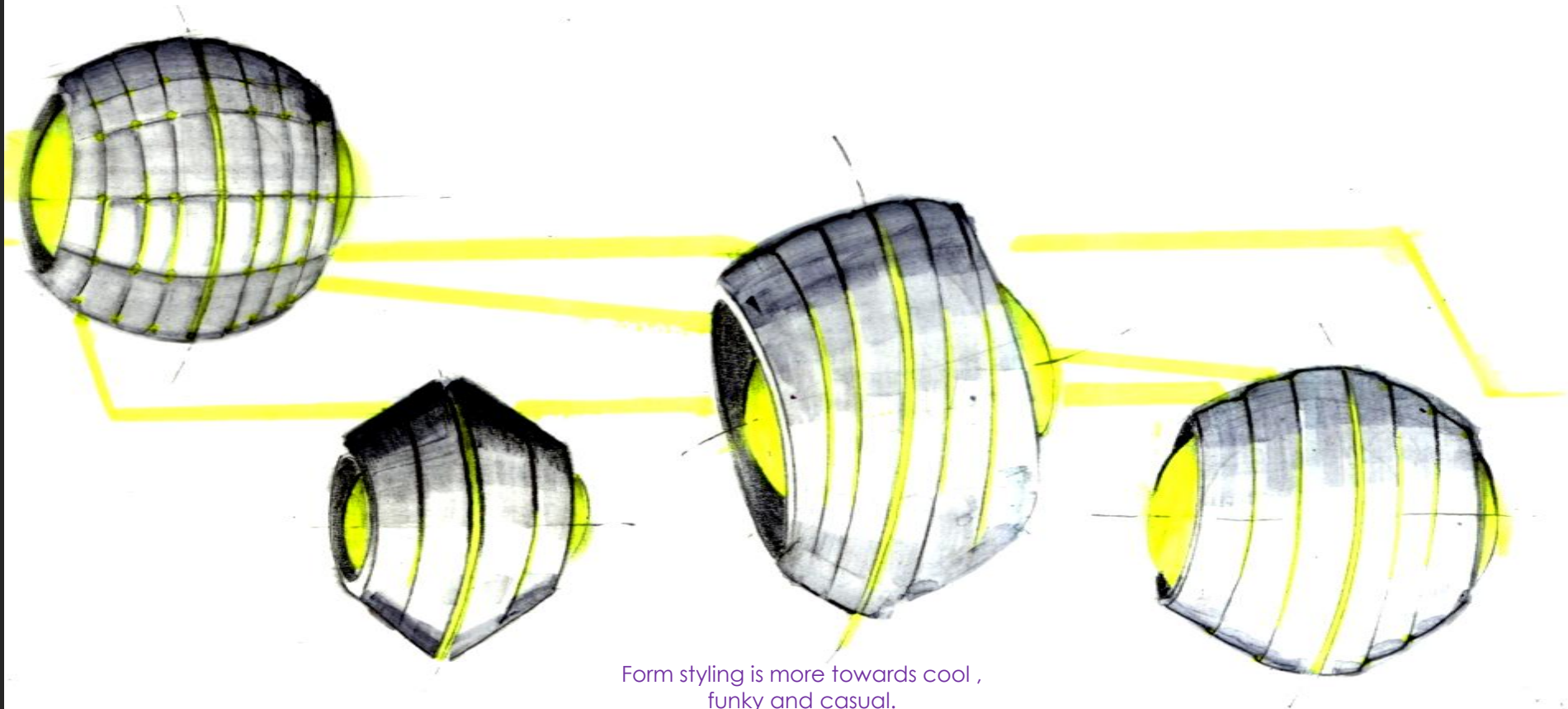
Emphasis on circular elements and
concentricity

Use of bright ,warm colours evokes
a sense of youthfulness ,play
value.

Agile forms blending into each
other give a sense of movement.

SPEAKER SEMANTICS

EXPRESSIONS



Concave cut-outs from the
spherical form.

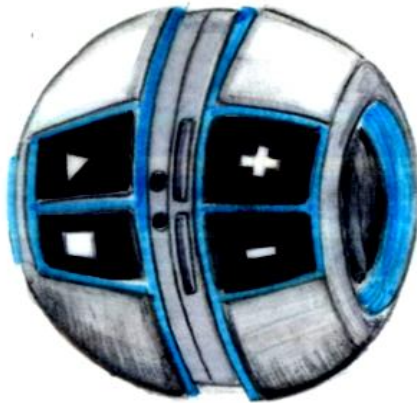
Dynamic ,agile form language.

Form styling is more towards cool ,
funky and casual.

Use of bright ,warm colours evokes
a sense of youthfulness ,play
value.

SPEAKER SEMANTICS

EXPRESSIONS



Emphasis on circular elements and concentricity

Concave cut-outs from the spherical form.

Slots & features for IP OP jacks and charging ports.

Clearly visible stop, play, pause and volume control elements and icons.

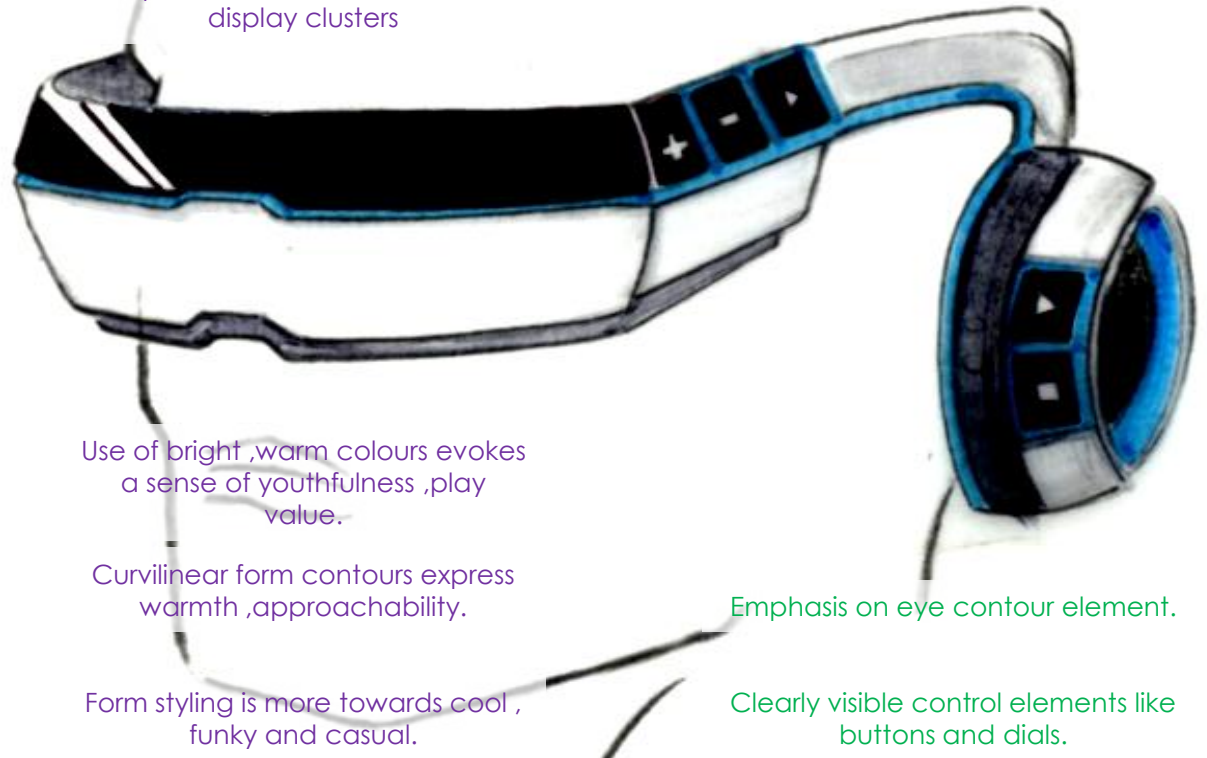
Perforated mesh for sound output.

SPEAKER SEMANTICS

Form elements that indicate the product is comfortable to use.

Multiple textures, materials & trim highlights makes the product look sporty, proactive.

Simple and intuitive control and display clusters



Use of bright, warm colours evokes a sense of youthfulness, play value.

Curvilinear form contours express warmth, approachability.

Form styling is more towards cool, funky and casual.

EXPRESSIONS

Form contours to accommodate max. no. of senses Nose grooves, eye contours, head fastening straps, ear elements.

Representation of spectacle frame form. (B shape)

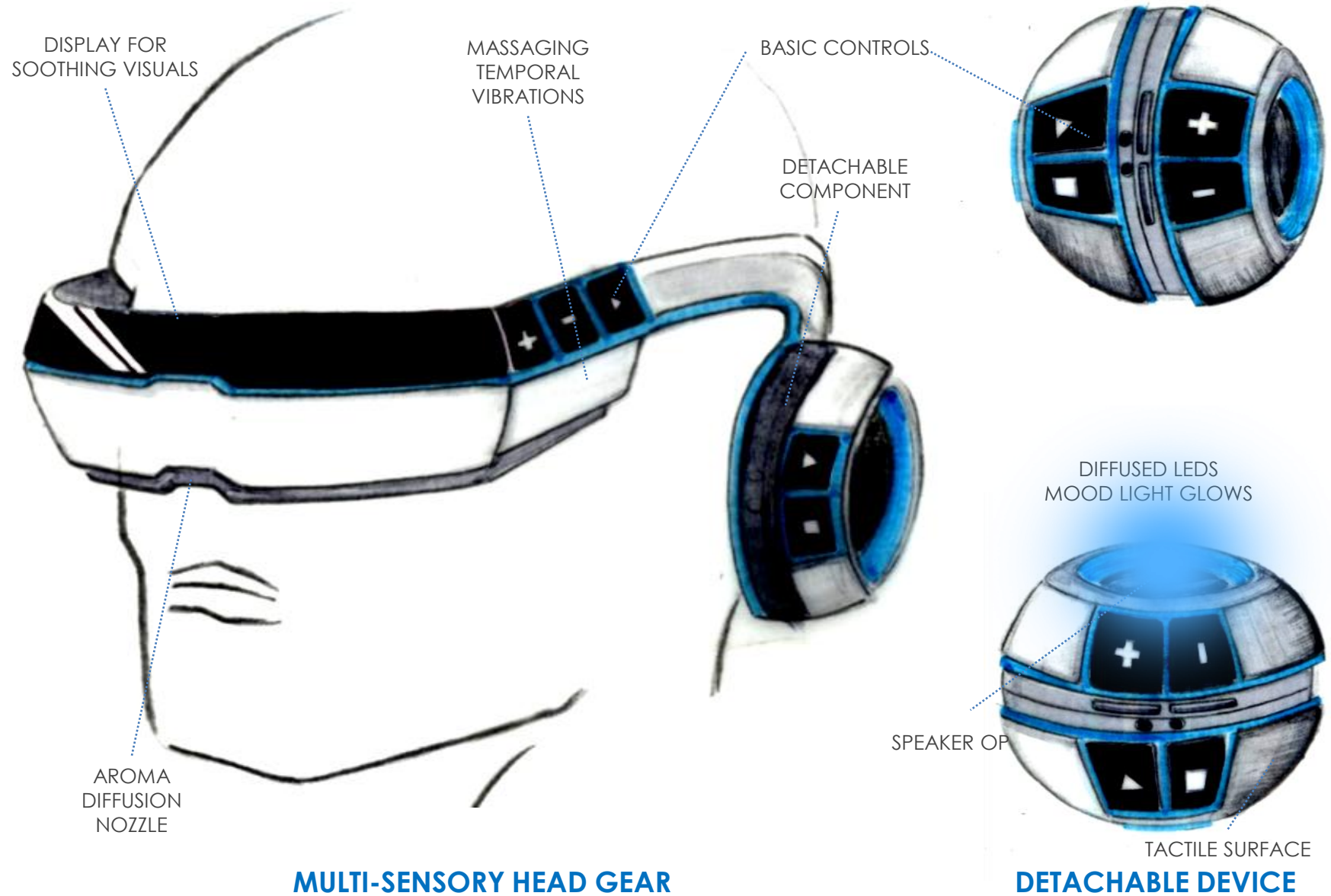
Emphasis on eye contour element.

Clearly visible control elements like buttons and dials.

HEAD-GEAR SEMANTICS

DEFINING PRODUCT USABILITY ,FEATURES AND USAGE SCENARIOS

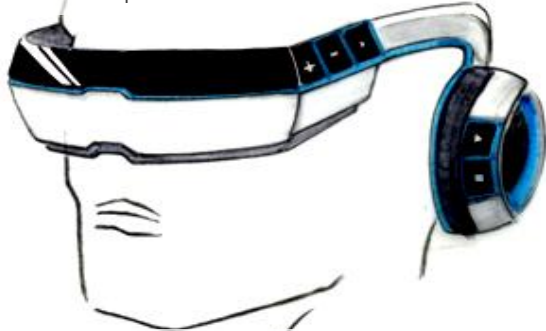
1. PART NOMENCLATURE



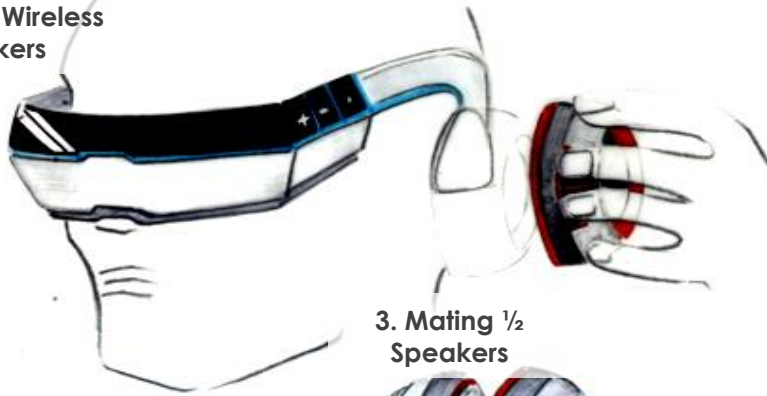
2. ASSEMBLY / DISASSEMBLY INSTRUCTIONS

1. Fully Mated View :

- a) Multi-Sensory Headset
- b) Deattachable Wireless Speakers



2. Unmating Wireless 1/2 Speakers



3. Mating 1/2 Speakers



5. Typical Usage Scenarios



4. Mated Wireless Speakers

3. USAGE SCENARIOS

A) HUGGING AND SLEEPING
IN FETAL POSITION



B) LYING DOWN HOLDING
THE DEVICE



C) HOLDING /SQUEEZING LIKE A STRESS BALL



D) TABLE-MOUNTED MODE:
SPEAKERS + MOOD LIGHTING





4. FEATURES OF VISUAL SUB-SYSTEMS

A) HEADGEAR MODE

The head- mounted LCDs function as the primary Visual OP generator.

Features pre-loaded soothing visual scenes.

B) SPHERE MODE

The diffused LED strip for mood-lighting act as primary Visual OP generator.

- i) ACTIVE MODE
Fast Green Blinking
- ii) SLEEP ASSIST MODE
Slow Orange glows
- iii) SPEAKER MODE
Blue glows

CONTROLS

As all rewards are based on the scoring system . Basic START/ STOP ,INCREASE /DECREASE for both screen & lighting control are adequate.



5. FEATURES OF AUDITARY SUB-SYSTEMS

A) HEADGEAR MODE

The half-sphere elements have bi-directional speakers for Audio OP. The speakers directed to the ears (Towards the base of the $\frac{1}{2}$ sphere) act as primary OP.

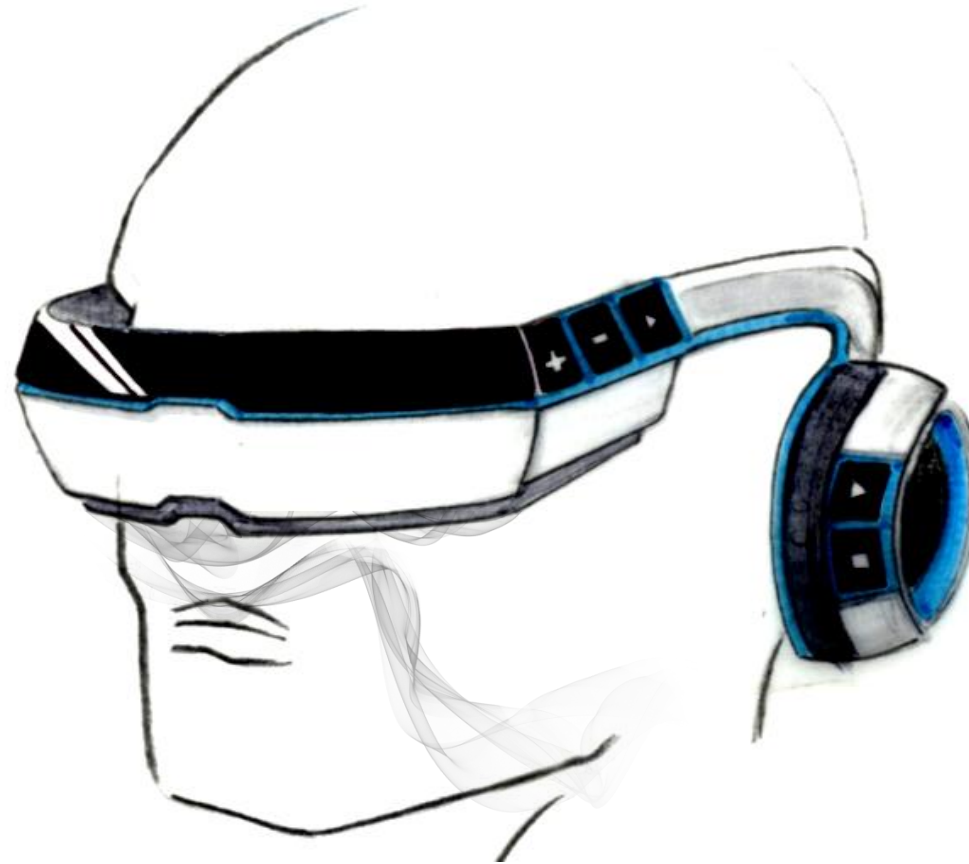
B) SPHERE MODE

The speakers directed away from ears (Towards the cut-out of the $\frac{1}{2}$ sphere) act as primary OP.

- i) ACTIVE MODE
Users Control
- ii) SLEEP ASSIST MODE
Binaural Delta Waves
- iii) SPEAKER MODE
Ambient Sounds

CONTROLS

As all rewards are based on the scoring system. Basic START/ STOP, INCREASE /DECREASE for both screen & volume control are adequate.



6. FEATURES OF OLFACTION SUB-SYSTEMS

A) HEADGEAR MODE

Aroma diffusion subsystem is housed near the nose contours. Olfaction rewards require higher scores. Aromatic oil may be refilled when exhausted.

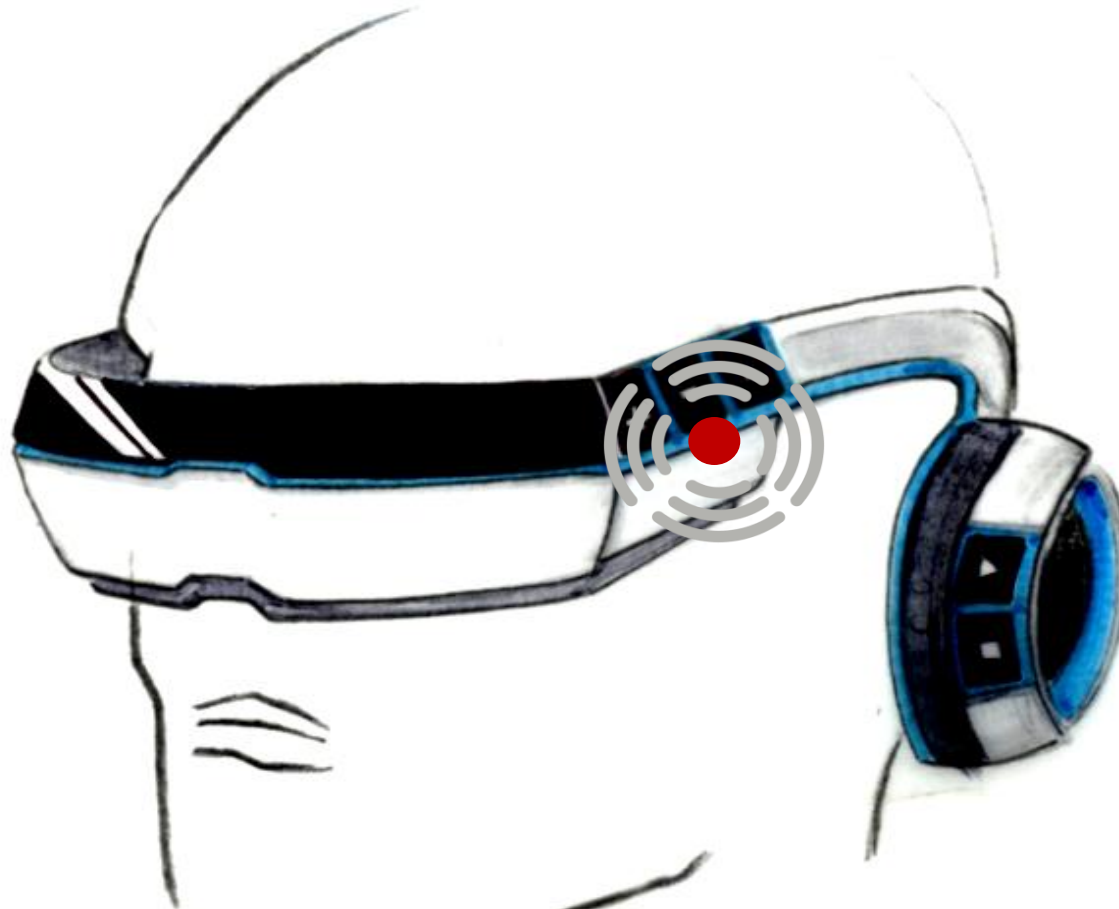
B) SPHERE MODE

No Aroma Diffusion in Sphere Mode.

- i) ACTIVE MODE
N/A
- ii) SLEEP ASSIST MODE
N/A
- iii) SPEAKER MODE
N/A

CONTROLS

As all rewards are based on the scoring system . Basic START/ STOP ,INCREASE /DECREASE for intensity control are adequate.



7. FEATURES OF TACTILE SUB-SYSTEMS

A) HEADGEAR MODE

Temporal Massage Vibration elements act as primary tactile OP.

Produces soothing vibrations to users temporal zone.

B) SPHERE MODE

Outer surface is designed in rugged elastomer that can be squeezed like a stress ball.

i) ACTIVE MODE
N/A

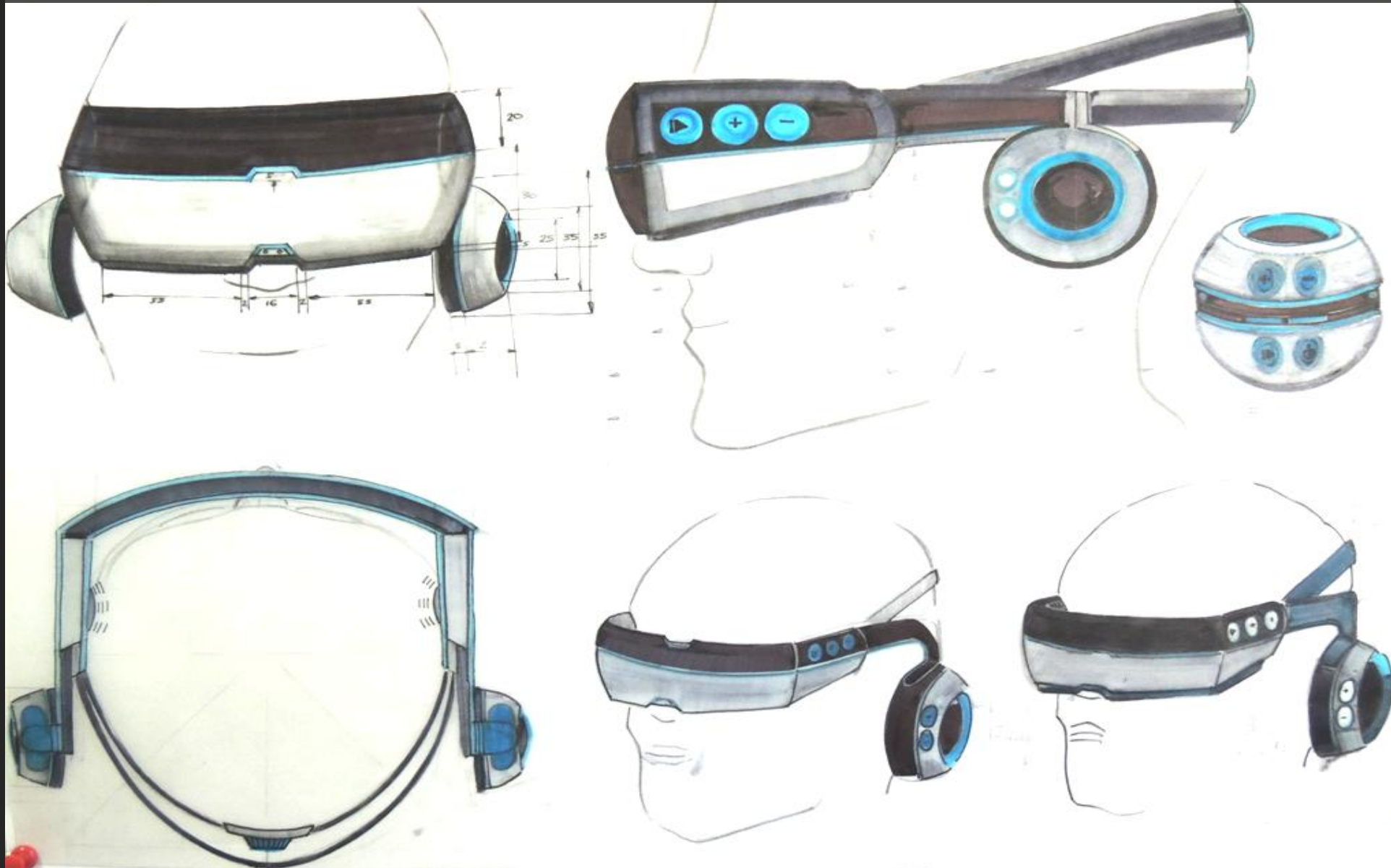
ii) SLEEP ASSIST MODE
N/A

iii) SPEAKER MODE
N/A

CONTROLS

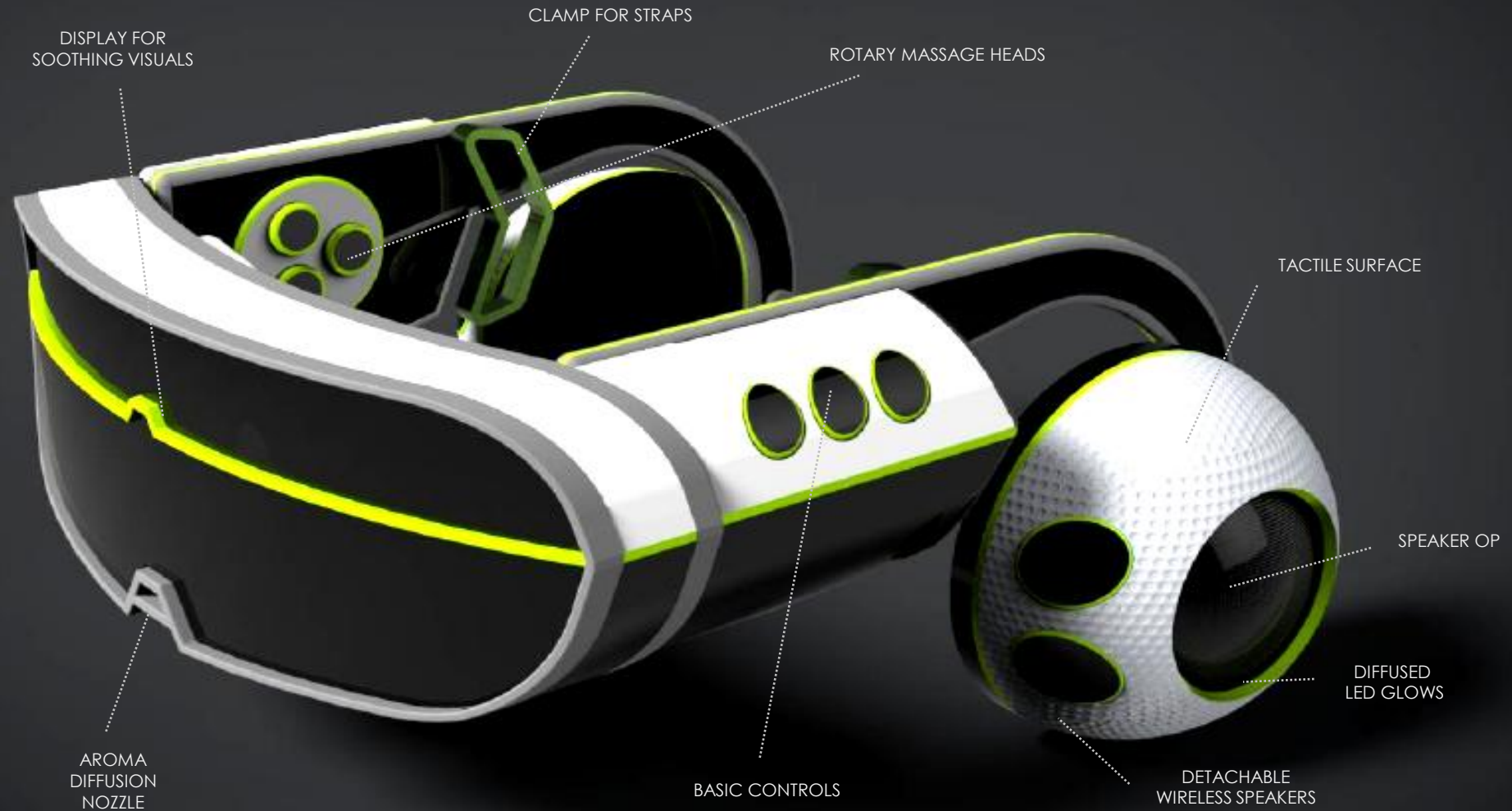
As all rewards are based on the scoring system . Basic START/ STOP ,INCREASE /DECREASE for intensity control are adequate.

FINAL DESIGN CONCEPT : MULTI-SENSORY HEAD GEAR

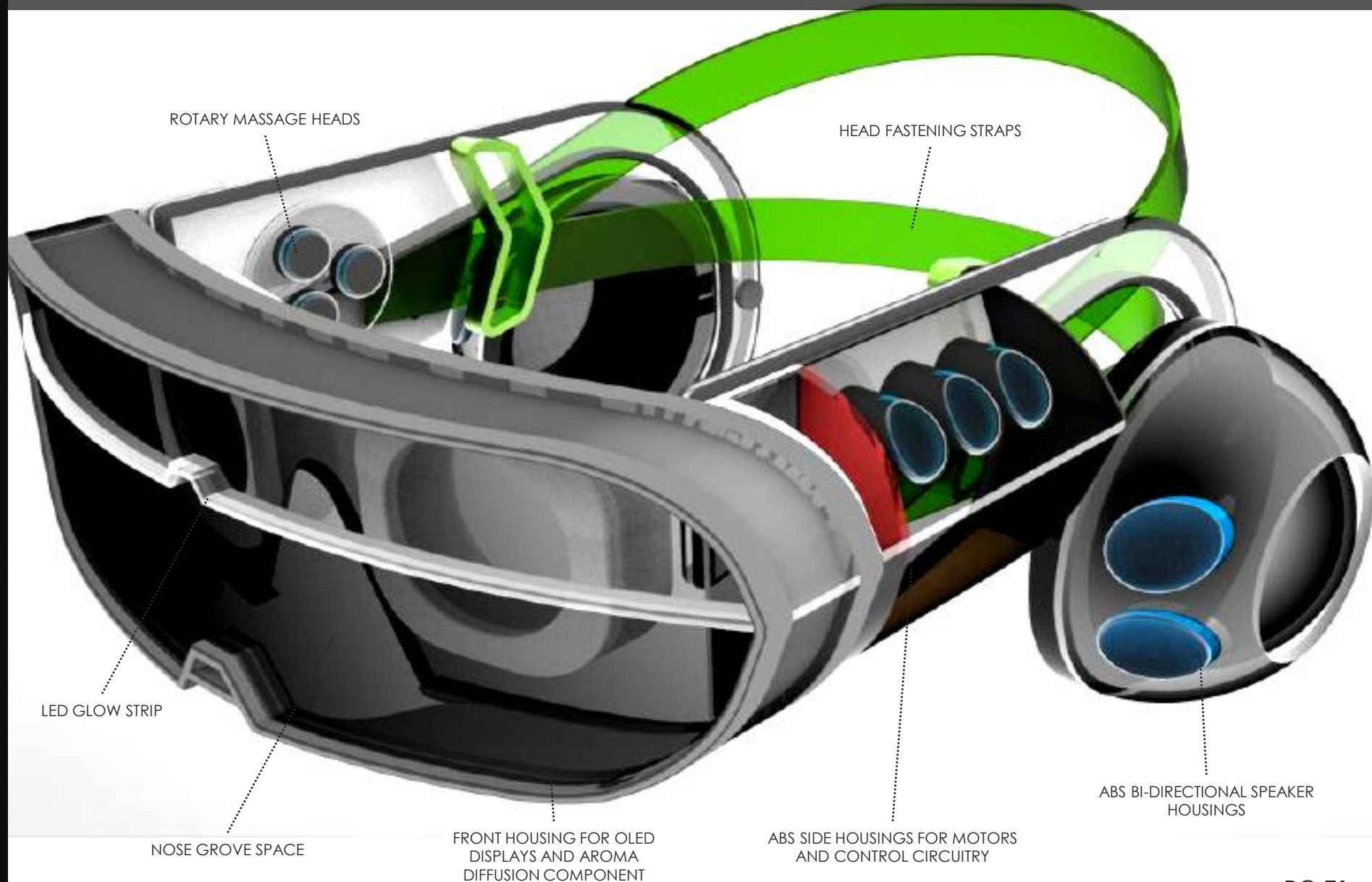


FINAL DESIGN PROPOSAL : REINFORCEMENT LEARNING APP, MULTISENSORY HEAD GEAR , DETACHABLE COMPONENT

FINAL DESIGN CONCEPT : MULTI-SENSORY HEAD GEAR



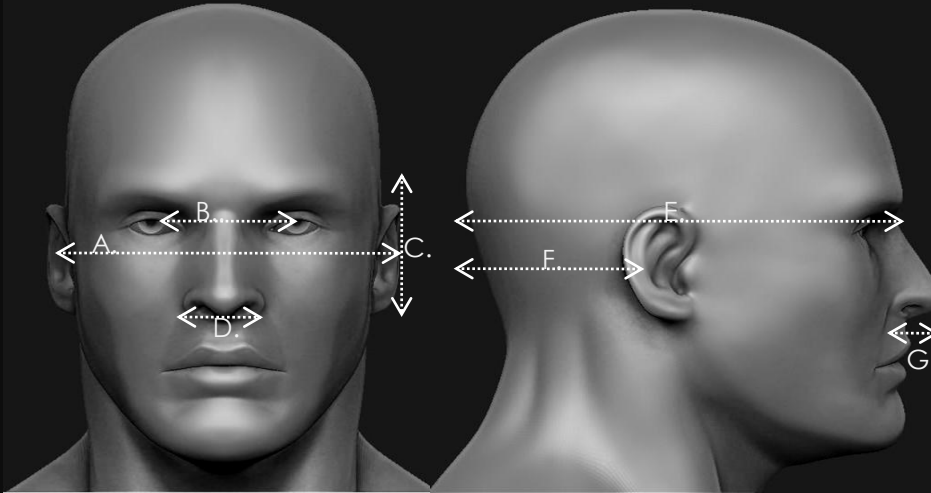
PRODUCT ARCHITECTURE : X-RAY VIEW OF COMPONENT VOLUMES



PRODUCT ARCHITECTURE : VOLUMETRIC PACKAGING OF COMPONENTS

SL.		LENGTH (MM)	WIDTH (MM)	HEIGHT (MM)	REQD VOLUME (MM3)
A. VISUAL SUBSYSTEM					104100.00
1	2 LED STRIPS	230	5	1	2300.00
2	FUZZY LOGIC IC CKT -PROCESS CONTROL -LDR	30	2	30	1800.00
3	2 O-LCD DISPLAYS	50	50	20	100000.00
B. AUDITORY SUBSYSTEM					57600.00
1	GALVANIC RESISTANCE SENSORS- MOOD SENSING CKT	30	2	30	1800.00
2	2 BIDIRECTIONAL STEREO SPEAKERS	30	30	30	54000.00
3	FUZZY LOGIC IC CKT -PROCESS CONTROL	30	2	30	1800.00
C. TACTILE SUBSYSTEM					34800.00
1	2 MASSAGE HEADS ROTARY	30	30	5	9000.00
2	FUZZY LOGIC IC CKT -PROCESS CONTROL	30	2	30	1800.00
3	2 SERVO MOTORS	30	20	20	24000.00
D. OLFACTION SUBSYSTEM					45550.00
1	AROMA DIFFUSION ACTUATOR	50	35	25	43750.00
2	FUZZY LOGIC IC CKT -PROCESS CONTROL	30	2	30	1800.00
E. PRODUCT INTERFACE DESIGN					11600.00
1	8 CONTROL + BUTTONS	20	20	2	8000.00
2	MASTER SYSTEM IC + FUZZY LOGIC FXNS	30	2	30	1800.00
3	SYNCH CKTS TO SMART PHONES	30	2	30	1800.00
F. OTHER HARDWARE COMPONENTS					28440.00
1	CHARGING CKTS	30	2	30	1800.00
2	OP JACKS & CONNECTORS	8	4	20	640.00
3	MEMORY CARDS	20	20	5	2000.00
4	RECHARGEABLE BATTERIES	60	40	10	24000.00
TOTAL VOLUME OF COMPONENTS					282090.00
HEAD SET MODE					331250.00
d)	FRONT END	190	25	50	237500.00
b)	2 SIDE STEMS	75	25	50	93750.00
SPHERE MODE		R = 35			181218.33
TOTAL SHELL VOLUME					512468.33
EXPECTED DIMENSIONS & COSTING / PIECE					512470 CUBIC MM

ANTHROPOMETRY

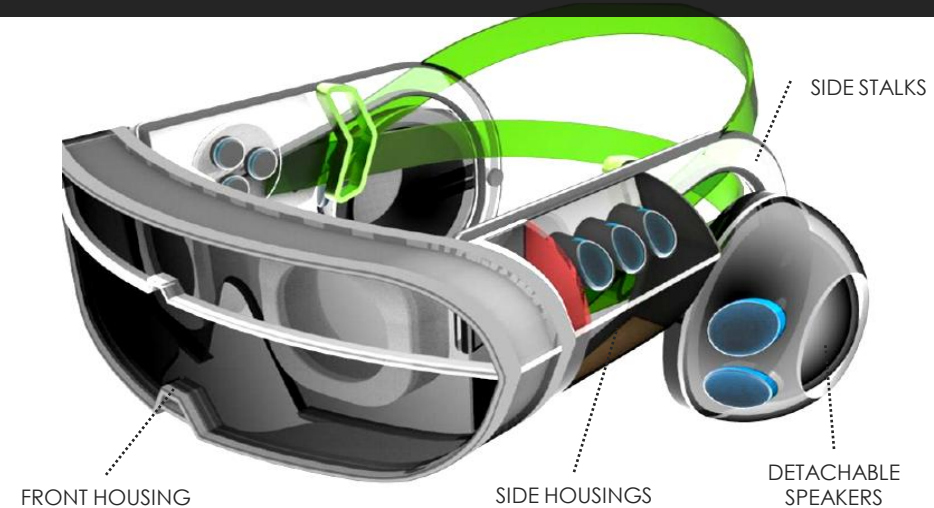


Since size adjustability is facilitated through velcro- straps , all basic dimensions are designed to accommodate 95th percentile adult male.

The core dimensions that were mapped onto the headgear model include:

A. EAR TO EAR	:95 TH PERCENTILE	165 MM
B. EYE TO EYE	:95 TH PERCENTILE	90 MM
C. BROW TO NOSTRIL	:95 TH PERCENTILE	80 MM
D. NOSE WIDTH	:95 TH PERCENTILE	45 MM
E. HEAD LENGTH	:95 TH PERCENTILE	200 MM
F. EAR – BACK OF HEAD	:95 TH PERCENTILE	100 MM
G. NOSE LENGTH	:95 TH PERCENTILE	35 MM

MATERIALS & MANUFACTURING



The 3 main body casings may be injection moulded in ABS plastic to facilitate impact strength & weather-proofing.

Soft-touch elastomer linings are provided wherever there is device to skin contact.

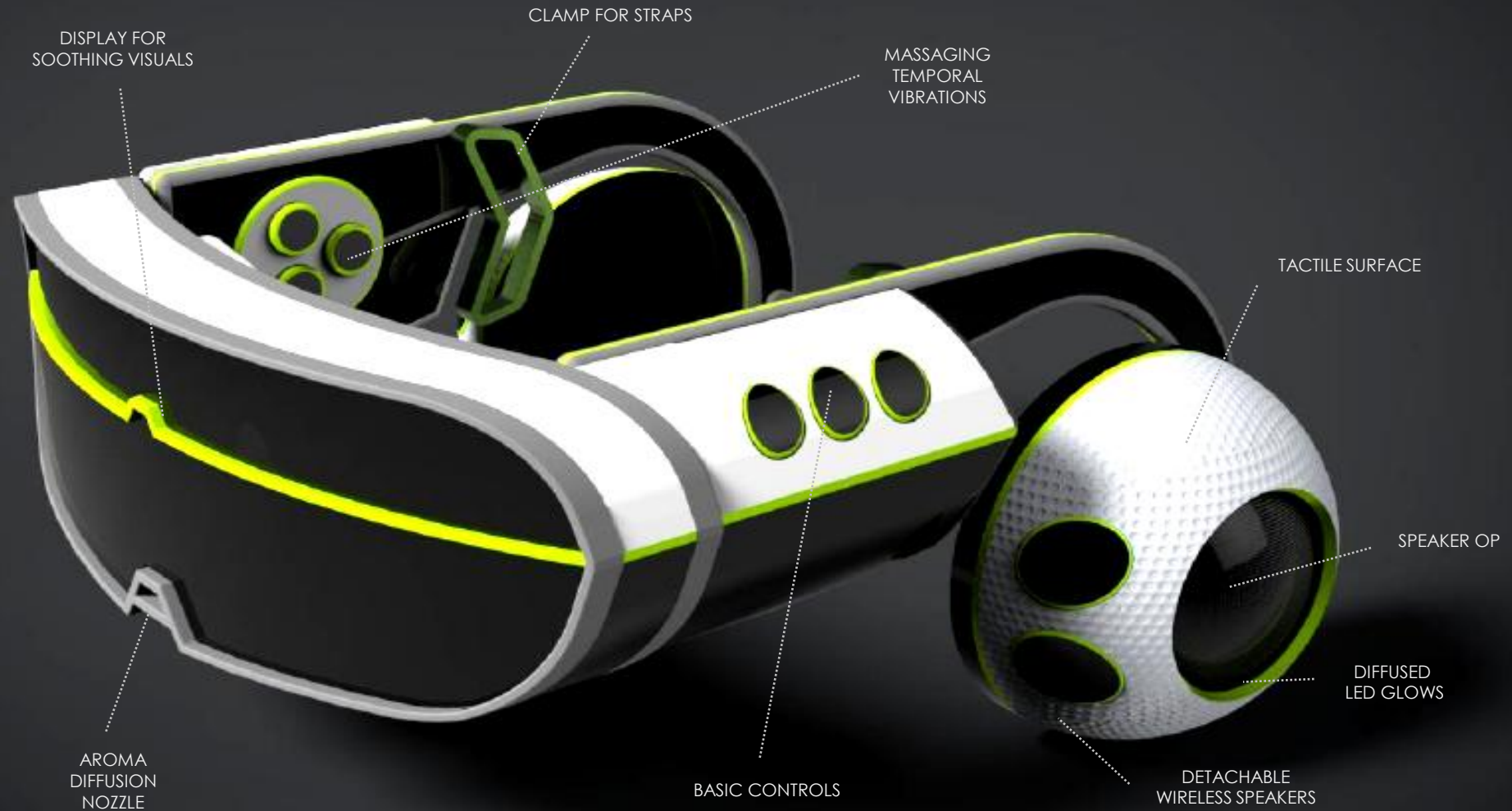
The following materials were considered for manufacturing the multi-sensory head gear and speaker assembly.

Front Housing	:	Gorilla Glass , ABS Plastic ,Elastomer
Side Housings	:	ABS Plastic
Side Stalks	:	Black Acrylic with Elastomer Lining
½ Spheres	:	Elastomer Layered ABS Plastic
Fastening Strap	:	Elastomer Backed Nylon-Velcro
Fastening Clamp	:	Anodised Aluminium

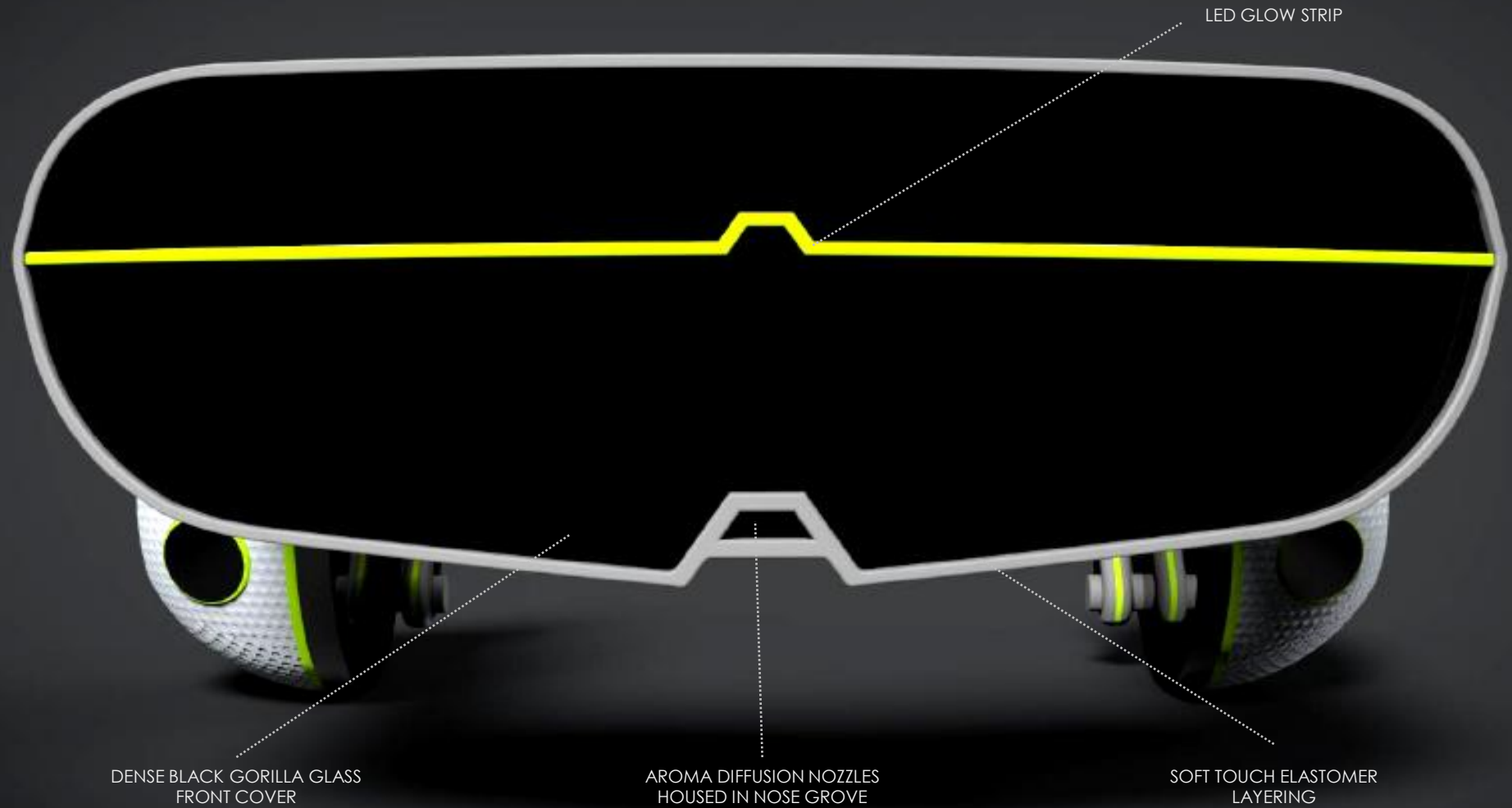
Approximate Manufacturing Cost/Piece : INR 9000

Approximate Weight of Product : 900 Gms

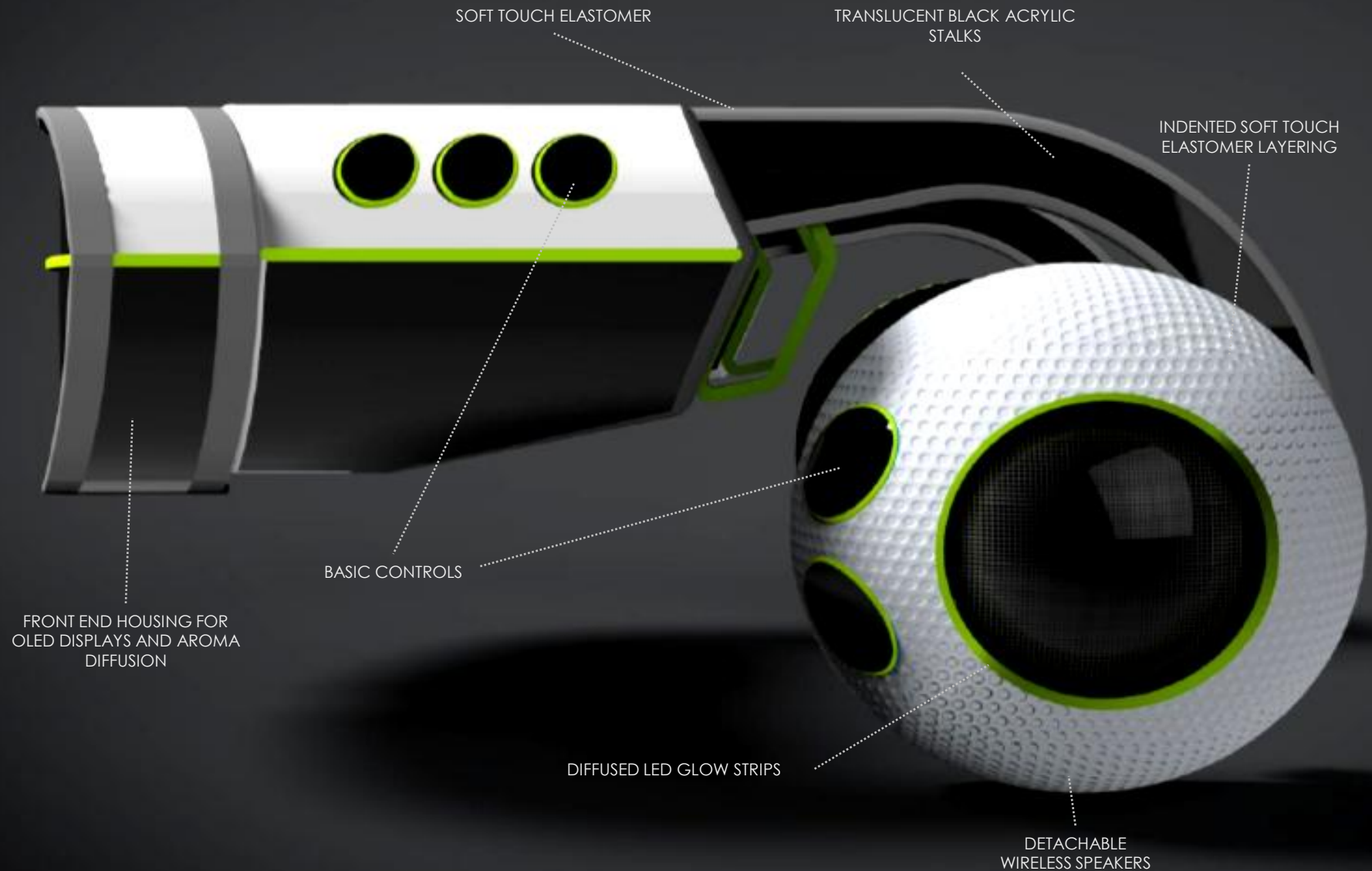
FINAL DESIGN CONCEPT : MULTI-SENSORY HEAD GEAR



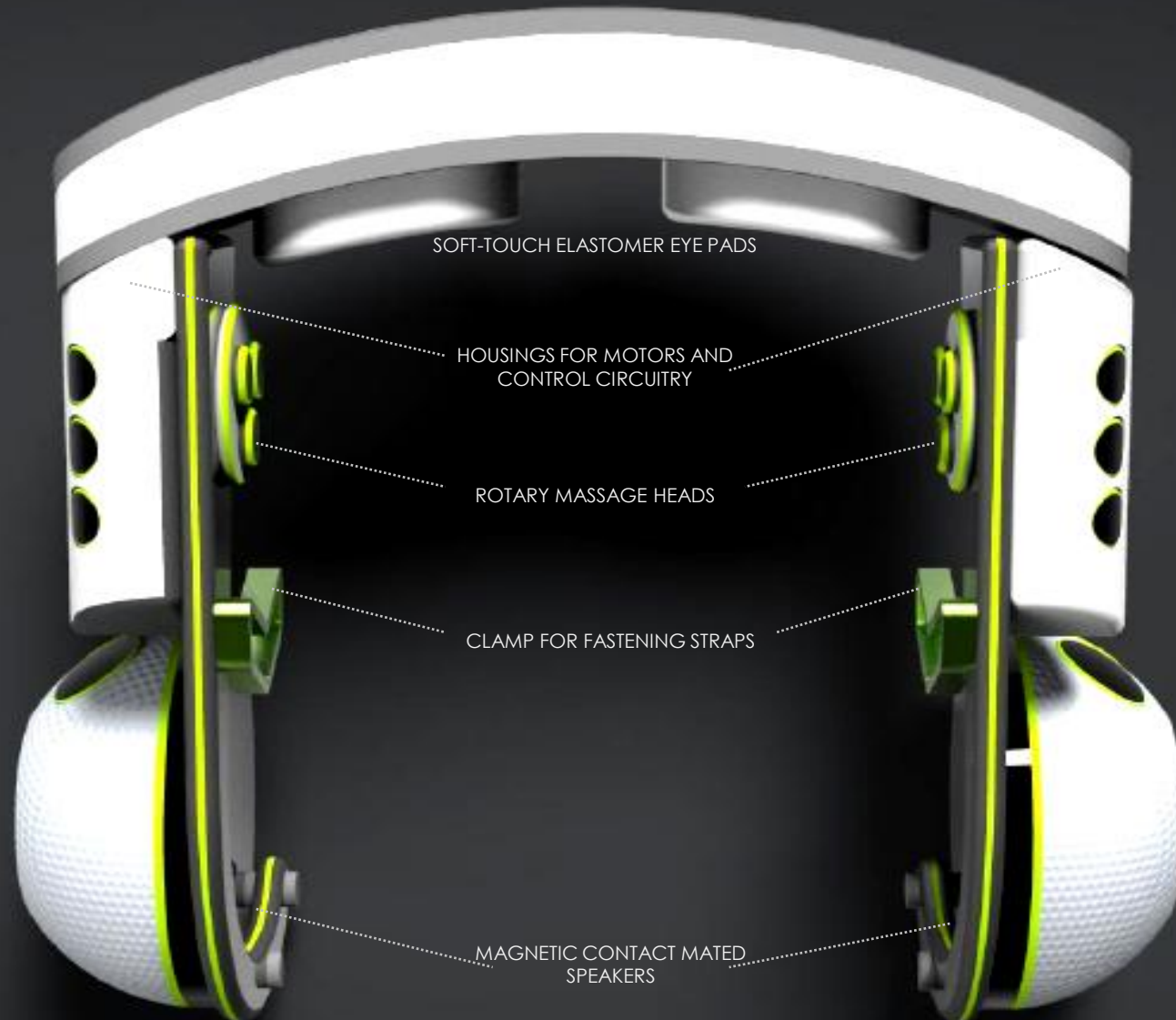
FINAL DESIGN CONCEPT : MULTI-SENSORY HEAD GEAR

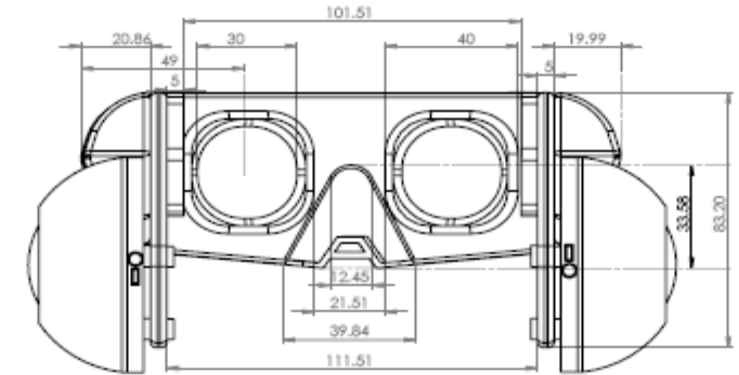
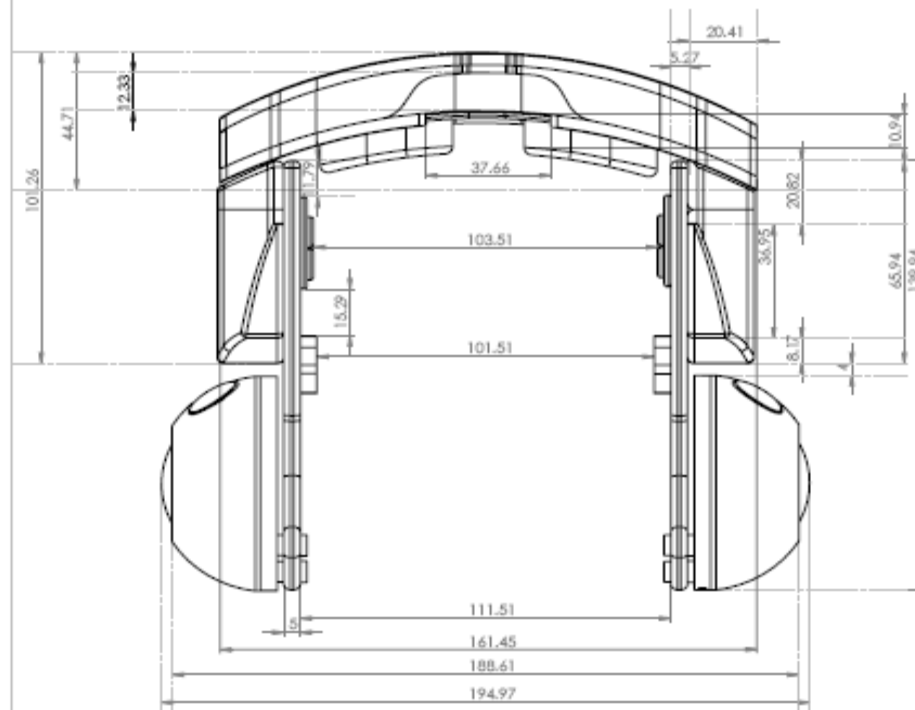


FINAL DESIGN CONCEPT : MULTI-SENSORY HEAD GEAR



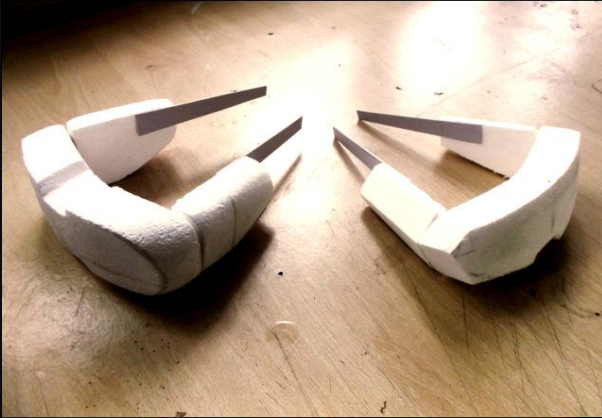
FINAL DESIGN CONCEPT : MULTI-SENSORY HEAD GEAR





1. FILL IN THE FOLLOWING INFORMATION: NAME (LAST, FIRST, MIDDLE) ADDRESS (STREET) CITY STATE ZIP		2. DATE OF BIRTH (MM/DD/YYYY) 3. SEX (M/F) 4. RACE (A/B/C/D/E) 5. ETHNICITY (A/B/C/D/E) 6. RELIGION (A/B/C/D/E) 7. POLITICAL AFFILIATION (A/B/C/D/E) 8. OCCUPATION (A/B/C/D/E) 9. EDUCATION (A/B/C/D/E) 10. MARITAL STATUS (A/B/C/D/E) 11. NUMBER OF CHILDREN (A/B/C/D/E) 12. NUMBER OF PETS (A/B/C/D/E) 13. NUMBER OF VEHICLES (A/B/C/D/E) 14. NUMBER OF TRAVEL TRIPS (A/B/C/D/E) 15. NUMBER OF TRAVEL DAYS (A/B/C/D/E) 16. NUMBER OF TRAVEL HOURS (A/B/C/D/E) 17. NUMBER OF TRAVEL MILES (A/B/C/D/E) 18. NUMBER OF TRAVEL COSTS (A/B/C/D/E) 19. NUMBER OF TRAVEL INCOME (A/B/C/D/E) 20. NUMBER OF TRAVEL SAVINGS (A/B/C/D/E) 21. NUMBER OF TRAVEL EXPENSES (A/B/C/D/E) 22. NUMBER OF TRAVEL PROFITS (A/B/C/D/E) 23. NUMBER OF TRAVEL LOSSES (A/B/C/D/E) 24. NUMBER OF TRAVEL RISKS (A/B/C/D/E) 25. NUMBER OF TRAVEL OPPORTUNITIES (A/B/C/D/E) 26. NUMBER OF TRAVEL CHALLENGES (A/B/C/D/E) 27. NUMBER OF TRAVEL REWARDS (A/B/C/D/E) 28. NUMBER OF TRAVEL PUNISHMENTS (A/B/C/D/E) 29. NUMBER OF TRAVEL REWARDS (A/B/C/D/E) 30. NUMBER OF TRAVEL PUNISHMENTS (A/B/C/D/E)	
31. NUMBER OF TRAVEL REWARDS (A/B/C/D/E) 32. NUMBER OF TRAVEL PUNISHMENTS (A/B/C/D/E) 33. NUMBER OF TRAVEL REWARDS (A/B/C/D/E) 34. NUMBER OF TRAVEL PUNISHMENTS (A/B/C/D/E) 35. NUMBER OF TRAVEL REWARDS (A/B/C/D/E) 36. NUMBER OF TRAVEL PUNISHMENTS (A/B/C/D/E) 37. NUMBER OF TRAVEL REWARDS (A/B/C/D/E) 38. NUMBER OF TRAVEL PUNISHMENTS (A/B/C/D/E) 39. NUMBER OF TRAVEL REWARDS (A/B/C/D/E) 40. NUMBER OF TRAVEL PUNISHMENTS (A/B/C/D/E) 41. NUMBER OF TRAVEL REWARDS (A/B/C/D/E) 42. NUMBER OF TRAVEL PUNISHMENTS (A/B/C/D/E) 43. NUMBER OF TRAVEL REWARDS (A/B/C/D/E) 44. NUMBER OF TRAVEL PUNISHMENTS (A/B/C/D/E) 45. NUMBER OF TRAVEL REWARDS (A/B/C/D/E) 46. NUMBER OF TRAVEL PUNISHMENTS (A/B/C/D/E) 47. NUMBER OF TRAVEL REWARDS (A/B/C/D/E) 48. NUMBER OF TRAVEL PUNISHMENTS (A/B/C/D/E) 49. NUMBER OF TRAVEL REWARDS (A/B/C/D/E) 50. NUMBER OF TRAVEL PUNISHMENTS (A/B/C/D/E)		51. NUMBER OF TRAVEL REWARDS (A/B/C/D/E) 52. NUMBER OF TRAVEL PUNISHMENTS (A/B/C/D/E) 53. NUMBER OF TRAVEL REWARDS (A/B/C/D/E) 54. NUMBER OF TRAVEL PUNISHMENTS (A/B/C/D/E) 55. NUMBER OF TRAVEL REWARDS (A/B/C/D/E) 56. NUMBER OF TRAVEL PUNISHMENTS (A/B/C/D/E) 57. NUMBER OF TRAVEL REWARDS (A/B/C/D/E) 58. NUMBER OF TRAVEL PUNISHMENTS (A/B/C/D/E) 59. NUMBER OF TRAVEL REWARDS (A/B/C/D/E) 60. NUMBER OF TRAVEL PUNISHMENTS (A/B/C/D/E) 61. NUMBER OF TRAVEL REWARDS (A/B/C/D/E) 62. NUMBER OF TRAVEL PUNISHMENTS (A/B/C/D/E) 63. NUMBER OF TRAVEL REWARDS (A/B/C/D/E) 64. NUMBER OF TRAVEL PUNISHMENTS (A/B/C/D/E) 65. NUMBER OF TRAVEL REWARDS (A/B/C/D/E) 66. NUMBER OF TRAVEL PUNISHMENTS (A/B/C/D/E) 67. NUMBER OF TRAVEL REWARDS (A/B/C/D/E) 68. NUMBER OF TRAVEL PUNISHMENTS (A/B/C/D/E) 69. NUMBER OF TRAVEL REWARDS (A/B/C/D/E) 70. NUMBER OF TRAVEL PUNISHMENTS (A/B/C/D/E)	

DIMENSIONAL PHYSICAL MODEL PHOTOGRAPHS



- *Ref : "INDIA: 10 Million Depressed – on the Optimistic Side" By K. S. Harikrishnan : Inter Press Service News Agency 2011 as seen on 30th Jan 2015
- *Ref: Tuunainen, A; Kripke, DF; Endo, T (2004). Tuunainen, Arja, ed. "Light therapy for non-seasonal depression". Cochrane Database of Systematic Reviews (2): CD004050.
- *Ref: Le Scouarnec RP, Poirier RM, Owens JE, Gauthier J, Taylor AG, Foresman PA. (2001). "Use of binaural beat tapes for treatment of anxiety: a pilot study of tape preference and outcomes". Altern Ther Health Med. (Clinique Psych in Montreal, Quebec.) 7 (1): 58–63
- *Ref: 'The Hamilton Rating Scale for Depression' , <http://healthnet.umassmed.edu/mhealth/HAMD.pdf>
- *Ref: "Depression ,a hidden burden" <http://www.who.int/topics/depression/en/> as seen on 21st Dec 2014
- *Ref: Suicide and depression among college students: A decade later. SR Furr, JS Westefeld, GN McConnell. Research and Practice, 2001 - psycnet.apa.org
- *Ref:The Epidemiology of Major Depressive Disorder Results From the National Comorbidity Survey Replication (NCS-R) Ronald C. Kessler, PhD; Patricia Berglund, MBA; Olga Demler, MS; Robert Jin, MA; Doreen Koretz, PhD;
- *Ref: Learning and behavior: A contemporary synthesis.,ME Bouton - 2007 - psycnet.apa.org
- *Ref : Reinforcement learning: An introduction AG Barto - 1998
- *Ref:Cognitive-behavioral therapy. BO Rothbaum EA Meadows, P Resick, DW Foy - 2000 - psycnet.apa.org
- *Ref: Prevention of recurrent depression with cognitive behavioral therapy: preliminary findings GA Fava, C Rafanelli
- *Ref:http://altmedicine.about.com/od/aromatherapy/a/mood_aromatherapy.htm as seen on 30th Jan 2015
- *Ref:<http://www.scientificamerican.com/article/tapping-natures-headache-remedies/> as seen on 30th Jan 2015
- *Ref:<http://www.trendhunter.com/protrends/mood-tech> as seen on 21st Dec 2014
- *Ref: National Institute of Mental Health : <http://www.nimh.nih.gov/health/topics/depression/index.shtml> seen on 30th Dec 2014

