

# Playful Device for Elderly to help them to Exercise

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Project III  
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2008-2010

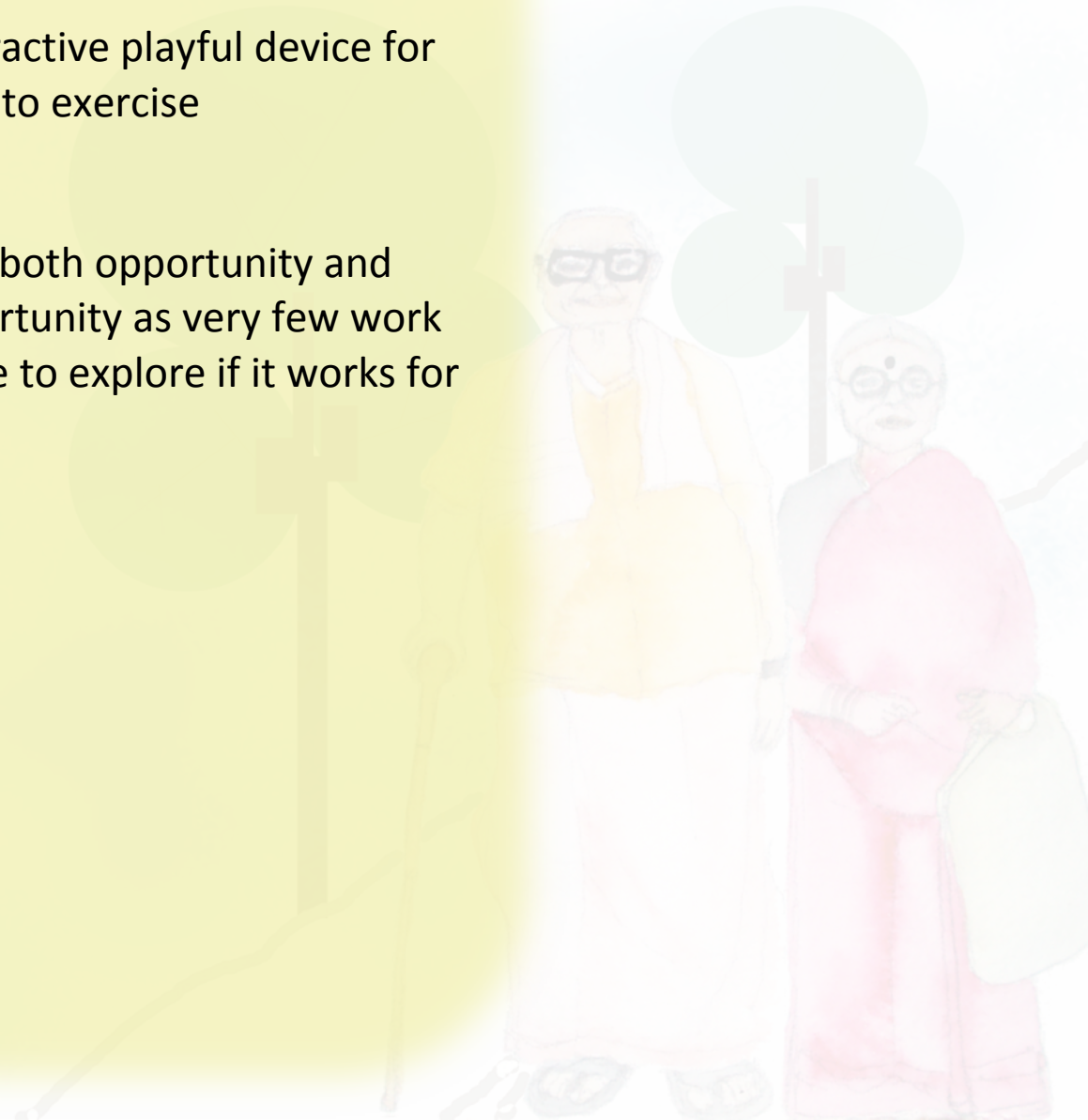


**Aim:**

My project aimed to develop an interactive playful device for elderly which will invisibly help them to exercise

**Opportunity & Challenge:**

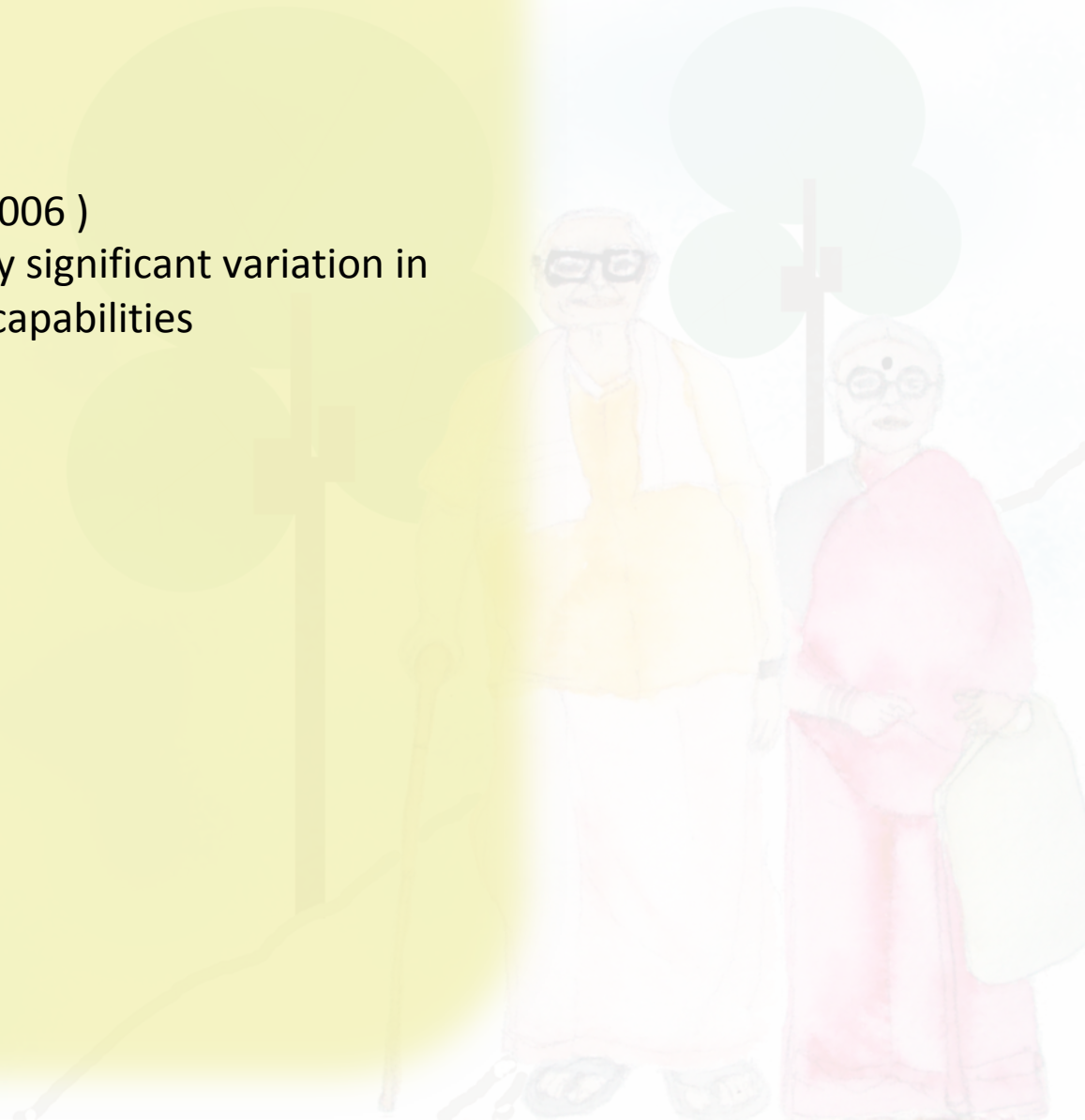
The word playfulness for elderly was both opportunity and challenge for my project. It was opportunity as very few work is done in this area. It was a challenge to explore if it works for elderly user group

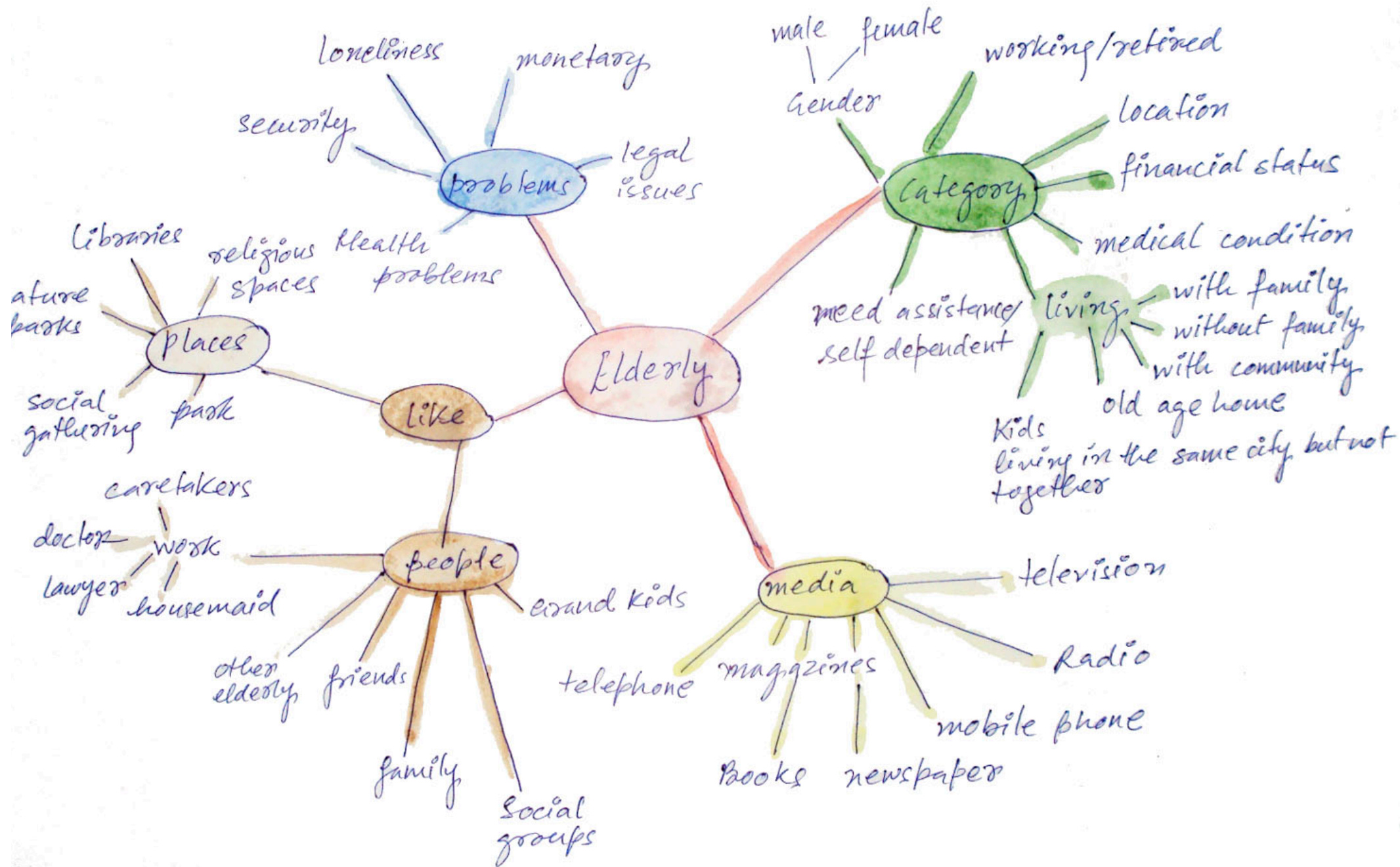




**Elderly:**

- Old or aging
- Geriatric
- 65 above - 65-74: young old
- 75 above : old old (Nishijama et al, 2006 )
- The group of people characterized by significant variation in physiological, mental and functional capabilities





## User Studies & Observations:

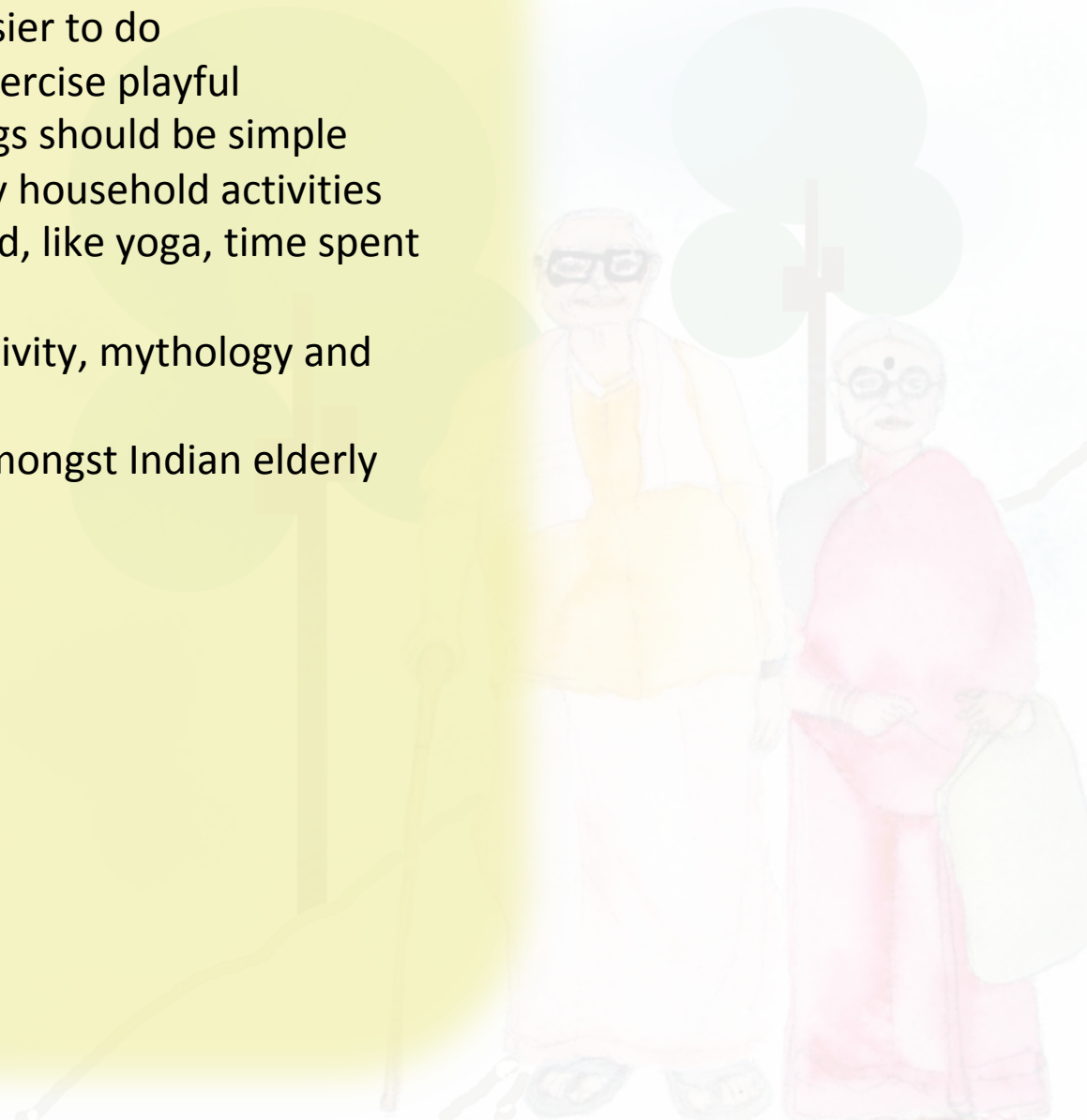
- Initially approx. 25 elderly already doing exercise daily were observed for few days and then contextual enquiry was done with 2-3 of them. Participatory approach was followed in order to understand them better.
- One physiotherapy doctor was interviewed and two research experts working in the field of elderly were consulted for feedback and data.
- Later Contextual Inquiry was done with 6 users, both male and female who may or may not do exercise daily.



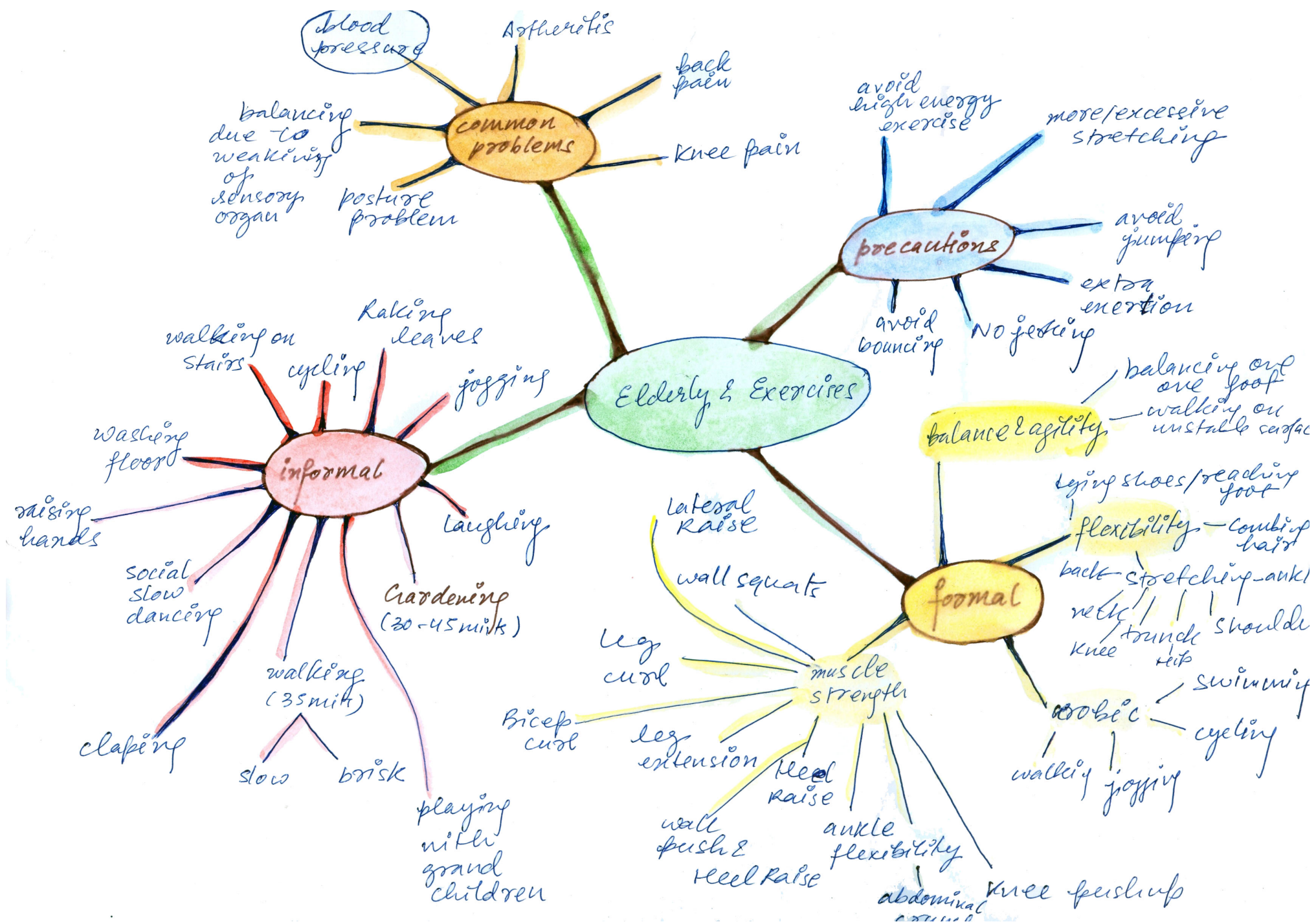
### **Top observations/insights/opportunities:**

Collaborative task makes exercise easier to do

- To bring in motivation by making exercise playful
- Complexity should be avoided, things should be simple
- To map the ideas around some daily household activities
- Cultural aspect should be considered, like yoga, time spent with family etc
- To incorporate liking of religious activity, mythology and nature in design solution
- The non acceptance of computer amongst Indian elderly should be considered







## Common problems:

Human body performs major three types of function:

- 1) Bio-mechanical
- 2) Physiological
- 3) Psychological/neural

### Common Problems

Back pain

Knee pain/joint pain

Posture problem

Arthritis

Weakening of sensory organs

Balancing problem

Blood pressure

Diabetes

Heart problem



## **Suggested Exercises for Indian Elderly:**

According to the Geriatric Fitness Manual( Kasturi Sen Ray, 2009) made for Indian elderly the following exercises should be done by them in order to remain fit. They are categorized in three parts:

- Muscle strengthening exercises/Flexibility exercises
- Aerobics
- Exercise for balance and agility

### Precautions suggested while exercising

Avoiding high energy exercise

Avoiding excessive stretching

Avoiding more number of counts

Avoiding jumping

Avoid in jerking body

Avoiding bouncing

\*Present data is evolved from field work, literature study, experts comments



## Muscle Strengthening exercises/ Flexibility exercises

- wall squat,
- Leg curl,
- Leg extension,
- Heel raise,
- Ankle flexibility,
- Bicep Curl,
- Wall push up,
- Knee push up,
- Triceps extension,
- Lateral raise,
- Abdominal crunch



e) a)



b)



c)



d)



i)



f)



g)



h)



k)



### Exercise for balance and agility

Balancing on one foot

Walking on unstable surface

Walking and doing some cognitive task together

Balancing with eyes closed and open

### Aerobics

jogging

swimming

Slow dancing

cycling

walking



## Informal activities suggested & performed as exercise

Walking slow

Playing with grand children

Gardening

laughing

clapping

Raising hands

Washing floor

Raking leaves

jogging

Cycling

Walking on stairs

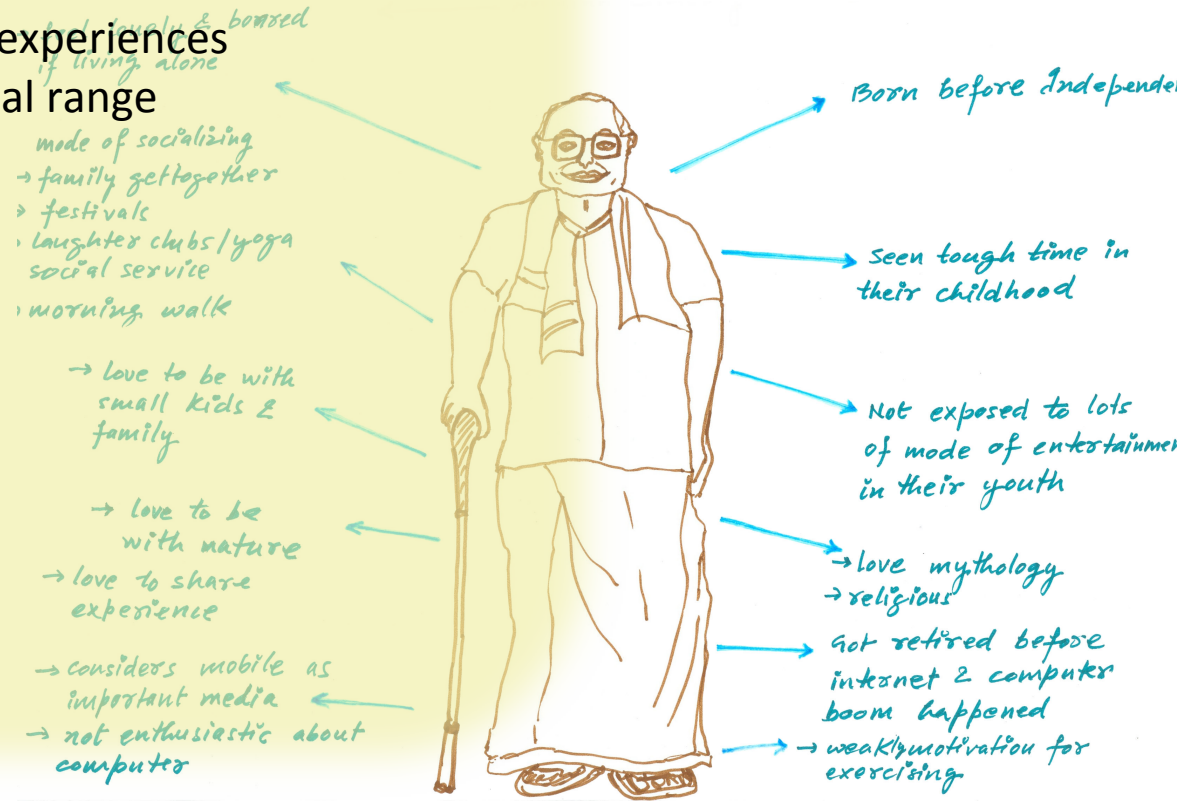
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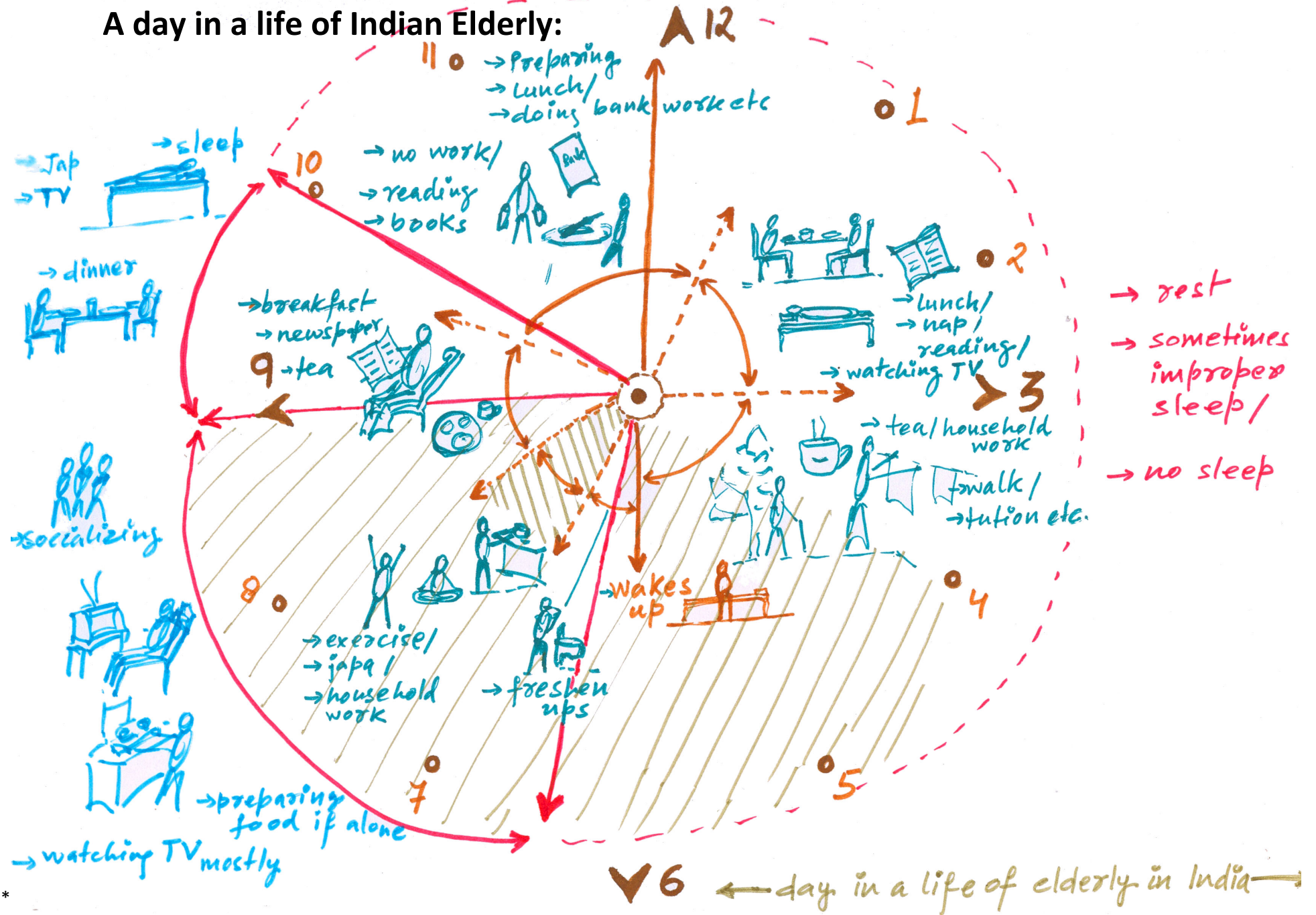
## An Indian Elderly:

The common findings for an Indian elderly found in user studies are:

- Born before Independence, have seen tough time in life and less entertainment trend
- Got retired before internet and personal computer boom
- Weak motivation for doing exercise
- More religious/ love mythology/ like to be with nature
- Like to be with kids/ family/ share experiences
- Want simple products in economical range

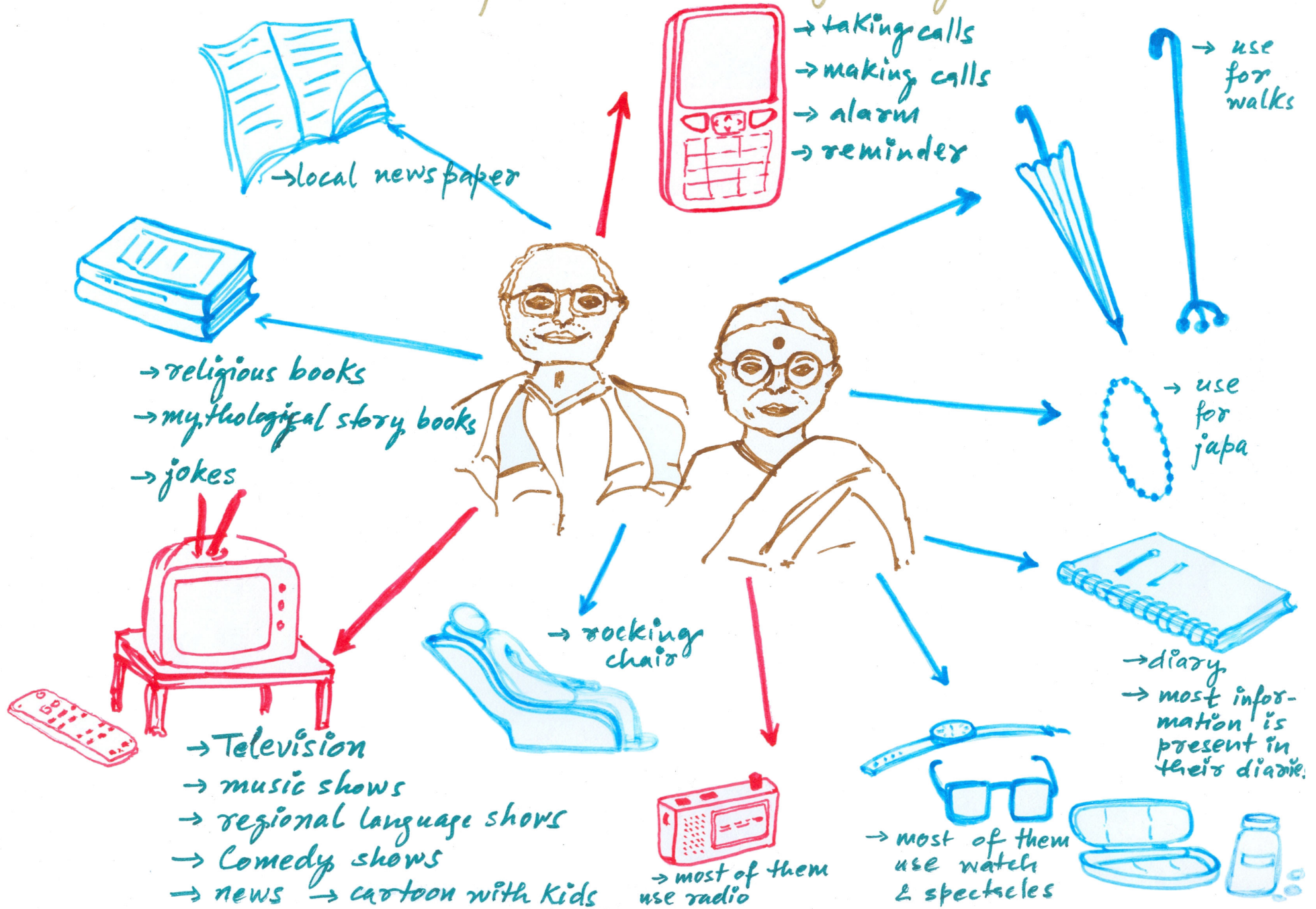


# A day in a life of Indian Elderly:





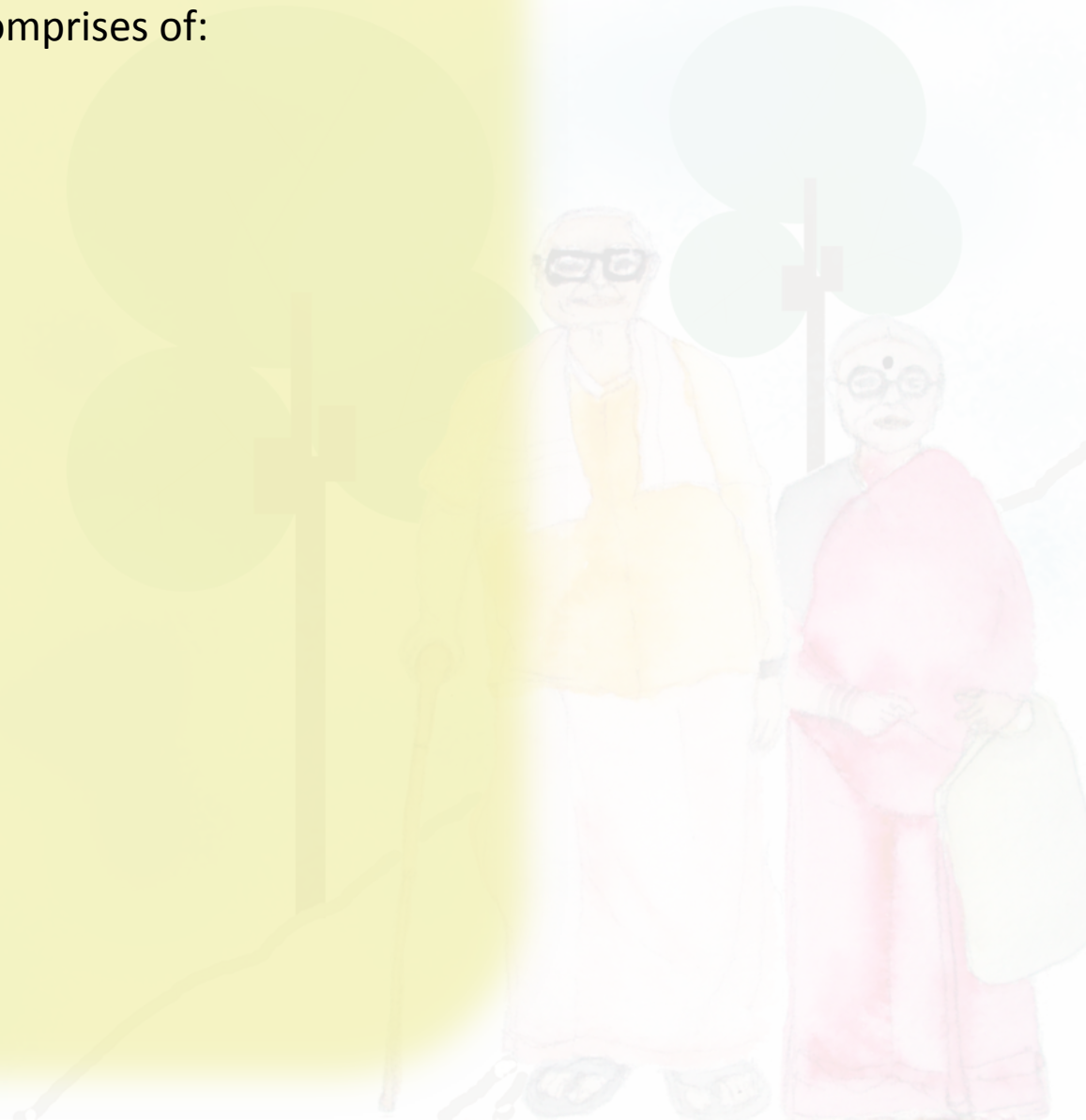
# ← Artifact & Media Used By Elderly In India →



## **A day in a life of Indian Elderly:**

Main activities from the whole day comprises of:

- Eating
- Sleeping
- Watching TV
- Help in cooking/arranging clothes
- Bank/market
- Walk/exercise/social gathering
- Reading
- Performing religious chores
- Taking tuition/some other work



## Case study:

### DanceAlong:

DanceAlong: Supporting Positive Social Exchange and Exercise for the Elderly Through Dance  
Pedram Keyani, Gary Hsieh, Bilge Mutlu, Matthew Easterday, Jodi Forlizzi  
Human-Computer Interaction Institute Carnegie Mellon University  
5000 Forbes Avenue, Pittsburgh PA 15213

The idea is an augmented dancing environment that allows elders to select dance sequences from well-known movies and dance along with them. The idea was tested with the users from Pittsburgh, the number of user is not mentioned. It was an exploratory project and was concluded with the thought to build several other projects like this which will provide community interactions amongst elderly.

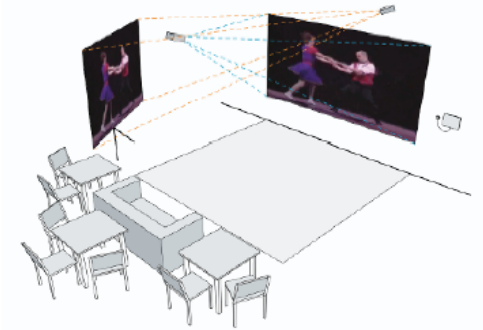


Figure 1. DanceAlong system.



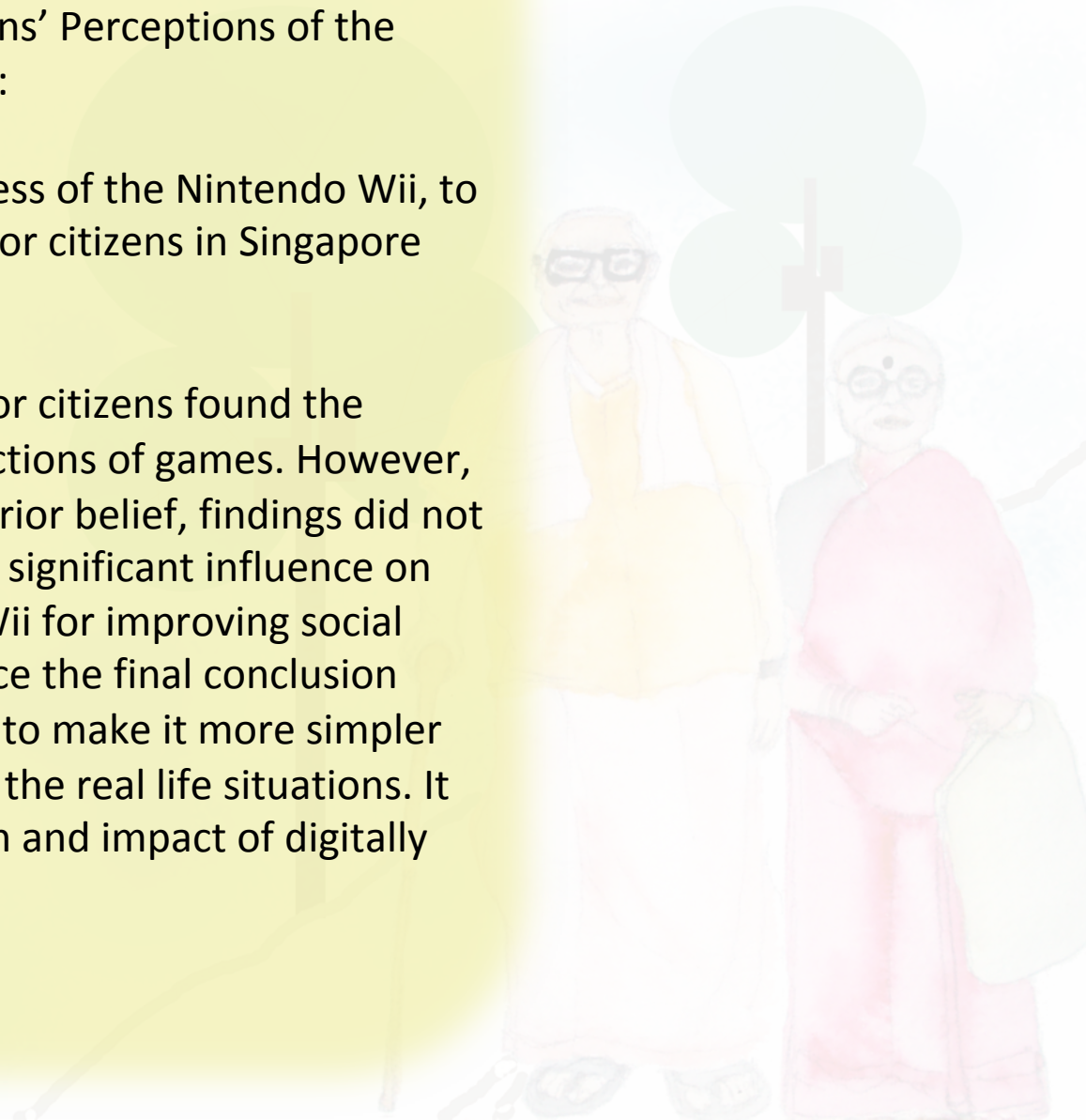
Figure 3. First user testing.

**Case study:**

An Exploratory Study on Senior Citizens' Perceptions of the Nintendo Wii: The Case of Singapore :

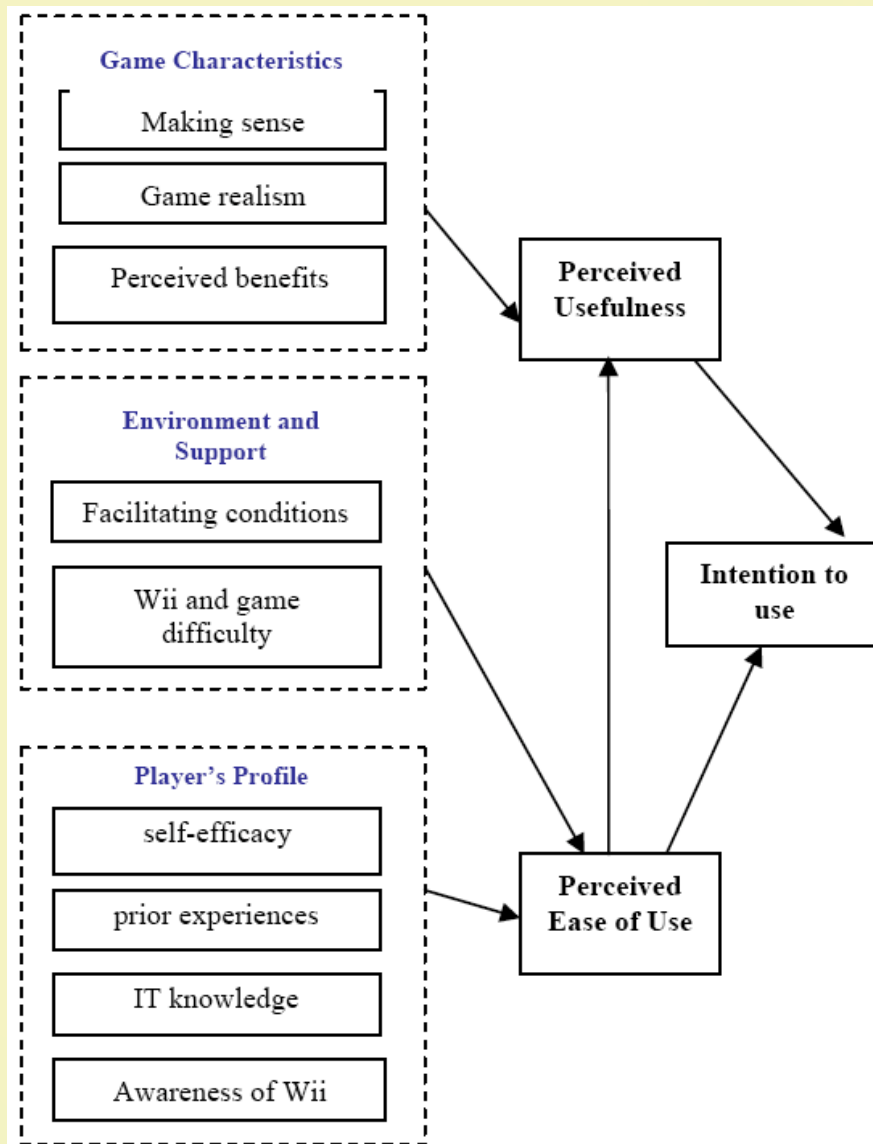
The paper aims to assess the usefulness of the Nintendo Wii, to promote regular exercise among senior citizens in Singapore (aged 65 years and above).

Experiment finding showed that senior citizens found the Nintendo Wii usable with realistic depictions of games. However, on the other hand and differing the prior belief, findings did not show that perceived usefulness has a significant influence on senior citizens' intention to use the Wii for improving social interaction, health and exercise. Hence the final conclusion derived from paper was a suggestion to make it more simpler and realistic. The game should mimic the real life situations. It ended with a discussion on the design and impact of digitally mediated games for elderly users.





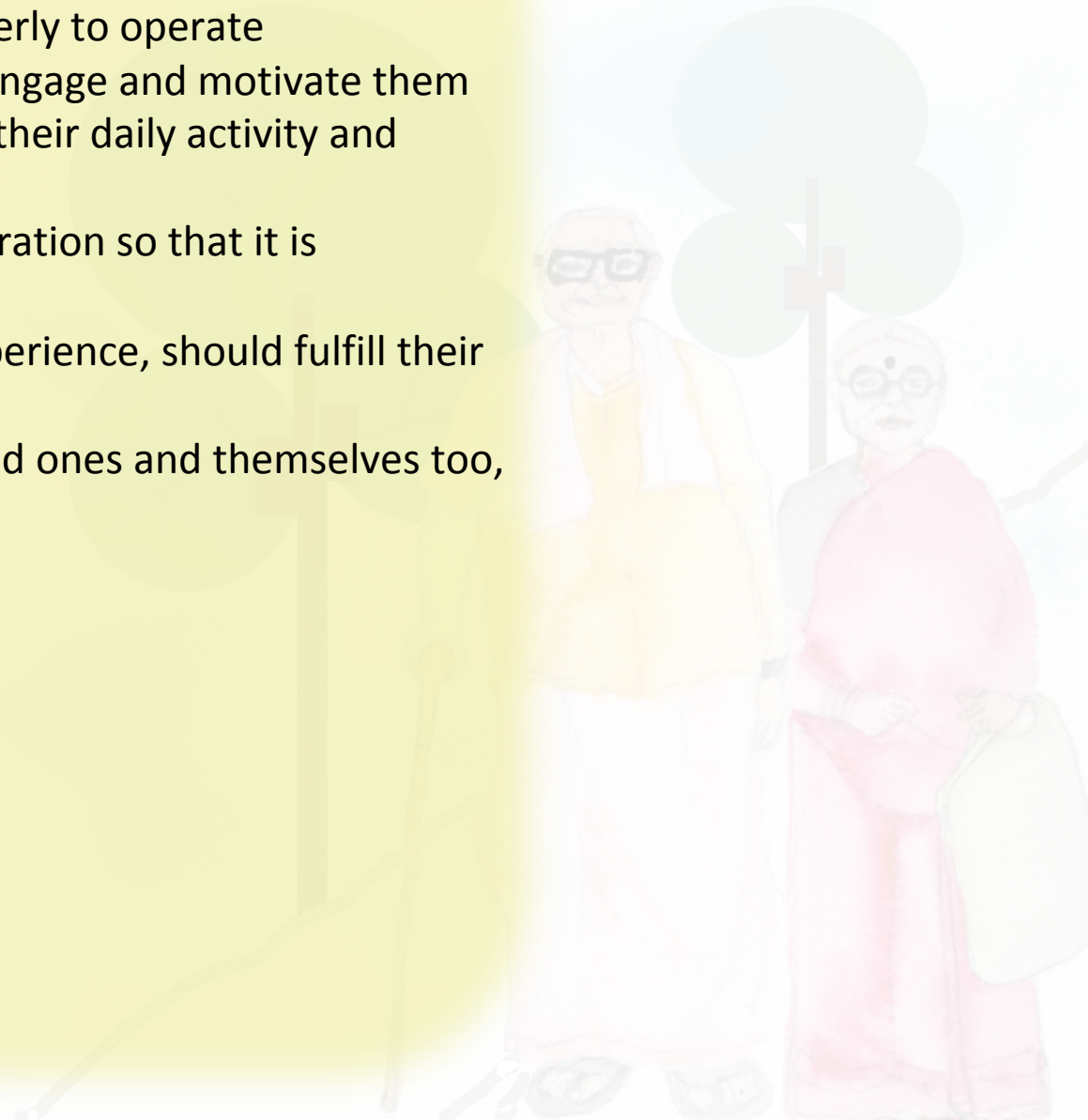
## Case study:



**Figure 1.** Research Model

**The inference drawn from all the studies and data are:**

- The design should be simple for elderly to operate
- It should be interesting enough to engage and motivate them
- It should be more focused towards their daily activity and likings
- The cost should be taken in consideration so that it is affordable by masses
- It should give them new & good experience, should fulfill their aspirations
- It should connect them to their loved ones and themselves too, directly or indirectly



# Design Explorations





1) Ball game: This was based on the wall push exercise. In this game there was an hour glass for measuring time, a ball in a pipe with markings. The player need to push the wall and reach highest point maximum no of times at one time to win.



3) pressure balloon: This idea was based palm pressure exercise. The one who presses and throws more particle on opposite side wins



4) Grab chair: This idea was based on balancing exercise. The user needs to reach to the chair sit and come back in time in order to win.

2) Musical wall: This was based on the ant crawl exercise. In this the user can create and play music while moving fingers up and down. The condition was that, that user need to do it in consecutive rows so that the crawl exercise happens and user enjoys playing music at the same time.



5) Loop: This idea was based on the ankle rotation exercise. The idea is to rotate the ball in the loop and in order to do that user need to keep his feet intact with the ball or he/she will loose.



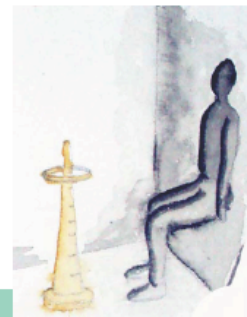
6) reach out: This idea was based on the stretch exercise. The idea is a pendulum as a marker to reach the stretch point. The pendulum will go to the same limit as the users in opposite direction.



9) Squeeze remote: This idea was based on the palm exercise. The idea was to use this as a TV remote for controlling different functions on squeezing. THIS IDEA WAS TAKEN FORWARD TO MAIN DESIGN DEVELOPMENT



10) Lawn sprinklers: This idea was based on the heel raise exercise. On pressing the mat with the heel the lawn sprinklers will move in order to water garden.



8) squat meter: This idea was based on the squat exercise. The idea was to win when reach the maximum limit and number of times. the loop will go to the mark till where user will squat.

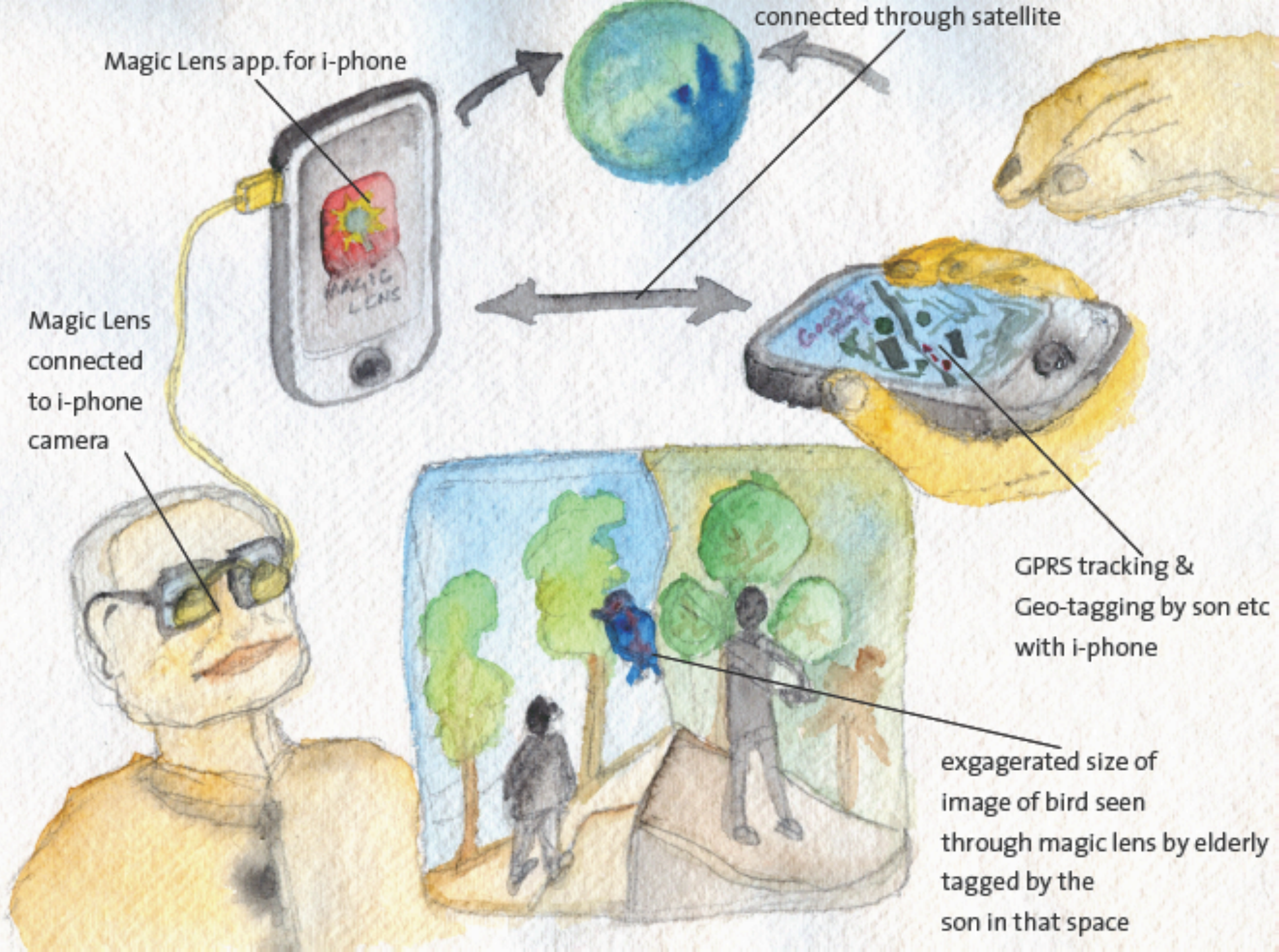


11) leg puppet: This idea was to move the legs while telling stories to small children. Different up and down movement can happen.



12) Dancing wall: This idea to repeat the dance action as done by the other partner on the wall remotely or near.





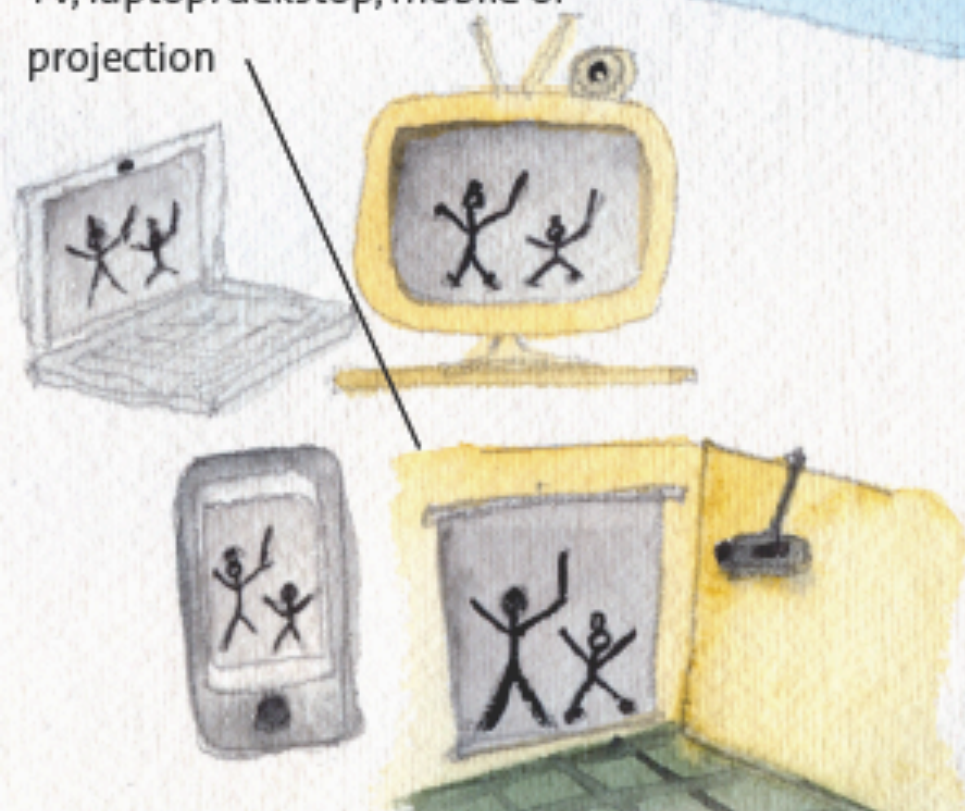


s-tory

can be played indoor as well as  
outdoor

various platforms

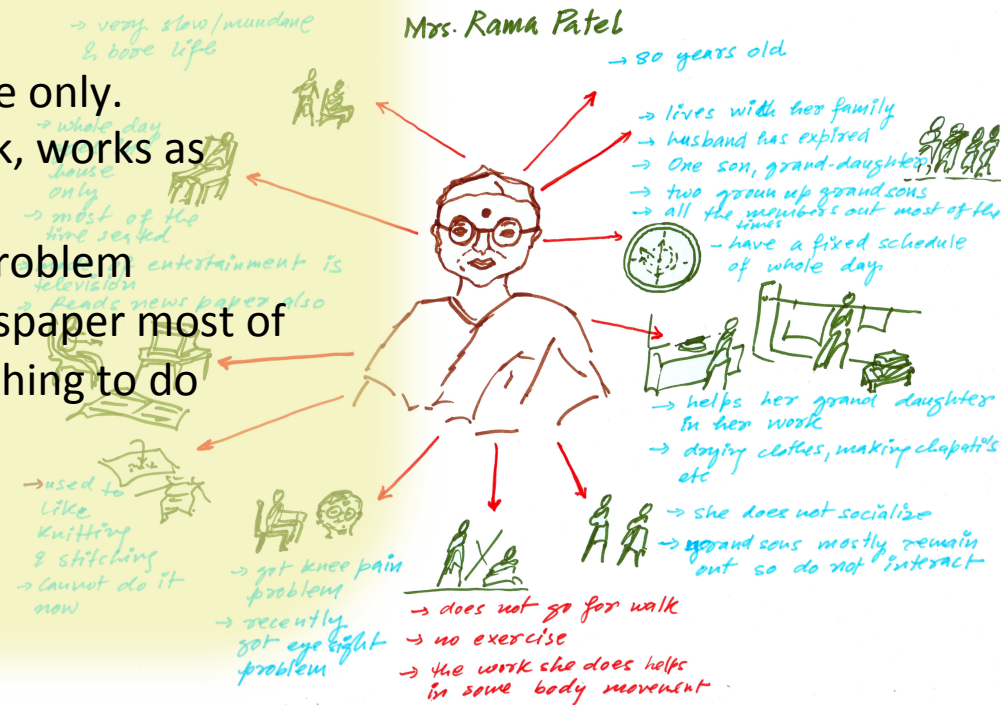
TV, laptop/dekstop, mobile or  
projection



Record, store & share

## Persona 1 - Mrs. Rama Patel:

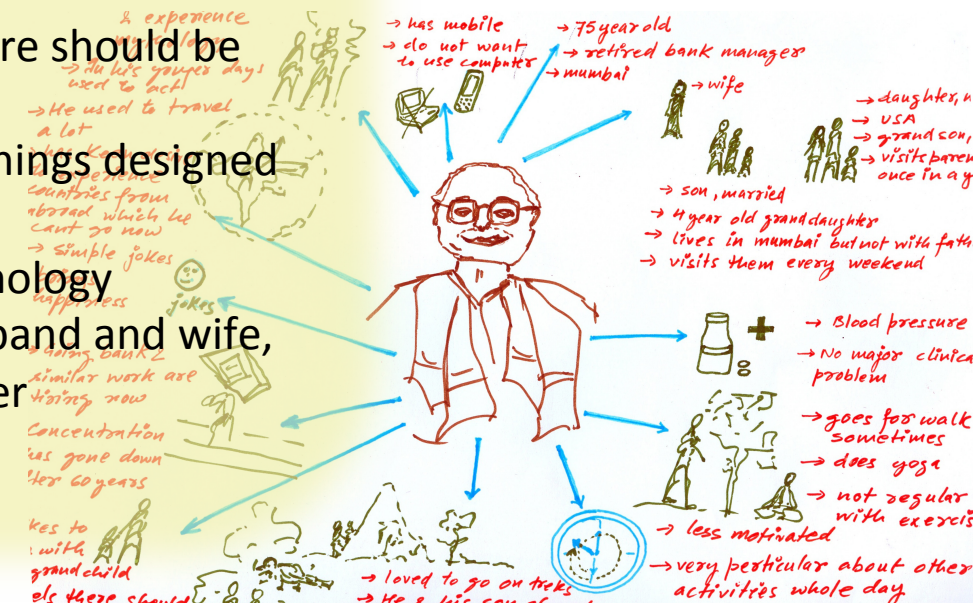
- She is 80 years old woman, lives with her family, husband has expired.
- She has one son, one daughter-in-law, two grand kids (above 16)
- Except Rama all family members are out of the house most of the day
- She has a fixed schedule of whole day
- She helps her grand daughter in making chapattis, drying clothes etc.
- She does not like to socialize, remains in home only.
- She does not go for any walk, her daily work, works as exercise for her.
- She has got knee joint pain and slight eye problem
- She watches television and reads local newspaper most of her time she remains alone and without anything to do





## Persona 2 - Mr. Rajan Kapoor:

- He is a 70 year old retired bank manager from Mumbai
- He has two sons, he and his wife lives with younger one the elder lives in the same city visits him on weekends. Have a small grand son (6yrs)
- He has got blood pressure problem but no other clinical problem
- He is very particular about his whole day activities, sleeps on time
- He feels less motivated for doing exercise some times goes for walk
- He plays with his grandson and feels that there should be something for elderly to play to
- He says even simple jokes makes happy, so things designed should be very simple from front end
- He liked to act and wants to experience mythology
- He has mobile phone common between husband and wife, only use it for calls, don't want to use computer







Mrs Rama patel got e-mote as a gift from her son

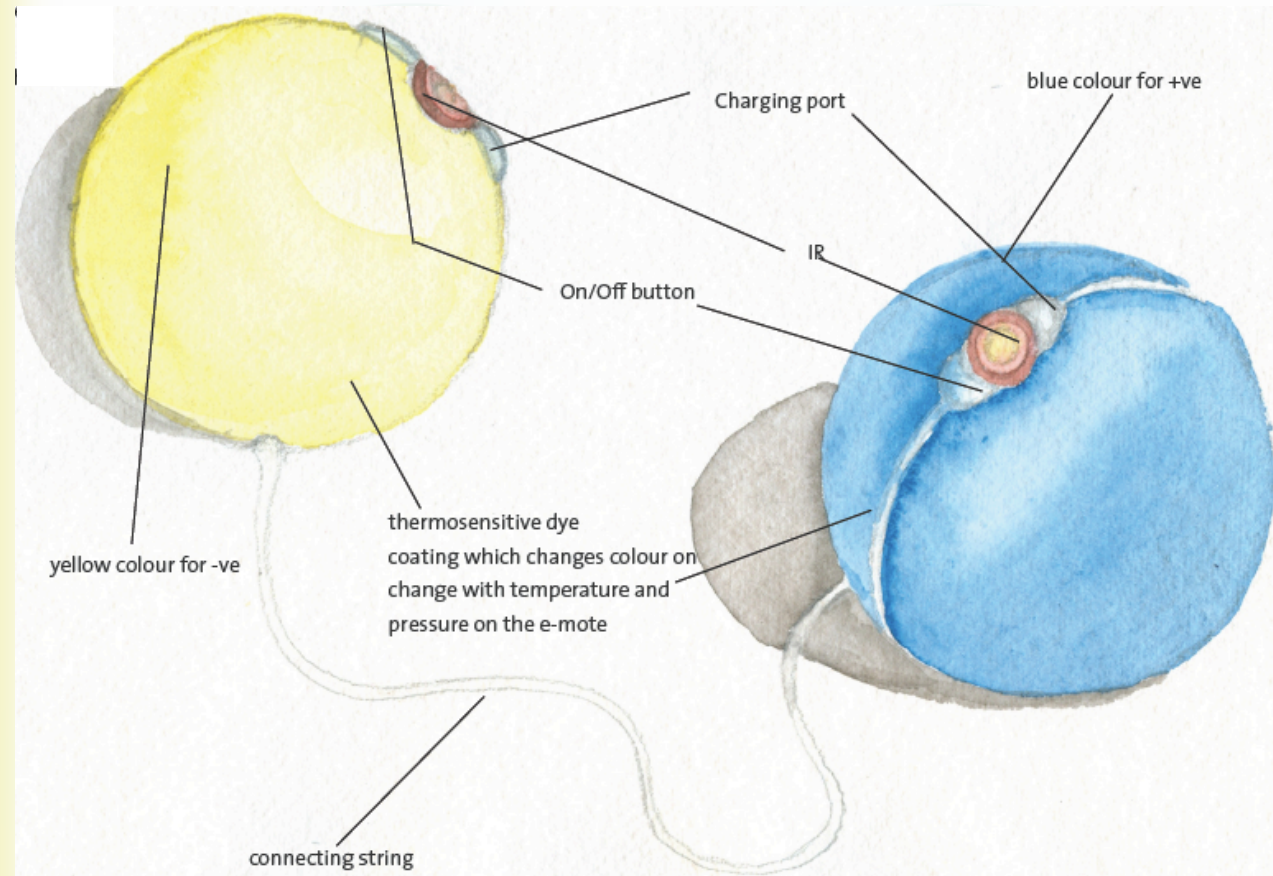
\*Room Image from [www.shutterstock.com](http://www.shutterstock.com)

## System Detailing:

Gesture mapping for e-mote			
Gestures	TV on/off	Channels +/-	volume +/-
Squeezing the ball	Not required to make it complex as one time function	<b>best ( left for channel -, right for channel +)</b>	Good but volume change will happen less
Shaking one ball	do	Good but not much movement will happen	Good but not much movement will happen
Shaking both the balls together	do	Confuses the user	Not a good mapping with two balls
Moving one ball at a time in different direction	do	Good but irritating if more channel needs to change	<b>best ( left for volume -, right for volume +) +/-2 points at a time</b>
Moving both ball up and down at the same time	do	Confuses the user	

### Product features:

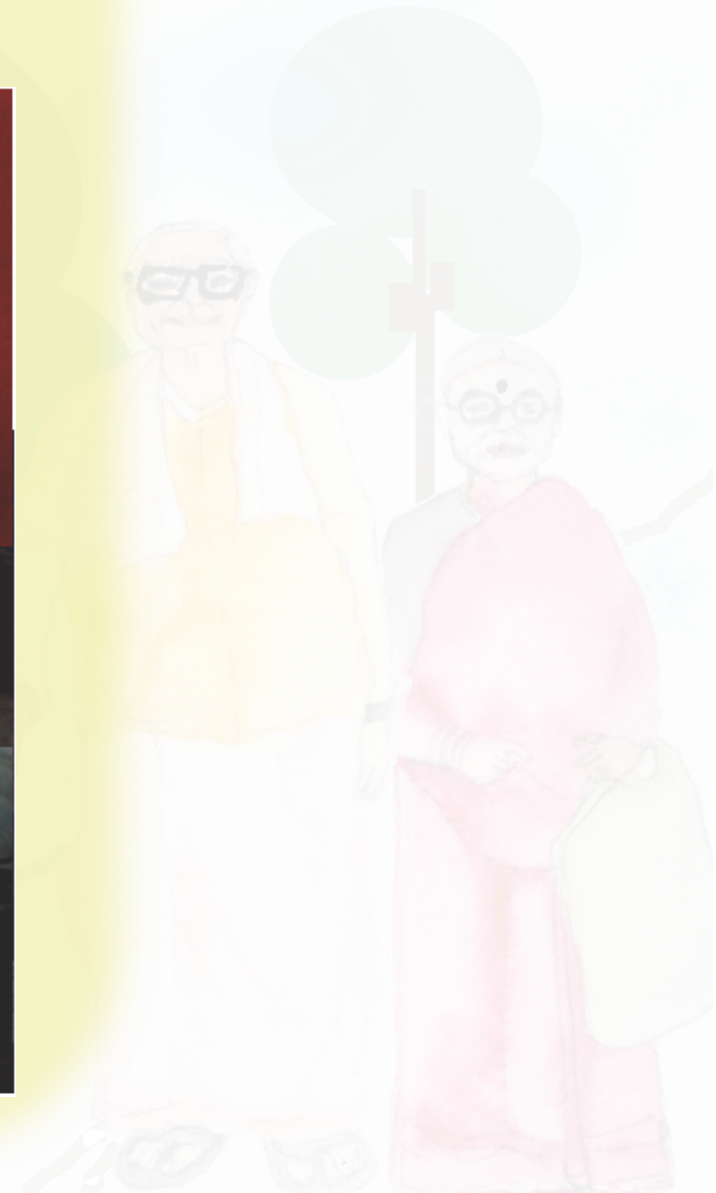
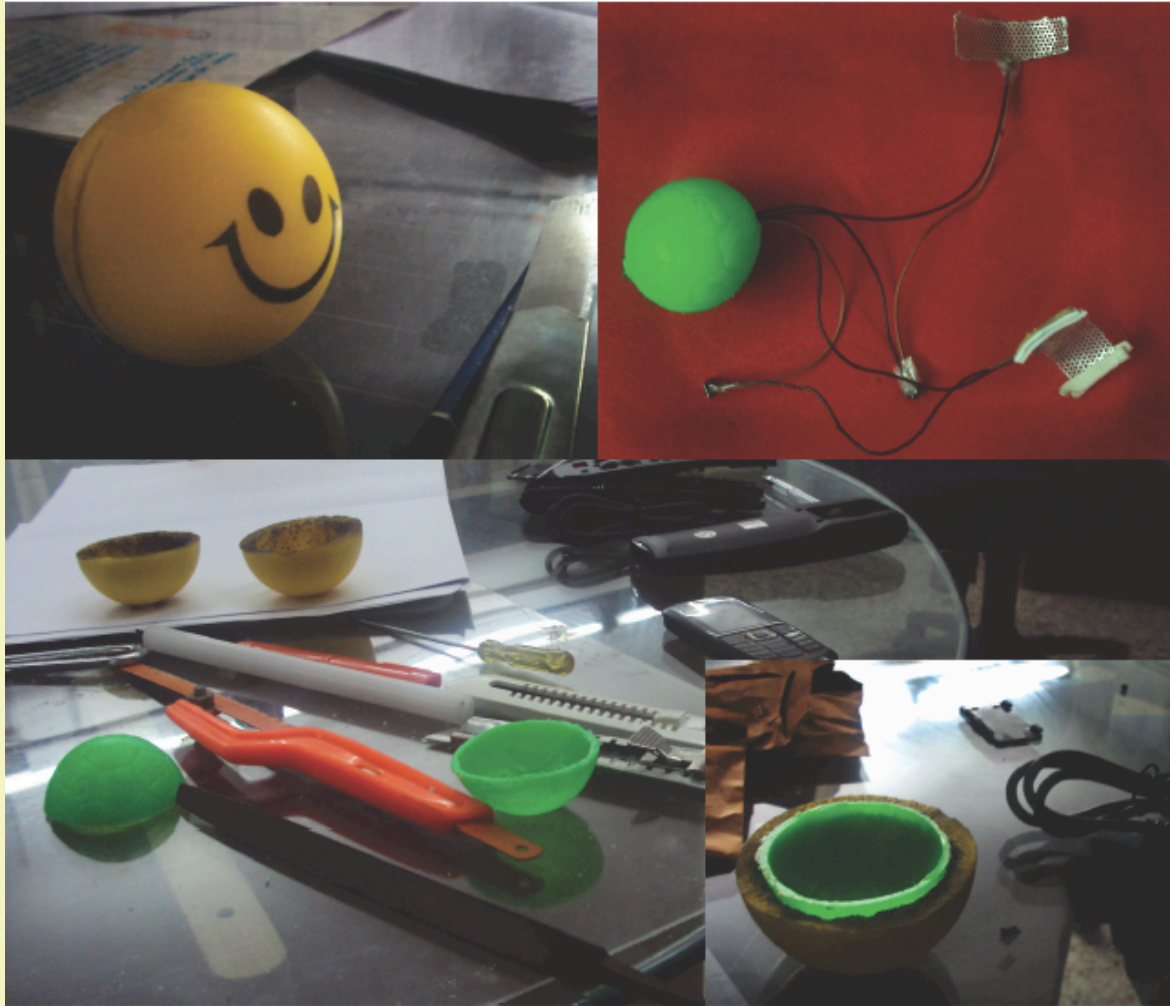
- The e-mote has two parts connected with a stretchable string
- yellow part is for moving back both for channel and volume where as the blue part is for moving up
- It has an on and off button
- The outer cover of the parts are made up of material which can be pressed, a spongy material
- There is a charging point for charging the battery
- The surface is coated with a temperature/pressure sensitive dye which changes color
- The sensors used are pressure sensor and accelerometer





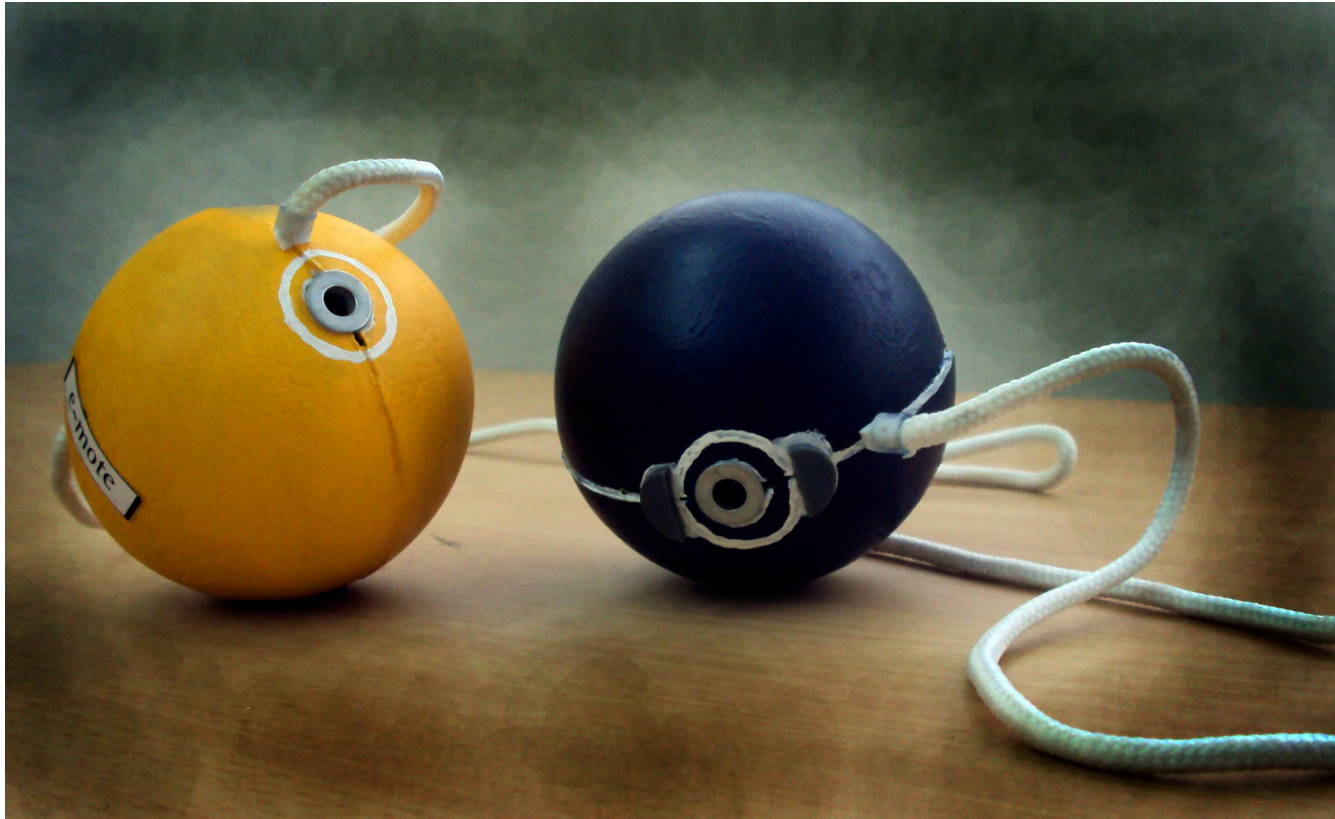
## Prototype:

High fidelity prototype is developed

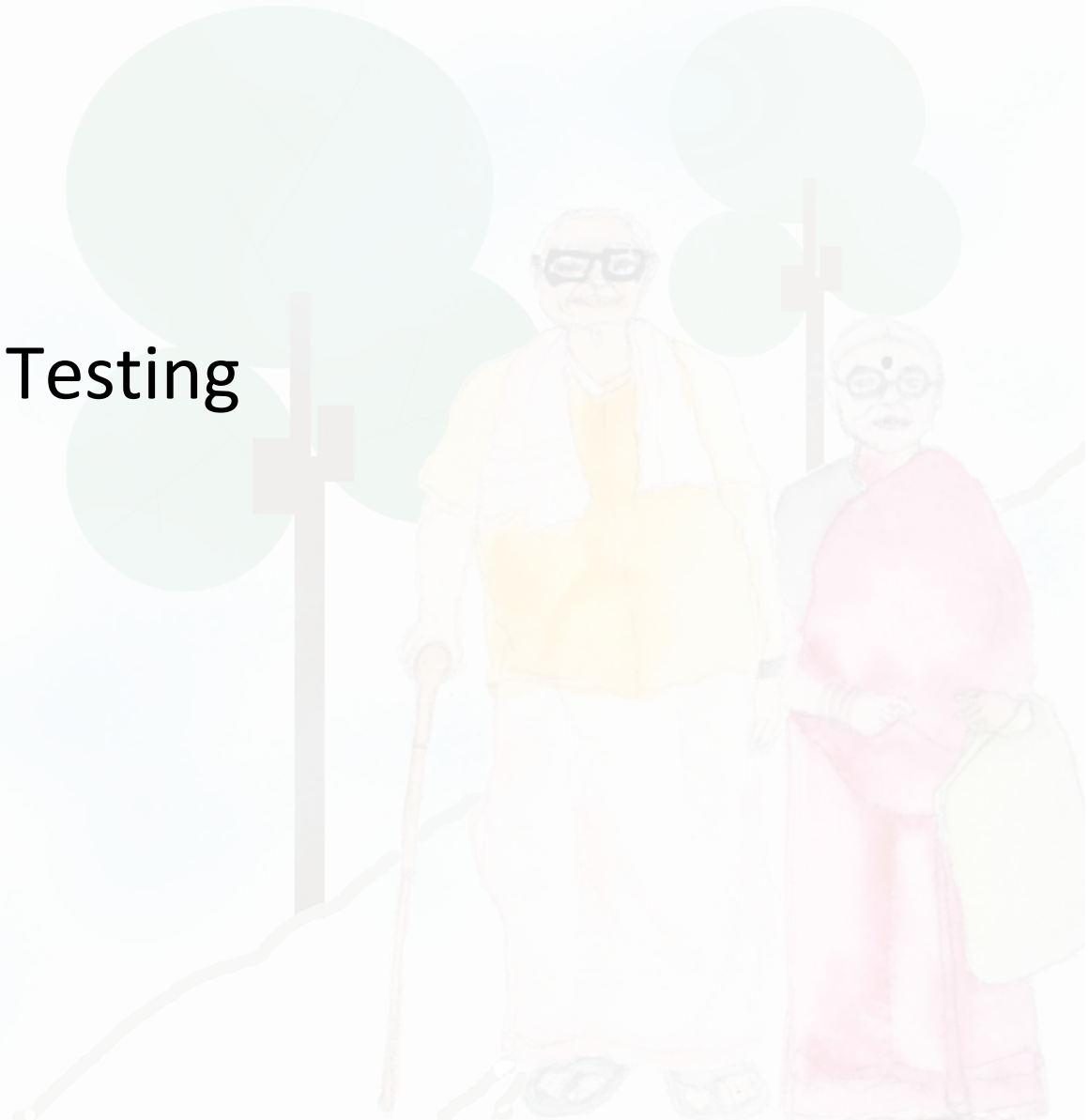




## Prototype:



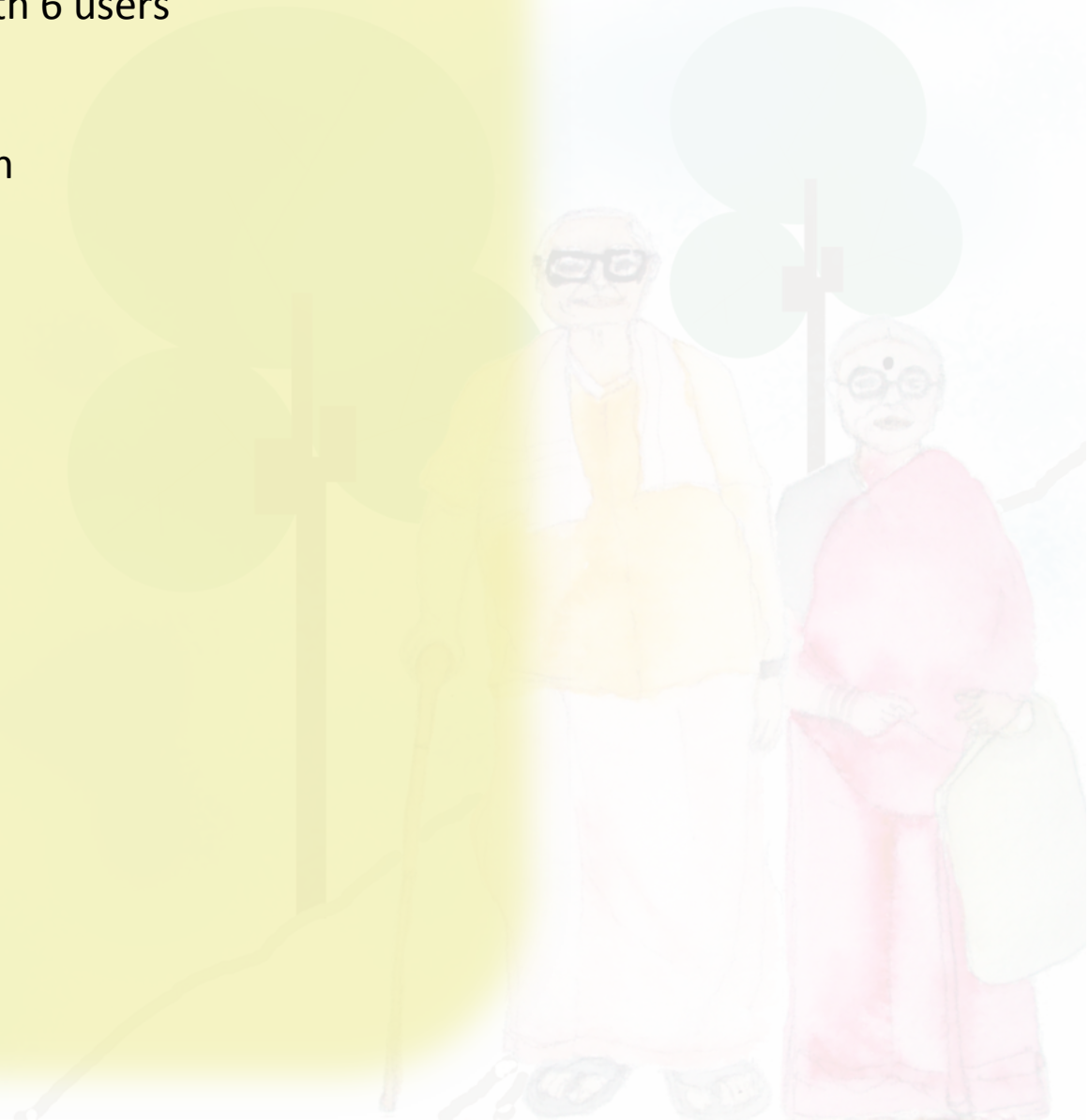
# User Testing



Performance Test was conducted with 6 users

**Steps involved in the test:**

- Setting up Goal and its prioritization
- Listing Target user
- Preparing Screener
- Specifying Protocols
- Tasks setting
- Observation while performance
- Analysis
- User comments
- Conclusion



Goal Prioritization			
Goal	Importance	Severity	Priority
To give elderly new, playful & fun experience while using TV remote control	5	5	25
To exercise elderly palm, hand, upper body movement while using the remote	5	4	20
To have a very simple operational interface	5	5	25

**Target Users:**

Age - 65 and above

Education - Preferably educated

Economy - Middle class and above

Like watching TV

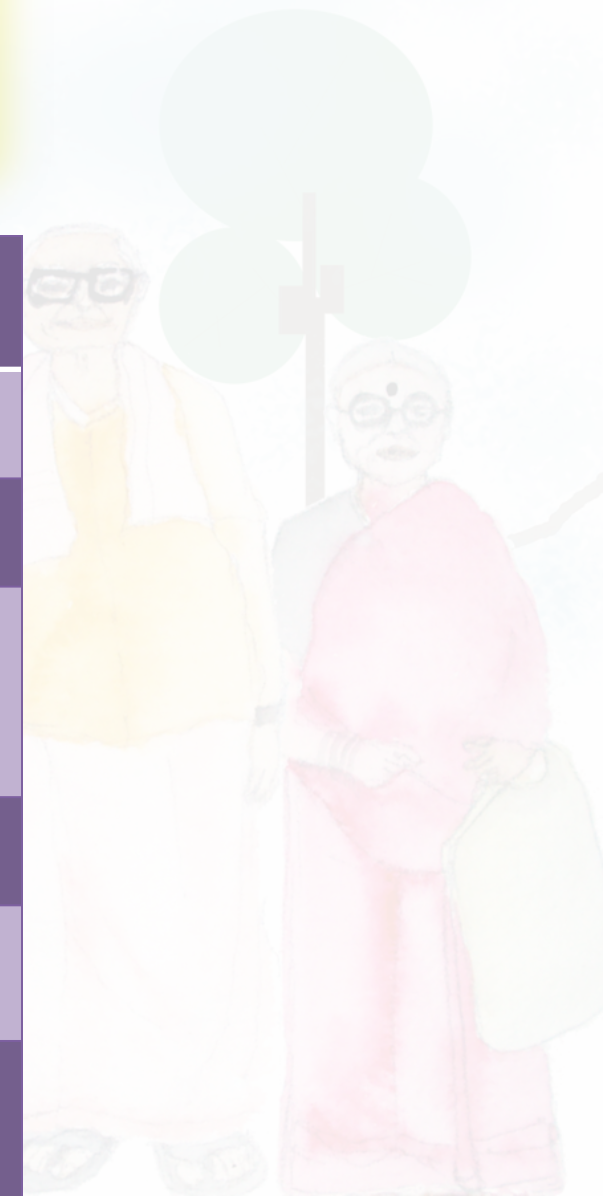
Have personal TV



**Screeners:**

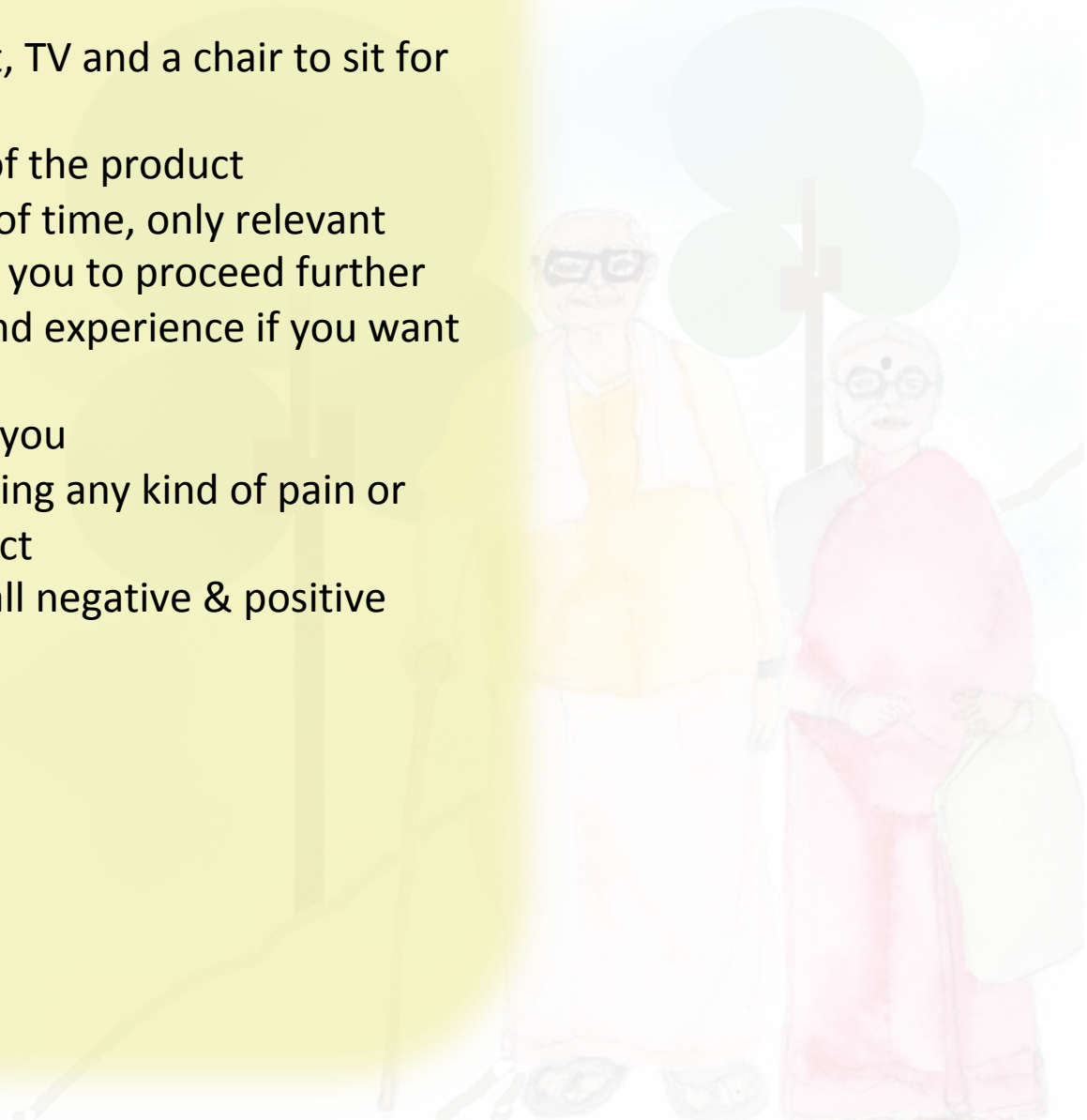
Hello my name is Shalini Tripathi from IDC, IIT Bombay. I am seeking few people who are interested in participating in evaluation of a product. This is strictly a part of course study and I will be testing only the product and not your skills or intelligence. The evaluation will consist of a one on one interview on \_\_\_/06/2010 at IDC, IIT Bombay. It will be at your convenience and will last for maximum 30 minutes. The interview will be strictly for research and all of your comments will be confidential. If you are interested in participating, I would like to ask you a few questions.

Sr. no.	Questions	Answer Condition	Instructions
1	What is your name?		Go to Question 2
2	What is your age?	If 65yrs or above	Go to Question 3, Otherwise Terminate
3	What is your educational and professional background?	If educated retired/working male middle class or above economic strata, or female with monetary support	Go to Question 4, Otherwise Terminate
4	Do you like watching TV?	If yes	Go to Question 5, Otherwise Terminate
5	Do you do any kind of exercise, if yes are you regular?	If no	Go to Question 6, Otherwise Terminate
6	Do you watch TV daily, how many hours?	If yes & more than one hour	<b>Recruit</b> him/her if you think he is <b>articulate</b> enough, Otherwise Terminate



**Protocol:**

- You will be provided with a product, TV and a chair to sit for performing the test
- This is not a test of you, but a test of the product
- You can ask questions at any point of time, only relevant answers will be given which will help you to proceed further
- You can talk aloud your thoughts and experience if you want to
- Try to explain what was frustrating you
- You can stop and tell if you are getting any kind of pain or inconvenience while using the product
- Please be honest in your answers, all negative & positive comments are welcome



**Scenario:**

You are sitting in your drawing room/lobby/bedroom and your son brings you a new remote control for your television specially for you. Use your gift to let your son know if it is working for you

The task was asked to be performed twice:

- Without showing how it works
- By showing how it works

**Task 1:**

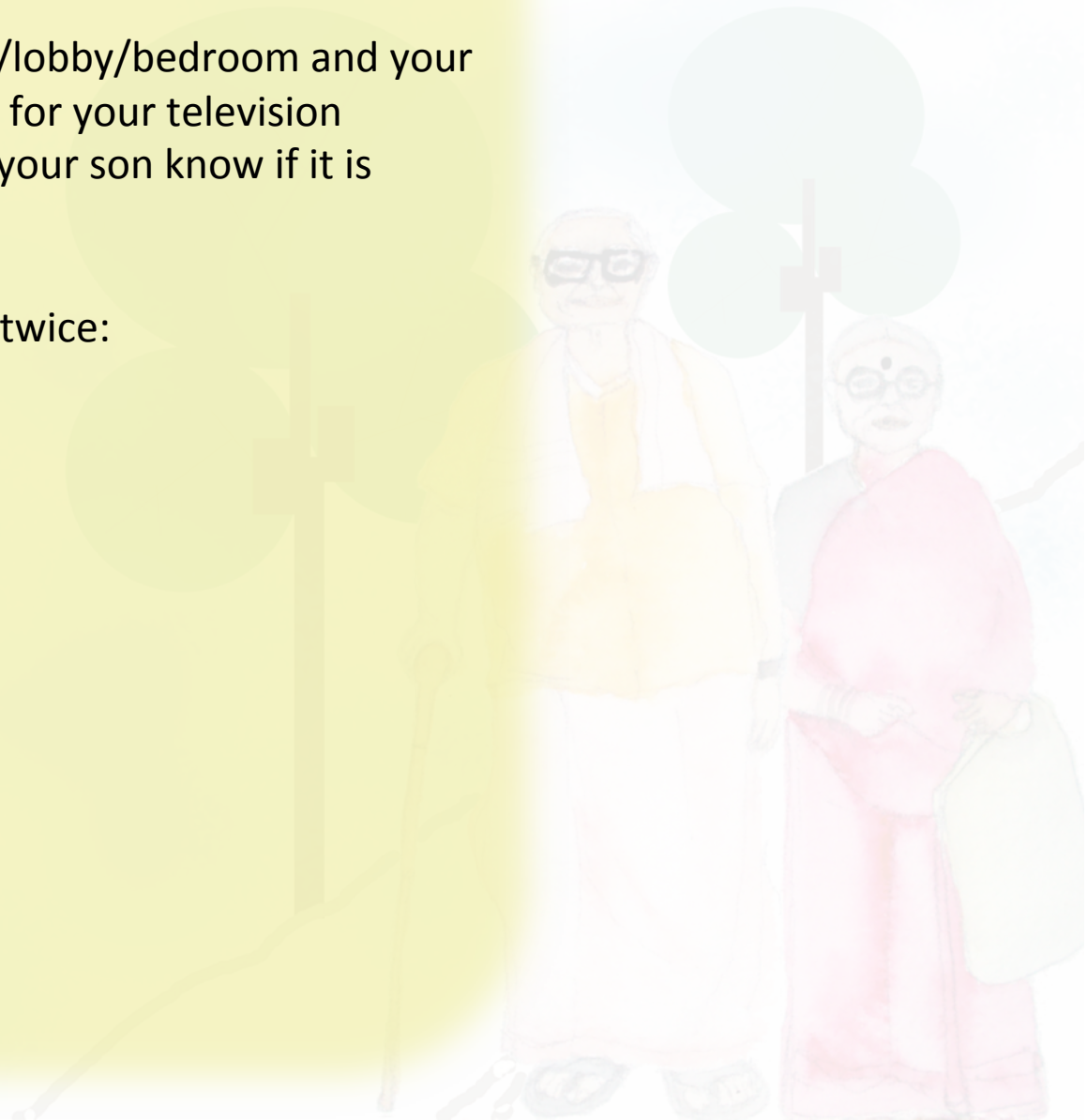
Switch on/off the television

**Task 2:**

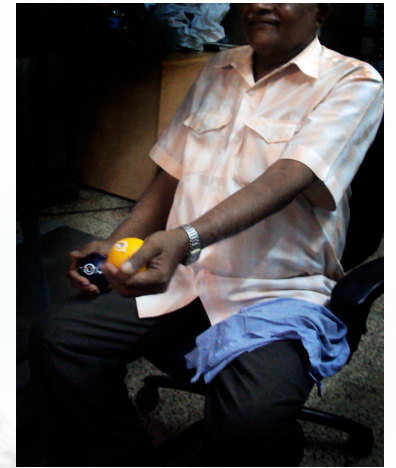
Change the channel of the television

**Task 3:**

Change the volume of the television

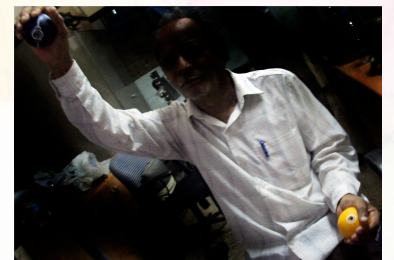
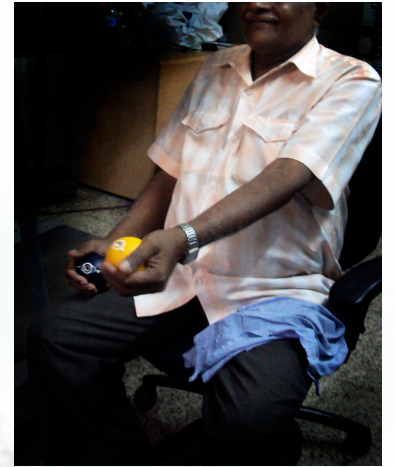


## Observation:

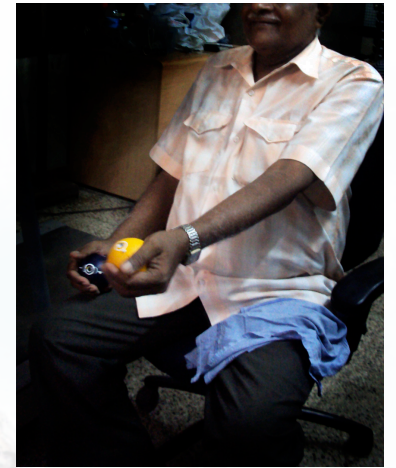










**Observation:**



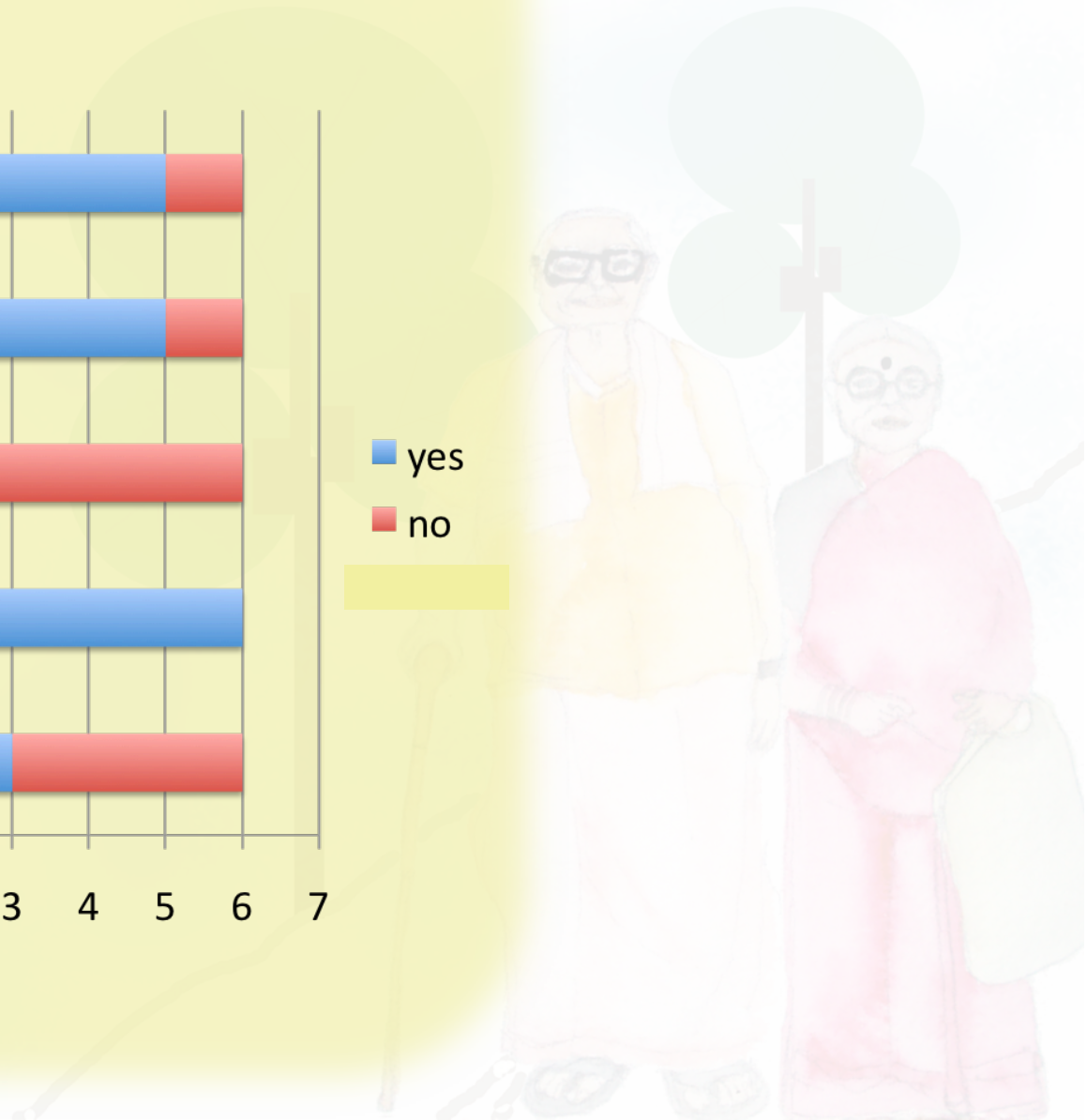
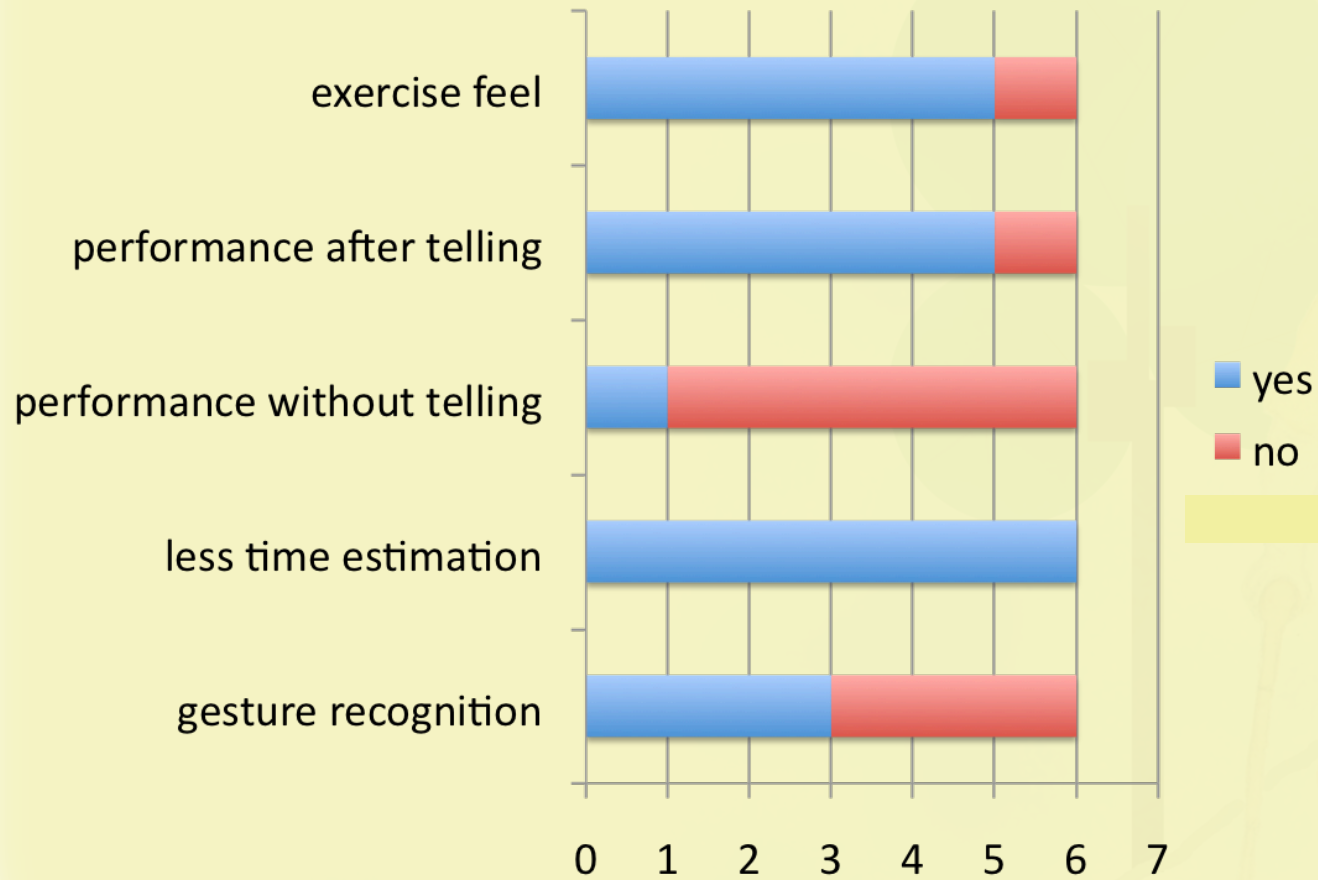
**Observation:**

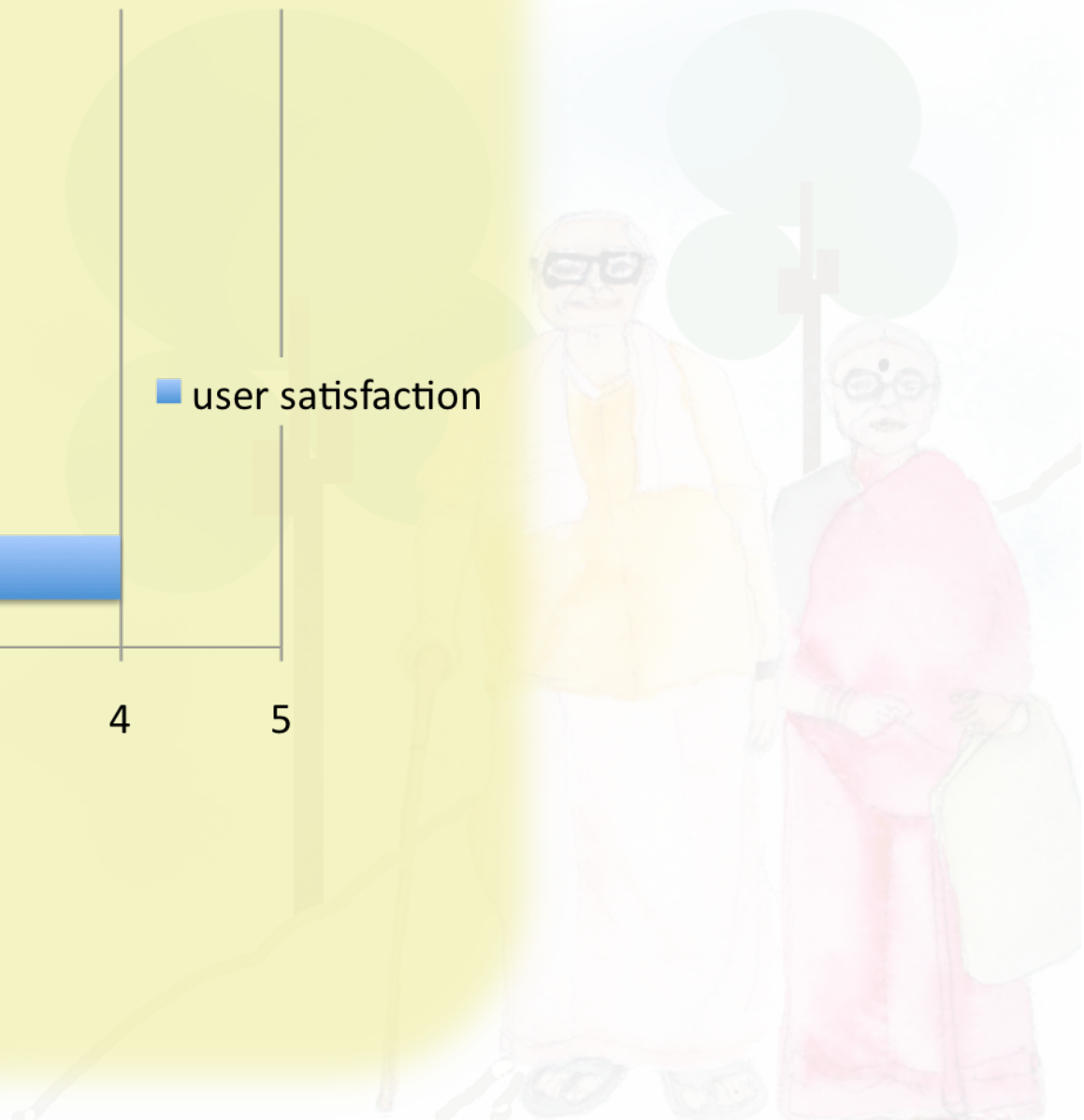
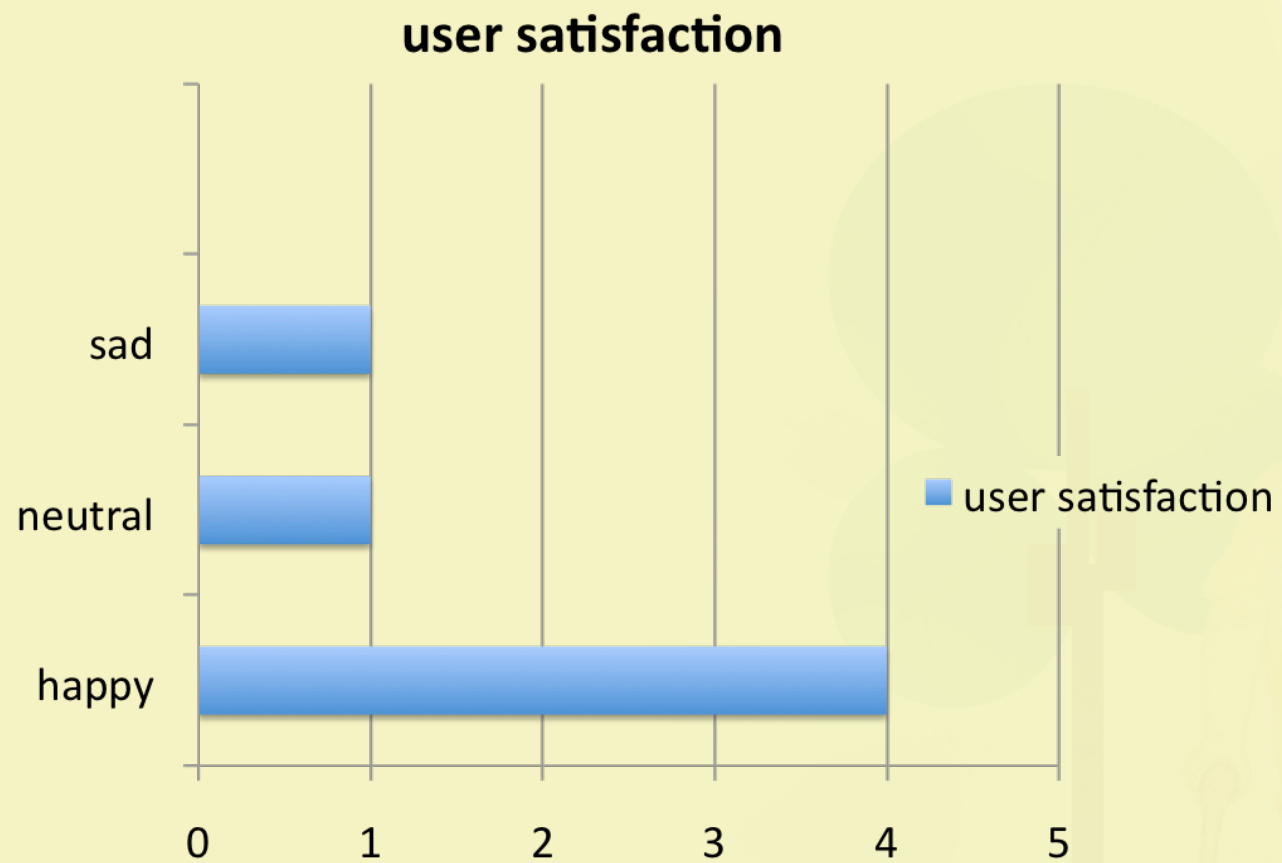


Analysis						
Tasks & Factors	User 1	User 2	User 3	User 4	User 5	User 6
Smiles/ frown/ neutral during the performance						
User estimated time less than the time he sat/ user was not getting bored	✓	✓	✓	✓	✓	✓
Recognized gestures – squeezing/moving hands without telling	X	✓	X	✓	X	✓
User was able to change channel/change volume without telling how to do it	X	X	X	X	✓	X
User was easily able to change channel/change volume after telling how to do it	✓	✓	✓	✓	✓	✓
User agreed to the fact that it is helping them to exercise too and were happy about it	✓	✓	✓	✓	✓	X
	✓	X	✓	✓	✓	X
User found the product useful for them						



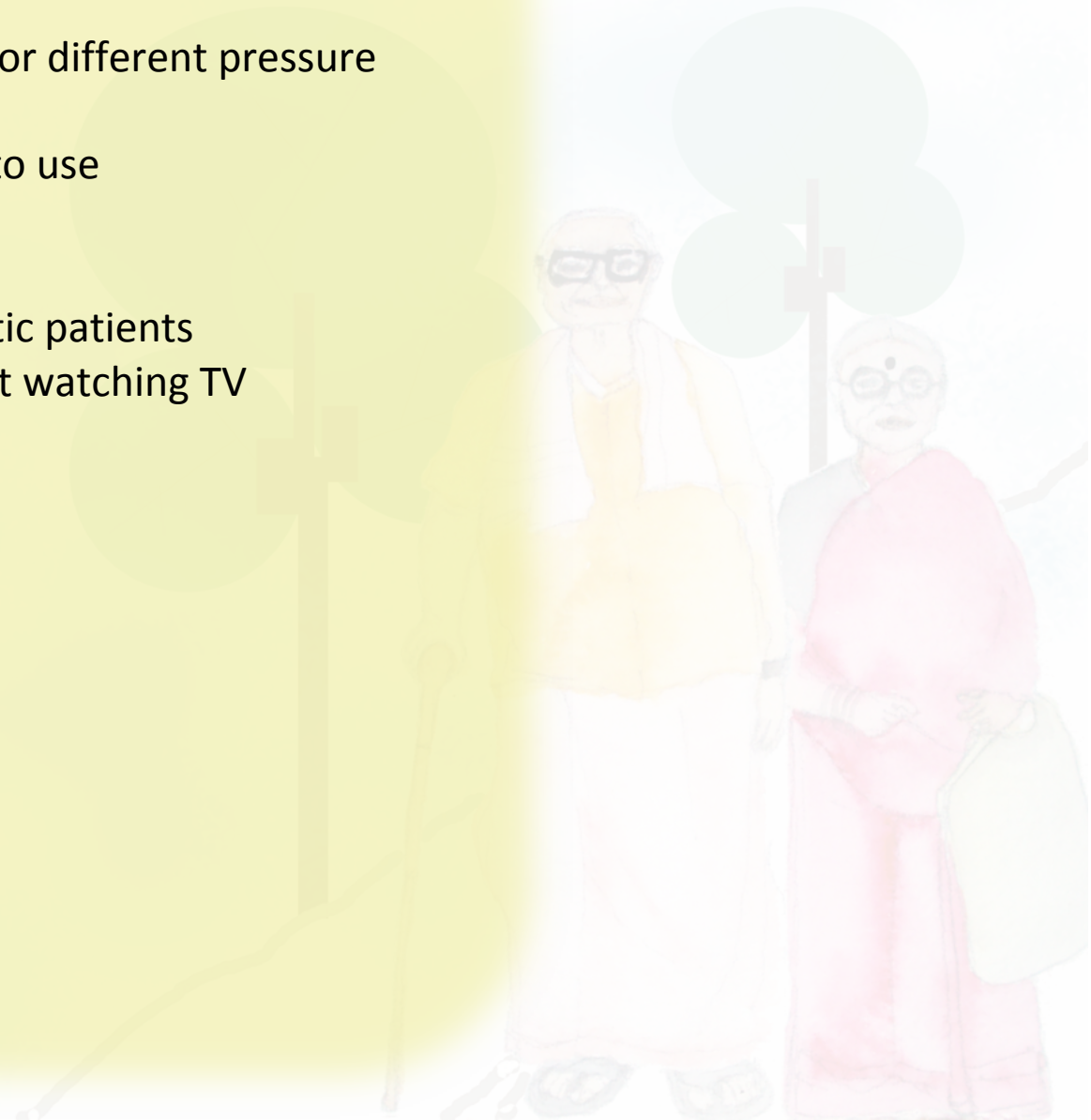
## Performance test graph





### **User Comments:**

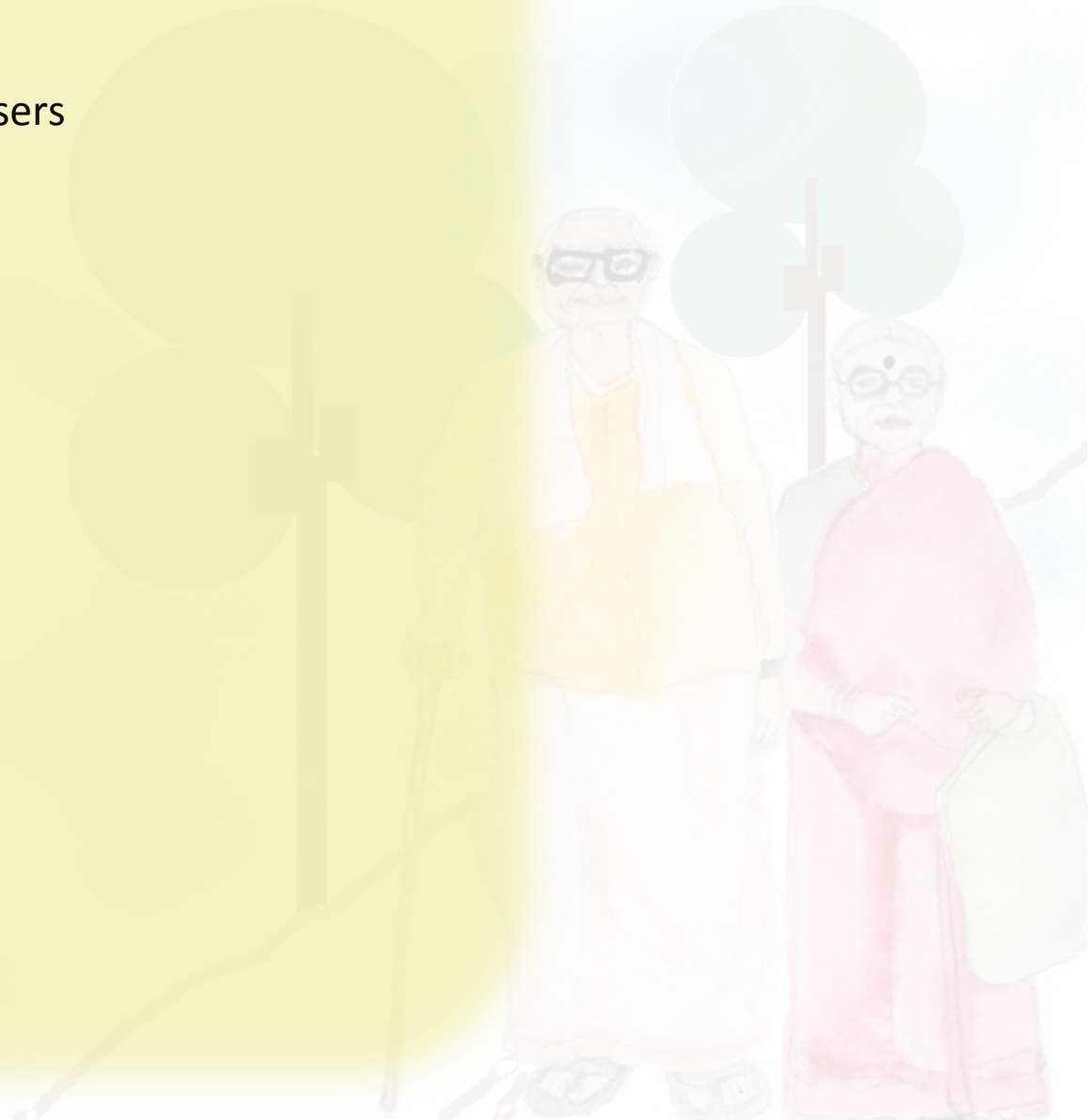
- The two parts should be designed for different pressure strength
- The product seems useful and fun to use
- It can be of different sizes
- It should not be very hard to press
- The product is also good for paralytic patients
- This can also be used while I am not watching TV





## Future Works:

- User Testing of emote with more users
- Prototyping the s-tory



## **Acknowledgements:**

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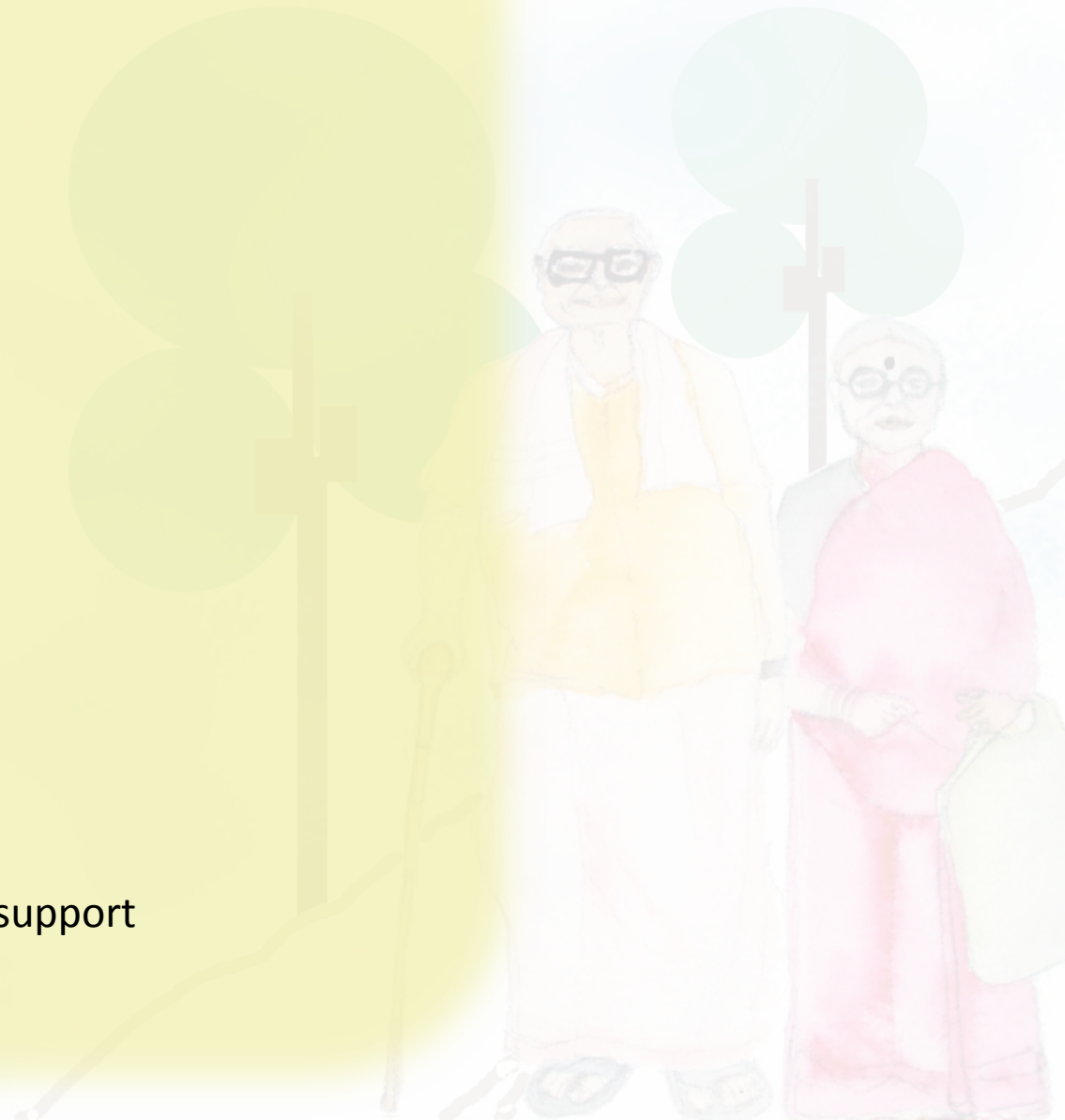
Mrs. Kusum Laskman Pathak

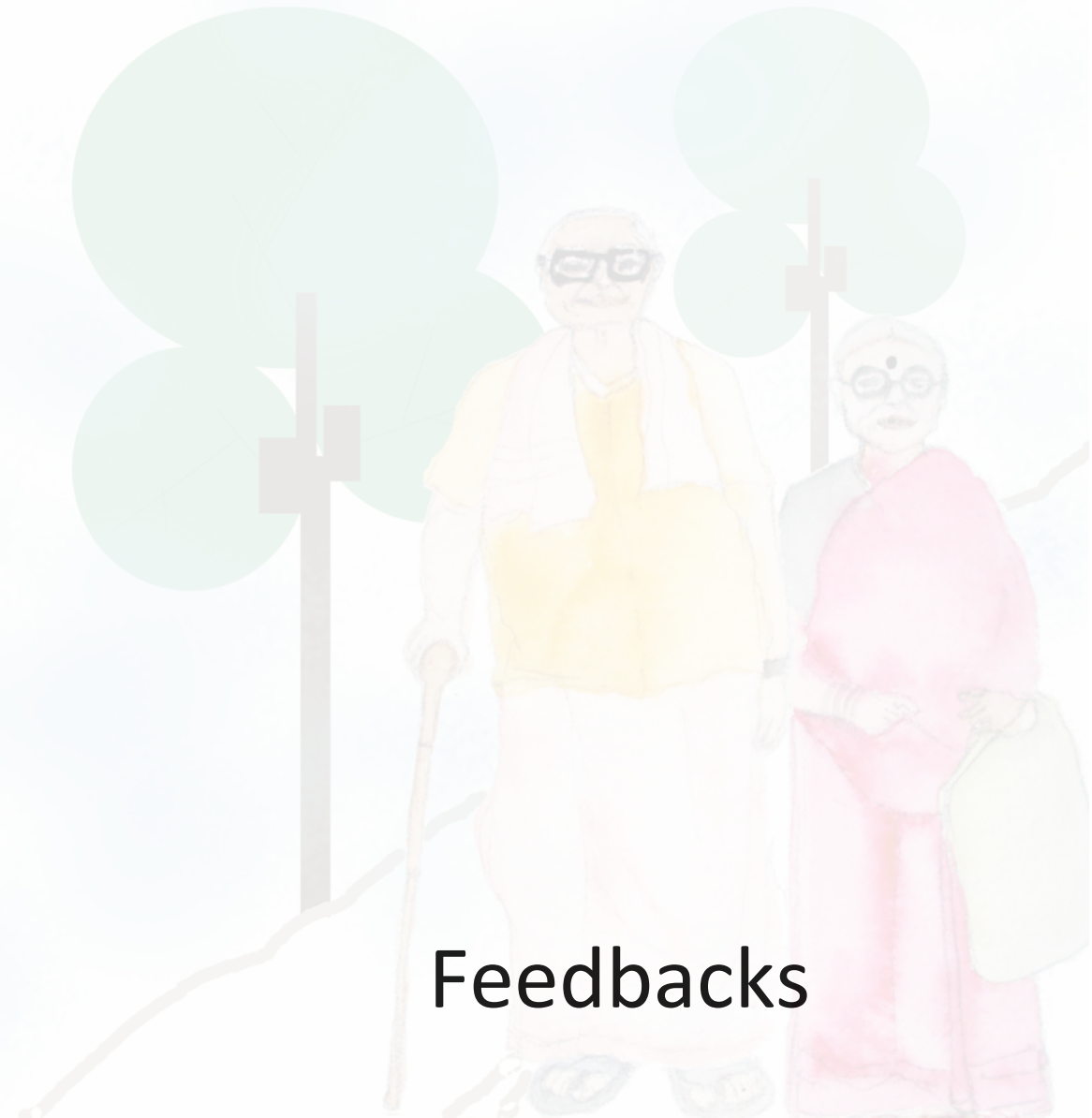
Mr. kavle

Mr. Naresh

All my elderly friends from park

All friends and family for their moral support





Feedbacks