
Research Report - DECO2200

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Abstract

This research paper aims on understanding how children will likely behave during space travel and finding better ways of integrating medicine and health support in space for them through technology. The problems that were investigated include all health issues that astronauts currently face during space missions, children's behaviours and preferences in a similar environment to spacecraft, children's perception towards health and exercise, and the limitations on existing devices and interfaces. Based on the findings, it was found that in an enclosed space children tend to feel bored and their preference of entertainment is different in terms of age. Also, they require a user-friendly interface that encourages them to remain motivated in terms of health and fitness.

Research Questions

- What are the current health challenges of traveling into space and how are these challenges currently being dealt?
- In what ways does family play a role in space tourism in the future?
- How does children perceive and approach health and fitness? What are their motivation and goals?
- How does children behave in a confined space during air travel and train travel?
- What are the existing health monitoring devices designed for children? What are their strengths and weaknesses?
- In what ways can we improve the experience of health and fitness in space for children?

Research Methods

These are the methods that will be used throughout the research:

▪ Online Ethnography

This method provides high credibility of the data being collected. Therefore it provides reliable insights to the research travel that would not be possible to gather through other methods alone, such as interview. (Tomitsch et al., 2018).

▪ Competitor Analysis

To become more aware of current and/or future competitions, a competitor analysis is an essential step in this research. It is used to assess the strengths and weaknesses of existing competitor which will help us gain a better understanding of opportunities to improve competitive advantage. (Tomitsch et al., 2018).

▪ Persona and Storyboard

To better understand the target user and the problem better, personas and storyboards are conducted (Tomitsch et al., 2018).

Introduction

With the growth of the space industry and technological advancements, the possibility of commercial space travel is becoming bigger and bigger. If NASA is able to change the economics of spaceflight by increasing competition and lowering costs, its possible that private citizens and families will routinely visit space (Drake, n.d.).

When it comes to space travel, health is the most important and difficult to maintain. One the most important aspects to look at is the health and well-being

of children as they require specific consumer needs. They are also more vulnerable compared to adults as their bodies are smaller and not fully developed yet. Therefore, it is important to investigate and explore ways in which children can receive the best and most adequate healthcare and support during space travel in a commercialized setting.

Background Research

To investigate the ways in which children can receive the best and most adequate healthcare and support, it is important to look at the current health challenges of travelling into space and what measures have been taken to overcome these challenges. Additionally, other aspects should be explored such as the behaviors and preferences of our target market in a similar setting (specifically air travel) through research and online ethnography.

Effects of Space Travel in Human Body

The human body undergoes a lot of changes during a space mission. Some of the most common health risks that astronauts face during a space mission are muscle and bone loss, weightlessness, unloading, and radiation exposure.

According to a research done by NASA's Human Research Program on a mission to Mars, there are five categories that these health risks are grouped into:

1. Gravity Fields

It has been known that during astronauts' time in space they experience loss of mineral in bones, with density dropping at over 1% each month due to

space gravity fields. In addition to that, muscle weakening and shrinkage is inevitable as there is no weight in the back and leg muscles ("The Dangers of Zero Gravity | Davidson Institute of Science Education", 2020). Because of this astronauts are more prone to diseases such as muscle atrophy and osteoporosis upon coming back to Earth.

Currently, NASA has found a solution which allows astronauts to have an easier time when adapting upon returning back to Earth through routine exercising. To maintain muscle and bone strength, it is recommended that astronauts exercise at least two hours a day. Due to microgravity, the equipment they use is different to the one used on earth. For example, for weightlifting purposes they are using a machine called ARED, for Advance Resistive Exercise Device which utilizes two canisters that create vacuums that astronauts can pull against with long bar ("How do astronauts exercise in space?", 2019).

2. Isolation/Confinement

Being confined in the spacecraft with a group of people away from the mass population for a long period of time will most likely result in behavioral changes. In a lecture by Dr. Dervay on Spaceflight Medical Operations, behavioral psychosocial is said to be one of the limiting factors in many respects to go to Mars (Space Medicine Medical Operations, 2016).

Using five-minute self-tests and journals is what Nasa claimed has been affective among astronauts living in a confined space together, allowing them to have a space where they can vent their frustrations without judgement. Additionally, the self-test informs astronauts the effects of fatigue on their performance.

3. Hostile/Closed Environment

In a closed environment like the spacecraft with bad air quality (from microbes and microorganisms), people are more prone to illness and diseases as their immune system is altered and their stress hormone levels are increased.

To prevent people from illness, NASA uses technology to monitor the air quality, ensuring that it is safe to breathe and that there are no harmful contaminants ammonia and carbon monoxide.

4. Space Radiation

Astronauts receive ten times more radiation on space stations than on Earth due to the nonexistence of magnetic field and atmosphere to protect them. As a result, travelers may experience a damaged central nervous system, reduced motor function, behavioral changes, and radiation sickness.

5. Distance from Earth

Travelling to a place hundreds of miles away from Earth requires an attentive planning in case there is an equipment failure especially in terms of nutrition and medicine supply. Nutrition is a very important health factor that needs to be considered on a daily basis especially in the context of space travel where the diet is completely different. Astronauts are trained to follow a certain diet during space missions and are restricted to eating food that is already dehydrated.

Currently, Nasa is using the space station to gather data regarding what type of medical events could occur in space over a six-month period. This include

what type of skills, procedures, equipments, and medications that are needed (Abadie, Lloyd & Shelhamer, 2015).

These are the current ways and methods in which NASA has done to tackle and prevent these issues. However, in a commercialised setting there are still some things that need to be considered to ensure that all passengers receive the appropriate health support during the flight. These may include things like the experience of health and fitness for different user groups.

In the context of space travel in tourism industry, families are one of the target users that we might need to highly consider of. It is predicted that family tourism would grow at a faster rate than all other forms of leisure travel as it represents the reunion of family members during leisure time. (Schänzel *et al.*, 2012) Therefore, it's possible that they would grow at the same or even higher rate by the time commercial space travel era comes.

One of the family members we might want to focus on is children. As a consumer, children have always had specific needs and wants. In terms of health and fitness, they require a more playful approach to ensure that they are receiving the appropriate support.

Maintaining health and exercising is part of the daily routine of astronauts to prevent issues such as muscle and bone weakening. Evidently, the user experience of space fitness for children needs to be well thought of.

In order to facilitate a better fitness experience, we need to understand how children approach health and fitness in general and how they behave in a similar setting such as air travel.



Figure 2: This image shows a two year old girl showing her interest in a physical toy that is given by the airplane crew. Picture taken from a youtube video (Coleman, 2020)

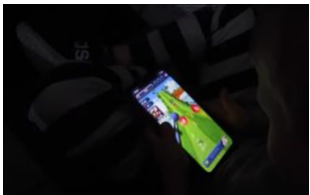


Figure 3: In this image, an older boy (4 years old) is playing games on a phone during the flight (Coleman, 2020).



Figure 4: Two girls are wearing their personal headphones to watch their favorite show on a device in the airplane (O, 2019).

Children's Perception on Health and Fitness

Exercising for health purposes might not be a new concept for children. However, they are more prone to feel bored in a short period of time so they might not be able to cope with something so repetitive in a long period of time as an exercise in space especially when it doesn't involve any incentive. Thus, it is important to know about their underlying motivations for exercise.

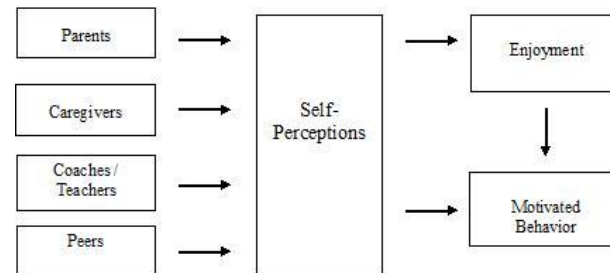


Figure 1 : This figure shows some of the factors that affect children's motivation towards sports and exercising (*Locomotion Motivation*, n.d.).

From the figure above, we can see that most of the factors that is affecting children's motivation come from adults, specifically how they shape the child's self-perceptions on health and fitness. Children tend to follow or copy everything that adults demonstrate them to do even if there are clear or obvious reasons why those actions would be irrelevant (Nauert, 2019).

Children's Behaviours and Preferences During Air Travel

To understand better about children's behaviours and preferences in a similar setting as space travel, an online ethnography was conducted. This method is used to observe children's behaviours and preferences during air

travel through online resources to get a wide range of information (appendix page 1). From the findings, there are some things that are noticeably common:

- Children are more likely to feel bored than adults relatively quickly. They need some sort of entertainment such as watching movies, playing games, toys etc.
- Children prefers entertainment with a loud audio and are usually unabashed of their surroundings.
- Children bellow the age of 4 are usually new to the concept of digital entertainment and more familiar towards physical toys.
- Most children are new to the concept of hygiene, so their parents have to help them.
- Young children feel uncomfortable with the airplane seats as they are designed for adults.

Online Ethnography on Wearable Devices for Health Monitoring

In this era of technological advancement, wearable devices are integrated into our daily lives. They are continuously being developed for medical & health care and sport & fitness purposes.

Most wearables are wrist-worn (smartwatch) and have health monitoring features such as heart rate sensor, sleep tracker, activity tracker, and ambient temperature sensor. Others are usually worn on the ears, eyes and clothing.

Health wearables makes it possible for continuous patient monitoring, home healthcare as well as real-time health and fitness optimization. The user and health professional can use and analyse the data transferred from the wearables to the user's smartphones which makes it easier in case of an emergency ("Wearables in

MedTech: Past, Present & Future | Integrated Technologies Ltd", 2020).

The wearable industry has many products that are specifically designed for children or can be used for children. To better understand how these products sits within communities, cultures, and groups (how it's being used, its benefits and drawbacks, etc) an online ethnography was done utilizing the steps taken from the book "Design. Think. Make. Break. Repeat" (Tomitsch et al., 2018).

Key findings on online ethnography:

- Most wearables that are designed for children consider material (needs to be safe and playful at the same time) and aesthetics to grab attention.
- Kids are interested on the idea of having a competition with friends and family using the step tracker in wearable devices but lose their interest relatively quickly.
- User-friendly interface is helpful for children to navigate the wearable without the need of parental guidance.
- Mini games that come with the wearables are commonly ignored by children. Children are more interested in games that are made specifically for gaming than the mini games offered by the wearable brand.
- Children are more attracted towards vibrant colors as their attention span is lower than adults. Most of the children wearables that have good reviews on their product design have vibrant, playful colours.
- Most wearables do not consider how most children can be forgetful about wearing and charging their wearables.

Competitor Analysis

To discover methods and ways for children to receive the best healthcare in space, it is important to explore and compare existing devices and companies in the market that have been successful and effective in addressing the problem (Tomitsch et al., 2018). The competitors include those that are prominent in the wearable industry and portable health products (appendix page 21-23).

Key findings of competitor analysis:

1. Garmin

Garmin is a company that produces activity trackers and sport watches, aimed at heavy physical activities such as running, swimming, cycling, jogging and running. It's a brand that is well suited for people who are passionate about sports. Although most of their products are targeted towards adults, there are some targeted towards children and have made successful penetration to the market.



Figure 5 : Garmin Vivofit Jr 2 – Star Wars Theme (Wise, 2018).

The product shown in the figure is one of their wearable smart watches designed for children.

It is targeted towards children who need to the motivation to be active and parents who need to monitor their child's physical activities.

As any other Garmin smartwatches, it offers a wide range of features such as sleep and step tracker, stress tracking, mini games, and phone apps.

Why is it unique?

One of its Unique Selling Points (USP) is that it has a feature where parents are able to create and assign chores for children and give rewards to them. Most parents really like the idea of having parental control over their children's physical activities so they have less worries. Moreover, the Disney themed phone apps and mini games intrigued the kids and made them motivated to be more active.

What are its advantages and disadvantages?

Based on the product reviews from various social media and online video platforms, the advantages of the product are:

- It doesn't need to be charged as frequently due to its high battery performance which makes it easier for children who are forgetful.
- A rich user experience due to the variety of features it offers.

While the disadvantages are:

- The advanced features of the watch require parental guidance as the

children are unable to understand them.

- Although the mini games are its unique selling point, most children lose their interest quickly in these games as they are not as interesting as mobile games.

2. Fitbit

Fitbit is a trusted brand for health and fitness tracker. It's in the same product category as Garmin but it's targeted towards a wider range of target market. Most Fitbit users are people who needs motivation to be active or simply active people who wants to monitor their workout.



Figure 6: Garmin Vivofit Jr 2 – Star Wars Theme (Farhat, 2019).

One of their products that is targeted towards children is Fitbit Ace 2. Fitbit Ace 2 is designed with children in mind. Starting from its material, vibrant kid-friendly colors, to its user-friendly interface.

Why is it unique?

One of the features that make this product different from other wearable products is its ability to adapt to the user's preferences such as the interchangeable straps and animation feature. Its concept is that when the user grows up, they might get bored of the animation and want something more grown up. Moreover, Fitbit Ace 2 offers a lot of social related features such as sending challenges, cheers and messages to friends and family. Their mobile app also supports syncing with multiple devices making it convenient for the users to manage their family members' data in one mobile device.

What are its advantages and disadvantages?

Based on the product reviews from various social media and online video platforms, the advantages of the product are:

- Easy to use as the interface of their products is simple
- Flexible design enable the users to personalize their watch as they change their preference
- Excellent battery performance.

While the drawbacks of the product are:

- Some of their watch doesn't come with a GPS tracker so parents are unable to track their child's location
- There's also no heart rate monitor.

3. Tytohome

Tytohome is a digital remote exam kit that enables people to conduct basic medical examination at home. It is targeted towards people who wants to receive healthcare without the stress of travelling and waiting. The product is also convenient for people who are immobilized or have difficulties of travelling to a local hospital.

It features a digital camera, thermometer, and at-home medical diagnostic kit which includes things like tongue depressor, otoscope and stethoscope.



Figure 7 : Tytohome Remote Medical Exam Kit with touch screen interface and organic product design (*Tyto Remote Exam Kit*, n.d.).

Why is it unique?

This product is able to be paired with video conferencing apps and connects the user to a certified healthcare professional for diagnostic plan and a prescription.

What are its advantages and disadvantages?

Based on the product reviews from various social media and online video platforms, the advantages of Tytohome are:

- It saves the need to go to the doctor
- Worried parents are able to feel less worried for their children (they are able to check up on their child's condition at anytime)
- Convenient for emergency purposes
- Its interface is straightforward and easy to understand.

While the drawbacks of the product is:

- There is a possibility of inaccuracy as the user is conducting the medical exam.

4. Naked Labs

Naked is a 3D Fitness Tracker that shows a holistic picture of your body and how it changes overtime. It uses 3D scanning technology to track your body measurements and send the data to the mobile app. It is targeted towards the fitness community with a wide range of user groups ranging from overweight people to athletes.

Why is it unique?

The product they offer is able to make the user visualize how their body is changing easily (through the use of an app) and they are able

to integrate 3D technology into a mundane object seamlessly.



Figure 8 : Naked Home Body Scanner (*Naked Body Scanner*, n.d.)

What are its advantages and disadvantages?

Some of the advantages Naked has over its competitors are:

- Their product is innovative and simple to use
- They have good reviews from popular online video platform influencers.

Meanwhile their disadvantages are:

- Their product is not portable and have little interaction with the physical product
- Due to its high price point, their product is not attracting people with lower income.

Exploring User Interfaces

In order to find better ways of improving the user experience of health and fitness for children in space, it is important to explore possible user interfaces and its limitations. These user interfaces include existing interfaces that have already been invented, future interfaces and fiction concepts that is often found in sci-fi movies.

Existing Interfaces

- **Mirror Smart Home Fitness**

Mirror is an interactive home fitness device that offers live virtual fitness classes in different disciplines including cardio, strength and yoga. It replicates how it feels like to be in a real fitness class. The device comes with the mirror, a Bluetooth heart rate monitor and six fitness bands. The purpose of this interface is to provide fitness information to the user through the use of a smart mirror. Smart mirror or virtual mirror is a device that reflects the user's image on a screen making it look like a mirror. This enables the user to simultaneously do their workout as instructed and see whether they are doing it correctly or not.

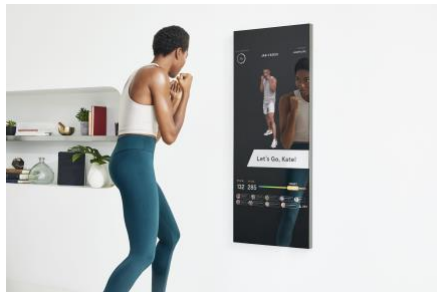


Figure 9: Mirror Smart Home Fitness (Lee, 2018).

The interface is simple and easy to use as it can be controlled using a phone app. In the app, the user is able to browse through different workouts based on their preferences, schedule their classes, and see their progress. It is also linked with Spotify, a digital music service, to help both the user and the instructor set up a workout playlist.

What are its limitations?

Although this device closely replicates the experience of commercial gym classes, it comes with its limitations. The interaction between the user and the device is limited to showing data and visuals. The device doesn't have a touch screen feature and forces the user to use their phone and download their app to control the device. This makes it inconvenient for the user and they could easily get distracted by entertainment offered by other apps as they are using their phone (social media apps, YouTube, etc).

- **Virtual Reality for Fitness**

In 1968, an American computer scientist Ivan Sutherland created a head-mounted display system which allows the user to see a virtual environment with simple wireframe rooms (Cooke, 2017). Over the years, the system developed into what we know today as Virtual Reality (VR). VR has continued to progress in many aspects including its graphics and realism.

In the fitness industry, the concept of integrating VR to exercises is still relatively new. An example of that is Black Box VR. Black Box VR is a virtual reality gym experience that incorporates VR video games into its workouts. In the workout game, the users are able to compete with the AI (Artificial Intelligence) using exercises linked to certain game features. For example, if the user wants to do a direct attack to

the AI they would need to do a chest press. There's also a reward system when the user wins the game such as points and trophies.



Figure 10 : This image shows what the interface of Black Box VR game looks like when the user wins (*Black Box VR Interface*, n.d.).

The purpose of its interface is to provide the user a gamification experience of the workout. The user interface design feels very gamified with the colourful interface and icons that are often used in games such as coins and gems. Due to addictive and fun nature of games, the users are able to stick with the workout longer and stay motivated.

What are its limitations?

Similar to the Mirror Smart Home Fitness , the use of phone application to control the VR makes it inconvenient for the user especially when they want to change their workout and browse through different exercises. To do that, they would need to take off the VR gear first and open the app.

Moreover, the exercises are more prone to be ineffective compared to a traditional workout

because the user can't see their reflection as a guide to determine whether they are doing the exercises correctly or not.

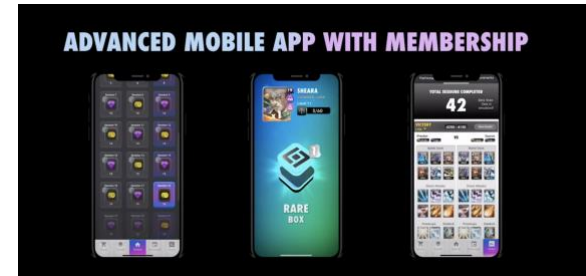


Figure 11 : Black Box Virtual Reality (VR) mobile app (*Black Box VR - Preflight 10 min version*, 2019).

Future Interfaces

- **Augmented Reality Contact Lenses**

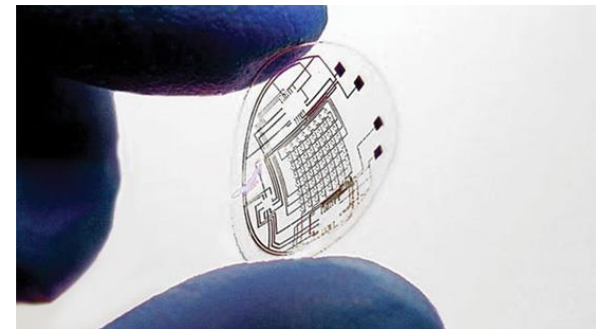


Figure 12 : Augmented Reality Contact Lenses project (Craig,2011).

One of the most interesting projects that involves augmented reality is contact lenses that contain a display. This project is currently being developed at the University of Washington (Parvis, 2009).

The lenses have a built-in LED (Light-emitting diode) that is powered wirelessly through Radio Frequency and other electronic circuits. If the number of LEDs that can be contained in these lenses is increased, it can possibly display various contents such as images, words and even videos (Craig, 2011).

In the future, this technology might be implemented for commercial purposes including the fitness industry to display data from monitoring devices or exercises videos. It is also likely that these lenses will have a separate control unit to control the display such as a phone application.

What are its limitations?

The eye is one of the most fragile part the human body. There is no guarantee that the LEDs will not damage the user's eyes after a long period of usage and leave them with a broken vision. It is very risky as it might impact the user for the rest of their life. Moreover, the small nature of these contact lenses makes it harder for the user to maintain its physical condition.

Sci-fi Interfaces

Apart from the existing and future interfaces, it is also important to explore how interfaces will be used in future scenarios through analysing interfaces in science fiction movies (appendix page 24).

- **Black Mirror : Fifteen Million Merits**

The user interface shown in this movie is a display with advanced gesture recognition. The purpose of the interface is to provide entertainment to the user and display data.

In the movie, the interaction between the user and the interface is shown mostly through hand gestures. For example, the user can browse through data using gestures such as swiping left and right as shown in figure and the system would give immediate feedback.



Figure 13 : In this image, the user is interacting with the interface by browsing through a list of music albums using hand gestures (*Black Mirror: Fifteen Million Merits Interface*, 2014).

The users are also able to use complex gestures to interact with the interface such as playing First Person Shooter (FPS) games.

The interface provides visibility through the large connected displays and sound output. The use of colours and 3D animations gives a realistic experience for the user.

What are its limitations?

The system is limited to using hand gesture as its primary input. As a result, it might impact how society interacts with each other such as using less voice interaction. Furthermore, the connected

displays disrupts how the user views the information (it's creating or forming a grid).

Extreme Characters

To identify new aspects of the design problem and aid in the creation of personas and storyboard, extreme characters method was utilized as it involves imagining extreme personalities and their traits, values and daily practices (Tomitsch et al., 2018).

The steps taken to make these extreme characters are choosing extreme user types that fit the design problem, composing the characters and creating an attitude for each character. Based on these steps, the chosen character types are:

1. The Sporty

Johnny is a 12 year old boy who lives in Sydney, Australia and goes to a public school. He's very social and likes to hang out with his friends a lot. He likes being active and his favourite sport is swimming. His goal is to compete in international level. His main motivation comes from his coach and friends.

2. The Superfan

Marsh is a 7 year old girl who lives in New York and does home schooling. She's not very social as she rarely meets other kids. She's a big fan of Disney and likes to buy their merchandise a lot. She does ballet and dance classes. Her motivation is being able to dance like Disney characters.

3. The Nerdy

Akiko is a 10 year old who lives in Japan and goes to a public school. She's a hardworking student in school and likes reading books a lot. She rarely do

any exercise or sports outside of school hours. She's very competitive, especially in academics.

4. The Techie Gamer

Sam is a 15 year old boy who lives in Canada and goes to a private school. He's an average student who likes to make his own personal animation projects. He plays games a lot in his free time. He rarely works out except during P.E classes in school.

These characters are then used to help create persona and storyboard (appendix page 25-27).

Persona and Storyboard

Personas are fictional characters that represent the users and it should "communicate motivations, frustrations attitude, goals, behaviours and demographic information." (Tomitsch et al., 2018)

To explore possible aspects of our user types, personas and storyboards were conducted to understand the target user and the problem better, in an effort to create better possible solutions.

1. User 1

The first user persona talks about a very active and social child who's frustrated about not being able to do his favourite sport in space. The user is also worried about not being able to contact his coach and friends who motivates him.

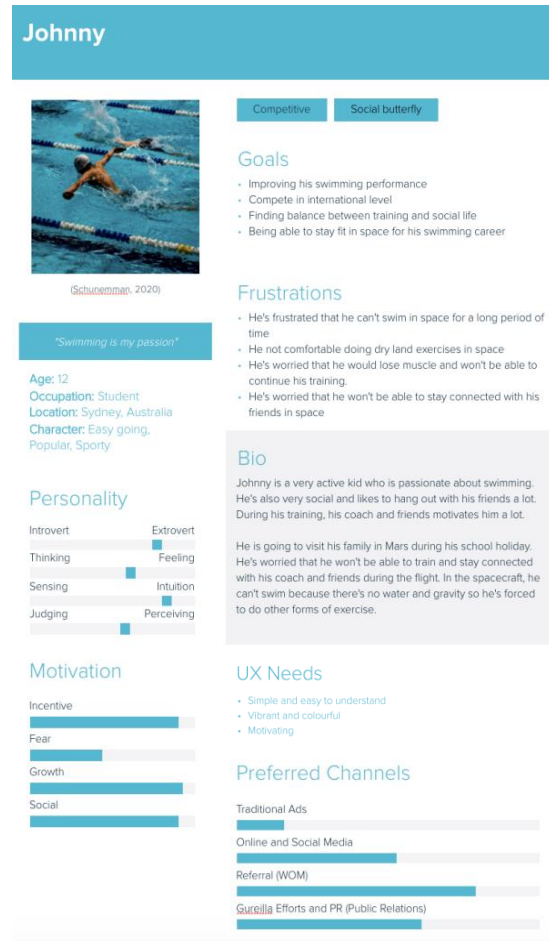


Figure 14 : Persona for User 1 (appendix page 25)

This persona was then made into a storyboard. The storyboard narrative shows how the user experiences motivation loss to workout throughout the space travel journey due to the absence of his coach and friends.

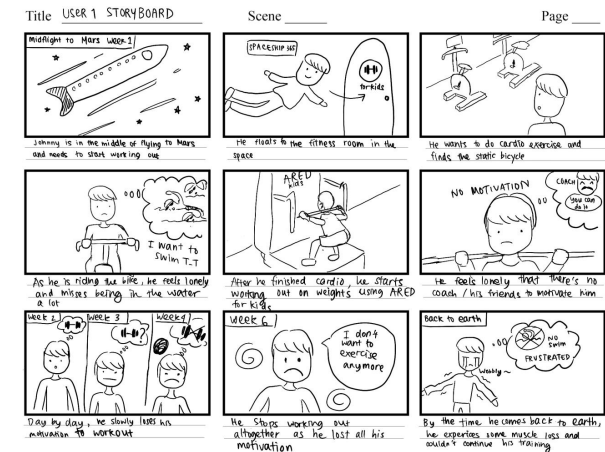


Figure 15 : Storyboard for User 1 (appendix page 26)

From the storyboard we can see that although the user knows how to do the exercises properly through training and drills, he feels discouraged as there are no adults or peers to help and cheer him during the process.

2. User 2

The second user persona talks about a user who is inexperienced with exercising but wants to start working out to fit in with his friends. His frustration is that he lacks motivation when it comes to exercising as he gets bored easily.

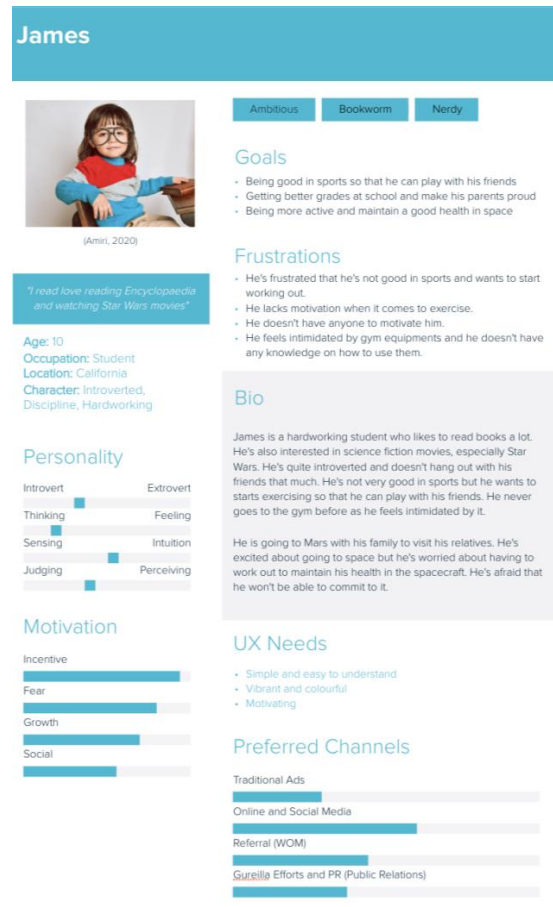


Figure 16: Persona for User 2 (appendix page 25)

The frustrations that the user experiences are then made into a storyboard. The storyboard narrative shows how the user slowly loses his motivation as he finds the workout to be unengaging.

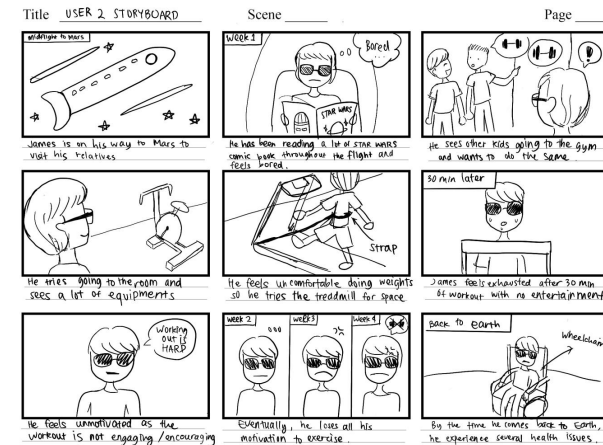


Figure 17: Storyboard for User 1 (appendix page 27)

From the storyboard, we can see how the user feels intimidated by gym equipment in space and finds himself only doing cardio exercises as he is more familiar towards it. He then feels that the cardio exercises is boring and not encouraging enough. Eventually, he loses all his motivation.

Research Conclusion

Based on the findings from the research, it can be concluded that:

- The efforts of NASA and other organizations to face the current health challenges of going into space haven't considered the possibility of commercial space travel yet.
- Adults and caregivers have a huge impact in how children perceive and approach health and fitness. Their positive support is needed to encourage children to stay active.
- Existing wearable technologies and interfaces could become the solution to this problem as they offer a variety of features that support children to meet their fitness goals. However, the interfaces have limitations.
- The most common theme found in existing interfaces that disrupts the user experience is having a separate control unit, typically a phone app. This makes it inconvenient and may distract the user from interacting with the device due to other apps that offer entertainment.
- From the competitor analysis, the mentioned brands have good product designs for their target market and a user-friendly interface which is essential in designing for children.
- Thus, in designing a good solution to the design problem, we would need to consider how the product attracts children (such as vibrant colours, safe material, and flexibility) , its user interface, and how it can encourage children to do physical activities.

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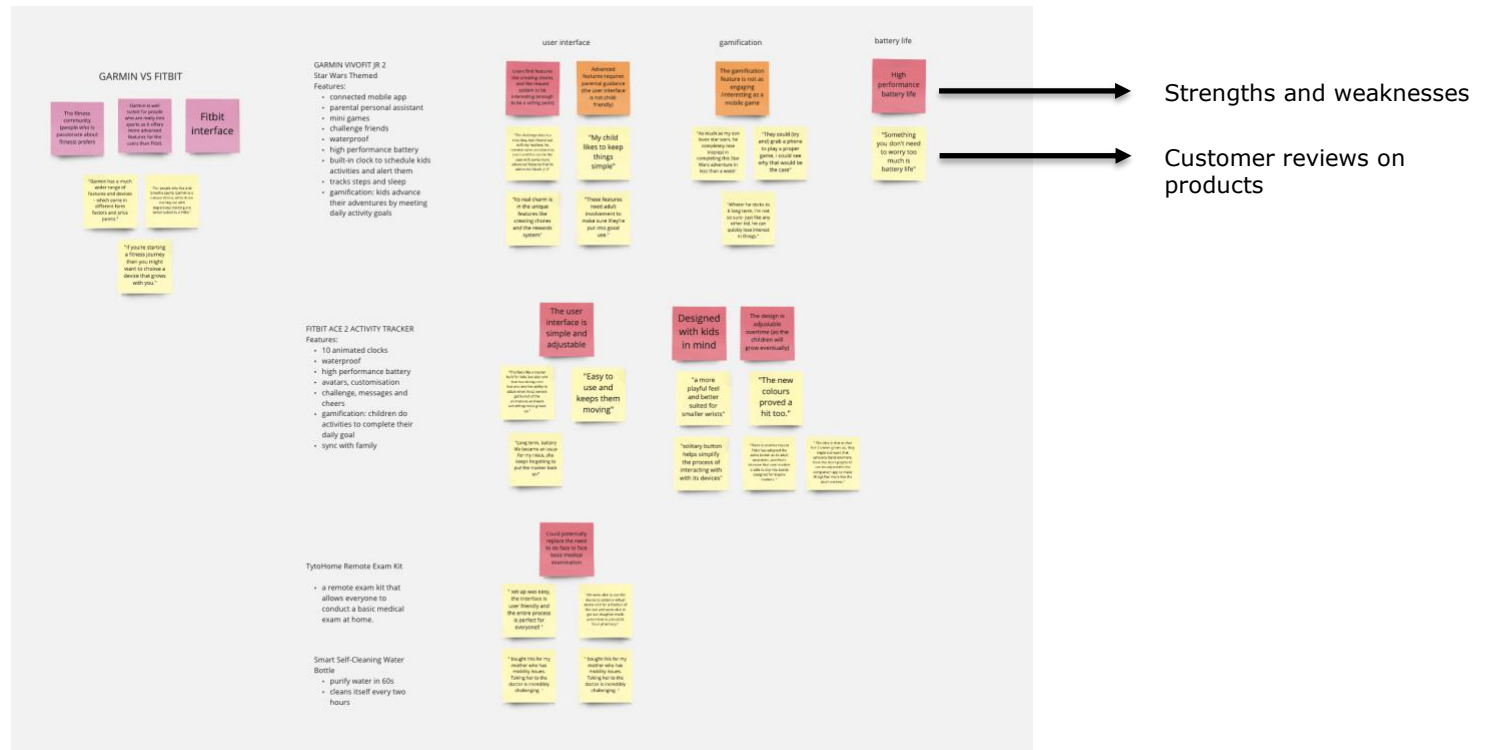
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APPENDIX

Data Gathering



Research data on online ethnography and competitor analysis were gathered through the use of affinity diagramming (without the solution).

Online Ethnography

Online Ethnography		Data sheet	
Source (e.g. community or social media platform)			
Social Media Platforms, Blogs, Sites			
Data record (E.g. quote)	Recorded observations (E.g. demographics, communication style, interests, social media habits, content published/shared)	Interpretation (E.g. what could this data mean)	Themes (E.g. what common patterns do you see)
"a more playful feel and better suited for smaller wrists"	Male adult, communicate using formal conversation, likes to post reviews on blogs, has his own website where he post reviews of various products	The product has good material that is well suited for children	Most wearables that is designed for children considers material (needs to be safe and playful) and physical appearance for attraction.
"Whether he sticks to a long term, I'm not so sure just like any other kid, he can quickly lose interest in things."	female adult, communicate using casual conversation, likes to post product reviews in her personal blog	Kids lose their interest in using the step tracker for competitions relatively quickly	Kids are interested in the idea of being competitive with their friends using the tracker in the wearables but lose their interest relatively quickly.
"solitary button helps simplify the process of interacting with its devices"	female adult, communicate using formal conversation, likes to post product reviews in her personal blog	User interface of the wearable is simple and easy to understand for children	User-friendly interface is helpful for children to navigate the wearable without the need of their parents' help
"As much as my son loves our man, he completely lose interest in completing this far when activities in less than a week"	female adult, communicate using casual conversation, likes to post product reviews in her personal blog	Kids are more interested in playing "proper" mobile games such as those that are made specifically for gaming, not as a third party app.	Game features in wearable devices competes with the game market
"This feels like a tracker that he likes, not one that has strong core features and the ability to stop when not wearing get rid of the accessories and wear something more games"	male adult, communicate using casual conversation, likes to post product reviews in his personal blog	The product is able to be customised by the user as they go through changes in preferences.	Wearable with gpx product design considers flexibility and the long term effects of the environment (how in the future the child's interest might be different)
"These new colours proved a hit too, it's well suited for those of younger generations."	female adult, communicate using casual conversation, likes to post product reviews in her blog	Kids are more attracted towards bright, vibrant colours as their attention span is lower than adults.	Colour is an important factor that needs to be considered when making children products
"These features need adult involvement to make sure they're put into good use."	female adult, communicate using formal conversation, likes to post product reviews in review websites	Parents need to guide their kids on how to use the advanced features of the wearable	Advance features requires parental guidance
"Long term, battery life becomes an issue for my niece, she keeps forgetting to put the tracker back on."	female adult, communicate using casual conversation, likes to post product reviews in review websites	The battery decreases easily when the user is not using it. The user is forgetful if the product design is easily forgettable	Most wearables don't consider how the device drains the battery when the user's not using it.

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Online ethnography on existing wearables

Online Ethnography		Data sheet	
Source (e.g. community or social media platform)			
Social Media Platforms, Online Video Platform			
Data record (E.g. quote)	Recorded observations (E.g. demographics, communication style, interests, social media habits, content published/shared)	Interpretation (E.g. what could this data mean)	Themes (E.g. what common patterns do you see)
"I need to make sure that I clean and wipe the seats first before letting my child sit"	Female adult, who likes to travel with her family, communicates using casual conversation, likes to post youtube videos and vlogs.	Parents concerned about hygiene during air travel especially during the pandemic	Parents are usually concerned with hygiene and comfort of their children during air travel
"I usually give my kid a game to play with or a movie to watch to help them stay quiet"	Female adult, who likes to travel with her family, has 2 children (both girls), communicates using casual conversation, likes to post youtube videos and vlogs.	When children are bored they can't stay quiet so they need some sort of entertainment.	Children are more likely to feel bored than adults relatively quickly. They need some sort of entertainment such as watching movies, playing games, toys etc.
"We usually bring our personal headphones because the videos they're watching are very loud and we don't want to disturb other people"	Female adult, who likes to travel with her family, communicates using casual conversation, likes to post youtube videos and vlogs.	Headphones are usually worn to prevent other passengers being disturbed as the entertainment they watch is usually loud.	Children likes entertainment that has a loud sound and they usually don't care about their surroundings.
"In the plane my son got bored with the watching movies, so watching a game app"	Female adult, who likes to travel with her family, communicates using casual conversation, likes to post youtube videos and vlogs.	Younger children prefer can't understand/grasp the content offered digital entertainment yet	Children below the age of 4 are usually new to the concept of digital entertainment and more familiar towards physical toys.
"I usually bring my own seat mat for my 2 year old because she feels uncomfortable"	Female adult, likes to travel with her family, communicates using casual conversation, likes to post comments on youtube video	Parents are concerned about their children's comfort during the travel	Young children feel uncomfortable with the airplane seats as they are designed for adults.

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Online ethnography on children's behaviours and preference during air travel

Competitors Analysis

Competitor	Garmin	Fitbit	Tytohome	Naked Labs
Target Market	People who are passionate about sports, children who need to find the motivation to be active, parents who want to monitor their child's physical activity	Children who need to find the motivation to be active, those who are overweight, active people who want to monitor their workout	People who want to receive healthcare without the stress of travelling and waiting, immobilized people	People who are overweight, athletes (fitness community)
Product Category	Wearable health monitoring device	Wearable health monitoring device	Portable health examination kit	3D Fitness Tracker
Unique Selling Point (USP)	<ul style="list-style-type: none"> • creating chores and reward system • Mini games • Disney theme phone apps 	<ul style="list-style-type: none"> • Flexibility of design • Animated clocks • Avatars that can be customized 	<ul style="list-style-type: none"> • Pairing with teleconferencing app • Connects the user to a certified healthcare for diagnosis, treatment plan and a prescription 	<ul style="list-style-type: none"> • Able to integrate a digital interface to a mundane object (mirror) • The users are able to easily visualize how their body is changing

Features	<ul style="list-style-type: none"> • Mobile app controls • Waterproof • High battery performance • Built-in clock • Sleep and step tracker • Stress tracking 	<ul style="list-style-type: none"> • Waterproof • High battery performance • Friendly challenges, messages and cheers • Gamification: children do activities to complete their daily goal • Sync with family • Sleep score 	<ul style="list-style-type: none"> • Digital camera • Thermometer • At-home diagnostic kit which includes: tongue depressor for examining throat, otoscope for ears, stethoscope, etc 	<ul style="list-style-type: none"> • Smart mirror scanner • Weight loss program • Mobile app to view data • A weight scale • Detailed data
Advantages	<ul style="list-style-type: none"> • Offers a wide range of features • Children are able to use the watch for longer period of time for physical activities (durability) • Richer experience (with the mini games and phone apps) 	<ul style="list-style-type: none"> • Easy to use as the user interface is simple • Flexible design enable the user to customize the watch 	<ul style="list-style-type: none"> • Saves the need to go to the doctor • Parents feel more at ease for their children • Emergency purposes • Interface is straightforward and easy to understand 	<ul style="list-style-type: none"> • Innovative product • Simple to use • Good reviews from popular influencers
Disadvantages	<ul style="list-style-type: none"> • Advanced features requires parental guidance (for children line) 	<ul style="list-style-type: none"> • Doesn't come with a gps • No heart monitor 	<ul style="list-style-type: none"> • Inaccuracy of medical examination 	<ul style="list-style-type: none"> • The product is not portable

	<ul style="list-style-type: none">• Mini games are not as engaging/interesting as mobile games• Doesn't come with a GPS			<ul style="list-style-type: none">• Doesn't have a lot of interaction with the physical product
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Exploring Existing User Interfaces

Explore Existing User Interfaces

"Critique by creating"
– Michelangelo

Activity 1 : Critiquing Interfaces in Movies

Instructions:

1. Watch a movie scene by following the video link at the top
2. Critically evaluate the interfaces and interactions by answering below

1. Fifteen Million Merits

[VIDEO](#)

1. What is the **purpose** of the interface?

To provide information to the user

2. What **form(s)** of UI is it?

Gesture recognition

3. Which elements **afford** interaction? How?

The display recognises hand gestures and gives immediate feedback

4. Identify **mapping** between input and feedback.

The user uses gesture as input and the system displays the output

5. How does the interface offer **visibility** to users?

Using displays, speaker

6. How do colours, shapes, materials affect **UX**?

The use of colours and 3D animations give realism to the experience

7. What are the **limitations** of this UI?

Its limited to a static, connected displays with only gesture input

8. **Sketch** how the interface might be improved.

Instead of using connected display, it can utilise a curve/ very large display

2. Sight: Contact Lenses with Augmented Reality

[VIDEO](#)

1. What is the **purpose** of the interface?

Display augmented interfaces into the user's everyday life through the use of contact lenses

2. What **form(s)** of UI is it?

contact lenses

3. Which elements **afford** interaction? How?

LED lights integrated within the lens, through gesture sensor

4. Identify **mapping** between input and feedback.

The user gives input through interacting with everyday objects and the system gives feedback

5. How does the interface offer **visibility** to users?

The LED lights integrated within the contact lenses displays image, videos etc

6. How do colours, shapes, materials affect **UX**?

The interface uses game elements for gamification (shown when the user is cooking)

7. What are the **limitations** of this UI?

Might leave damage to the human eye, hard to maintain the condition due to its small nature.

8. **Sketch** how the interface might be improved.

 **safer material**
great durability and blinks when lost (easy to be found)

Persona

Johnny



(Schwimmer, 2020)

"Swimming is my passion"

Age: 12
 Occupation: Student
 Location: Sydney, Australia
 Character: Easy going, Popular, Sporty

Personality



Motivation



Competitive Social butterfly

Goals

- Improving his swimming performance
- Compete in international level
- Finding balance between training and social life
- Being able to stay fit in space for his swimming career

Frustrations

- He's frustrated that he can't swim in space for a long period of time
- He not comfortable doing dry land exercises in space
- He's worried that he would lose muscle and won't be able to continue his training.
- He's worried that he won't be able to stay connected with his friends in space

Bio

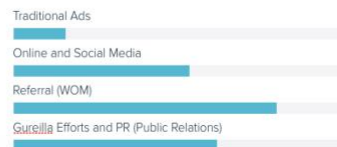
Johnny is a very active kid who is passionate about swimming. He's also very social and likes to hang out with his friends a lot. During his training, his coach and friends motivates him a lot.

He is going to visit his family in Mars during his school holiday. He's worried that he won't be able to train and stay connected with his coach and friends during the flight. In the spacecraft, he can't swim because there's no water and gravity so he's forced to do other forms of exercise.

UX Needs

- Simple and easy to understand
- Vibrant and colourful
- Motivating

Preferred Channels



James



(Amiri, 2020)

Ambitious Bookworm Nerdy

Goals

- Being good in sports so that he can play with his friends
- Getting better grades at school and make his parents proud
- Being more active and maintain a good health in space

Frustrations

- He's frustrated that he's not good in sports and wants to start working out.
- He lacks motivation when it comes to exercise.
- He doesn't have anyone to motivate him.
- He feels intimidated by gym equipments and he doesn't have any knowledge on how to use them.

Bio

James is a hardworking student who likes to read books a lot. He's also interested in science fiction movies, especially Star Wars. He's quite introverted and doesn't hang out with his friends that much. He's not very good in sports but he wants to starts exercising so that he can play with his friends. He never goes to the gym before as he feels intimidated by it.

He is going to Mars with his family to visit his relatives. He's excited about going to space but he's worried about having to work out to maintain his health in the spacecraft. He's afraid that he won't be able to commit to it.

UX Needs

- Simple and easy to understand
- Vibrant and colourful
- Motivating

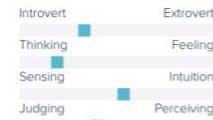
Preferred Channels



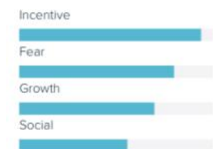
"I read love reading Encyclopaedia and watching Star Wars movies"

Age: 10
 Occupation: Student
 Location: California
 Character: Introverted, Discipline, Hardworking

Personality



Motivation

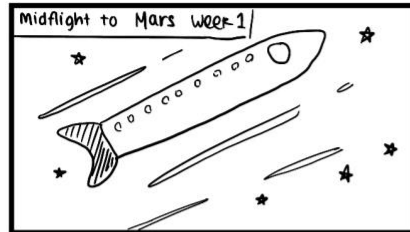


Storyboard

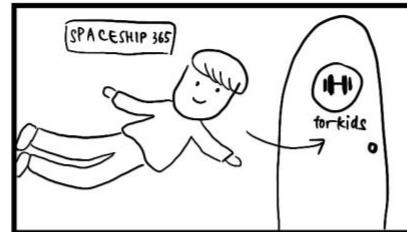
Title USER 1 STORYBOARD

Scene _____

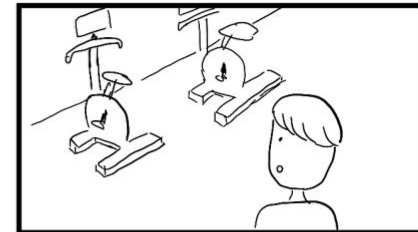
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Johnny is in the middle of flying to Mars and needs to start working out



He floats to the fitness room in the space



He wants to do cardio exercise and finds the static bicycle



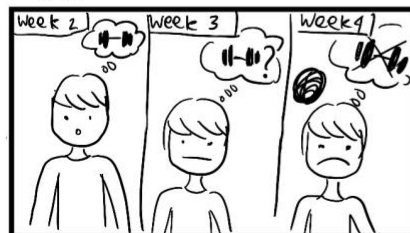
As he is riding the bike, he feels lonely and misses being in the water a lot



After he finished cardio, he starts working out on weights using ARED for kids



He feels lonely that there's no coach / his friends to motivate him



Day by day, he slowly loses his motivation to workout



He stops working out altogether as he lost all his motivation

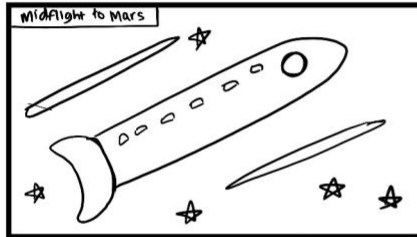


By the time he comes back to earth, he experiences some muscle loss and couldn't continue his training

Title USER 2 STORYBOARD

Scene _____

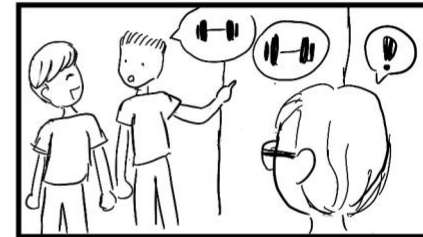
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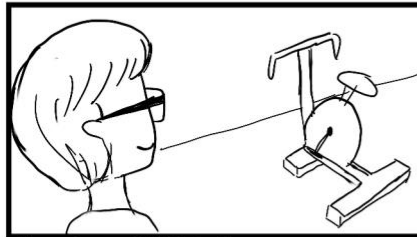
James is on his way to Mars to visit his relatives



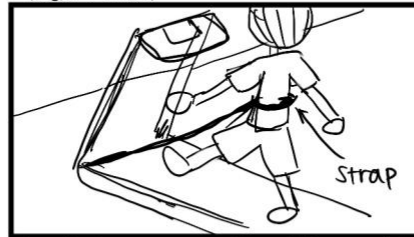
He has been reading a lot of STAR WARS comic book throughout the flight and feels bored.



He sees other kids going to the gym and wants to do the same



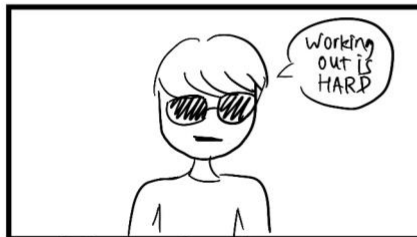
He tries going to the room and sees a lot of equipments



He feels uncomfortable doing weights so he tries the treadmill for space



James feels exhausted after 30 min of workout with no entertainment



He feels unmotivated as the workout is not engaging / encouraging



Eventually, he loses all his motivation to exercise.



By the time he comes back to Earth, he experience several health issues.