

ProWalker

AIAP Technologies Pte Ltd



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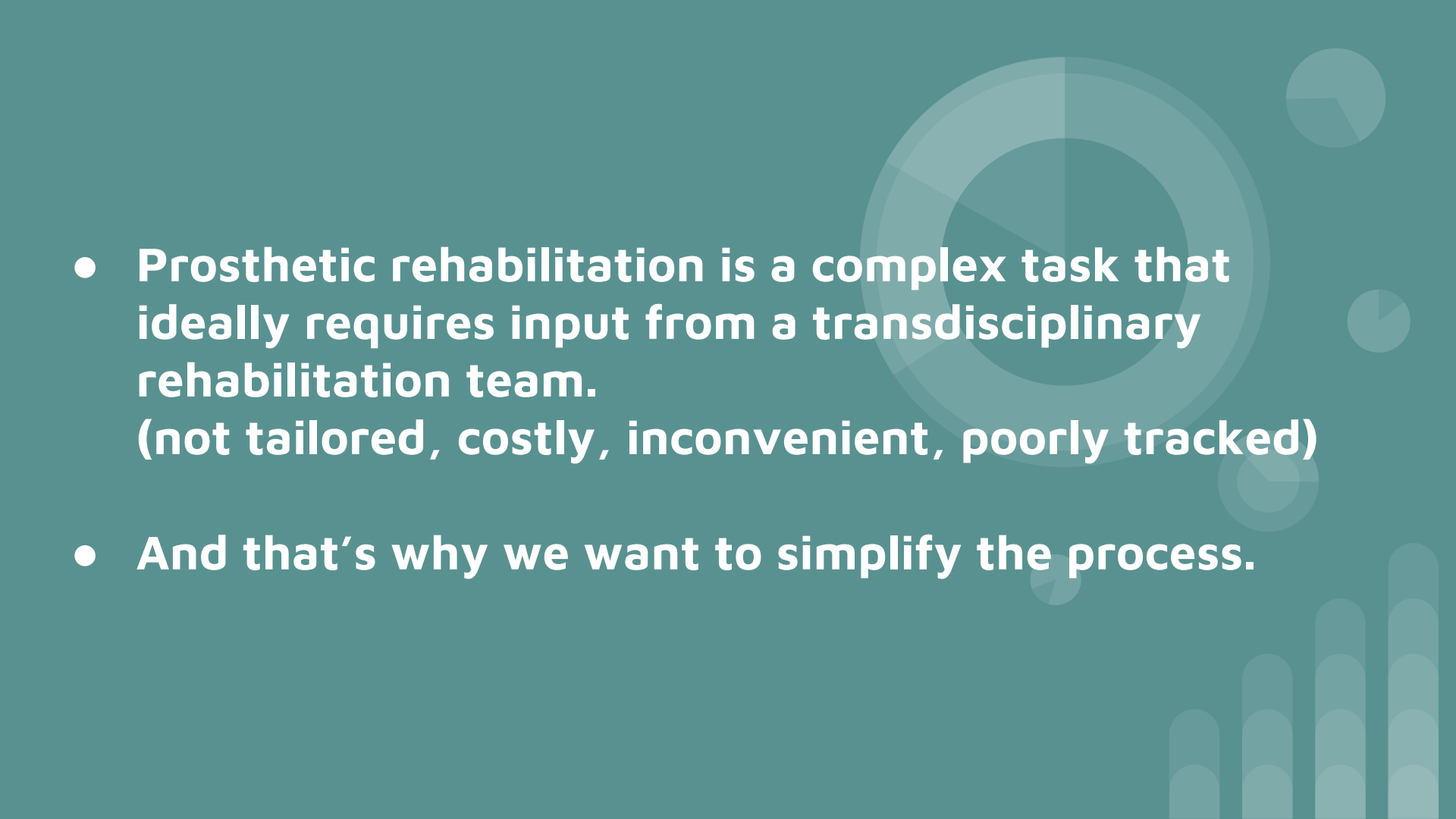
1. Motivation
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Motivation

ProWalker



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- **Prosthetic rehabilitation is a complex task that ideally requires input from a transdisciplinary rehabilitation team.
(not tailored, costly, inconvenient, poorly tracked)**
 - **And that's why we want to simplify the process.**

ProWalker

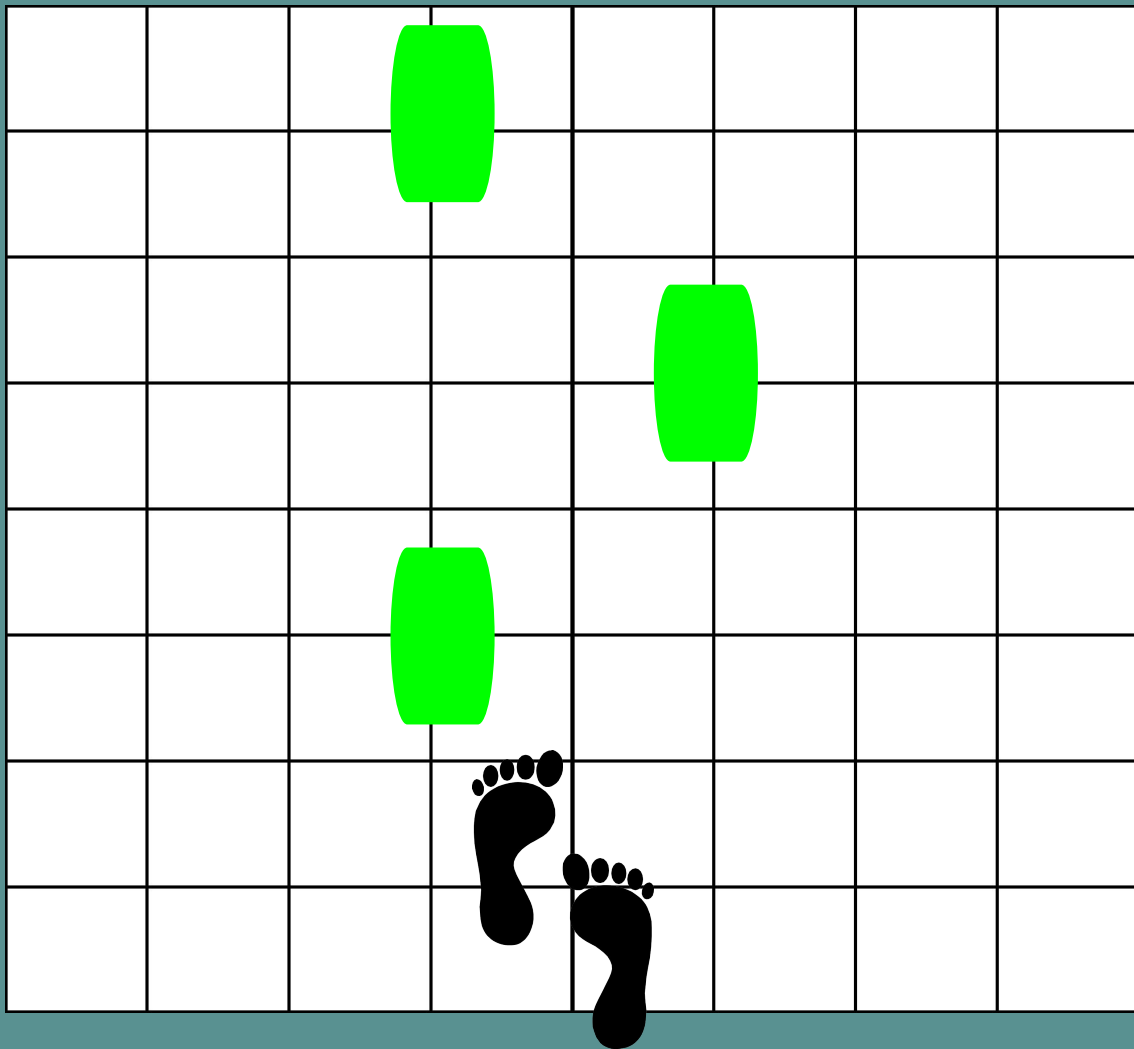


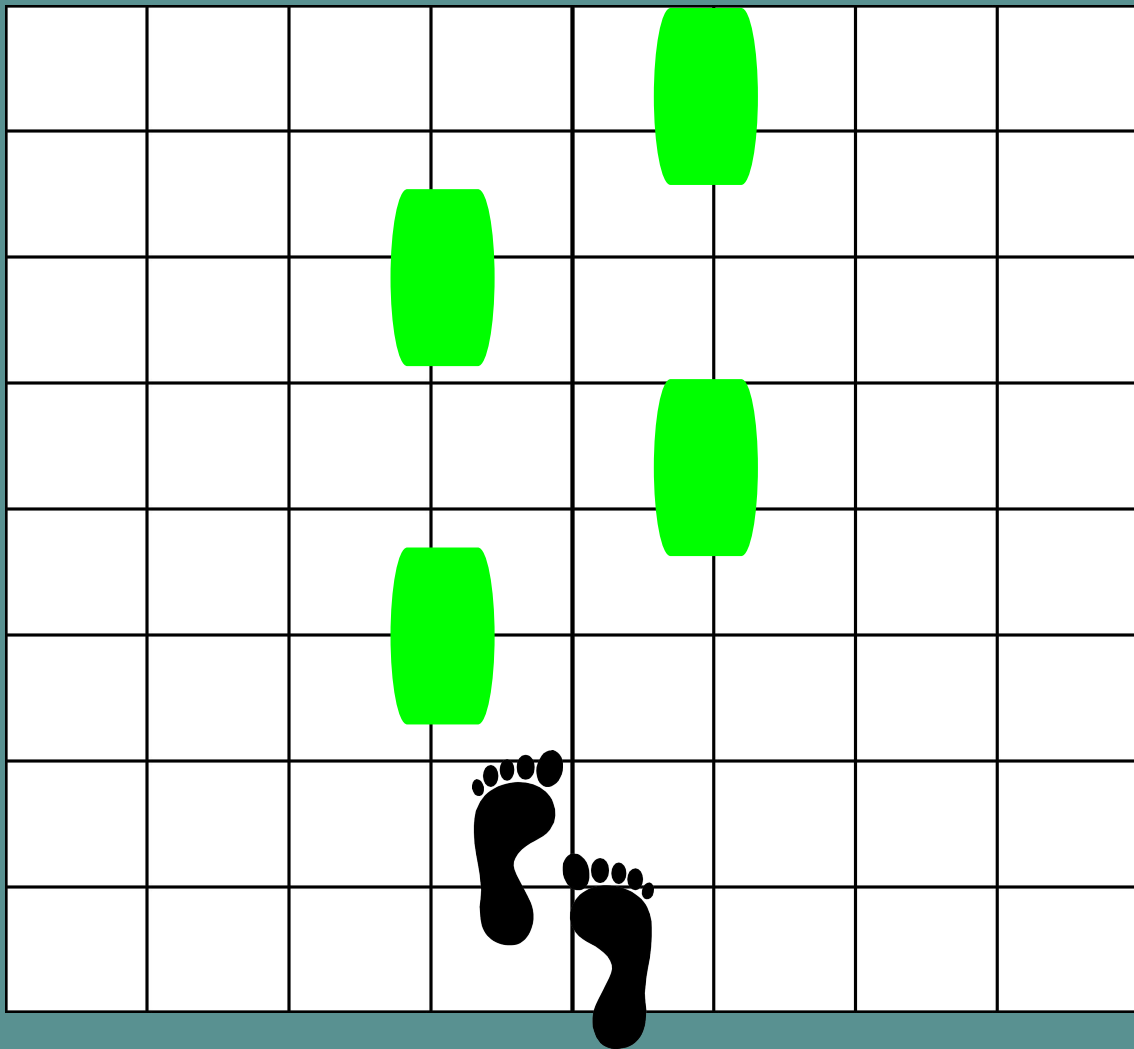
We'll create a AI physiotherapy with the help of AR and machine learning.

System (limbs, rails and AR+speech)

AR provides visual aid to Anne where to land her feet. Speech will guide Anne when to take the next step and correct her mistake. The rails will determine the distance and position of Anne. There are 5 sensors attached on the prosthetic limb which will capture the data required for us to calibrate the prosthetic limb according to Anne's behavior.







Hardware

- Gridded Mat + IR camera
- AR goggles
- Prosthetic limb with 5 sensors (accelerometer and gyroscope)
- Smartphone

Software

- Application to connect hardware to computer
- Cloud database
- Mobile App



Marketability

ProWalker



Market Size

185,000 new lower extremity amputations each year in US.

60 min Physiotherapy Session = US\$150

3 sessions per week for average of 10 weeks = \$4,500

Market size of US\$832m / year

Median Salary of Physiotherapist = US\$85,000

ProWalker Estimated Cost

| | |
|--------------------|----------------|
| AR Device | \$400 |
| IR Camera | \$500 |
| Prosthetic Sensors | \$100 |
| Total | \$1,000 |

Amputee Rehabilitation

1. Pre Operative
2. Surgery/ Reconstruction
3. Acute post-surgical
4. Pre prosthetic
5. Prosthetic Prescription
6. Prosthetic Training
7. Community Integration
8. Vocational Rehabilitation
9. Follow up

Only these two phases will be converted to AI

**AI to assess the
rehabilitation
progress**

**Shorter
Treatment
duration**

**Personalized
Rehabilitation**

**Increased Strength
and Dexterity**

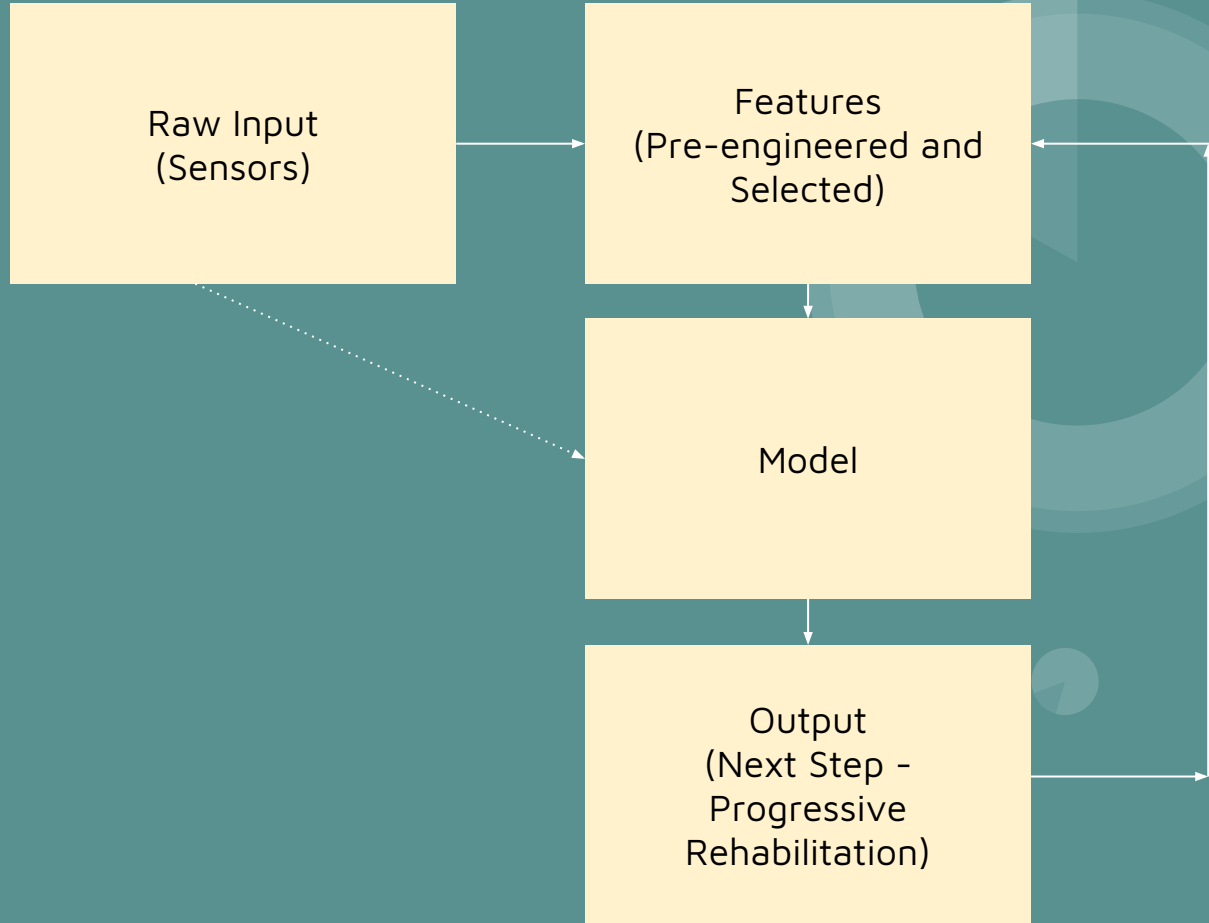
*Use of Technology in Occupational Therapy Rehabilitation.
Julia Naumes (2013)

**Treatment reduced
to 6 weeks**

*Intelligent Physiotherapy Through Procedural Content
Generation

Shabnam Sadeghi Esfahlani and Tommy Thompson

**Augmented Reality
Multimodal
feedback System**



Models

Preliminary

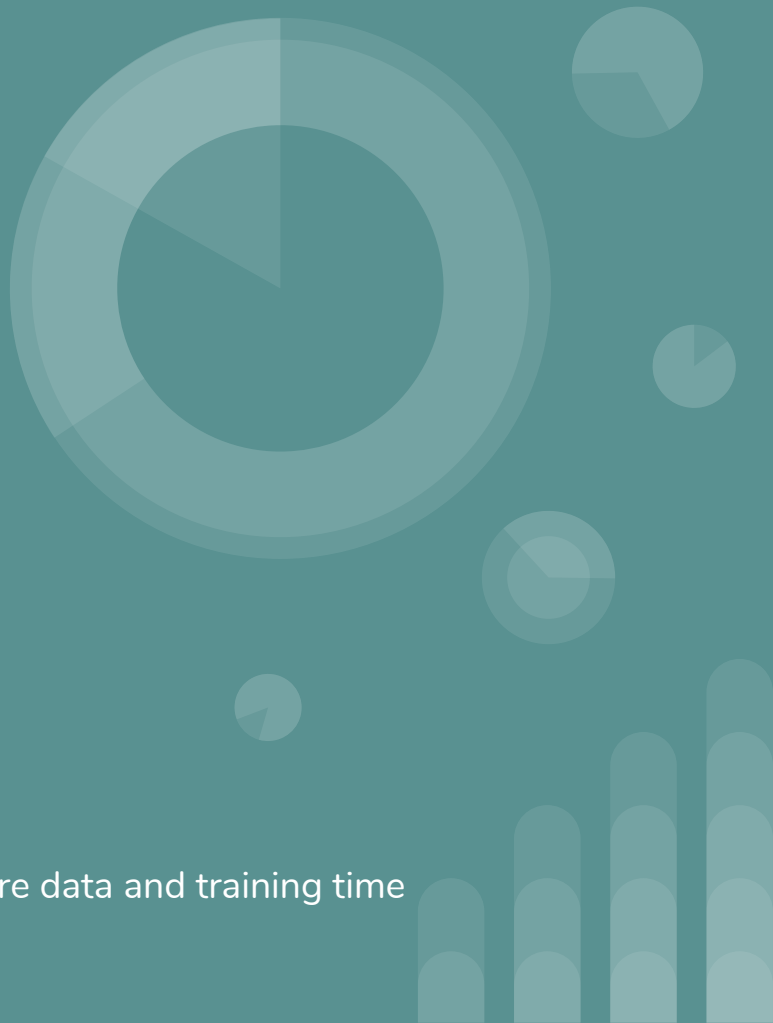
Multinomial Linear Regression
Gradient Descent

**small amount of data, short training time, fast response*

Advance

Artificial Neural Networks and Deep Learning
Reinforcement Learning

**better predictive outputs for tailored learning, requires more data and training time*



| Var | Description | Device | Sensors / Components |
|------------|--|-------------------------|----------------------|
| Height | User characteristics | Prosthetic Limb Sensors | Accelerometer |
| Weight | User characteristics | | |
| Ax | Linear acceleration of leg in the x-direction at point i | | |
| Ay | Linear acceleration of leg in the y-direction at point i | | |
| Az | Linear acceleration of leg in the z-direction at point i | | |
| Gx | Orientation of leg in the x-direction at point i | | Gyrometer |
| Gy | Orientation of leg in the y-direction at point i | | |
| Gz | Orientation of leg in the z-direction at point i | | |
| Actual_x | Mean placement of foot in x-direction | IR Camera | Camera |
| Actual_y | Mean placement of foot in y-direction | | |
| Actual_deg | Mean angle of foot | | |
| t_step | Time taken for one step to be made | Mobile | Time |
| t_session | Time spent on one session | | |
| Pain_level | Input of pain by user | | AR Device |
| Next_x | Mean placement of next step in x-direction | Display | |
| Next_y | Mean placement of next step in y-direction | | |
| Next_z | Mean placement of next step in z-direction | | |

Metric of Success:

Engineering

Time take for each step

Accuracy of step

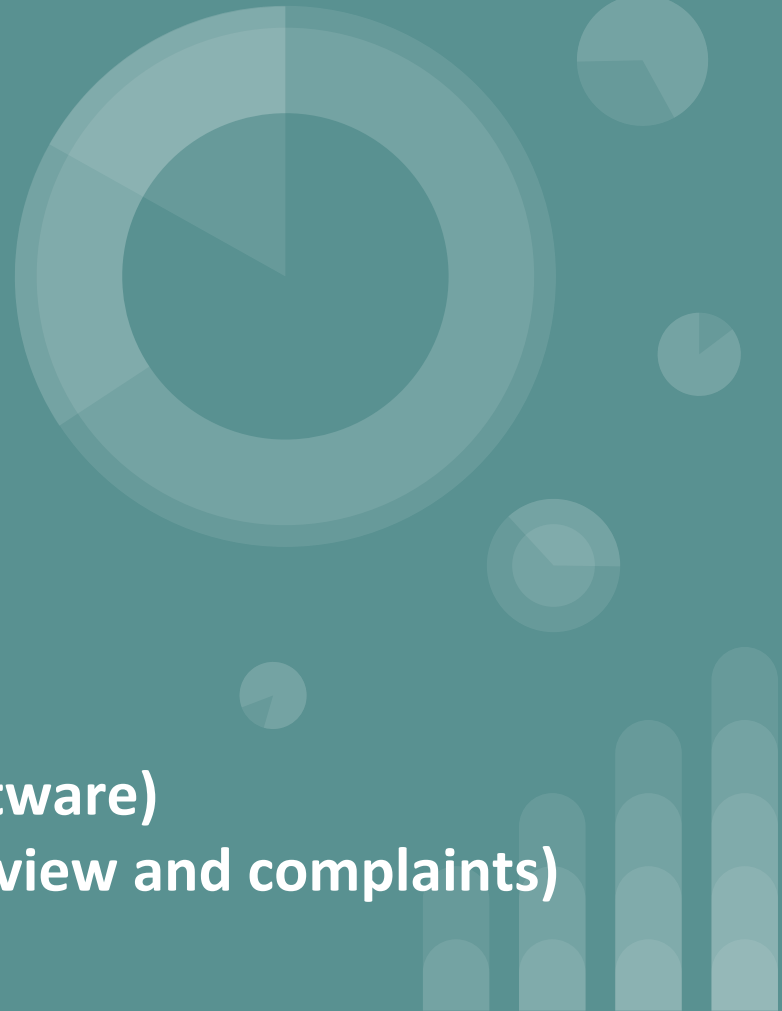
Pain level

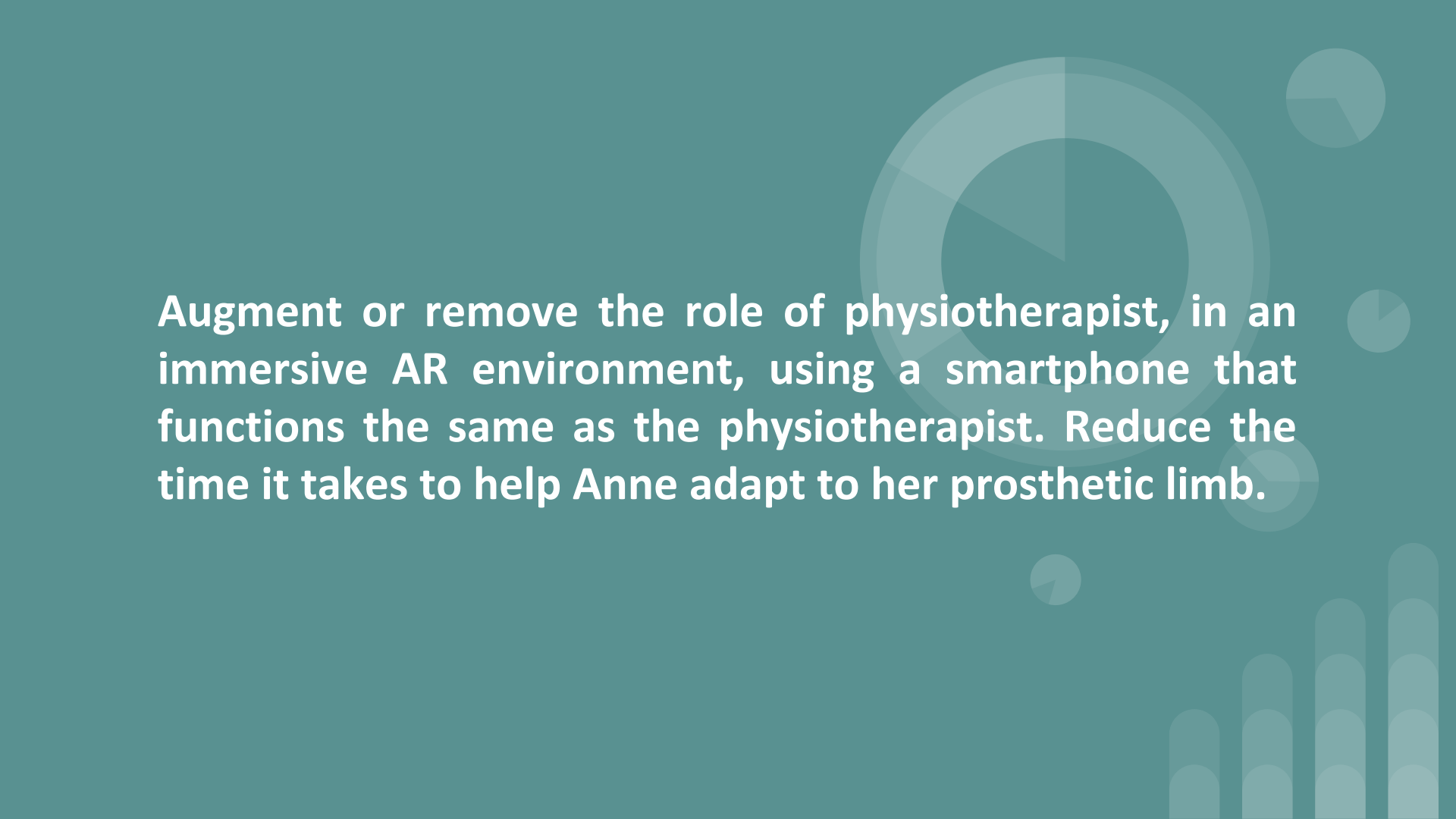
Session-to-session progression

Business

Cost (Prosthetic limbs, rails and AR software)

Quality and Satisfaction (Popularity, review and complaints)





Augment or remove the role of physiotherapist, in an immersive AR environment, using a smartphone that functions the same as the physiotherapist. Reduce the time it takes to help Anne adapt to her prosthetic limb.