PODLI - Sensory pods for Syngap

Start Date	01 Dec 2017
Initiated Activity	TOM:Melbourne Makeathon 2017
Challenge	PODLI - Sensory pods for Syngap
Photo	
Stage	PROTOTYPE
Type	ACCELERATOR WORKSHOP EVALUATE

About the project

	English Details	Local Language Details
Need Knower Background	Jaeli, eight years old, and Dali, six years old, are sisters with a rare genetic mutation in SYNGAP1, an essential synaptic protein in the brain. Mutations to this gene result in intellectual disability and epilepsy. The sisters were the first to be diagnosed with this condition in Australia. So far only 250 people have been diagnosed worldwide though it is thought that this gene mutation may be diagnosed in many others with non-syndromic intellectual disability in the future. As a result of this genetic mutation, Jaeli and Dali both experience a number of conditions including epilepsy (partly controlled with medication, but still having frequent absence seizures), autism spectrum disorder (each girl with distinct sensory preferences and repetitive behaviours), ataxia (reduced motor coordination), pica (in their case putting small objects in their mouths with the inherent risk of choking), and insomnia (early morning waking between 4-5 am). They need near constant attention and caregiving. Our need knowers are also Danielle and Dan, their loving, well humoured, endlessly giving and vigilant parents. The girls morning behaviours of waking early, climbing into bed with their parents, moving about, and turning up their iPad volume have led to parental exhaustion/carers fatigue.	
Challenge	Danielle and Dan want a solution that allows both girls to safely and independently entertain themselves in the early hours of the morning and avoid getting into their parent's bed and waking them up. Each girl needs her own solution as they have specific behaviour patterns, sensory preferences and usually play separately and are known to fight and bite occasionally when together. By achieving this challenge it will also allow Danielle and Danny to get more sleep and reduce carers stress. The parents are used to closely watching the girls and the solution needs to provide them the opportunity to monitor the girls remotely. They would like there to be an educational component to the solution and engage the girls in other activities besides using their iPads. Ideally the girls would reestablish sleep but this was not an expected outcome.	
Solution	The team made two hexagon-shaped sensory play pods to furnish Jaeli and Dali's bedrooms, each customized to the girls' specific needs and providing a fun and safe play space for the girls in the morning. The robust pods are built from CNC-cut modular interlocking plywood, lined with acoustic and engineering felt and lit with remote controlled integrated coloured LED floor lighting. The pods aim to engage and entertain the girls through easily interchangeable and upgradeable sensory panels and are centered around a tethered iPad dock on a flexible mount, preventing the girls from taking their iPads into their parents' bedroom, as is their current behaviour, and enabling them to interact with their iPad in a comfortable space. The environment provides a range of hands-on activities beyond the iPad interface. The current array of sensory panels include an infinity mirror, textured walls, a puzzle maze, hinges/locks/clasps board, an educational alphabet board using magnetic beads and with laser engraved personalized words. There is also a touch panel triggering a circle of LED lights together with an integrated iPad charger and a video WiFi monitoring system built in that connects to an app. The motion triggered camera can notify Danielle and Dan and enable them to see and hear the girls without having to leave the comfort of their bed. The soft felt lining is adorned with an abundance of colourful shapes and favorite costumes attached by Velcro that encourage free creative play. The parents said that they love it, but most importantly, the girls love it! And with its inherent flexibility, the pods can be adapted to any child's developmental stage and sensory preferences making it a great solution for children of all abilities. We bring you ... PODLI!	
Team	Paul Justin, Miki Schwartzbord, Jenny Kan, Tess Adsett, Duncan Murray, William Crisp, Vincent Tseng, Geoff Ayre, Danielle, Dan, Jaeli and Dali Williams.	

Approximate Time to Build	Approximate Cost to Build
3 days	**$500 per pod excluding donated materials (felt and some formply)**

For more information on the Williams family, SYNGAP and supporting research into SYNGAP, follow links :

http://www.news.com.au/lifestyle/health/health-problems/they-hardly-talk-theyre-still-in-nappies-they-have-seizures-every-hour/news-story/bc77bdf0a8b11f5a1bac07ccf5531dab

https://m.facebook.com/TheProjectTV/videos/10155050419378441/

http://www.supportepilepsy.com.au/event/SynGAPresearch

General Warnings and Cautions

- Read through entire manual before attempting to build this device.
- Do not attempt a step if you are unsure of what you are doing. Certain steps in this manual require experience with fabrication tools. Incorrect implementation can lead to injury of yourself and others. For assistance or clarification of any step, contact team members.

Meet the Team

Makers:

Paul Justin Industrial Designer		Tess Adsett Occupational Therapy Student			
	Jenny Kan Architect		William Crisp Social Worker and PhD student	Vincent Tseng System Integration Engineer/ Data Engineer/ Program Developer	Geoff Ayre Electronic engineer, system designer and software developer
Miki Schwartzbord Family Doctor Team Leader		Duncan Murray Industrial Designer			

plus a bunch of mentors and helpers.... special shout out to Gabi!

Need Knowers:

Danielle, Dan, Jaeli and Dali Williams

Family Extraordinaire!

Documentation Contributors:
Miki Schwartzbord ,Maya Bell
Tess Adsett, William Crisp, Miki Schwartzbord

Icon Glossary

The following icons may be used throughout this manual—each with its own purpose.

> The warning icon is used to signify whenever someone who is attempting the procedure may injure themselves or damage the equipment.

> The info icon is used to signify useful bits of information that complement the instructions.

> The tip icon is used to provide information for after the procedure is completed, such as tips for disassembly.

Device's Timeline

History of Device

Project Start Date: 25 Oct 2017

Project End Date: 03 Dec 2017

Origin of Project: TOM: Melbourne - Team 6 - PODLI

25 Oct 2017 Pre- TOM Event at Swinburne University, Melbourne

- Team met for first time, identified each others backgrounds, skills, connection to event prior to meeting need-knowers
- Brief received - initial brief was for a "Robust Entertainment Device" that the girls can operate safely and independently to listen to music and watch videos
- Met the Williams family. Observations:
    - Constant attention and supervision required by Jaeli and Dali
    - Frequent brief seizures, their autistic behaviours (ie Jaeli in love with her blue glove!), ataxia and pica
    - Girls climbing and clambering around the auditorium with inherent falls risk
    - Putting objects in mouth with risk of choking
    - Medication regime
    - Parental hypervigilance, fatigue. Presence of au pair for additional help
    - Parents humour, good nature, total dedication and attention to their girls
    - Girls independently using iPad, turning up volume, switching youtube channels, watching cartoons
- Received explanation of Syngaps
- Danielle and girls left, leaving Dan to fill in knowledge gaps -
    - explored each girls unique behaviours, developmental stage and sensory preferences
- Team leader chosen - Dr Miki Schwartzbord
- Brainstorm ideas:
    - "Erised": reflective mirror with augmented reality projection
    - Interactive simulated fish tank
    - Makey make – interchangeable tactile objects to control device (https://shop.littlebits.cc/products/makey-makey ; https://www.makeymakey.com
    - Sleeping aids – recordings of parents voice, soothing ; intrasleep hypnotherapy
    - Dali – app with her parents image repeating her words back to her - echolaly
    - Install app to control device volume for Dali (ie https://itunes.apple.com/au/app/volume-sanity/id764527872?mt=8)
    - Interactive multi-sensory play space at home

- Challenges encountered
    - Clarification of brief and aim of TOM inspired intervention
    - Need knowers needs are quite pervasive and broad, difficult to narrow down. Both girls have different needs affected by their character, age, abilities and sensory preferences
    - Need for parents to get adequate rest overshadows possible other projects ie that could develop specific aids that may assist girls in other situations
    - Needs required to evolve with time and be adaptable in order to have longevity
    - Challenge posed is multifactorial ie related to disabilities/organic problems ie seizure patterns, individual behaviours and habits, parenting techniques
    - Maybe need two projects developed simultaneously or one adaptable project
    - Solution needs to be environment specific, adaptable. Challenge of testing solution at TOM event
    - Hesitancy to reinforce reliance on iPad by parents and makers but this has become habitual and a preferred toy
    - Not all team members present
    - Team members feeling their skills not suitable to needs ie lack of software development skills/app building, currently maker skills lean towards design, graphics, product development

- Plan: establish Slack group to facilitate communication between makers and need knowers; meet at google hangout to brainstorm further
- See for complete preTOM summary as shared amongst team members

26 Oct 2017 Slack group created TOM:ERISED

channels to facilitate general communication and research into: syngap, family, girls, space, brainstorm ideas, technology and also for documentation, media

08 Nov 2017 Google Hangout

- Attendance by Danielle and Dan and 8 team members including new members Geoff and Vincent - software and hardware engineering background
- After further needs clarification and brainstorming session the idea started to form around an interactive furniture space for each girl with ipad mount, speakers, lighting, individualized sensory preferences

Potential Improvements

Cycle #	Cycle Start Date	Cycle End Date	Suggested Modifications	Need Knower Feedback
1	01/12/2017	03/12/2017		
2				
3				

Physical Description

Brief Physical Description

A ply-wood hexagonal structure with varying sensory stimulation panels, iPad dock and video monitoring.

Components of Device

Mechanical Hardware:

Type 1:

Type 2:

Electrical Hardware and Circuits:

Type:

Software and Programming:

Platform:

Language:

List of Labeled Components

:

:

Bill of Materials

Product Name: PODLI x 2	
Part ID / Purchasing Link	Supplier
https://www.bunnings.com.au/carter-holt-harvey-formrite-2400-x-1200mm-17mm-f14-formply_p0390072	**Swinbu Univers** Bunning Wareho
	Swinbur Universi
	Swinbur
	Swinbur
http://www.jjdavies.com.au/engineering-felts-australia	J.J Davi & Sons
http://www.autex.com.au/acoustics/vertiface/	Autex
http://www.msy.com.au/vic/malvern/pc-accessories/16593-tp-link-nc220-wireless-n300-day-night-cloud-camera.html	MSY
https://www.jaycar.com.au/450mm-flexible-gooseneck/p/AM4127	Jayco
https://www.aliexpress.com/item/12mm-RGB-Diffused-Monocolor-LED-Pixel-Light-Punctiform-Waterproof-5V-DC-Waterproof-IP66-Xmas-Decoration/1280377764.html	Duncan
	Duncan
https://www.littlebirdelectronics.com.au/arduino-starter-kit~41185	Vincent
https://www.bunnings.com.au/brilliant-lighting-12v-led-rgb-valla-deck-light-kit-6-pack_p7072332	Bunning
https://www.bunnings.com.au/zenith-8g-x-40mm-zinc-plated-hinge-long-thread-timber-screws-100-pack_p2434150	"

https://www.bunnings.com.au/zenith-6g-x-15mm-hinge-long-stainless-steel-thread-timber-screws-16-pack_p2420095	"
https://www.bunnings.com.au/pillar-products-0-9-x-2m-mirror-tinted-window-film_p3961895	"
https://www.bunnings.com.au/pillar-products-squeegee-window-film-applicator_p3961906	"
https://www.bunnings.com.au/pillar-products-250ml-window-film-application-solution_p3961915	"
https://www.bunnings.com.au/whites-hook-and-loop-tree-tie_p3321623	"
https://www.bunnings.com.au/hpm-4-outlet-powerboard-surge-w-master-switch_p4420536	"
https://www.bunnings.com.au/arlec-1m-piggy-back-extension-lead_p4420174	"
https://www.bunnings.com.au/hpm-8-10mm-white-hook-cable-clips-100-pack_p4430474	"
https://www.bunnings.com.au/master-lock-30mm-brass-combination-padlock_p4210706	"
	"
https://www.bunnings.com.au/zenith-4g-x-12mm-brass-countersunk-head-wood-screws-30-pack_p2420386	"
https://www.bunnings.com.au/kinetic-10mm-x-2m-clear-pvc-reinforced-plumbing-hose_p4920264	"
https://www.bunnings.com.au/brutus-50mm-x-10m-reflective-safety-tape_p1091366	"
	"
https://www.spotlightstores.com/	spotlight

- Compiled Resources and References
  - Tools and Machines Required

Tools and Machines Required

Name of Tool/Machine
CNC machine milling, Laser cutting

  - Supplementary Files

Supplementary Files

    - CAD Files

CNC CUT TEMPLATE : PODLI_CNC CUT TEMPLATE.dwg

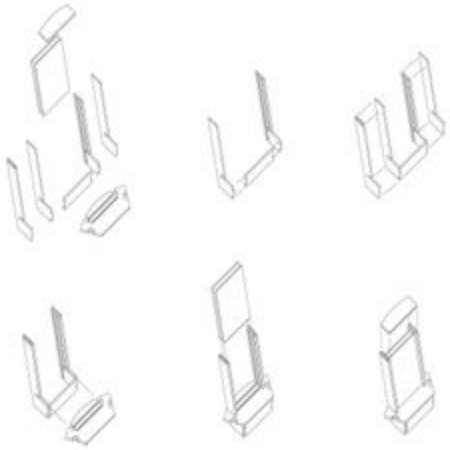
PODLI LOGO: PODLI_LOGO.ai

ALUMINIUM BRACKETS PODLI_ALUMINIUM PLATE (1).dxf :

Code Files

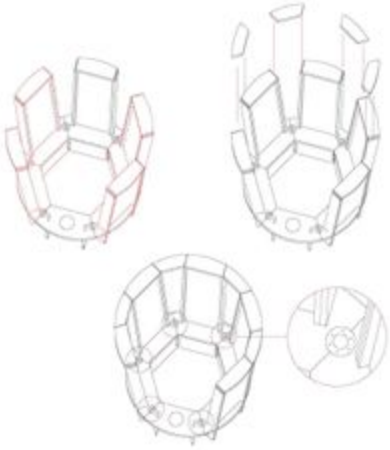
Diagrams

PODLI
MODULAR UNIT
X 5



PODLI
BASE ENTRY UNIT
X 1

PODLI
UNIT ASSEMBLY



PODLI_MODULAR...TRUCTIONS.pdf

Video Demonstrations

Software and Programming Online Resources

Software and Programming Online Resources

APIs

code for touch panel and infinity mirror : https://slack-files.com/T7Q28N4TU-F8FB98CKT-12f2e20461

Libraries

Other Reference Material

Build Instructions

Subassembly #

Subassembly 1: Creating the pod base

Step #

Instructional Step /

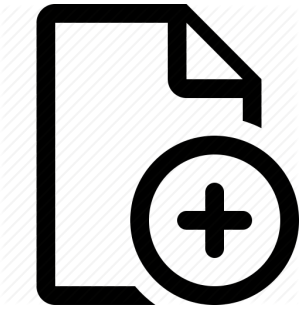
Tools and Machines Required for this Step

Name of Tool/Machine

Materials and Parts Required for this Step

Name of Material/Part	Quantity

Supplementary Files Used for Subassembly



Instructions

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Step #

Instructional Step /

Tools and Machines Required for this Step

Name of Tool/Machine

Materials and Parts Required for this Step

Name of Material/Part	Quantity

Supplementary Files Used for Subassembly

Instructions

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Subassembly #

Subassembly :

Step #

Instructional Step /

Tools and Machines Required for this Step

Name of Tool/Machine

Materials and Parts Required for this Step

Name of Material/Part	Quantity

Supplementary Files Used for Subassembly

Instructions

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Step #

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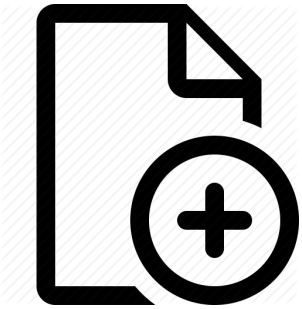
Tools and Machines Required for this Step

Name of Tool/Machine

Materials and Parts Required for this Step

Name of Material/Part	Quantity

Supplementary Files Used for Subassembly



Instructions

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