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CURIOUS THINGS

HOW CAN DESIGN RESEARCH ASSIST THE DEVELOPMENT OF AUDIO-TACTILE TOOLS FOR
GROUP MUSIC THERAPY SESSIONS INVOLVING PARTICIPANTS WITH DEMENTIA®

A THESIS PRESENTED IN PARTIAL FULFILMENT OF THE REQUIREMENTS FOR THE DEGREE OF

MASTER OF FINE ART

WITH A DESIGN ENDORSEMENT

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ABSTRACT

This design research project explores the creation of sensory tools for Music therapists involved with the care of patients with Dementia. The research aims to develop appropriate prototypes that provide a more engaging, stimulative and therapeutic experience for participants in group therapy music sessions. The purpose of this research is to assist facilitators and music therapists in providing residents with tools that allow for more explorative modes of active live music making. This mode of interaction is intended to spur a haptic and sonic curiosity amongst participants, that allow for more positive group experiences. The design research explores whether such tools are able to effectively assist Music therapy sessions for dementia patients through evaluating responses to ergonomic, haptic, sonic and visual properties in the object. The study involved a qualitative design research methodology using co-creative, iterative design approaches. Methods and processes involved user observations, rapid prototyping, user diaries, ongoing prototype workshops, user testing and a focus group.

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CHAPTER 1

INTRODUCTION

Introduction

“By 2050, 147,359 New Zealanders will have dementia – over 2.6% of the population, and more than triple current numbers” (Alzheimers New Zealand, Reports and Statistics section, 2012, para. 3). “Greater investment in research is imperative in meeting the challenges presented by the projected increases in dementia prevalence in coming decades, with priority accorded to research on care practices and the delivery of services as well as biomedical and medical research” (Alzheimers New Zealand, 2008, p. 63). Music therapists in New Zealand however have discovered “various ways in which music can be used to promote the wellbeing of older people, including those who have dementia” (Rickson, 2011, para. 2).

As a musician, and textile designer (BDes Textiles Hons) I have incorporated components of textile design, interactive sensory design and experimental music making into my current practice. Previous works have manifested themselves into interactive sonic sculpture and interactive audio-tactile design. As my practice developed, I became interested in situating my practice within a field I felt could benefit from my interactive audio-tactile works. The shift has witnessed a move away from catering towards and ‘art based’ focus and into a ‘health based’ mode of practice. The change in my project intentions saw a longing to use my sensory design based practice for more effective wellbeing purposes. I became aware of the need for modes of practice similar to my own that could contribute towards designing for healthcare based programmes for dementia care. For this masters degree (MFA) my intention is

to employ processes from my current studio practice, alongside aspects of user experience design to undertake my research.

The uses of active group music therapy sessions for older adults with Dementia is becoming an effective mode of therapy within residential care and for dementia care services in New Zealand. Within these sessions, the use of 'live music making' as an activity is especially effective in its promotion of social engagement and management of various stress related behaviours associated with dementia. This form of group activity is an effective intervention supported by many care homes as it affiliates notions of comfort, identity, occupation, attachment and inclusion to more appropriate levels of care. Musical instruments within this context become activated not only as an aid for the therapist, but importantly a physical sensory apparatus for the patients. Music Therapists practicing in residential based dementia wards are frequent consumers of musical instruments. As group focused activities are common in these facilities, therapists often require a variety of percussive driven instruments for their sessions. The designs however, of these products lack specificity towards the physical conditions and stages of dementia present in participants. Not only are they limiting ergonomically, they also overlook appropriate sensory design features essential in dementia rehabilitation.

In forming a case for this, I will be particularly investigating the current need for multisensory percussive based products to be developed and used within music therapy sessions for elderly persons with dementia. Rather than redesigning the musical instruments currently used in these programmes, I aim to create innovative, audio-tactile sensory tools that can assist in providing a multi sensorial experience for the patients in the sessions.

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“researching how users actually behave, use products or interact with their environments renders measurable, empirical evidence that can accurately inform the design process for product development” (Cheatham, 2011, p. 4)

These characteristics are a part of the ‘human centred design approach’. I have used this approach in my research as an attempt to reveal a ‘rich set of suitable outcomes. This writing discusses the methods and processes I undertook in my quest to explore the creation of suitable sensory tools for music therapy participants with dementia. Firstly, chapter two introduces the role of group music therapy sessions for dementia. I then go on to discuss how design thinking can assist in the creation of new tools for the sessions. Chapter three in the text begins with observation and critique of music instruments currently used in sessions. This chapter also discusses current musical and sensory products available for purchase by therapists. Chapter four describes the iterative processes I used to gather all necessary information in the prototype development. These approaches were used in effort to explore the development of audio tactile tools and evaluate how they could assist the music therapists working with dementia patients. Finally I discuss the critical thinking behind the design development of the tools. Information and design concepts that result from this research aims to contribute knowledge towards designing effective music therapy tools for dementia care in rehabilitative care programmes in New Zealand.

CHAPTER 2

MUSIC THERAPY FOR DEMENTIA
IN PRACTICE
ON PERCUSSION
THE ROLE OF DESIGN

“The World Alzheimer Report 2011 revealed that in countries like New Zealand, only 60% of cases are diagnosed/documentated. This means that there is potentially a further 40% of people with dementia in New Zealand that have not yet been diagnosed – making the numbers above significantly higher” (Alzheimers New Zealand, Reports and Statistics section, 2012, para. 5).

Music therapy for dementia.

Alzheimer’s New Zealand describes dementia as a “group of conditions that change and damage our brains” (Alzheimer’s New Zealand, Dementia Definition section, 2012, para. 5).

Dementia is a neurological disorder that manifests through brain functioning impairment, affecting language, memory, perception, personality and cognitive skills. This affects a person’s ability to perform everyday tasks and activities. There are many different types of dementia such as Front temporal dementia, Lewy body disease, Vascular Dementia and most commonly Alzheimer's disease. “Alzheimer's disease is a progressive, degenerative disorder that attacks the brain's nerve cells, or neurons, resulting in loss of memory, thinking and language skills, and behavioural changes” (Alzheimer’s Foundation of America, Dementia Definition section, 2014, para. 1). As dementia causes gradual damage to the brain, there are approaches that can be taken to stall the pathological process.

Alzheimer's New Zealand (2012) association classifies the stages of dementia as follows:

Stage 1 - Early to mild dementia. Symptoms include repeating one-self and being easily upset.

Stage 2 - Moderate dementia. Symptoms include forgetting to eat or maintain personal hygiene.

Stage 3 - Severe dementia. Symptoms include the inability to recognise family and friends. (para. 6,7,8,9)

Pharmacological treatment is important in treating the effects of dementia, however non- pharmacological treatment is also important in treating problematic behaviours associated with dementia and the social and emotional needs of people living with dementia. Psychosocial interventions such as music therapy are necessary in preserving cognitive functioning, improving mood, restoring self-esteem and improving quality of life (Guetin et al., 2012).

Key to music therapy is the notion of participation in activities. Lack of participation over long periods of time can significantly increase symptoms such as anxiety, depression and paranoia in persons with dementia (as cited in Sole, 2014). The World Federation of Music Therapy defines music therapy as the “professional use of music and its elements as an intervention in medical, educational, and everyday environments with individuals, groups, families, or communities who seek to optimize their quality of life and improve their physical, social, communicative, emotional, intellectual, and spiritual health and wellbeing” (WFMT, 2011, para. 2).

There are two main types of music therapy known as active and receptive music therapy. Active music therapy involves the use of musical instruments in live music making activities. This further applies to improvisational music making with voice and with instrument, dancing or movement activities. Receptive music therapy consists of listening to music that is sung, performed with an instrument or playing a selected audio recording for the participant.

In Practice

In sessions run by the participating music therapist, the use of active music therapy is applied to group focused sessions in this structure:

1. Music therapist arrives in session where participants in all the participating wards are assembled in a circular seated position.
2. The therapist greets the participants, and then moves around to each individual offering them a selection of an instrument to use in the session.
3. Participants will either chose to select or not select instruments to use for the session. If the participant is unaware of how to use the instrument, the therapist will then proceed to showing them how to use the instruments through behaviour modelling.
4. The music therapist then proceeds to the centre of the circle and picks up a guitar. Based on conversations already occurring, the weather or song preferences of the participants, the therapist will then proceed to lead the group into song.
5. At this point participants either actively use their music instruments or sing along to the song. Each song choice following the first will evolve from conversations involving topics such as reminiscing.

The instruments are mainly percussion-based instruments that accompany the melodies produced by the guitar. The Cochrane Collaboration (2013) also sees the benefits of using musical instruments as:

- “Improving gross and fine motor coordination with persons suffering in neurological trauma from a stroke, head injury or disease process.
- Possibly help Alzheimer’s patients to organize time and space” (Vink, Bruinsma, & Scholten, 2013, p. 3).

Tzu Chi College of Technology and Tzu Chi University in Taiwan conducted an investigation into the use of percussion instruments with familiar music in-group music therapy sessions (Sung, Lee, Li, & Watson, 2011). The study aimed to reveal if such interventions reduced anxiety and agitation with institutionalized adults with dementia. The intervention included the use of instruments such as the hand bell, tambourine, maracas, and guiro tone block, flapper and loop bell in active live music making activities. Behaviours were assessed and measured using the *Cohen Mansfield Agitation Inventory* (CMAI) and *Rating of Anxiety in Dementia* (RAID) scale through observations. The results of the assessment proved that participants in the experimental group showed a dramatic reduction in anxiety and agitation scores than those in the control group. They also found that the interventions provided opportunities for communication and social interaction. Although successful, the study was limited as it was only conducted in one residential facility and also need to be tested over a longer period of time and focusing on other behavioural outcomes.

Similarly, a study conducted by Lord (1993) also involving live active music making, set out to assess the improvement of social, cognitive and emotional functioning of individuals with dementia of the Alzheimer’s type (as cited in, Vink et al., 2013). The

results showed that participants in the music group showed signs of alertness, happiness and had a greater recollection of their personal history than the other two groups (Vink et al., 2013). The study states that the methods used in this study were not completely validated, however the results do show the positive effects of live music making with musical instruments.

On Percussion

Both studies above are examples of how beneficial active live music making can be for elderly persons with dementia. As these studies are done to analyse behavioural, social and physiological outcomes, very little is mentioned or acknowledged regarding the effect of using musical instruments in such sessions. Many of the instruments used by practicing therapists display sonic, tactile and visual qualities that play a major role in engaging or not engaging participants in the sessions. Percussion instruments used by music therapists in active group 'live music making' sessions are in focus for this study as they are the most commonly used type instruments owned by music therapists for their own individual practices. One primary justification for the use of percussion instruments in music therapy is because of 'perceived accessibility' i.e. the ease at which it can be used or operated (Knight & Matney, 2012).

The Role of Design

“ Innovative design thinking and strategies can be a big contributor to creating more efficient healthcare delivery, continuous improvement in quality, and lower total cost” (Forbes, 2013, para. 3).

Due to nature of the project involving a health and wellbeing application, design research strategies were adopted from institutions working in similar fields. The Helen Hamlyn Centre for Design and The Design Council specifically use design research methods in projects related to ageing and ability. Collectively they have the sole purpose of transforming people’s lives through transformational design. Two projects from each institution were examined, one for the relevance of the topic of designing for dementia, and the second looking at strategies of designing for sensory focused outcome.

The Helen Hamlyn Centre for design’s project *Green Space: Environments and Activities for Adults with Autism* extended into creating a guide on how to design outdoor environments for adults with autism. The research investigated the needs and aspirations of autistic adults, incorporating these findings into sensory garden design concepts. The study used observations, interventions, interviews and prototype development rigorously in their work. Through immersing themselves in environments where the research was conducted allowed them to develop sensitivity towards the participants needs.

The Design Research Council’s *Ode* project was one the successful projects to come out of their ‘*Living Well With Dementia Design Challenges*’. The research resulted in the development of a fragrance releasing system designed to stimulate appetite amongst

people with dementia (Design Research Council, 2014). This system released food fragrances that coincided with meal times three times a day. Through workshop development with a fragrance lab and user feedback methods, the product was developed to combat symptoms of malnutrition prevalent in the later stages of dementia. The second successful project to come out of the design challenge was the *Buddi* bracelets that were designed as an effective wearable alarm and communication device for persons with dementia. The project rose from identifying that current emergency bracelets made users feel stigmatised, were unattractive and did not work outside their home (Design Research Council, 2014). The bracelets were designed to allow users the freedom to be independent and feel confident in receiving help in emergencies. Innovative solutions as means of providing effective, dynamic products sensitive to the current needs of persons with dementia show as key themes in research mentioned above.

Although the Helen Hamlyn research projects do not directly address dementia, its relevance lies in the need to craft design methods used in age and ability with sensitivity towards human sensory perception. Key aspects in their research are the importance of understanding activities, objects and environments concerned with the participants. Projects from The Design Research Council not only identify how human sensory perception can be stimulated but how innovation can provide confidence and independence in persons with dementia. Outputs such as these show how current design-based research can be applicable for a range of health based issues.

CHAPTER 3

CRITIQUE OF CURRENT INSTRUMENTS

PRODUCT EVALUATION SUMMARY

Critique of Current instruments

The music therapist involved in the research project uses a wide range of percussion instruments in the music therapy sessions run in all three participating care homes. Before the sessions begin, the therapist greets each participant and offers a selection of percussion instruments often the therapist 'models' or shows the participant how to operate the instrument if they are unsure (see Figure).

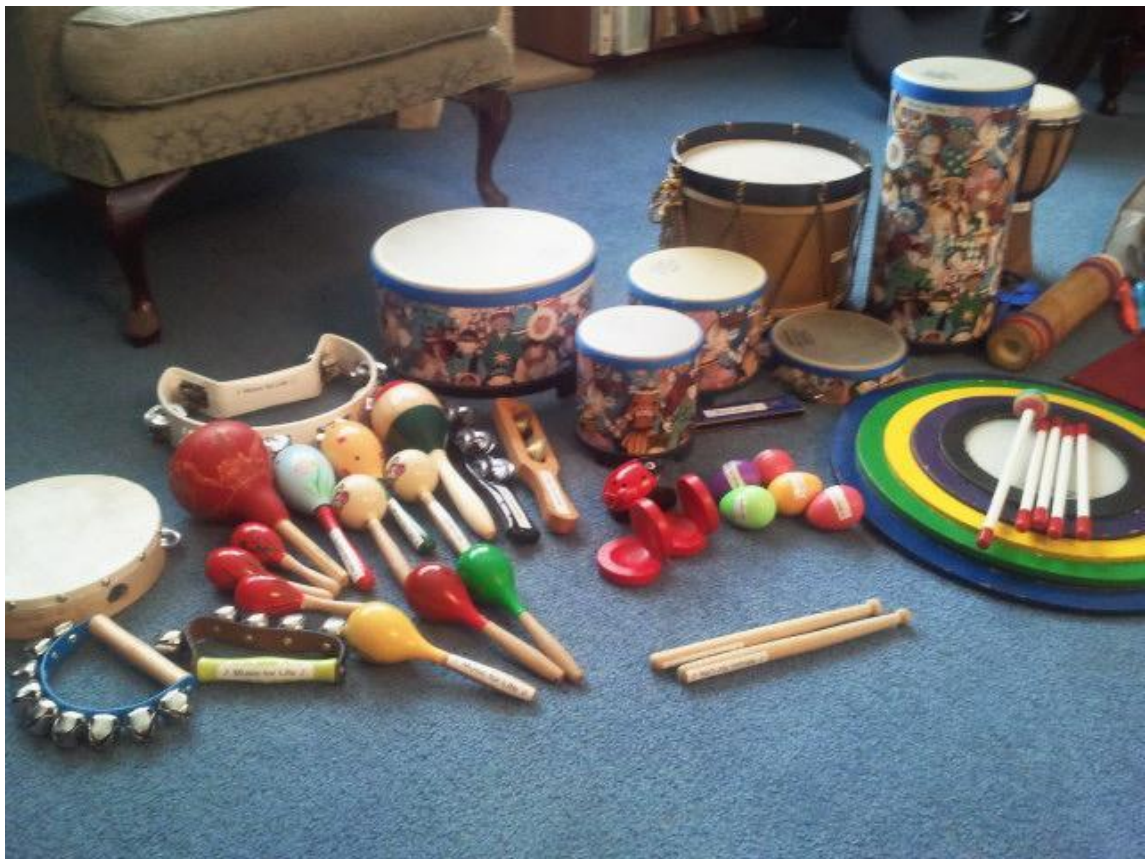


Figure 1. Byrne, B. 2014. Percussion instruments used in music therapy sessions. From left, sleigh bells, tambourines, maracas, unknown bells, drums, castanets, egg shakers, flat drum, rain stick, bongo drum.

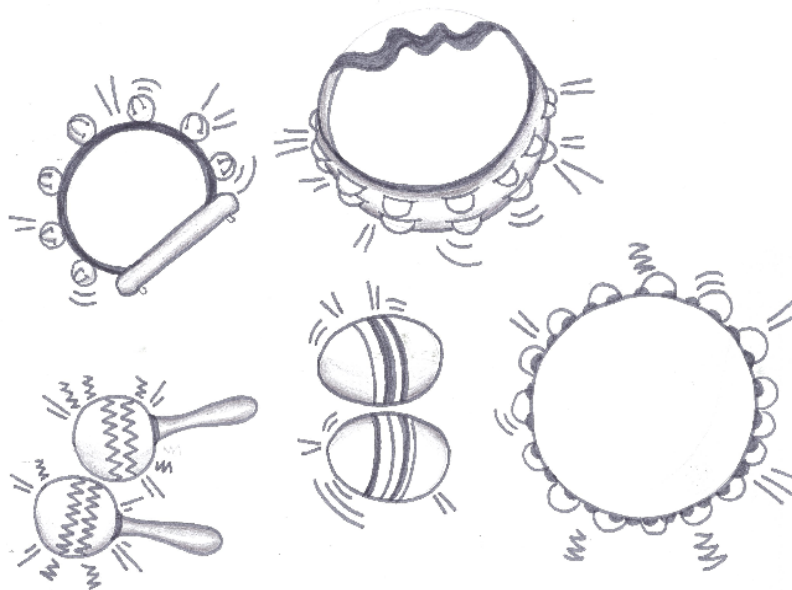


Figure 2. Byrne, B. Percussion instruments most commonly selected by participants in the music therapy sessions. From top left; 1.hand held sleigh bells, 2.moon shaped tambourine. From bottom left 3. maracas, 4. egg shakers and 5. calf skin tambourine.

Product Evaluation Summary

Through observations of the use of instruments over a month I discovered that the hand held sleigh bells, maracas, egg shakers and tambourine were selected mostly by participants (see Figure 2). Observations of these instruments showed that particular features such as size, shape, colour, familiarity and sound made them favourable for participants (see Appendix A for details). Limitations in the instruments were in the ergonomic design of the instruments and the aesthetics of the instrument. For example, though handles existed on the tambourines, its shape and weight made it difficult for users with arthritis or limited hand movement. Because of the 'standard' music instrument design (i.e. colour, materials, shape) participants would lose interest in using them in the sessions opting to 'hold' rather 'use'.

These key observations identified the need for instruments or tools to be sensitive towards the physical abilities of participants, and multi sensory characteristics. These multi sensory characteristics involve, more stimulating, colours, shapes, and tactile surfaces that could draw the participants into more constant participation (see Appendix A for more details).



Figure 2. Spacekraft , 2014. From left; Auditory Sensory Tub & Tactile Vibration Sensory Tub.

To contrast my findings, I looked at two current businesses known as Spacekraft and Sensory Toy Warehouse who sell sensory and musical products (see Appendix B & C). These businesses provide a range of resources for therapists, family members, carers and facilities concerned the therapeutic elderly and senior care. I wanted to identify features in their products that could cater for the issues I identified earlier in my survey of the current instruments used by the therapist.

The auditory and tactile sensory tubs sold by spacecraft boasted large range of exciting vibrant musical and tactile stimulating products. They also catered for specific therapeutic needs. For example the auditory tub contained products specifically for 'auditory' musical stimulation and the tactile tub for more tactile stimulation.



Figure 3. Sensory Warehouse , 2014. From left; 15 piece Percussion Bag and Ocean Sounds Musica Set.

Though Sensory Warehouse's musical sets lack the vibrant aesthetics of Spacecraft, it does contain music instruments that produce 'interesting' and 'effective'. The 15 piece percussion kits consists of a fairly standard array of percussion instruments that are also used in the current music therapy sessions. The ocean sounds music set on the other hand includes an interesting collection of world instruments with a focus of 'natural sounds. The sensory tubs from spacecraft had created separate' tactile' products from 'auditory products'. This shows that products currently sold for therapeutic purposes are still separated in their out put. The website also does not recommend these products in their 'elder' and 'senior' care product sections. Sensory warehouse on the other hand sold musical products for therapeutic purposes that were both 'standard' and 'interesting'. This also showed that sounds of standard music

instruments and world instruments are endorsed as effective therapy tools. Though the sounds may be more dynamic, the products do lack an visual and tactile properties that could be more engaging for the users in the sessions. Overall, it is clear that products currently available to practitioners have very specific purposes. Whether it is purely 'audible stimulation' or 'tactile' stimulation. These products show a need for audible, visual and tactile characteristics to overlap in the design of tools for music therapy practices. This validated my early observations of the limitations of current tools where I identified the qualities of percussion instruments as being limited in use.

As dementia progresses, so does the sensory deprivation of individuals. Thus the application of 'multi sensory' characteristics in the design could be an effective way of engaging participants who are sensorially deprived. Multisensory stimulation for therapeutic outcomes belongs to the 'Snoezelan' concept. This involves the use of "sensory stimuli to stimulate the primary senses of sight, hearing, touch, taste and smell, through the use of lighting effects, tactile surfaces, meditative music and the odour of relaxing essential oils" (World Wide Snoezelan, 2014, para. 1). This stimulation is done to counteract the sensory deprivation of individuals exposing to engaging 'stimuli'. I intend to apply similar characteristics in the research in an attempt to bridge the gap between 'musical instrument' and 'multi sensory stimuli'.

CHAPTER 4

METHODOLOGY

OBSERVATIONS

RAPID PROTOTYPING

USER TESTING

USER DIARY

FOCUS GROUP

Methodology

This design based research project has employed qualitative strategies in collecting necessary data. For this project I have adopted strategies of design thinking that involve Ethnographic design and action based design strategies. Ethnographic approaches were used such as observing and collecting feedback from the music therapist the beginning of the project. Towards the end of the project, action based research methods were applied in the continual development of the final product. The project heavily relied on a co creative design process with the music therapist. The following methods were employed in the design process:

- user observations;
- ongoing semi formal interviews with the music therapist;
- rapid prototyping;
- user diary;
- focus groups;
- user Testing;

Ethical Consideration

A full ethics application was approved for this research under the Human Ethics Commission Southern application number 14/29. To ensure all ethical considerations were made, all intended research methods were discussed with my supervisors alongside any issues that may arise. For this research all both the therapist, focus group participants and residential facility were given information and confidentiality agreements to. All necessary steps were taken under the regulations of the full ethics application to ensure all ethical standards were adhered to in the process.

Observations

Through the months of February to May I began shadowing the music therapist working in various therapy sessions. I attended sessions in elderly residential facilities in both group sessions in dementia wards and general group music therapy wards. The intentions of the observations were to observe the therapist working in 'practice' in various 'settings'. This included observing the musical instruments that were used in each sessions and how they functioned in different settings.



Figure 3. Byrne. B, 2014. Shadowing the music therapist.

Crouch and Pearce (2012) speak of this technique as playing an essential role in orientating the researcher to the characteristics of the research environment in order to understand them better. As I did not have ethics approval at the time to record any information from those visits, my role was purely observational. In reaching the end of these visitations and with the approval of a full ethics application in July, the need

for more effective tools in sessions at the dementia wards became increasingly evident.

Once approved, I immediately began observing the therapist in three different dementia wards in local residential facilities in the wellington region. Aside from purely observing, I also took notes, images, and drawings and conversed with the staff present through the research process.

In most dementia care homes, group activity sessions normally consist of residents who are at various stages of the condition . While groups are often organised based on physical mental ability it would not be appropriate for this research to separate and observe participants in stages of 'mild', 'moderate' and 'severe' stages of dementia. This is because music therapists working with grouped sessions in such wards experience residents who are continually progressing with the disorder and other physical conditions. For example a person at a mild stage of dementia could rapidly progress to a more severe stage and could not remain within the same observational group. The research was undertaken in the following dementia wards;

- Ward 1 -involved person with moderate to severe dementia that were mostly hospitalised and limited physically.
- Ward 2- involved persons with dementia in mild to severe stages of dementia that were mobile and physically active.
- Ward 3- involved persons with dementia in mild to severe stages of dementia that had other physical conditions on top of dementia.

Summary of observing the music therapist through shadowing' and ongoing interviews

Through shadowing and ongoing conversations with the therapist, I was able to gather first hand insights into the sessions run in the wards. I did this to gain an understanding into the therapists' professional practice in this setting. Crouch and Pearce also discuss this process as a way of understanding the "bigger-picture context where individuals engage in particular events or particular practices" (Crouch & Pearce, 2012, p. 92). Furthermore, MacDonald talks of shadowing as a means of gaining 'specific experience which is relevant to a particular expert role' (Macdonald, p. 457). In this way, following the therapist enabled me to understand the perspective of a professional in the field of music therapy.

In contrast Hawthorne's theory states that limitations in this method of data collection can arise through participants changing or adapting their behaviour because they know they are being watched (Smeyers, 2006). Participants in all sessions were informed that I was present observing the therapist. To ensure that my presence would not deter or disrupt participants and the therapist in the sessions I was seated alongside participants wearing a visitor's badge. Through an open semi structured interview I was able to understand why the instruments were used and why the sessions were conducted in that particular manner. I was also able to validate my observations through allowing the therapist to give as much detail needed into why things were done in a certain way. This validation was complementary to taking any

observation as a means of clarifying and enriching the data collected (Crouch & Pearce, 2012).

Summary of Observations

It became evident through the information gathered from observations and conversations with the therapist that percussion instruments are not only important as 'functioning' sound making tools. They also aid in fostering different group experiences. This occurs in stages such as:

1. Rhythmic engagement
2. Participation both active and receptive.
3. Brings participants into a musically controlled time and structure.
4. Structure affecting physiological responses by alternating participants 'movement'.
5. Song structure affecting emotional responses through igniting memory.
6. This allows participants to improve identity.
7. Relate, discuss and prompt discussion with others.

The tools provided all the necessary requirements of a percussion instrument functioning for 'therapeutic purposes in this context. Whilst the needs of the participants are addressed with engaging in rhythm and time, the instruments failed to prompt more 'explorative' modes of interaction. For example explorative feeling, gazing, listening to the instruments. Through observations I also noticed that

participants who engage in live music making have moderate to high levels of physicality. Therefore participants who were less active, had limited to no participation. The therapist had identified a need for tools that was interesting and could add positive experiences to the session and engage all participants at different stages of dementia.

Rapid Prototyping

“The purpose of Rapid Prototyping is to swiftly create something material that can facilitate conversations with partners, be tested with users, refined and improved, and final discussed with a broader audience” (Tschimmel, 2012, p. 16).

Rapid prototyping methods were used to begin the conceptualization of the prototypes. Action research methods were applied in an iterative process to develop relevant outcomes. These methods is suitable is it connects reflective practice to being deliberate planned and systematic (Crouch & Pearce, 2012). Information gathered from observational data and the instrument critique was developed into prototypes and concept ideas, workshopped with the therapist and evaluated. The prototypes were then redesigned, workshopped, re-evaluated and implemented into the prototype, concluding in preliminary concepts for user testing.

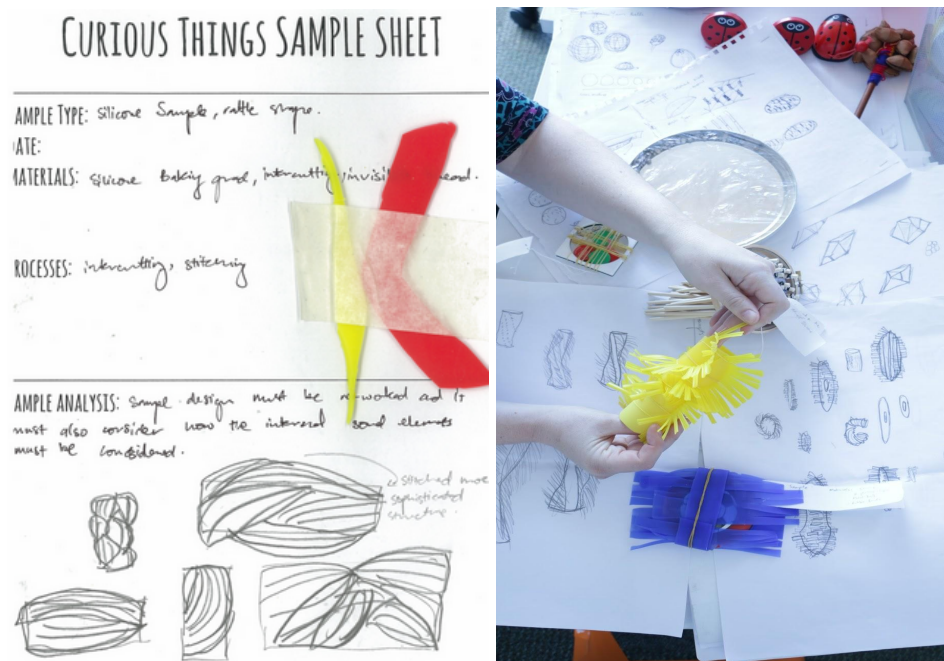


Figure 4. Byrne, B, 2014. Evaluation sample sheets .

The evaluation notes in the sheets were based on a co-creative ideas formulated and discussed whilst developing the prototype (see Figure 4). The danger of prototyping however occurs when the researcher “elaborates the prototype rather than “question its premise” (Koskinen, Zimmerman, Binder, Redstrom & Wensveen, 2011, p. 135).

For this reason evaluation and selection of prototypes were situated on its potential to be developed and used across all sessions. Methods used in this process were sketches, deconstruction and reconstruction of different materials, and evaluation sheets. Favourable features from the critiqued instruments were integrated into the concept creation.

These features were considered in establishing new concepts:

- The size and shape of the egg shaker
- The round handle of the maracas
- The round frame of the tambourines and handle of the sleigh bells
- The exposed sonic structure of the tambourine and sleigh bells

- The internal sonic structure of the shakers
- The soft surface of the tambourine

These prototypes were developed from initial ideas related to merging the multi sensory and musical instruments. The samples above (see Figure 5) were then presented to the therapist and were discussed the most suitable sample. These samples contained internal sonic systems such as rattles and shakers. The second user-testing phase (see Figure 6) saw an expansion in prototypes and material.



Figure 5. Byrne, B, 2014. Rapid prototype Phase 1. Initial development of concepts.

Through our discussions we saw the need for the prototypes to expand in experimentation into materials with sonic properties and forms that were more suitable for the participants in the sessions. Overall, the aim of this phase was to merge together elements of musical instruments and multisensory stimuli through engaging aesthetics and sonic outputs (see Appendix G & H for further details).



Figure 7. Byrne. B, 2014. Preliminary User Tested prototypes

Preliminary User Testing



Figure 8. Byrne. B, 2014. Successful prototypes from preliminary user testing.

This preliminary testing phase saw the testing of a variety of prototypes in all three dementia (see Appendix J for further details). Through this testing phase key samples were identified as being the most engaging for participants. From the top left of Figure 8 this was:

- Nimbus sample- handheld bamboo chopstick chime
- Flying Saucers sample- handheld lycra encased shaker disc with marbles
- Yarn ball sample- hand held ball with internal bells
- Yellow Frilly tube- hand held shaker tube with textured silicone cover
- Textured discs- hand held patting disc that also rests on user lap

User Testing Final Phase One



Figure 9. Byrne, B, 2014. Prototypes from user testing final phase one. From top left; green lycra disc with marbles, blue jeweled disc, nimbus 1&1, patterned shaker disc, lycra red sample, yellow frill & yarn balls.



Figure 10. Byrne. B, 2014. Yarn disc sample in use from user testing final phase 1. This sample is a hand held shaker.

User Testing Final Phase Two



Figure 11. Byrne. B, 2014. Prototypes from user testing final phase two. From the top texture pompom disc, textured turquoise jewel disc, marble disc shakers & nimbus

The user testing process one and two revealed the need to explore different versions of the prototypes to test how participants would respond elements such as colour combinations, and texture (see Appendix K & L for further details). Successful samples to come through this phase were:

- Nimbus sample- handheld bamboo chopstick chime
- Yarn ball sample- hand held ball with internal bells
- Yellow Frilly tube- hand held shaker tube with textured silicone cover
- Textured & Translucent disc - handheld patting disc that also rests on user lap

This meant that participants at various stages were drawn to the use of the samples because of visual, tactile and audible qualities. The prototypes however still needed to refine the 'sound output' of the samples.

User Testing Final Phase Two



Figure 12. Byrne. B, 2014. Prototypes from user testing final phase three. From the top textured felt disc, textured gem disc, yarn balls, translucent shaker disc & nimbus.

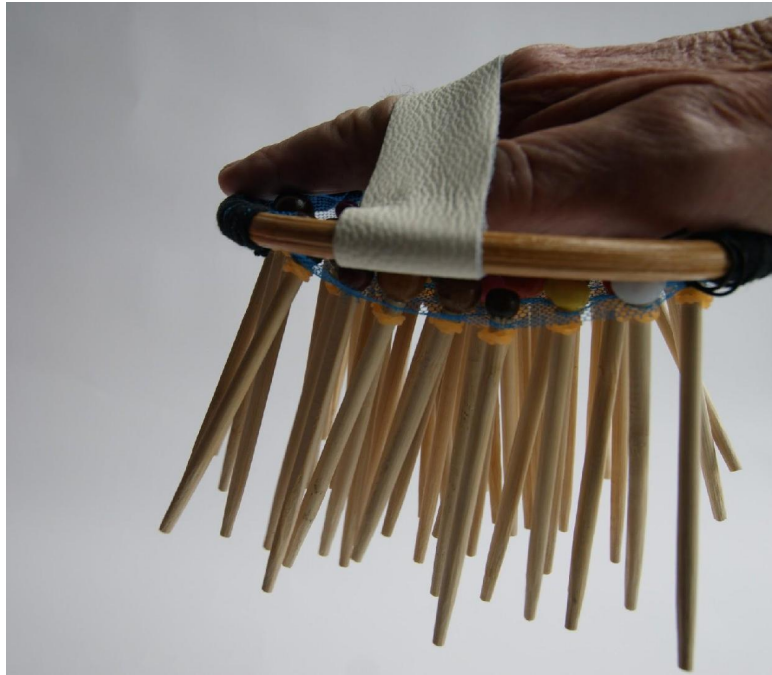


Figure 13. Byrne. B, 2014. Prototypes from user testing final phase three. Nimbus.



Figure 14. Byrne. B, 2014. Prototypes from user testing final phase three. Yarn Ball sample.

This final user-testing phase concluded with a final set of design concepts for the audio- tactile tools (for further details refer to Appendix M & T). These were the yarn balls, textured and translucent discs, and nimbus samples. Throughout the user testing phase these samples underwent continuous changes to adapt its 'design features' for the use of the participant. For example colour, weight, acoustics were adapted in the yarn ball samples to encompass 'minimum movement' for 'maximum sound'. This user testing phase was effective in trialling the concept ideas and reworking, re evaluating and reshaping the prototypes for testing.

User Diary

“User diaries is a design method to gain insight into people's lives, particularly patterns of behaviour” (Design Research Council, 2014, User diary section).

A user diary was used in the project to gain insights into how the prototypes were performing in the user-testing phase. This method helped to focus on ‘what was working’ and ‘what wasn't working’. As the music therapist uses ‘clinical note taking’ as a means of recording experiences in the sessions, a similar model was applied to structure of the diary. Thus a user diary was appropriate in this aspect of the research as it functions similarly to the note taking method used by the therapist. Ziefle (2011) advocates this method stating that it allows the participant to be in control of the information that they share in the diary. Unlike interviews, where often participants may constrict by interview questions, the user diary allows them to record a variety of experiences and behaviours. The data collected in this way is rich and increases the reliability and validity of entries (Ziefle, 2011, p. 288). The user diary underwent two phases of adaptations in this project to establish ‘appropriate measures of observations’ for the prototypes.

The template of questions were developed based on observations of the therapist and conversations related to how the therapist structured the clinical notes for the sessions in the dementia wards. The therapist identified that from a therapeutic standpoint ‘stimulus’ and ‘interaction’ was important to consider in note taking. This resulted in the forming of the questions being very ‘open’ and specifically tailored to identifying stimulus and interaction. The template encouraged a freedom of expression of ideas through drawing and the ability to record any observations that

This user diary phase resulted a refined method of data collection that involved a virtual user diary. This user diary was set out on a Microsoft excel sheet and was used in the preliminary and final user testing phase. As the sheets produced statistical graphs, this was used to show a clearer visual representation of the data and the effectiveness of the prototypes. Data at this stage was needed as means of clearly identifying what prototypes to eliminate and what prototypes to focus on developing. This data was purely to observe general trends rather than generate quantitative data and analysis. A section was given for the therapist to also provide any additional or important notes (see Figure 15). This was to allow for more descriptive 'rich' data to also be recorded alongside the graphs (see Appendix N-T). The identified categories of observations were also influenced by collective discussions with the therapist in regards to observations of participants with the instruments.

Focus Group

“The value of focus groups comes from an assumption that attitudes and beliefs do not form in a vacuum but emerge from shared contexts” (as cited in Crouch & Pearce, 2012, p. 117).

A focus group was conducted at Massey University in Wellington with final year Master of music therapy students who have had experience working with the elderly, patients with dementia and persons with neurological disorders. The session topic was based on discussing ‘tools of engagement’ in their music therapy practices. In the session participants were invited to respond freely to a set of questions, these were recorded in note form, and drawings. Participants were given the freedom to draw ideas elaborate further on questions. A summary of notes was taken and is described below.

Key points:

- It is important that participants are able to ‘feel’ the sound vibrations through experience with the instrument
- It is important that for persons with dementia, instruments must be used that require ‘little movement’ but maximum sound output.
- Colour plays a role in aiding ‘differentiation’
- Ethnic instruments are popular because of textural elements such as beads, the type of sound it produces and the unfamiliarity of the instrument or how to use it.
- Comprehension is important, and shakers such as ‘banana’ shakers are suitable for some participants but not all.

- Bells, tambourine and e.g. shakers also identified in conversation as being commonly used with dementia patients.

CHAPTER 5

CRITICAL REFLECTION

Critical Reflection

“Mechanical, acoustical, or electrical vibrations are the sources of sound in musical instruments” (Fletcher & Rossing, 1998, p. 3).

Fletcher and Rossings' (1998) *The Physics of Music Instruments* describes the scientific phenomena related to the functioning of musical instruments. This text was hugely valuable in considering the acoustic design of my prototypes. From a scientific perspective the text discusses structural mechanics of western music instruments alongside physics formulas to further understand the sound production of these instruments. The information in the text is an intended guide for makers of music instruments, listeners, composers and performers (Fletcher & Rossing, 1998). The information from this text was essential in informing the choice of physical forms that being developed in the rapid prototyping stage and through the user testing/prototype development phase.

The focus of my concept design was to create instruments that functioned both in a percussive way and as a visual and tactile stimulant. In trying to bring these together I needed to consider sonic properties and surface design elements. This included considering the sonic properties of all materials and the placement and arrangement of theses materials into an acoustic form. Data collected from my observations and first hand observations showed that patients with dementia were 'drawn' to the sound of world percussion instruments'. The Moreno (1988) speaks of the use of 'ethnic instruments' with the dual purpose of "Establishing connections between specialized

groups. Involving clients from ‘mainstream music ‘ into musical experiences through the exotic appeal of unfamiliar music styles and approaches to music making instruments” (Moreno, 1988, p. 17). Ethnic music instruments such as the *rain stick* and *cabasa* are also considered to be both ‘pleasant’ to hear and ‘interesting’ to experience by clients in music therapy session. The structure of the *cabasa* was taken into account during the rapid prototyping phase. Not only did it ‘look interesting’ but it also had tactile elements that were stimulating and ‘curious’. Berger (2002) describes the use of the *cabasa* as a percussive ‘system’ beneficial for audible and tactile stimulation.

Knowledge of the acoustics behind music instrument design has influenced the practical choices made with the design of my surfaces. Bart Hopkins’ book *Musical Instrument Design: Practical Information for Instrument Making* (1996) is a conventional read into the construction of various musical instruments. From woodwind instruments to stringed instruments, Hopkin provides an illustrated ‘do-it-yourself’ perspective for the avid music enthusiast. Hopkins explains the fundamentals of sound before considering the making of musical instruments.

As sound is created by fluctuations in air pressure, these fluctuations are expressed as vibratory cycles are known as frequency (Hopkin, 1996, chapter 1). The way the brain interprets these frequencies are in the form of *notes* or *itches* and the *tone quality* of this sound is known as *Timbre* (Hopkin, 1996). The human ear can perceive a range of 20hz to 20,000hz. Elderly listeners experience a severe “decline in auditory peripheral sensitivity alongside high-frequency hearing loss” (as cited in Gygi & Shafiro, 2013, p. 1373). In a study conducted by Gygi & Shafiro (2013), it was found that ageing adults

must be exposed to 'higher frequencies' as this helps them to perceive complex auditory environments.

"The experience of sound is at the very core of human consciousness, and it can be a powerful tool for healing" (as cited in Goldman, 2009, para. 1).

Dr Jeffrey Thompson speaks of therapeutic applications of sound in his study *The Clinical Use of Sound*. Neuroacoustics is associated with the feeding back of electromagnetically produced brain frequencies to the brain through the use of sounds waves (11th Step Meditation, 2009, para. 3). In contrast to music therapy where the sound is used to facilitate a 'patient's musical self expression', his research focuses on the direct application of sound for beneficial 'physiological responses' (Goldman, 2009). Through observations to date, it became evident that the percussion instruments in the music therapy sessions had the ability to bring participants into a 'natural rhythm'. Thompson (2007) defines the origins of this natural occurring rhythm as *primordial sounds*. These sounds are deeply imbedded into our subconscious from early experiences of vibrations and pulses in the womb (Thompson, 2007, para. 13). In an experiment conducted by Thompson, 3d psychoacoustic processing and pacing were used to decipher how the perception of sound could affect the brain activity and biological timings of the human body. Comparisons can be made in relation to the psychoacoustic perception of sound produced by the percussion instruments in the music therapy sessions

The placement of instruments spatially in the room, could affect how the participants perceive sound, recognize sound and biologically adjust to a 'relaxing' rhythmic pace. Thompson mentions that we record sound experiences three dimensionally and this allows us to adjust well to sounds being mimicked in a three dimensional manner. "Our

bodies will adjust itself to the most powerful external pulse cycle it is exposed to” (Thompson, 2007, para. 25).

A horse of a different colour: Do patients with Semantic Dementia recognise different versions of the same object as the same (2006) analyses object recognition in patients with semantic dementia. Key findings pointed that patients with semantic dementia over generalized and under generalization comprehension of objects (Ikeda, Patterson, Graham, Ralph, & Hodges, 2006). For example stating that a picture of a zebra looked like a horse with ‘funny things’ i.e. stripes. In designing the prototypes it was important to consider ‘what the objects might look similar too’ or be mistaken as something else. The text offers a psychological study into the cognitive ability of persons with dementia. As the patients are given the opportunity to select the instruments themselves, it was important to be alert as to how certain sizes, shapes and colour could affect their choice. The study showed that in the case of colour, this did signify a change of object. Colour preferences of persons with dementia were studied in a research project *Colour Discrimination, Colour Naming and Colour preferences among individuals with Alzheimer’s disease* (1999). From the top the preferences were blue, red, green, yellow, purple, orange and brown. The research showed that the majority of patients with Alzheimer’s dementia had strong preferences of colour, possibly linking back to the preservation of early colour learning (Wijk, Berg, Sivik, & Steen, 1999).

When considering the use of colour it is important to consider how vision is affected in the ageing process and vision impairments associated with dementia. The Australian Department of Health's website informs readers of how colour should be appropriately considered when designing environments for persons with dementia. Colour in this field promotes social and emotional responses from people and can contribute to interesting and inspirational experiences (DHVA, 2014, para. 2).

In summary, application of colour relevant for my concept design needed to consider how:

- "Colour affects emotional responses
- colours that are majorly contrasted help with navigation and are very important
- overuse of colour can cause distraction
- colour discrimination is best at the warm end of colour spectrum
- bright colours such as yellow are highly visible
- persons with major vision issues are less sensitive to colours at both end of the colour spectrum
- colour combinations such as red and blue or yellow and green make effective colour combinations" (DHVA, 2014, para. 2).

Thus the application of colour in the design concepts would need to include bright colours, the placement of the colours through contrasts, and appropriate combinations are key for engaging participants visually.

"the tactile information about object surfaces is obtained through perceived contact stresses and friction induced vibrations generated by the relative motion generated by finger and fingertips" (Fagiani, Massi, Chatelet, Costes, & Berthier, 2012, p. 145).

Contact of a finger on rigid surfaces and textiles: friction coefficient and induced vibrations

(2012) is a scientific study focused on studying the response of the 'human hand' and surface. This study validates the use of varying surfaces and textiles as a means of spurring stimulation in the prototype design, As this particular study is not related to Dementia patients, what it underlines is the stimulation that surfaces can provide through friction. The text analyses measures of frequencies produced by the hand vibrations through testing various textiles and surfaces. Attaching a small accelerometer to the finger and running the finger on various surfaces carried out the tests. Results from the test showed that the larger the hairiness of the fabric is, the "larger the variations of the friction coefficient with respect to the scanning speed" (Fagiani, Massi, Chatelet, Costes, & Berthier, 2012, p. 156). Therefore using textures on the surfaces, combined with sonic properties could be an effective way of heightening stimulation.

As the ageing processes occur, the human skin becomes drier and less elastic, leading to a decrease in sensitivity to touch (Brawley, 1997). Brawley (1997) speaks of the sense of touch being important to us as humans as it a ways of 'communicating' with one another. Koepnick goes on to speak of how our human senses or the way we use our senses "are deeply ingrained in history and technological process, thus is testament to social change" (Koepnick, 1999, p.141). Because of this, it was important to consider tangible materials that were 'suitable', familiar and stimulating. This led to the incorporation of 'diy' and 'craft' design practices, alongside the incorporation of textiles into the instrument design. Through the use of networks such as Pinterest, I collated many 'diy' techniques for instrument making and textile design processes. The use of textiles became important when considering a material that was 'familiar' yet

could be manipulated in an interesting way. Historically textiles have catered to the very basic of human needs including warmth and comfort and identity (Voss, Kuperus, & Meerkerk, 2010). Textiles provide many functional and emotional purposes from the fabrication of floor rugs to the weaves of a comfortable blanket. They also contain characteristics structures such as 'stiffness', 'stretch', and 'textured'. Textile processes of 'fabric manipulating' such as intercutting, layering, and embellishment were also applied to test the stimulation of the haptic senses.

Through the rapid prototyping phase and early user-testing phase I became strongly influenced by contemporary 'art and craft movement'. Historically this movement had the primary focus of incorporating 'art' and 'labour' (Triggs, 2012). This meant engaging in the laborious process of creating something that could provide one pleasure through its function. For this research I had to acquire thinking from music instrument design to my current knowledge of textiles. From a process point of view this involved embedding information I had collected into every detail of the construction process.

The 'craft' movement involves 'do -it-yourself' processes. These methods are normally concerned with applying reusing existing materials into new exciting forms. In this aesthetic, the 'illusion of handmade' is represented through visual designs and processes or represented through 'thorough technique in processes'. Processes used in my making were hand stitching, diy music instrument making, diy home decorations, surface manipulation, hand netting, quilting and embellishment. Craft writer Victoria woodcock endorses these processes and many more in her book *A State of Craft* (Woodcock, 2011). Early critique of music instruments through to the concept development and testing phase, continuously expressed the notion of the 'circle' or

'curve'. This was expressed through the circular shapes of the drums to early tube shaker prototypes. From an ergonomic perspective, the shapes of the percussion instruments were held 'comfortably' where a 'curve' was present on the form structure.

CHAPTER 6

CONCLUSION

Conclusion

In the attempt to design 'audio-tactile' tools, an extensive, explorative design development process was undertaken. This needed to take place in order to design tools that were both functioning on a sonic level and a tactile level. To achieve this, careful consideration needed to be taken into the selection of materials and the application of materials in the design. This process involved the considerate placement of soft materials and hard materials into a form that embodied sonic and haptic functions. Experimentation in the process needed to cover a variety of materials in different combinations to find the most favourable outcome. These materials ranged from textiles, yarns, woods, nuts, seeds, bamboo metals, plastics, and silicone. This was to receive a wider set of experimental outcomes in the design process. From an acoustic perspective, the placement of each material on the prototype structure mattered in achieving the best audible output. For example in the 'yarn ball concept', the layer of yarns applied to the exterior structure could not be overly thick. If it were so, the sound produced by the internal bells would be mostly absorbed. Adaptations of music instrument design were used to create forms that worked acoustically. For example the 'nimbus sample' adopted the structural format of a 'wind' chime. By using the process of layering bamboo in a 'chime' like hanging structure, audible output was achievable. Failure did come quickly in attempting to balance both sonic and haptic like objects. The early 'flying saucer' design for example struggled to balance both of these elements. Though interesting to touch and feel, the

internal glass marbles did not provide pleasant sounds. However through continuous testing balance began to appear in both tactile and haptic features. An example of this was in the final iteration of the 'translucent discs'. The shaker like disc had an open light wooden cavity encased in a sheer mesh fabric filled with colourful internal metal beads. Users could not only use it as an instrument. But they could also feel the beads moving through the textile surface, also moving the beads themselves through the surface.

The overall style of the objects shifted majorly throughout the testing phase however stayed within the same 'craft' aesthetic. Experimentation in a range of different surface design techniques, pattern and colour placement were necessary in the design process. I quickly learned of certain shapes, colours, colour layouts were preferable by persons with dementia. For example the blue-jeweled tins were incredibly successful because of the high contrast between the bold blue jewels and the white matte background. The structural design of the nimbus was the most interesting of all samples as it had a 'non familiar' or interesting shape. In contrast, the yarn balls 'looked different' aesthetically but were immediately selected due to familiarity of shape. Through testing I became aware of the need to be sensitive to the use of materials in the prototypes. For example participants attempted to remove pompoms of the textured tin sample as they assumed it was lollies. Thus in designing for participants with differing stages of dementia, being sensitive to differing levels of comprehension was essential. Applying processes such as textile layering did result in successful results. For example the final textured tap pad was hugely successful as participants were not as active found the surface stimulating to feel and use. This relates hugely to previous research into the effect of tactile stimulation on the hand, i.e. thick textured surfaces evoking stimulation. Cultural preferences also

unintentionally appeared in the testing phase where materials associated from another culture became favourable by participants from that culture.

This multiplicity of functions related back to early research into ethnic music instruments such as the cabasa. For example the textured discs used the 'snare drum model', placing beads in the internal structure to amplify air vibrations caused by tapping. Final results showed a certain preference of the 'type' of sounds considered by the participants. This was evident in the design and results found in the final user-testing phase. Links made to this was through research into sound perception and primordial sounds. This was evident in the popularity of the 'rain like sounds of the nimbus sample. As the percussion instruments ranged between 300 hz to 500 hz this set well within the range of pleasant frequencies for the human ear. In consideration of the gradual loss of hearing often present in the participants, incorporation of high-pitched elements i.e. in bell tones of the yarn balls was intentional. This was successful as the yarn balls through all stages of user testing proved the most successful in engaging participants.

Throughout the research it became clear that often-surface design and sonic design features were compromised by the 'weight' of the prototype. Carers continually pointed out that weight was a major issue in most of the prototypes as this affected the use of the product. Thus resulting in the elimination of heavier samples in the final samples and the incorporation of lighter materials 'bamboo'.

The project concluded with these design concepts, which were found to be suitability applied in the creation of audio-tactile tools for persons with dementia. These concepts are reflective of the findings that occurred in all processes used:

- a) Textured pads- textural tapping pads that sit on the users lap for participants who are limited physically/allowing them to be involved and participate using less movement.
- b) Nimbus- hanging chime attracted to palm of hand. Participants who are moderately active/allowing them to be engaged in the vibration from external sonic structure
- c) Yarn balls- bamboo and yarn-encased balls with internal bells for participants from moderate high levels of active engagement/feeling bell vibrations through yarn structure.
- d) Translucent disc- bamboo shaker disc with clear top and colourful internal beads mild to high levels of active engagement/feeling beads move through disc as well as seeing them move through disc

The final testing samples identified elements that could be hugely improved. This was in material choice, design style, and breadth of application. Time restraints and limited access to a variety of other professions within the field proved difficult in the project. As a new field, there is a scarce selection of research that relates towards music therapy instruments.

Moving forward the potential exists for these prototypes to have a more purposeful application. Three key areas that have potential lie in:

- a) The appropriate aesthetic development – the critical study into a creating ‘visual design language’ which is appropriate for designing for dementia.
- b) Its production and marketability-involving a ‘local community craft driven’ enterprise where processes of manufacturing involve hand made processes used in a contemporary way.
- c) Material selection- choosing to use local, natural materials both hard and soft.

The study showed that potential lies in creating concepts sensitive towards the sensory needs of participants. As dementia is on the rise in New Zealand, so will the need for greater community support. Therefore somehow involving the local community in the production of products that could be used both in and out of residential facilities has huge potential. Natural sounds and unconventional music instruments also showed potential for further research and development. Both in the area of sound and object design for dementia, being tailored specifically to therapeutic needs of persons with dementia.

In Conclusion, the study did show that design research methods could assist in the development of audio tactile tools for group music therapy sessions involving participants with dementia. The human centred design approach focuses on designing for the 'needs of the user'; adopting ethnographic and co-creative and iterative action based processes did reveal appropriate design outcomes. I was able to take in these observations and place them into rapid prototype ideas that addressed those needs. Through ongoing discussion and involvement of the therapist and carers in this process, I was able to involve the user in the prototype development. User testing and the user diary were the two major methods informing the prototype effectiveness. The focus group enabled me to understand the benefits and difficulties of music instruments used in the practice of music therapy. The feedback from the focus group contributed to my understanding of 'what the instruments need to do for the client'.

The methods did also come with their limitations. As music therapy is a relatively new field, I found it difficult to involve other experts in the field in more regular interviews and ongoing conversations. Secondly was the process of rapid prototyping and user testing phases. As a textile designer by trade with no background in music instrument

design, I had to learn how to design audible surfaces. This was challenging, as I had to rely of feedback from the user diary and my own experimentation to create suitable prototypes quickly. Though the research showed that the samples could be used effectively by dementia more quantifiable research needs to be undertaken in relation to the physiologic response of participants with dementia. As dementia progresses so do patients behaviours and responses. This meant that the overall mood or interruptions in the sessions affected participants' responses towards the music making. This could have also affected the result in the. Due to time restraints I was limited in extending the development and evaluation of the prototypes. For this project, I felt that all design thinking processes played an essential role in obtaining the necessary information to create prototypes suitable to be used in the session. In moving the Curious things project further, these design processes would only sharpen and refine the prototypes potential.

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IMAGE LIST

APPENDICES

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Appendix

Appendix A

Summary of Instrument Critique Notes

Egg Shakers The instrument has a pleasant smooth exterior shape that fits conveniently into the palm of a hand. The sound produced by the internal beads are pleasant and non 'intrusive'. The colours of the shakers are vibrant and appealing. The user can also easily operate the instrument with ease. The success of the egg shakers aesthetic often detracts from using it as percussion instruments. After using the instrument for the first few songs, users hold onto the instrument for long periods of time during the sessions. The standardised shape smooth shape, and 'block' colours, gives the instrument a one-dimensional experience.	Hand held Sleigh Bells The instrument is easy to hold and operate during activities and is recognizable by participants. Produces a general 'nice' sound. Participants, who operate it successfully, do not use it for the entire duration of the session select the instrument at every session. Rather than using it actively participants hold onto the handle during the sessions. Because of the 'standard aesthetic' these bells do not possess features that prompt participants to explore it tactically. The instruments are recognizable by participants therefore remain 'un interesting' or speculative in live music making.
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Tambourine The calfskin and double row tambourines produce loud prominent sounds that allow more confident participation. The double row however has a higher pitch due to the presence of more metal jingles in the structure. A handle is also located in the double row tambourine allowing it to be easily held. The calfskin on the top of tambourine has a smooth surface. The size shape and weight of the tambourine often makes it hard to operate. Because of this participants often only use the tambourine sporadically and when not in use, the tambourine is often held.	Maracas The instrument is easily recognized by participants and because of its design can easily be easily operated. The smooth wooden surface of the maracas is also easy to hold. As the volume of the sound produced is ' moderate to loud' it is heard the most amongst others in the session. Because of this, participants become confident in keeping up a steady rhythm during the activity. As the oval end of the instrument holds most of the weight, this often becomes overpowering for the users.
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Appendix B

Auditory Sensory Tub and Tactile -Vibration Sensory Tub by Spacekraft

Tactile-Vibration Sensory Tub	Auditory Sensory Tub
Objectives: Contrasting experiences such as warm-cold, soft-hard,smooth-rough,reflective, absorbent, round angular	Objectives: Encourage participation Movement Hand-Eye co ordination Communication skills
1 x Sturdy Wheeled Tub 1 x Guira Shaker Tube 2 x Massage Rollers 1 x 2 Wheel Massage Roller 1 x Dome Massager 2 x Sensyball Small 1 x Koosh Balls 1 x Uv Mittens Two Pairs 1 x Backrest Massager 2 x Spider Balls 1 x Space Blanket Set Of 3 1 x Tactile Sand Tiles 1 x Mine Ball 1 x Bumble Ball 4 x Jumbo Water Wigglers 1 x Mini Cuddle Ball 5 x Finger Colour Mats	1 x Sturdy Wheeled Tub 1 x Sound Memory Game 6 x Chirping Straws 1 x Squistle 3 x Soundhose 1 x Supersoft Jingle Ball 1 x Voice Changer 1 x UV Groan Tubes 1 x Rattan Bamboo Chimes 1 x Otamatone Melody 2 x Egg Shakers 2 x Wrist Bells 2 x Wooden Frogs 1 x Musical Five Bells 1 x Clatterpillar 10 x Kazoos 4 x Tootflute

4 x Goohey Mesh Balls 1 x Tactile Hands & Feet 1 x Feelie Bags and Stand 1 x Tactile Discs 1 x Bobo Massager 1 x Crystal Organza Rainbow Pack 4 x Vibrating Farm Critters 1 x Touch and Match 1 x Massage Peanut Ball 1 x Squidgie Ball	3 x Train Whistle 1 x Mini Rainbow Maker 1 x Tambourine 5 x Talking Buttons 1 x Echo Bot 1 x Cage Bell 1 x Crocoglock 1 x Rainbow Talking Pegs 1 x Matching Sound Cubes
Price: £445.00ex VAT £534.00inc VAT	Price: £525.00ex VAT £630.00inc VAT

Appendix C

15 pc Percussion Bag and Ocean Sounds Musical by Sensory Warehouse

15 pc Percussion Bag	Ocean Sounds Musical Sets
Objectives: Offer a wide range of sounds, rhythms and tones to compliment music, dance, story telling, poetry movement play	Objectives: Explorative music making Exploring sounds of the sea and weather Sound effects Story telling
4x egg shakers 1x tambourine 1x triangle 2x maraccas 1x swing drum 4x hand bells 1x pair of finger cymbals 4 extra ones/still need to include name	1x Ocean drum 5x Bird Whistles 1x Gong 1x Jingle Stick 1x Rain stick
£70.00 Inc. VAT	Price: £89.69 Inc. VAT

Appendix D

Notes from shadowing observations

Session notes for visitations to all three wards:

Purely Observing through watching Session Structure

- All three wards have a duration of 60 minutes
- All three wards are located in an activity room/space where there are open windows.
- Two - four Carers with a manager or recreation officer are normally present in the room and
- Participants are all arranged in a circular arrangement in the group setting
- The therapist always sets up in the most central position to the group. This is so all participants can be in clear view of the therapist.
- Therapist always brings an acoustic guitar with a bag of various percussion instruments to every session.
- Therapist always warmly greets the participants introducing herself to new participants in the session asking questions like 'how was your day'.
- Therapist often remarks about the weather and temperature, asking what the recipients thought of the weather.
- Therapist will observe the overall 'mood' of the session briefly gazing across the room before beginning to play a song.
- Therapist goes around to each individual in the group with a bag of percussion instruments and asks them which one they would like.
- Therapist always shows the participants all the percussion instruments available and models 'how to use the instrument' if they are not sure how to use it.

- The session always begins with a 'hello' song and ends with a 'goodbye' song.
- All the songs chosen are from the 30s to the 70s and are familiar pop songs, local maori songs, scottish songs, dance songs, war songs and childrens songs from that time period.
- The sessions always changed depending on the overall mood of participants eg if the participants are unsettled the therapist will alter the song rhythm to settle them participants.

Appendix E

Notes from shadowing observations

Purely Observing Through Watching Participant Responses

- The visual look of the instruments were a deciding factor for the participants. Size, shape colour.
- Participants who were familiar with the sound of the instruments immediately selected the instruments.
- Participants with particular personalities selected certain instruments. For example more verbal and active participants chose instruments like the tambourine, or drums. Quiet participants chose instruments such as the egg shakers.
- Men often(not in all cases) chose certain instruments like the drums or tambourines and women(not in all cases) often chose instruments such as the shakers.
- The percussion instruments immediately allowed participants to feel included in the activity. Some participants who had limited movements still held onto instruments during the sessions

- The instruments helped patients to keep in time with the music.
- The participants who were actively using the instruments verbally and physically engaged in conversation, some spontaneous movements such as dancing.
- Participants who were limited physically and could still hear the singing and music often tapped their feet, nodded or verbally remarked spontaneously.
- Instruments such as the maracas and tambourines for participants were often too heavy to hold with one side having a greater weight. Because of this, participants often either held the instrument by the curvier end of the instrument or did not use them during the whole duration of the session.
- Participants with arthritis often found it hard to hold heavier instruments such as the drums.
- Instruments such as the tambourines and the sleigh bells with external exposed structure were explored more as participants could feel the metal jingles or the bells on the strap
- Instruments such as the egg shakers were easily held but were not used often as the participants liked to 'hold' the instrument.
- The instruments were very familiar to participants and functioned well as percussion instruments.

Appendix F

Observing through interviews, open ended conversations

Session notes for visitations to all three wards:

Purely Observing through conversing in an open semi structured interview with therapist

- Key goal for live music making with percussion instruments is to encourage movement.
- Clients to be moving is important

-Percussion is important they are easily operated 'easy to play'

-Empower clients by offering them an opportunity through using the instrument in session. This leads them to be in 'more control' over the session's rhythm and an opportunity to 'lead' and 'direct' overall session rhythm.

-Rhythmic elements are important in these sessions as the therapist has studied research done by the Auckland university into creating a social singing group for persons with neurological conditions such as Stroke or Parkinson's disease. Known as 'celebration choir', the study showed that rhythmic 'tapping' by patients has allowed them to 'move forward' through their current condition.

-Humans are naturally drawn to having a pulse /rhythm. Embedded into our physiological make up.

-Rhythm (using percussion instruments being key in the sessions helps Elderly persons with dementia who are anxious or agitated to 'slow' the 'speed' of their actions. It helps to slow their pace down and bring them into a steady rhythm

-Through the way music is designed ie with rhythm, this encourages/evokes movement.

-This response is visible in the early stages of dementia.

-Rhythm in music for persons with dementia is a way of modifying 'the pulse'.

-By controlling the rhythm/adapting it to a 'lengthened' process for elderly person, this allows them to have more time to respond to the music.

-Timing allows 'space' and 'time'

-Rhythm evokes 'energy' amongst elderly persons as they see the energy i model through leading with melody this encourages them to also be 'energetic'.

- 'Modelling behaviour' through leading the session or showing how they can use the instrument in rhythm stimulates cognitive ability and improves sessions by being involved in the music making also. This encourages other people to also model behaviour, and this prompts others to focus or join in on the behaviour in a group setting.

The Role of Song

-Song choice gives participants a space and time.

-Song choice is important and is based on memory in the MT sessions

- Songs are connected to a time,place and a person. Connects people to a memory.
- Song choice improves identity,links people back to 'who they are'.
- Memories and be relieved and remember who they are.
- Memories can be brought back through song. For example songs such as 'danny boy' often evoke sadness as they were commonly played at funerals.
- The use of historic 'dance' songs is used the practice to evoke memories of going to dances at dance halls.
- Is important to know the aesthetics of a song in the sessions ie 'when and how it was played'
- This encourages discussion,sharing experience,making new ones.
- Allows for an 'awakening' of the brain.
- Allows for participants to connect with others in a human way.Touch is important in this way too.
- The aim is to keep such discussions continuing after the session commences.

The Issue

- Percussion instruments are expensive and are purchased in kits that is large in variety but are not all effective for use in dementia sessions.
- Need for more 'stimulative element' to encourage participants who are normally do not participate in the active sessions.
- Stimulative in colour,shape and sound.
- Melodic instruments are not suitable for these sessions as it deters participants. Often participants will refuse to take a melodic instrument stating that they cannot play it.'cannot'
- Allow for more engaging interesting aesthetics that prompt discussion.
- Need for more dynamic instruments that can be appropriately used in the various setting.

Appendix G

Summary Notes from Phase 1 Rapid Prototyping Phase

Design goal: To incorporate stimulative 'interesting' textures and sonic elements together

Incorporated Features: Size and shape of the egg shaker, round handle of maracas, bells from sleigh bells

Early concepts and drawings focused on creating rapid prototypes that were to be held and operated by a human hand. these concepts were intended to be alternative instruments that were easier to hold and stimulating both visually and texturally for the participants in the sessions. Vibrant and bold colours were used to visualise the effect of colour on shape and form. Peculiar shapes, forms and textures with, more softer materials such as silicone were used. Internal sonic structures included shakers, mini bells and 'rattle' like compartments.

Final outcome:

The samples visually looked appealing, and could function to an extent as percussion instruments. The therapist favoured the tube shaped samples with the textures and thought they would be popular and pleasing for the patients. Although they worked well, critique arose from the samples looking like 'childrens toys'. More experimentation needed to happen that explored other 'sonic' prototypes using a variety of materials and a variety of processes.

Appendix H

Summary Notes from Phase 2 Rapid Prototyping Phase

Design goal: To expand existing prototypes into a broader range of prototypes with more 'purposeful' sonic considerations

Incorporated Features: All successful features

The second rapid prototyping phase saw a large selection of prototypes evolve in the design process. These included the use of sonic materials such as tin, bamboo and plastic beads worked into interesting shapes and forms. These concepts came about through research into music instrument design and ethnic music instrument design. They also included the use of fabrics such as lycra and yarns combined with new processes. The prototypes began to develop interesting 'characteristics' through visual structure design. These were percussive bead structures, bangles wrapped in rubber bands with internal bells, and tin lids wrapped in lycra. Also included in the rapid prototyping was a small handheld version of the 'touching nimbus' sculpture.

Final outcome:

Through evaluation the prototypes that were the most successful were the :

Yarn ball structure with bells- Based on 'open structure' so that one can see the bells shaking, 'comfortable' fit into hand , ability to feel vibrations of bells through the open structure. ,light weight.

Mini nimbus structure- Interesting look , 'gentle' rain like' sound it produced ,feel of external sonic structure,reasonable weight.

Clear top biscuit tin structure with beads- engaging translucent appearance due to clear top and ability to see beads rolling around the tin, varying sound output due to the sliding movement of beads in circular movement, lightweight.

Lycra wrapped tin lid structure with beads and marbles- soft lycra surface that allows user to slide and tap beads, moving the sound 'around' the tin lid, lightweight.

Frilly yellow silicone structure- stimulating surface texture, vibrant colour and ability to be easily held, lightweight, potential have sonic element developed

Coconut bead structure- gentle soft sound, interesting tactile feel to structure, light weight.

Square bangle shakers- light weight, clear internal structure, visible internal components, effective shaker sound, light weight

Through collective discussion and evaluation of the prototypes with the music therapist these samples were finally selected on their potential to be developed into more suitable testable prototypes across all sessions in the three wards.

Appendix I

Summary of Final Prototype concepts Notes

Design goal: To expand existing prototypes into a broader range of prototypes with more 'purposeful' sonic considerations

Incorporated Features: All successful features

The second rapid prototyping phase saw a large selection of prototypes evolve in the design process. These included the use of sonic materials such as tin, bamboo and plastic beads worked into interesting shapes and forms. These concepts came about through research into music instrument design and ethnic music instrument design. They also included the use of fabrics such as lycra and yarns combined with new processes. The prototypes began to develop

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Frilly yellow silicone structure- stimulating surface texture, vibrant colour and ability to be easily held,lightweight, potential have sonic element developed

Coconut bead structure- gentle soft sound, interesting tactile feel to structure, light weight.

Square bangle shakers- light weight, clear internal structure, visible internal components,effective shaker sound, light weight

Through collective discussion and evaluation of the prototypes with the music therapist these samples were finally selected on their potential to be developed into more suitable testable prototypes across all sessions in the three wards.

Appendix J

Summary of Preliminary Testing

Outcomes

The measure of success for this test was based on observations that showed behaviours associated with interaction. Two major perspectives of this test were to observe 'how the concepts worked' and 'why'. The test also included contrasting materials such as silicone, and natural materials such as walnuts, coconut beads and bamboo. Not only were these tested externally, but also the use of natural items such as 'beans' were experimented in the internal cavities of 'shaker' like structures. This was to test the sonority of the materials. Materials such as plastic and glass were also used in internal cavity structure. Bells became incorporated into the forms of some of the structure. The incorporation of these materials was intended to add 'sonic interest'. This is because such materials in the design phase showed interesting tonal qualities. Through the testing process the following samples were identified as successful:

-Nimbus- Round chime like structure consisting of many bamboo rods that can be held by a strap. The selection of the nimbus sample was based on the look, sound and function of the prototype. This spurred the interest of participants who would otherwise not participate in the session. An appropriate sized strap was needed to maximise engagement in with minimum movement

-Yellow frill- Tube shaker containing dhal beads wrapped in a textural silicone surface. The yellow frill was selected based on the visual and tactile appeal it had with participants. Carers present suggested that rather than the sound being in a 'tube' like container, it could potentially be in on the tips of the frills

-Flying Saucer- Mini metal pans containing marbles and encased in a lycra fabric. Carers suggested that for the lycra sample a handle be made at the bottom of the tin to allow users to comfortably

operate the sample. Carers also mentioned that it would be a great idea for participants' to 'make their own' flying saucer.

-Textured Silicone discs- metal disc with one end wrapped in silicone with seeds in the internal structure. Participants who were not so active used the silicone discs. The music therapist pointed out that participants used the hard tin surface more often as the 'tapping' produced more sound rather than the soft. Exploration of various textures was needed

-Yarn balls- Semi covered ball like structures of wrapped yarn with internal bells. The yarn balls were visually successful however structurally 'caved ' in. The therapist suggested trialling a 'squeezable' structure rather than fixed'

Appendix K

Summary of Final Test 1

Prototypes Tested

Yellow lycra frill, squash able yarn balls, lycra (name changed from 'flying saucer')disc with green glitter texture, lycra disc block texture and a wooden disc, textured tin with blue jewels, nimbus, painted satin percussion tins, semi translucent tin lid

Successful Outcomes

-Nimbus- Round chime like structure consisting of many bamboo rods that can be held by a strap. The strap height was adjusted silicone was used to allow for a more comforting hold. This allowed the palm to be closer to the bamboo sticks/participants able to feel vibrations. As one of the nimbus samples had a 'pink' strap, the colour of this became favourable by one participant. Different lengths of bamboo were applied to give the structure tonal variety A participant with Asian heritage immediately selected sample.

-Textured Tin with blue jewels- white lycra encased tin with blue jewels on the surface visually engaging. Having one end covered in fabric and the rest closed allowed for more sound to escape through lycra.

-Semi translucent disc- White lycra encased tin with plastic beads. Transparency drew participants engage in visually examining the sonic structure of the disc. Because of the softness was often held

-Yarn balls- Semi covered ball like structures of wrapped yarn with internal bells with squashable structure. As a test this did not work as participants did not want to use it because of the 'squashy structure'.

Unsuccessful outcomes

The unsuccessful samples in the testing phase were the lycra discs with marbles both red and green, the yellow frills with the bells and the pattern satin disc. The carers present made certain point that the discs too heavy for participants, thus stalling the participation of residents. The frills 'looked interesting' and contained textural elements, however it lacked 'sonic volume' due to the fabric dampening the sound of the bells. The discs were textural in print however this did not prompt an exploration of surface. Emphasis must be made on 'refining sound' and considering more 'pleasant sounds'.

Appendix L

Summary of Final Test 2

Nimbus, two -tone turquoise textured disc (half jewels half velvet), pompom textured disc, wooden ball with marbles

-Nimbus- Round chime like structure consisting of many bamboo rods that can be held by a strap. The strap material was changed to stretch velvet to add more 'stretch' and bounce in the movement. The lengths of the nimbus were evenly placed ie 1 x nimbus had all equally long pieces of bamboo and 2x nimbus has shorter yet similar pieces. The structure needed to be reinforced as the movement caused the sticks to fall through.

- Two -tone turquoise textured disc (half jewels half velvet) white lycra encased tin with turquoise jewels and velvet on the surface visually engaging. Sonic components inside included bells and plastic beads. Comments mentioned it as being the most 'visually appealing' or the two discs. People who are not as active are able to be included as it required less movement to use

-Pompom textures disc(same internal sonic structure) - White lycra encased tin with plastic beads. Participants drawn to softness however the pom poms were mistaken at times for 'lollies' and participants began picking at the texture. Carers weary of the pompoms being swallowed etc.

-Wooden marble discs- marbles wrapped onto a flat round wooden disc. A strap exists under the disc to allow the user to hold firmly in the hand and shake. The user is also able to move marbles around the flat surface. Though this was engaging because of some sonic properties, it was still too heavy for the participants.

Unsuccessful outcomes

The textured pompoms will not be used as this sample is not suitable for participants with varying comprehension. The marble sample will be discontinued as this is too heavy on the hands and a new design created that is more suitable for participants. The translucent discs will be introduced and the textured disc will use new colour arrangements and textural gems in the design for the next phase. Must refine sonic elements.

Appendix M

Summary of Final Test 3

Nimbus, felt textured disc, new jewel disc, translucent shaker disc, new lycra disc design

-Nimbus- Round chime like structure consisting of many bamboo rods that can be held by a strap. The structure had been reinforced through wooden beads at the tops of the sticks. This was to allow for a smoother feel of the sticks. This was also added to maintain balance of the sticks whilst moving. A cultural connection was established with another member with an Asian background chose this instrument and interacted with it. Will need to secure beads thoroughly though

-Textured Tin with felt textures- cotton encased tin with a textured felt surface on the top. Sonic structure contained plastic beads. Sample extremely successful with participants who are not completely mobile. As it sits on the lap, this sample is most effective for minimum movement-sonic output.

-Translucent disc- White mesh encased bamboo, wood veneer tin with a striped interior surface and colour contrasting beads. Will need to secure structure. Transparency element visually appealing. Users often commented on the sound being similar to 'sand'. A played this for a user who began to respond to the sound it produced through their behaviour

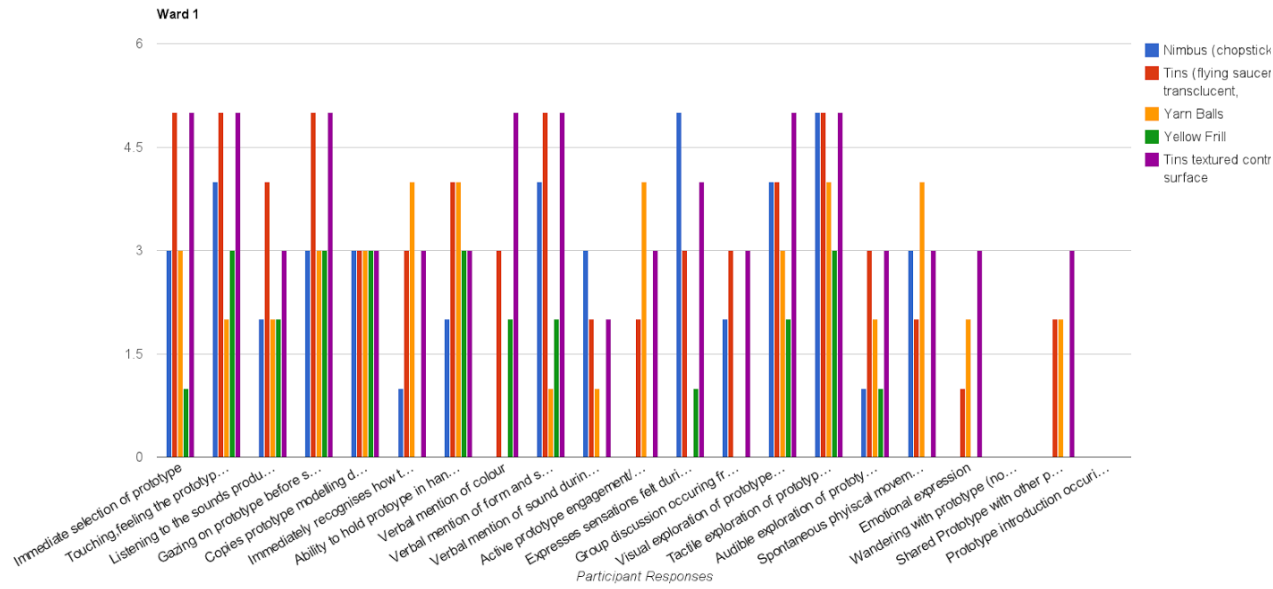
-Yarn balls with internal bamboo structure and varying bell tones- hugely popular but needed reinforcing in the structure. Colour would need to be used as a colour cue for identifying deeper sounding bells and higher pitch sounding bells

Unsuccessful samples

Lycra beads and the acrylic gem samples were removed from the testing phase due to structural and safety purposes.

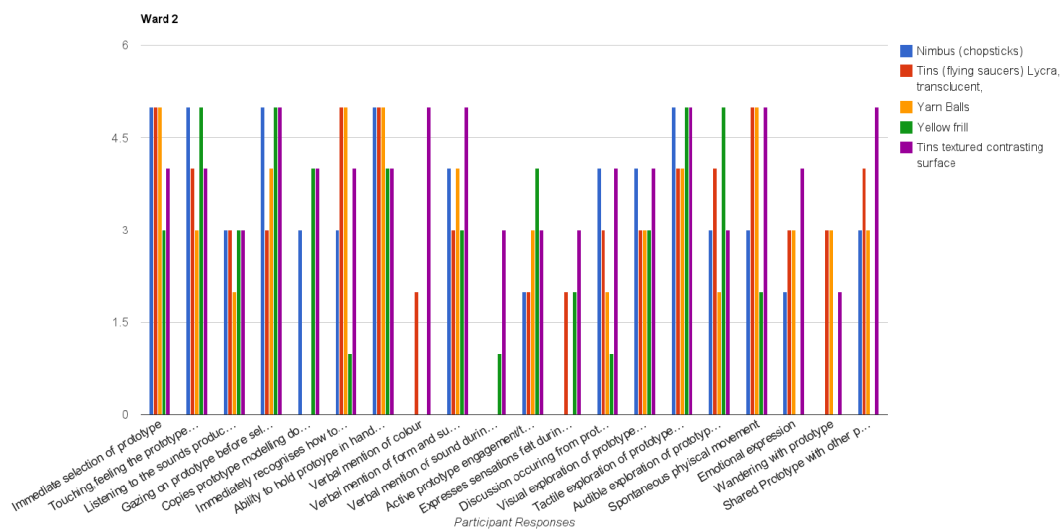
Appendix N

Final Testing Phase 1 Ward 1



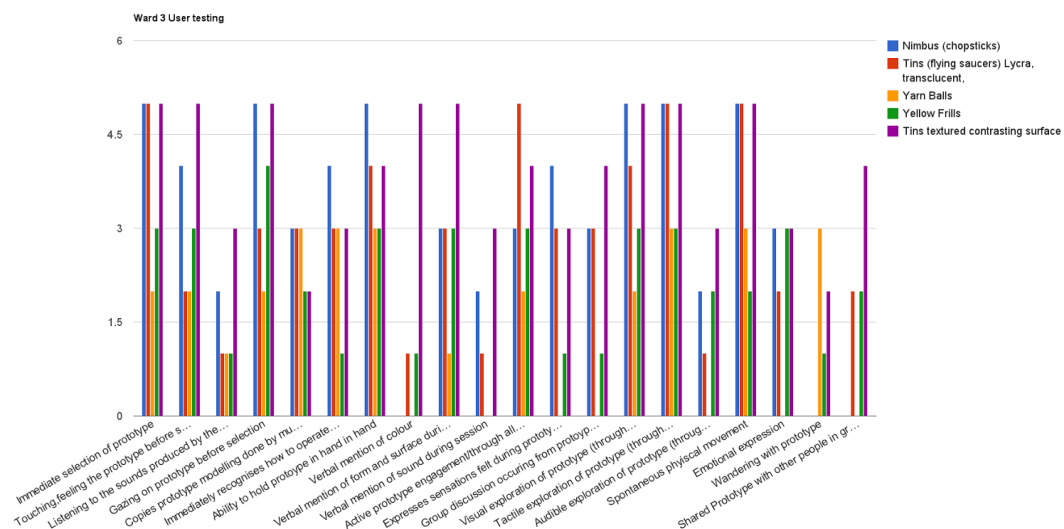
Appendix M

Final Testing Phase 1 Ward 2



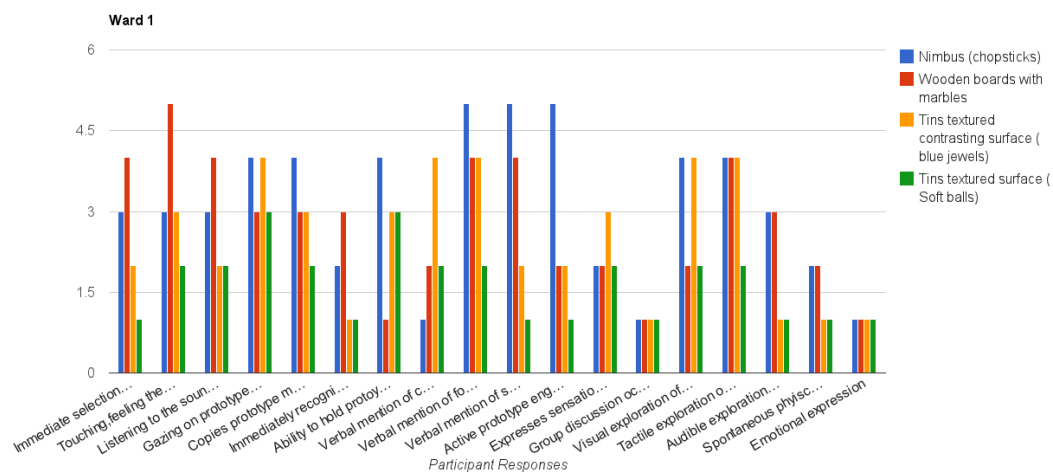
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Final Testing Phase 1 Ward 3



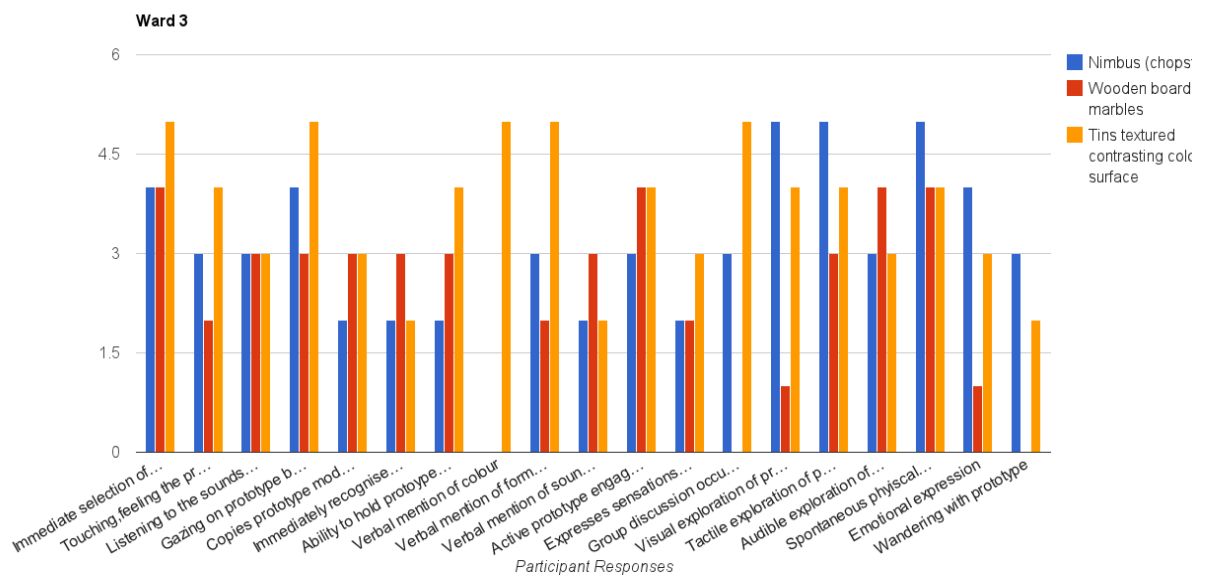
Appendix P

Final Testing Phase 2 Ward 1



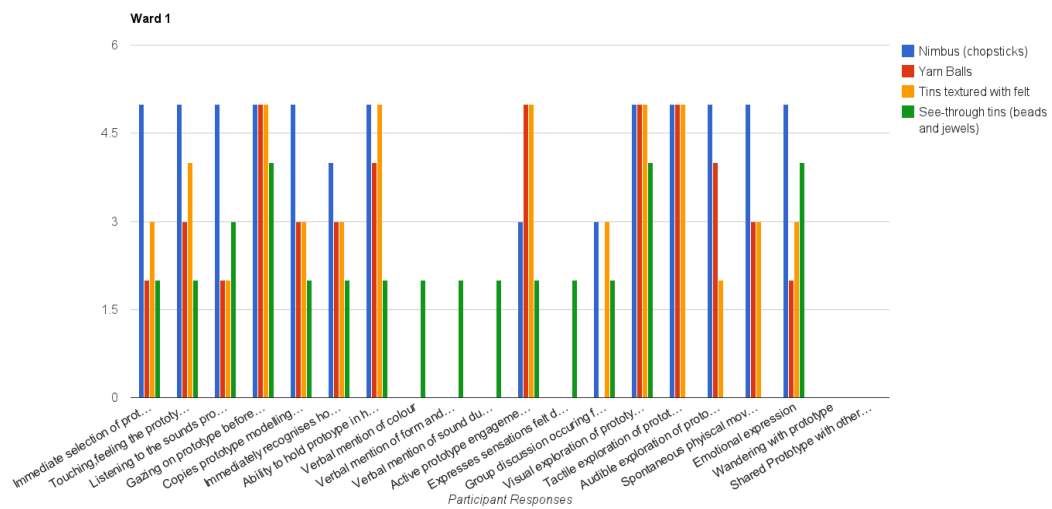
Appendix Q

Final Testing Phase 2 Ward 3



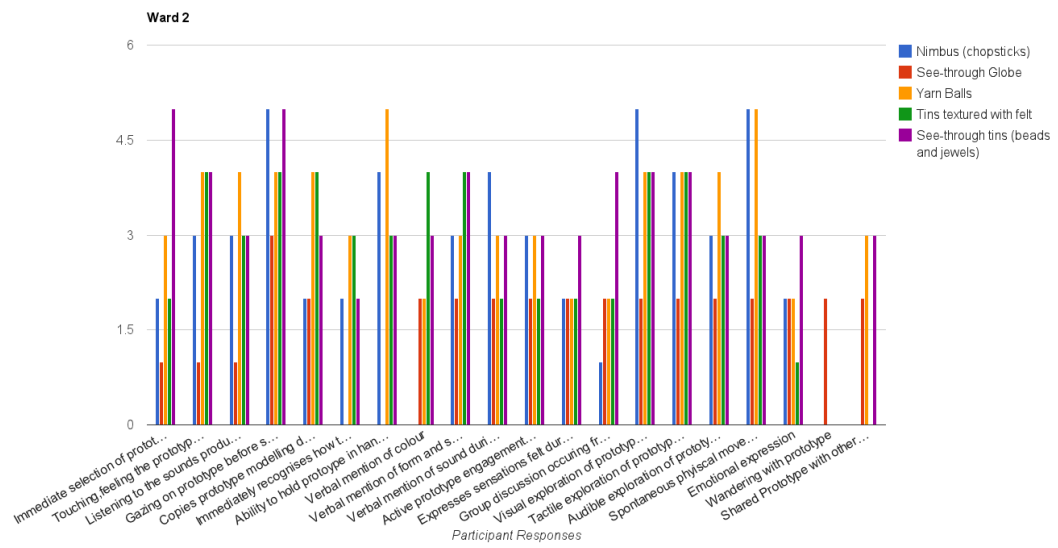
Appendix R

Final Testing Phase 3 Ward 1



Appendix S

Final Testing Phase 3 Ward 2



Appendix T

Final Testing Phase 3 Ward 3

