EXPLORING MOBILITY IN MUSIC

RESEARCH DISSERTATION

QUT INDUSTRIAL DESIGN

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ABSTRACT

Live music is a core aspect of entertainment across the globe. Given its importance, research into existing literature suggests that the health of travelling musicians (both mental and physical) is often overlooked, especially by the musicians themselves. However, there was a distinct lack of information regarding how the equipment that musicians use (sometimes on a day-to-day basis) effects their health, and as to how they feel towards equipment that serve as more portable, lightweight alternatives. After a thorough experimentation and analysis process, it was found that some musical equipment does have a negative impact on the health and wellbeing of musicians. However, the majority of those involved in the experiment felt that the benefits of lightweight, portable products do not outweigh the negatives caused by the compromises made to enhance portability. Therefore, most musicians still choose to use traditional equipment. Furthermore, several key issues with access to venues was highlighted, however these issues are largely accepted by the musician community as 'part of the job'. As supported by both primary and secondary research, musicians tend to sustain injuries that lead to health complications in later life – this cycle continues, as young musicians are forced to work in environments unsuitable for the task, and to use equipment that causes harm towards the user. Therefore, action can be taken to ensure musicians of today do not risk their health for the future.

Contents

INTRODUCTION

Musicians, together with their equipment, are often travelling between venues, studios, and their own home for performance and/or practice. Just as an example, Elton John's current "Farewell Yellow Brick Road" tour (as of the time this article was written) has seen over 120 venues across the globe (*#EltonFarewellTour*, 2020). Although this is arguably one of the world's largest current tours, with hundreds of members involved in production, the core principle moving people and equipment from venue to venue still applies. Hence, this research explores ways in which musicians travel, identifying key pain points in the moving process.

Travelling while on tour, or simply moving from the home to a local gig, involves a great deal of pressure, both mentally and physically. Musicians often play until the early hours of the morning, for either financial or recreational reasons, with some repeating these activities many nights in a row. Health is usually a factor of little importance in the daily life of a musician, and the mental strain of late-night performances, combined with physical overexertion of moving equipment and extended practice usually results in significant health risks (Ackermann, 2002). Unfortunately, these health risks are overlooked by musicians, as the benefits that touring or gigging offers, such as exposure to broader audiences (potentially employers), artistic promotion, and their overall passion for music outweighs the negatives caused by health problems. The pain induced by long-term injury is sometimes acknowledged, but mostly ignored by the most devoted and passionate musicians, as time spent away from their instrument is unacceptable, for either financial or personal reasons (Bosi, 2017).

The purpose of this report is to explore the health problems amongst musicians, the cause of those problems, and to find if there are any potential gaps in the current research available. It could be argued that, if a stress or strain could be removed (either mental, or physical), musicians could see not only a healthier lifestyle, but improved performance in circumstances where the quality of the performance is crucial. It would be safe to suggest that music is a highly passionate subject for many, and many positives would come from a solution to problems caused by the nature of the business. Hence, the aim of this project is to find a design solution to aid musician health and wellbeing while operating in a touring, busking, or mobile gigging environment.

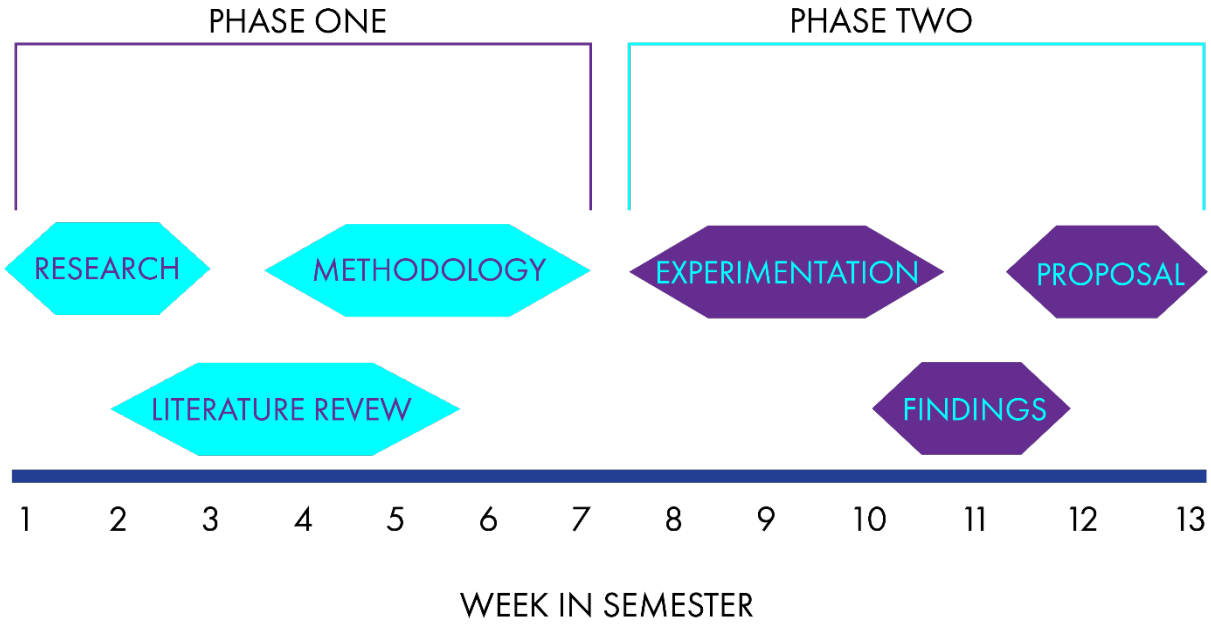


Figure 1 - Graphic Visual of Semester Project Overview

LITERATURE REVEW

TOURING and HEALTH

Musicians (and their supporting road and production crew) are often subject to various mental or physical stresses, depending on their role (Ackermann, 2002). It is of the musician's best interest to play at the peak of their abilities – if health problems occur, due to injuries sustained while playing or during the move from venue to venue, player skill is compromised, adding to the natural pressures of live performance (Ackermann, 2002). Typically, on top of sustained injuries, downtime between sets is also limited, preventing the musicians and production staff from getting the rest they require (Ackermann, 2002). More specifically, musicians and their supportive staff must endure poor sleeping arrangements, sudden climate changes, and cramped and drastically different work environments from show to show (Ackermann, 2002). Regardless, touring has obvious benefits for the careers of the musicians involved – more widespread exposure, travel experience, aural tuning (from experience in performing in venues with acoustic differences), and an enhanced artist profile (Ackermann, 2002). It can be argued that these benefits, in the eyes of the musicians involved, do outweigh the negative health effects caused, due to the possibility of career enhancement or financial support. Other than Ackermann's investigation, there is little research into this field (injuries of musicians while on tour).

A study conducted by Braulio Bosi showed that upper-body injuries accounted for up to 80% of total injuries among participant professional musicians with years of touring and playing experience (Bosi, 2017). A study conducted in the Netherlands showed that amongst the 13,000 instrumentalists tested, more than 60% of the group had musculoskeletal injuries that rendered some individuals unable to play due to pain (Bosi, 2017; Rietveld, 2013). Keyboardists and guitarists have been shown to be most prone to cumulative trauma disorder, with their activities playing their instrument only slightly less harmful than overusing computers (Bosi, 2017). It was found that upper-limb pain problems occur more frequently in music students, who had not yet experienced a professional music environment, even when compared to students in health, fitness, or athletics (Bosi, 2017).

The primary issue faced by musicians regarding their health is that, more often than not, they are unwilling to sacrifice their careers or passion for music for the sake of necessary rest and recovery (Bosi, 2017; Guptill, 2011). Time away from an instrument is usually unacceptable for a professional musician – while it could be argued that less serious musicians can accept to take the correct time to rest and recover, a professional's passion for playing usually wins over any practical requirement for health. Bosi interviewed several student musicians, and the results showed that while some students sought the necessary help for their sustained injury, most only acknowledged their injury and continued to play through the pain (Bosi, 2017). This attitude could be linked to another study of 59 professional musicians, where over 70% of the

individuals had sustained a playing-related injury, yet the same percentage of those interviewed refused to take time off (Bosi, 2017). The unwillingness of musicians to properly rest and recuperate was also shown in research conducted by Christine Guptill, who found that her participants (professional musicians) all had long term injuries, and similarly to Bosi's findings, all continued to play (Guptill, 2011).

Another, more focussed area of health in music revolves around the injuries sustained during drumming and percussion. Drumming usually involves very specific muscle movement – primarily, movement of the wrist, elbow, shoulder, and ankle (Workman, 2006). Most, if not all injuries sustained by drummers during playing are often caused by improper technique – wrist over-rotation, tight thumb grip, poor posture, or extreme movement of the shoulder can be remedied simply by working on technique or adjusting the setup of the drum kit or other percussion equipment (Workman, 2006). This school of thought is supported, albeit in a more general fashion, by Basil Tschaikov in the book *Physical and Emotional Hazards of a Performing Career*, who states that technically trained musicians are less likely to develop musculoskeletal issues (Tschaikov, 2012). However, other issues such as headaches, poor sleep, and irritability are caused by stress (Workman, 2006). Furthermore, overuse and awkward movement of the back or shoulders can also cause serious injury, especially when in regard to moving heavy equipment (Workman, 2006). It is safe to suggest that this information is linked to injuries sustained while touring – decreased down time and constant movement between venues could only increase stress levels, and further exacerbate injuries sustained.

A study from the journal *Medical Problems of Performing Artists,* which included 279 participants, indicated that musculoskeletal and mental health problems are severe issues amongst auxiliary (triangle, wood block, tambourine, etc.), keyboard (xylophone, marimba, steel drum, etc.), or membranophone (drum kit, timpani, marching drum, etc.) percussionists. Of those involved in the experiment, 77% of the group reported to having a playing-related musculoskeletal disorder (PRMD) – the keyboard percussionists had much larger numbers of PRMD's than the auxiliary and membranophone groups, with 89%, 79%, and 74%, respectively (Sandell, 2009). Amongst the injuries, the hands, arms, and lower back were most affected (Sandell, 2009). Furthermore, roughly 75% of all players reported very high stress levels due to their work environments, regardless of previous injuries sustained (Sandell, 2009). This stress caused fatigue, depression, and stage fright amongst those affected (Sandell, 2009).

Given the results from the research, a large majority of professional, non-professional and student musicians are put under great amounts of stress due to either injuries, their work environment, or health choices. It would be safe to suggest that this is a highly common theme that exists within the available research – each article supports the other regarding the injuries, results of stress on the individual, and the

causes for each. Furthermore, it can also be argued that regardless of the research, musicians still choose to ignore their symptoms due to their career path, financial pressures and ultimately, their passion for their instruments.

MUSICIAN IDENTITY

Due to the passion involved with musicians and their instruments, it would be safe to suggest that their identity as an artist is crucial for their own levels of self-esteem and artistic directions, regardless of whether the musician is professional. Some key aspects of the life of an indie musician, who are not strictly professional or classically trained, were highlighted in a study of the indie music scene in Brisbane by Ian Rogers. 'Indie' music can be classified as back to basic, stripped-back music with little to no professional input or planning (Rogers, 2008). Amateur musicians, with 'jangly' guitars and low-budget equipment, have created a music culture within Brisbane that almost universally disregards the dream of becoming famous or financially prosperous (Rogers, 2008). Instead, the indie music scene is dominated by those who play music purely recreationally, as a means of socialising, and in some cases, soothing anxieties or other mental health issues (Rogers, 2008). Due to the low-budget nature of the scene, most gigs are played to smaller audiences, in venues hired unofficially that are often hot, cramped, have limited access for equipment, and are arguably not suited for live music (Rogers, 2008). This suggests that the health of many of these amateur musicians is at risk, due to the poor standard of venues that are rarely optimised for live music. If injuries are sustained (which, as previously discussed, is highly likely given the individuals in question), these amateur musicians could lose their primary form of recreation. Musicians would also begin to suffer from any mental health issues that were previously soothed by their recreational activities. In turn, the identity of the musician would be compromised, further exacerbating mental health issues and lowering self-esteem.

The identity of a musician is impacted heavily by their experiences on tour, as is the construction of their identity (Nóvoa, 2012). Thousands of musicians move between city, country or town on a daily basis, as for some, mobility is intrinsic to being a musician (Nóvoa, 2012). A 2012 study on the tour experience of a revival band specialising in the genre of 1960's Jamaican reggae, "The Stingers" revealed the thoughts of the band throughout their journey between countries. The members travelled across six countries, with the tour lasting three weeks overall (Nóvoa, 2012). Each member of the band was a freelance musician while not on tour, each playing in small venues such as bars and clubs daily, to support their families (Nóvoa, 2012). The tour itself was in fact a financial loss to some of the members – this indicates the importance of touring, not for financial support, but as a means of gaining experience and identity construction (Nóvoa, 2012). That said, each member of the band refused to take risks that could lead to

financial instability (Nóvoa, 2012). It was found that the tour itself was both mentally and physically exhausting, with no paid road crew (roadies) or production team to assist in setting up for each show (Nóvoa, 2012). However, the musicians still thrived, as they described touring as simply a 'response to an impulse', with no objective reason to tour (Nóvoa, 2012). The atmosphere of the shows, the experience setting up for shows, the time spent on the road, and the fellowships created on tour were found to be essential for the artists identity as a musician (Nóvoa, 2012).

Given the importance of touring and mobility for a musician, it could be argued that the ability to efficiently relocate and perform to the best of the musician's ability is paramount for mental health and personal development. Furthermore, whether music is played for financial support or recreation, time spent away from the instrument is not viable (as discussed in sections prior). Mobility is key in live music culture – taking this away from a musician would ultimately destroy their sense of identity, self-esteem, and sometimes, a primary source of income (Nóvoa, 2012). Hence, it would be safe to suggest that a solution to any hidden pain points within the touring or gigging process for a musician would be welcomed, given it successfully enhances the experiences of the user. Consequently, a musician can enhance their own artist profile, and more positively construct their identity.

MUSICAL EQUIPMENT – LIFTING and CARRYING

There is no literature analysing the ergonomics or issues of lifting and carrying musical equipment. However, most musical equipment required for even a small gig sometimes requires two people in order to load in and out of venues. For example, a drum kit usually includes a set of basic 'pieces' for a genuine playing experience. An assortment of these pieces was weighed, in their carry bags, using a set of scales – the results are shown below in Table 1 (see Appendix 1 for images of weighed pieces):

TABLE 1 – WEIGHTS OF ASSORTED DRUM KIT EQUIPMENT

EQUIPMENT	*WEIGHTS*
BASS DRUM	14.9kg
SNARE DRUM	4.7kg
FLOOR TOM	9.7kg
HARDWARE	Hi-Hat stand – 6kg
	Cymbal stand – 6.5kg
	Snare stand – 4.7kg
CYMBALS (x5)	9.9kg
TOTAL	56.4kg

Assuming only a rudimentary drum kit is required (three drums, a hi hat assembly, and two crash cymbals with stands), the total weight comes to more than sixty kilograms. For clarification, only one cymbal stand was included in the total weight stated in the table – a very basic drum kit set up requires at least two crash cymbals and their stands. A hi-hat assembly includes both the stand and hi-hat cymbals.

As previously stated, independent acts such as The Stingers were forced to carry their own gear, without the aid of a professional hired road crew. Therefore, it can be safely assumed that a band member (most likely the drummer himself), was expected to load up to or beyond sixty or seventy kilograms of drumming equipment alone, before taking into account the backline (foldback speakers designed to allow musicians to hear themselves during performance), or any lighting equipment.

A study was conducted to explore the issues faced by United States Air Force (U.S.A.F) personnel in regard to lifting, carrying, or handling items (Kemp et al., 2010). Although not directly related, it could be argued that the results of this study (and similar studies) could be applied to musical equipment, as the weights of items carried could be similar. The study found that, between 1993 and 2002, overexertion injuries caused the most lost workdays in the United States (U.S.) workforce (Kemp et al., 2010). A survey in 2003 concluded that twenty-six percent of all injuries that year were due to overexertion (Kemp et al., 2010). Over a 10-year period, over four thousand injuries were caused by overexertion while lifting, carrying, or handling in the U.S.A.F. – this resulted in over 24,000 lost workdays (Kemp et al., 2010). The objects that caused the most injuries included boxes of Meal Ready-to-Eat (M.R.E.), which weigh only 9.75 kilograms (Kemp et al., 2010).

Given that the bass drum weighed was more than fourteen kilograms, it would be safe to suggest that anyone given the task of lifting the bass drum alone would be at risk of musculoskeletal injury due to overexertion. Articles studied prior made it clear that among the amateur and independent live music communities, the musicians themselves are forced to manage their own equipment, thereby putting themselves at risk of injury. This assumption of supported by the results of the studies analysed regarding ongoing musculoskeletal injuries among musicians – with this information in mind, it could be possible that the equipment used by musicians is causing several the injuries sustained, on top of poor playing technique and mental exhaustion.

Between 2017 and 2018, the Australian Bureau of Statistics (A.B.S.) found that the leading cause of work-related injuries was due to lifting, pulling, bending, or pushing equipment (see Figure 2 for graph from the A,B.S.)(*Work-Related Injuries, Australia, Jul 2013 to Jun 2014*, 2014)(NOTE – this reference is

outdated, and therefore shows the incorrect date). This proves that injuries due to lifting and handling are not limited by geographical location or profession. Furthermore, the task of lifting heavy items is more physically harming than some may suggest. This would further support the theory that musicians are more in danger of injury due to their work or recreation.

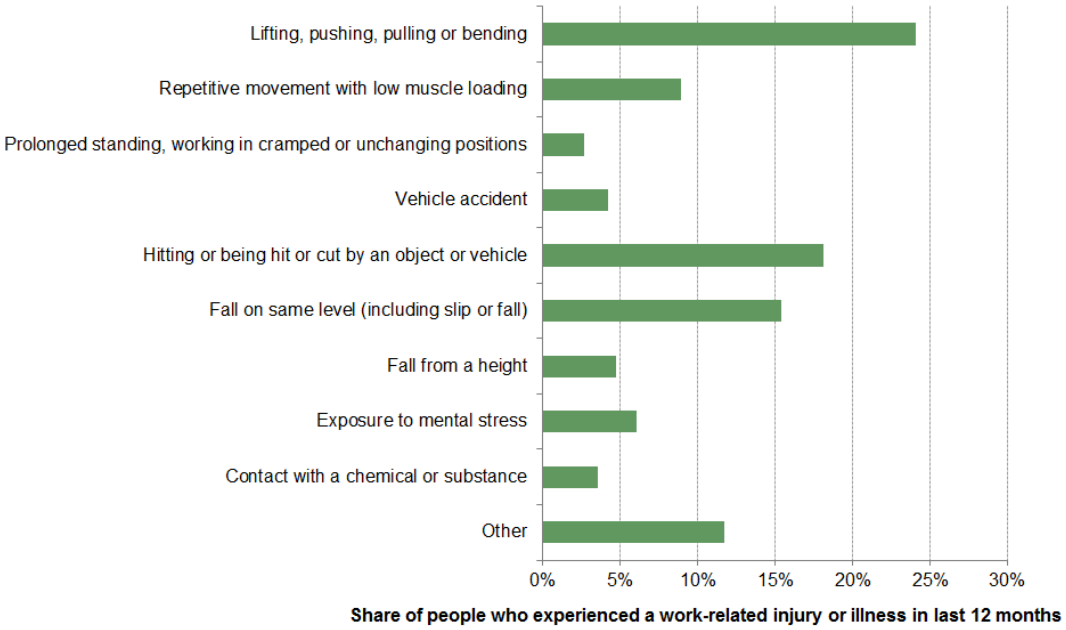


Figure 2 -- Graph highlighting causes of injury among Australian workforce (Work-Related Injuries, Australia, Jul 2013 to Jun 2014, 2014)

CASE STUDY – CURRENT SOLUTIONS in MOBILE PERCUSSION

The purpose of this case study is to analyse existing solutions for a mobile musician – more specifically, a mobile drummer. As the initial weight testing of a drum kit proved, drums are heavy, cumbersome items that, if handled incorrectly, could cause the handler musculoskeletal injuries. Two products were chosen, from leading percussion manufacturers, and product reviews from reputable music magazines were studied to find common issues or highlights of each product.

PEARL RHYTHM TRAVELLER

Figure 3 - Pearl Rhythm Traveller (Pearl, 2020)

Jim Miller, from the Jazz Times Magazine, described the Pearl Rhythm Traveller set as optimal for silent practice (Miller, 2019) (see Figure 3).

Miller also stated that the Rhythm Traveller was suitable for recording, as the single-head nature of each drum eased microphone setups within the studio (Miller, 2019). He noted that the drum kit was a flexible, easy to tune product that suited a variety of musical applications; however it was not without flaws (Miller, 2019). During playing, the bass drum was subject to forward creep, as the weight of the product was not enough for stable playing (Miller, 2019). Furthermore, when mounting rack toms in a comfortable playing position, the short depth of the bass drum caused more stability issues (Miller, 2019).

Mark Parsons from the Modern Drummer Magazine had similar feelings towards the Rhythm Traveller kit. He noted the kit had two distinct strengths – a quiet practice kit, and a very portable gigging kit (Parsons, 2001). In conclusion, similarly to Miller, Parsons felt that the Rhythm Traveller was a kit suited for the mobile, working musician (Parsons, 2001). Parsons also shared similar feelings to Miller regarding the instability of the kit.

In summary, the Pearl Rhythm Traveller is a high-quality mobile drum product, with the ability to perform well in a small range of environments. However, the kit does not come without flaws, as stability problems hinder the user experience. Furthermore, other than quiet practice or specific recording situations, it could be argued the kit does not excel in any other environment, as the product lacks the tonal and sound projection qualities required for high-quality, live performance.

TAMA COCKTAIL-JAM

Figure 4 - Tama Cocktail-Jam (TAMA, 2020)

MusicRadar's Adam Jones had mixed feelings about the Tama Cocktail-Jam portable drum set (see Figure 4).

While the build quality was good, the volume of the kit was lacking (Jones, 2014). The tonal qualities of the toms and kick drum were also unacceptable when compared to double-headed toms of standard drum sets – due to the construction of the kit, the 'floor tom' acted as a muffler to the kick drum, reducing volume and tone quality further (Jones, 2014). In conclusion, while a quality product, the Cocktail-Jam was deemed too niche to suit any musical performance environment (Jones, 2014). Given the Cocktail-Jam kit shares a single-headed design with the Pearl Rhythm Traveller, the latter product could also share the tonal issues that the former kit suffered from. However, this issue was not mentioned by the reviewers.

CASE STUDY SUMMARY

As mentioned by the reviewers, drum kit products aimed towards enhanced mobility share several compromises in their designs that, ultimately, hinder the user experience. While enhanced mobility and light weight are advantages for a mobile musician, these products fail to offer the tonal qualities or overall 'feel' of a real drum kit. There were no further reputable sources of information for the Tama Cocktail-Jam kit, therefore first-hand testing may be required to deduce the validity of the opinions shared.

LITERATURE REVIEW SUMMARY

It is clear that there are a number of common themes and concepts among research regarding musician health and live music touring, Untreated musculoskeletal injury and mental health issues are prevalent among professional and amateur musicians alike – statistically, it is caused by poor technique, the stress of performance, or mental overexertion due to lack of sleep. However, studies conducted analysing injuries among workforces indicate that lifting, pulling and handling activities are far more harmful than one might suggest. As proven by first-hand research into the weight of common instruments, these musical items often match or exceed the weights of items that have caused the loss of thousands of workdays in the workforce worldwide. Therefore, physical overexertion due to heavy equipment handling could also be a cause of musculoskeletal injury among musicians. Injuries sustained are further exacerbated by the musicians due to their almost universal unwillingness to treat the injury, due to financial pressures or their own passion for playing, Finally, research into existing portable percussion equipment showed that while the products are built to high standards, the compromises made hinder the playing experience.

It must be noted that due to the niche topic chosen, there were very few scholarly articles available for study. Hence, efforts were made to find articles with information that could be related to the topic. Furthermore, there is a clear research gap regarding the effects heavy musical equipment has to a musician or road crew member. While no studies have been directly aimed at this subject, there is potential for further investigation using firsthand experimentation.

RESEARCH DESIGN

EXPERIMENT

The experimentation process involved a combination of questionnaires and online interviews. Due to the unusual social circumstances of the time of writing this report, face to face interviews were not possible. For categorical purposes (such as age, gender, years active, etc.), quantitative information was required – quantitative information does not provide the necessary detail required for the purpose of this report. Therefore, the primary portion of data collected was qualitative. While more challenging to analyse, qualitative data provides a deeper and more genuine insight into the opinions of real-world users (NSW Government, 2020). Regardless, the purpose of the experiment was to gather the opinions and knowledge of people dedicated in the field of live music, in order to find hidden pain points within standard processes. Furthermore, the questions in both the surveys and interviews aimed to fill the research gaps found during the literature review - the lack of information regarding injuries sustained while moving musical equipment.

RESEARCH METHODS

QUESTIONNAIRES

The questionnaire included fifteen questions total, with four dedicated to quantitative data for categorisation purposes. These questions are age, gender, years active as a musician, and instrument group. The questionnaire was tested to ensure the correct time is allocated for each participant. The questionnaire was promoted using social media platforms such as Facebook for a total of four weeks in order to reach the maximum number of musicians possible, and to ensure a broad and unbiased response pool. The time frame also ensured the data used for the analysis process was final and did not change before submission.

INTERVIEWS

The interviews were of the 'semi-structured' type, as those interviewed would most likely be more comfortable will a less formal approach to the interview process. As a result, the answers should be more genuine, with allowances for deeper conversation in subject areas potentially undiscovered by the literature review or questionnaires (Barriball & While, 1994). The interviews were tested and scheduled to ensure there was correct time allocated for each interview. For the purpose of this report, it was decided that the interview transcriptions should not be written in verbatim, as that level of detail is not required.

PARTICIPANTS

Each participant of the questionnaires and interviews will be musicians of differing levels of experience and skill. In order to keep responses unbiased, musicians with different primary instruments and teaching backgrounds will be welcome to participate in the questionnaire. Regarding the number of participants, approximately four interviewees were contacted through appropriate social media channels. The number of responses from the questionnaire was largely dependent on the popularity of each social media page used.

ANALYSIS

The data was collected over the course of four weeks and coded using the Miro software.

QUESTIONNAIRE CODING

The coding of the data separated responses and highlighted shared opinions, experiences, pain points, and positive comments. Miro was used to more efficiently group the responses and ensured the information is presented clearly upon final presentation. This will also ensure whatever design is proposed will have the most appropriate research support.

INTERVIEW TRANSCRIPTS

Each interview was recorded for audio, and transcripts were made shortly after. The information from the transcripts were then manually coded using Miro in a similar method to the questionnaires, to ensure the data was grouped efficiently, effectively, and consistently.

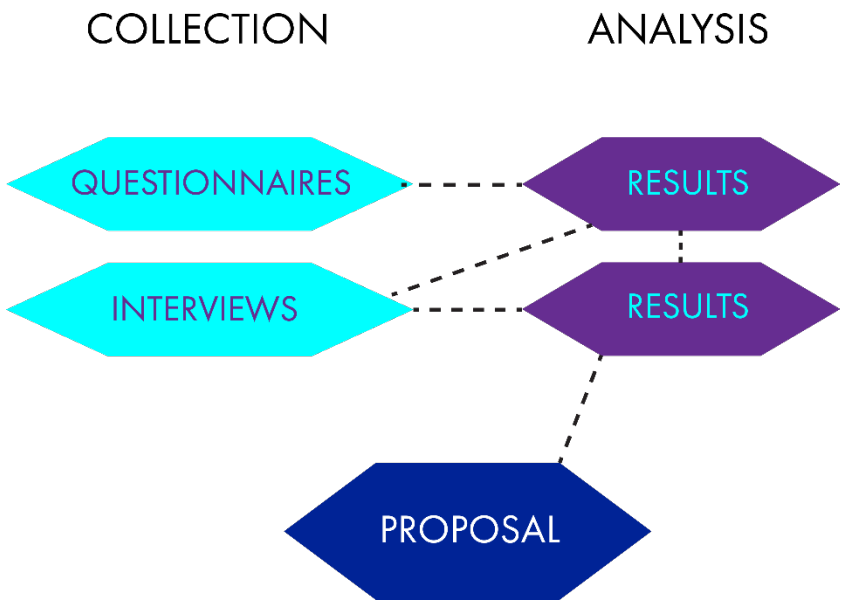


Figure 5 - Graphic Visual of Research Design Process

RESULTS

ANALYSIS

QUESTIONNAIRE

Over a period of four weeks (April 26th-May 17th), the questionnaire was left open to responses from the Brisbane Drummer's Group and the Australian Musician's Discussion Group. Once the survey was closed, it had collected a total of 33 responses, however not all 33 responses were complete. Regardless, the data collected from the questionnaire offered a vital insight into the thoughts and opinions of musicians nationwide.

The quantitative data collected was used to make charts to represent the data more accurately (see Appendix 5 for the remainder of summary charts). The questionnaire was analysed using the Miro organisation software (see Appendix 6.1 for the questionnaire Miro boards). Frames were made to suit the qualitative questions, and the responses were placed on the frames and split under headings such as "positive experiences", "negative experiences", and "general comments". If opinions were shared, or common keywords were found, the response was colour coded to indicate the similarities. Further charts were made using these codes to best show the data in a clear format.

INTERVIEWS

As mentioned previously, interviewees were contacted primarily through Facebook, however personal connections had been made prior to online contact through social activity within the live music scene. These interviewees were four percussionists, each with largely different backgrounds and experience levels. Similarly to the questionnaire responses, the interview transcripts were placed on individual frames within Miro (see Appendix 6.2 for the interview Miro boards). To keep analysis consistent, headings such as "Positive experiences" and "Negative experiences" were used to separate the extracted data. After individual transcript analysis, the responses were copied and placed into a master board to properly analyse and connect common themes, ideas, and opinions.

QUESTIONAIRRE FINDINGS

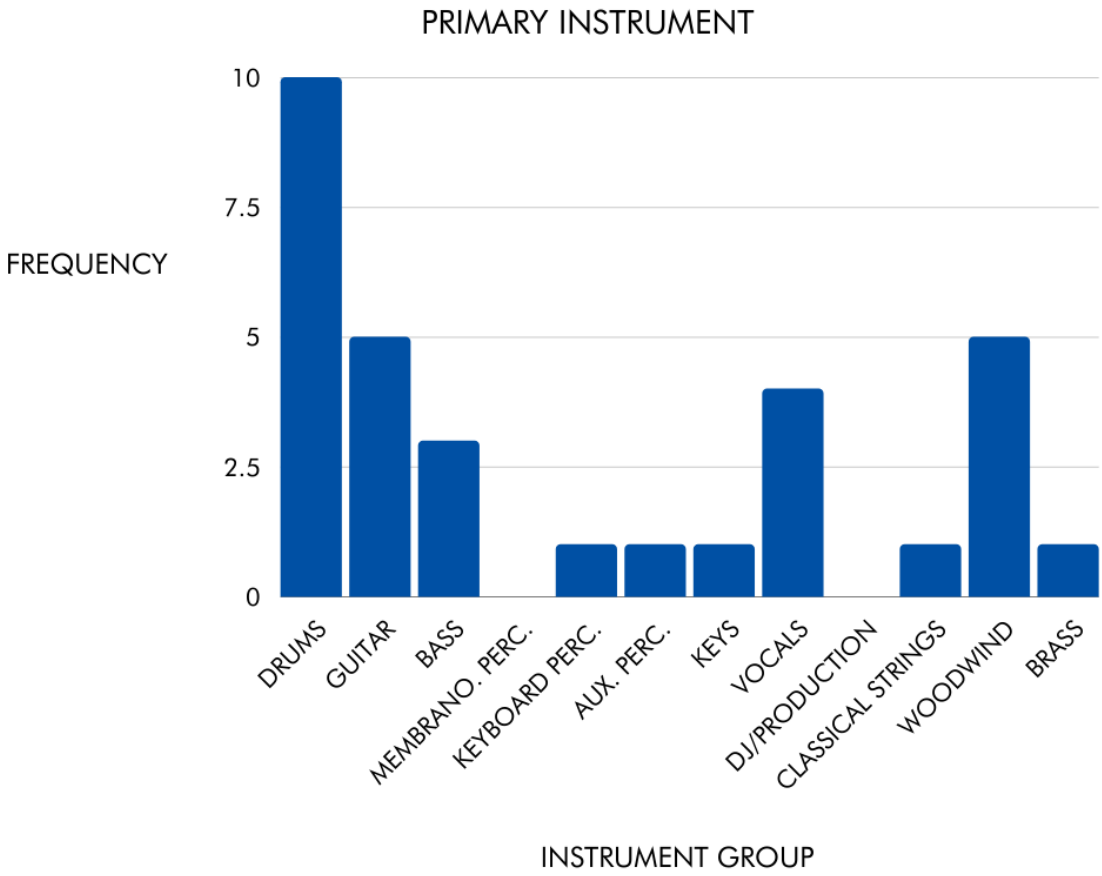


Figure 6 - Survey Respondent Instrument Groups

Figure 6 shows a summary chart of the numbers of musicians in each instrument group that took part in the questionnaire. It must be noted that due to the types of pages the questionnaire was shared, there were more drummers in the sample size. However, there was still a broad range of instrument groups. The most popular ages within the sample were between 18 and 25 (see Appendix 5.2). Given this data, it would be safe to suggest that this sample of experiment participants is relatively young. This could be due to a potentially higher number of individuals aged below 25 active on social media.

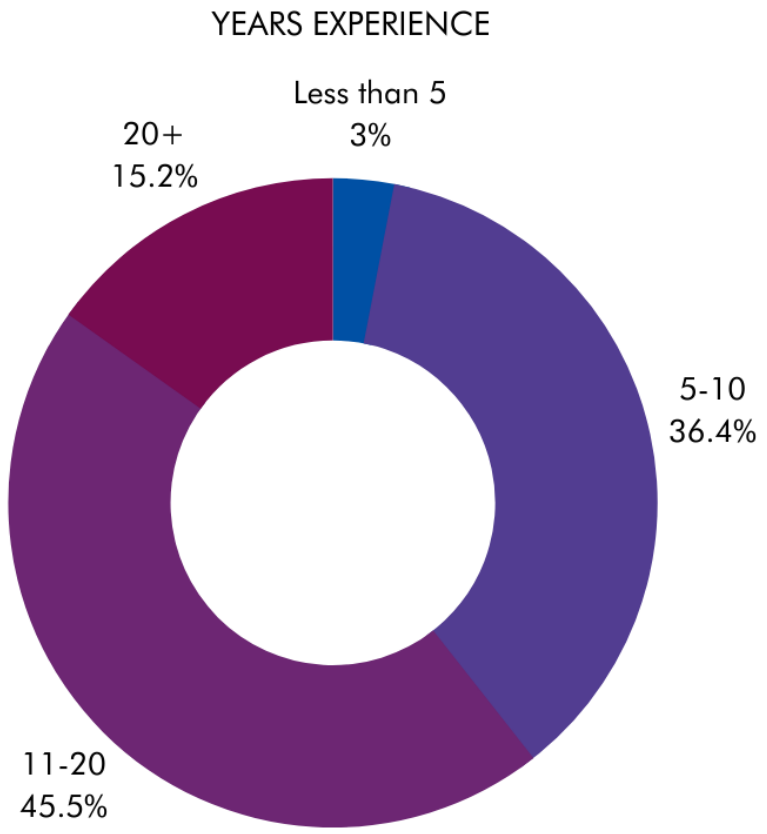


Figure 7 - Donut chart showing years of experience of musicians

While the most common ages for the questionnaire participants was between 18-25, it can be argued that the years of experience a musician has with their instrument is of greater importance. Figure 7 (above) shows a summary of the experience levels among the participants. Given the most popular experience bracket is between 11 and 20 years, this should indicate that over 45% of the responses are from those who have enough time with their instrument to provide genuine insights. This would add greater value to the data collected.

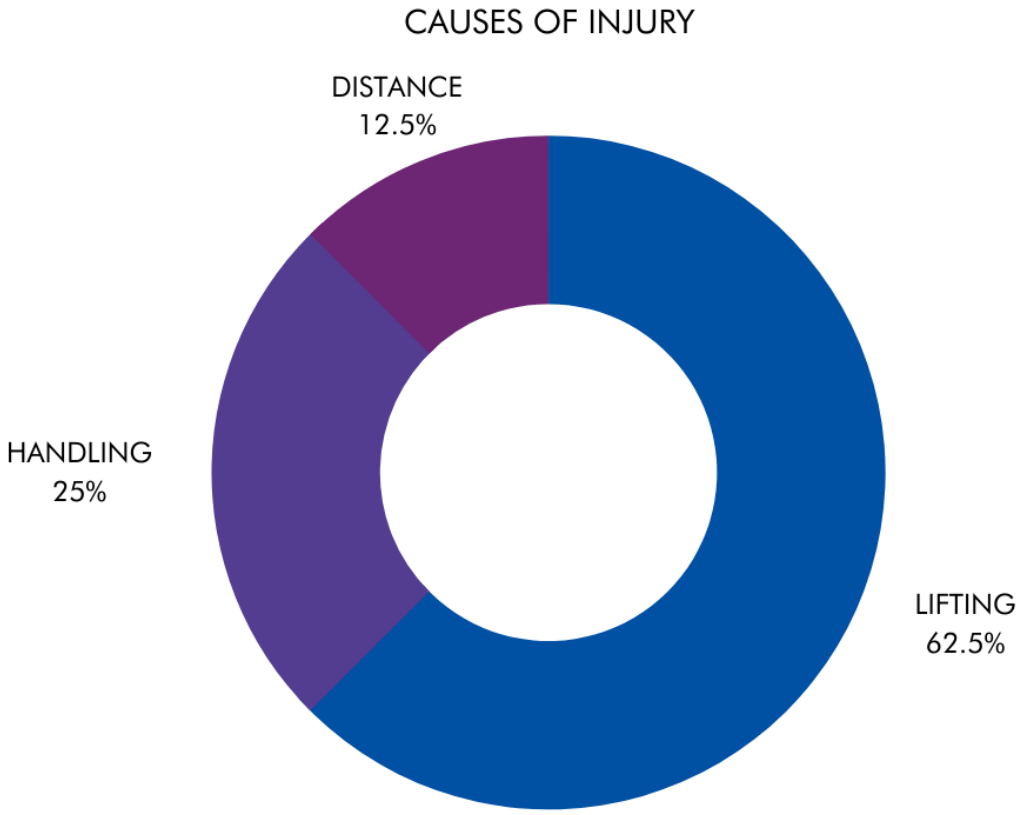


Figure 8 - Donut chart of most common injury causes

Figure 8 represents the most common cause of injuries amongst musicians. From the questionnaire data collected, it was clear that lifting musical equipment was the most common cause, with injuries such as sprained wrists and ribs, hurt shoulders, and grazed hands. However, injuries to the back were by far the most popular (see Appendix 5.3). Regardless, moderate injuries were sustained by the respondents through handling equipment (setup/teardown), and the distance between their transport and performance area.

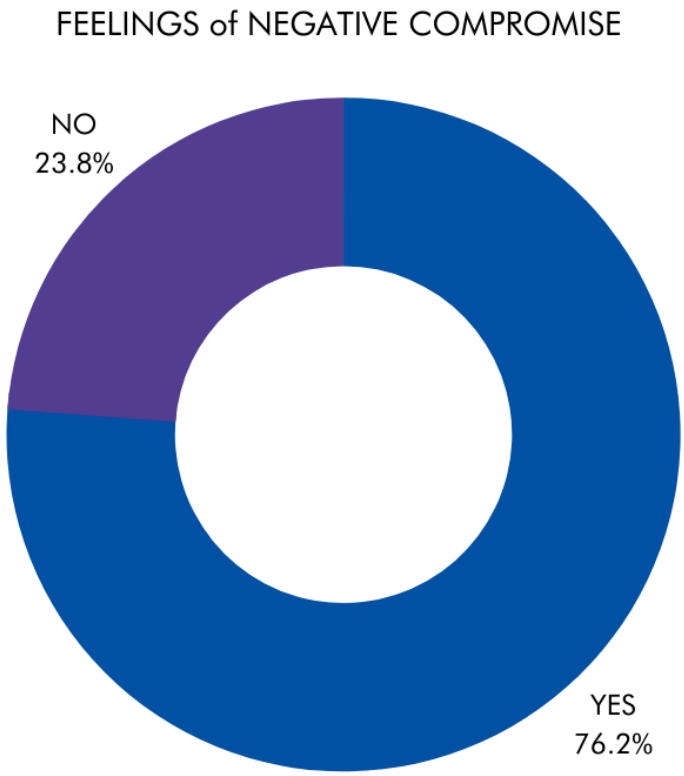


Figure 9 - Donut chart showing respondent's feelings of negative compromise

When asked about how respondents felt about compromises made to musical products featuring enhanced portability, over 75% of the 33 respondents believed that 'portable' music products were negatively compromised (see Figure 9). This should indicate that, among those involved in the experiment, there is a clear preference towards traditional instruments or related accessories/hardware.

INTERVIEW FINDINGS

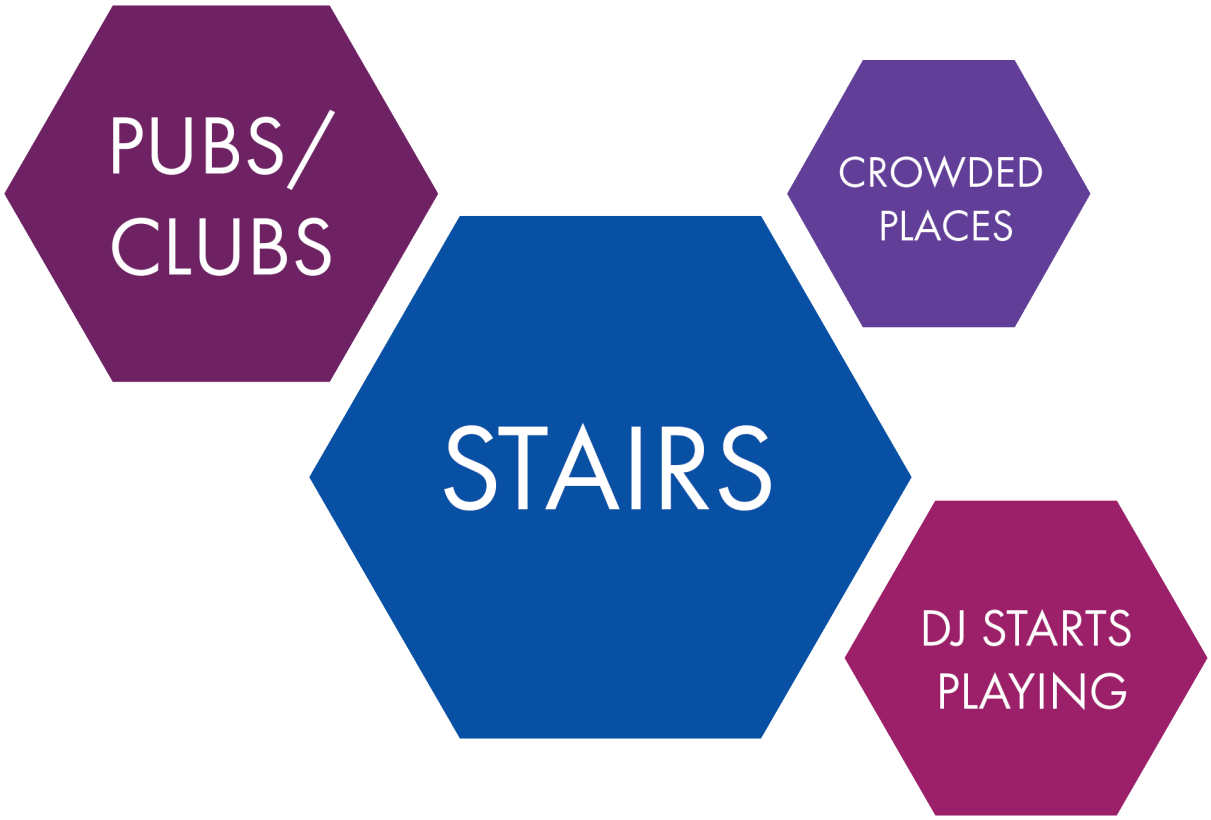


Figure 10 - Common Pain Points among Interviewees

All the interviewees had shared opinions regarding aspects of live performance. The most common pain points highlighted were a mutual disliking for stairs among interviewees, where any type of stairway that was necessary to traverse to or from the performance area was a major pain point. Compounding issues with stairs were varying levels of steepness, or too narrow of a stairwell. This result is supported by data collected from the questionnaire (see Appendix 5.4). Another shared frustration highlighted after analysis was an issue where a secondary performer (usually a Disk Jockey, or DJ) would commence playing soon after the end of the previous live performance. A large majority of these issues were described within the context of a pub or club environment.

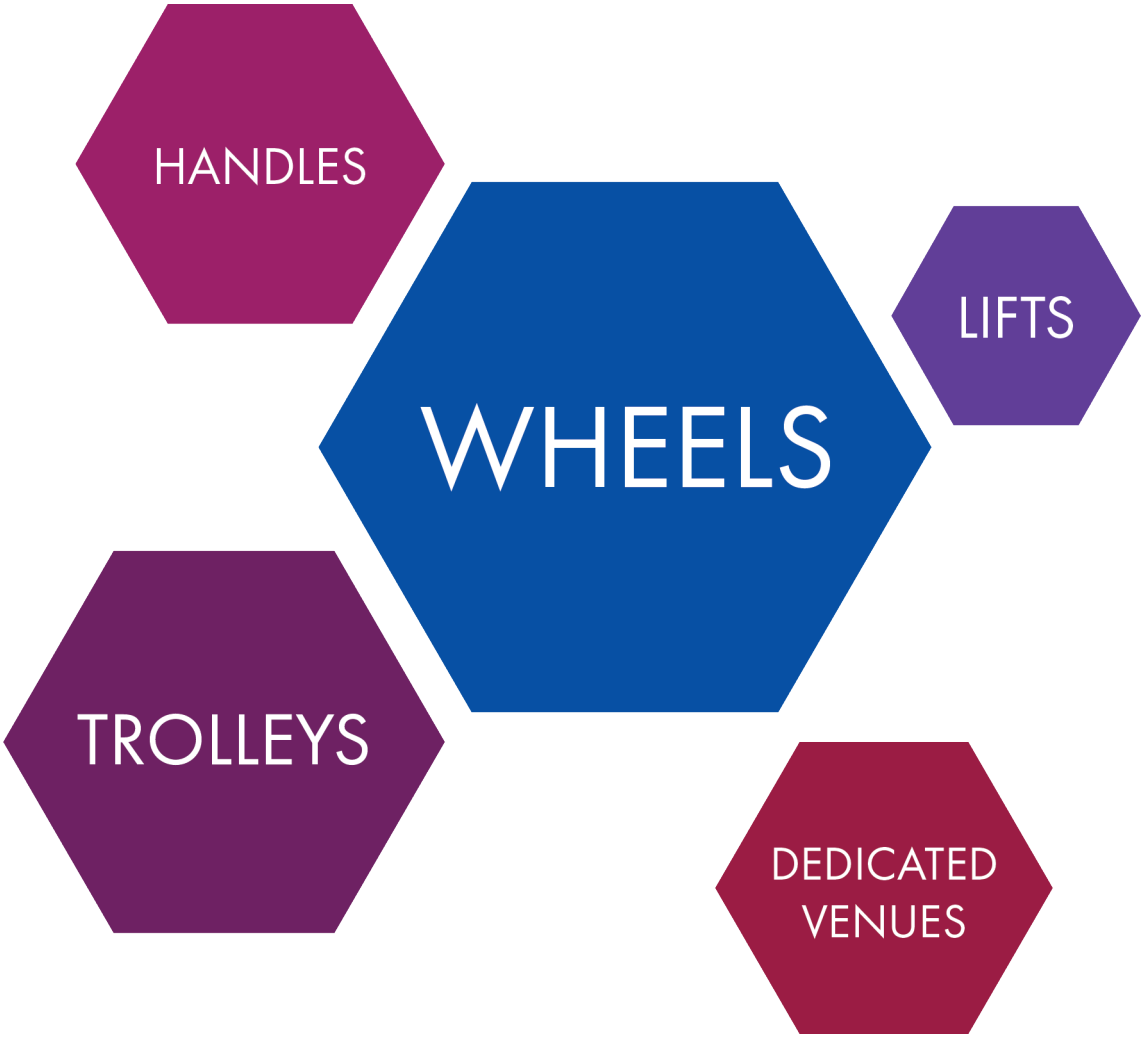


Figure 11 - Shared positive experiences among interviewees

In contrast to the pain points, most of the shared positive feelings among the interviewees were described within the context of a dedicated performance environment, such as theatres, corporate events, and dedicated music venues. All interviewees mentioned their liking towards wheels on their gear, and some wished that wheels should be incorporated to more products (regardless of their intended purpose). Furthermore, interviewees noted their positive feelings towards trolleys, and the usefulness of lifts to counter pains encountered with stairs.

DISCUSSION

This research was conducted primarily to identify the pain points of live music performance, while also to find any shared feelings amongst musicians regarding products with compromises to enhance portability. As mentioned in the literature review, there is a distinct lack of academically written information in this study area. Therefore, the experiment highlighted several common themes, both supporting and adding to the information collected from phase 1.

Rogers (2008) highlighted in his studies that musicians tend to work mostly in sweaty, hot, cramped environments, most often leading to mental or physical health issues for the musician. Analysis of both the interview and questionnaire data shows that these work environments are the norm for not only lower-grade performances, but professional environments as well. Venues such as small pubs and bars were most commonly associated with a negative work environment, which was attributed to the fact that these venues are not typically designed for live music performance. A shared frustration among musicians regarding pub and clubs were decisions made (by either the venue or performers) to begin the next act directly after the previous act finished – this resulted in overcrowded dance floors, blocking access for performers to exit the venue. As mentioned in the findings, positive work environment experiences are most commonly linked to a performance in a dedicated music venue. Therefore, this suggests that most venues (especially those for lower-grade performances) are not sustainable as music venues without design intervention, as both research and the data has shown that the most common venues for casual live performance are negatively affecting musician's health and wellbeing.

The data collected from the experiment also highlights the young average age of participants sampled. It could be argued that, if the young musicians are forced to play in conditions that are detrimental to long-term performance, this would inevitably lead to health complications in the future. This theory is supported by the studies of Bosi (2017), who highlights the high number of injuries amongst the older, professional musician community. Compounding these effects are the issues surrounding the current solutions for musical equipment storage, and injuries sustained while moving this equipment to and from the performance area. As mentioned previously, stairs in any venue are a problem for most musicians, and the design of some equipment has caused injury to some users. Two interviewees mentioned injuries sustained due to the design of equipment – one had a cymbal bag spontaneously fail, leading to roughly 10 kilograms of material to land on his foot, while another injured his back while lifting a hardware bag into his car. Questionnaire respondents made mention of injuries sustained due to the distance between their transport and performance area, a lack of a loading bay, and sometimes simply a lack of personal strength to be able to carry equipment from one location to another. One questionnaire respondent stated that loading in and out was "the worst part of the job", while two interviewees both stated that the process

was "exhausting", "tiring", and "physically demanding". Therefore, this information fills the research gap of how the equipment effects a musician's wellbeing over an extended timeframe.

The findings show that several moderate injuries have been sustained by musicians through lifting and handling their equipment. While some musical equipment is heavy, proper lifting techniques (or the addition of assistance) can counter excessive weight. However, three of the four interviewees mentioned that they are usually alone while loading in and out of a venue. Furthermore, injuries are still sustained by musicians regardless of the weight of the object – this could be linked to the research conducted by Kemp (2010), and information sourced from the Australian Bureau of Statistics (see Literature review). This information highlights the most common cause of injuries to both military and civilian workers, which is lifting and handling. Therefore, this suggests that regardless of the task at hand, injuries can be sustained while lifting any object if the lifting technique is improper.

Through research, Bosi (2017) and Guptill (2011) both supported the theory that most musicians choose to continue to play through injuries sustained while on the job, due to several factors. These factors include financial pressures, career pressures, or the passion for playing music. This theory was supported by one of the interviewees, who stated:

> "I'm guilty of being one of those people that will find a way to play at any cost. I had an autoimmune problem one time that had affected my ankle, but I was allowed to have some leave... Although I couldn't walk properly, I could play fine, and I managed to get up on the stage and It made me feel normal. It made me feel I wasn't missing out. If it's something you love, you try to do it as much as you can."
>
> - *Stephen Fischer, 2020*

Another interviewee also mentioned that, during a period where he was highly active as a musician, he would play several gigs for 4 to 5 nights in a row. This would result in feelings of exhaustion and muscle pain, and ultimately caused severe Repetitive Strain Injury (RSI). While he took time off to recover, until he was officially diagnosed, he continued to perform at high levels. This further supports Bosi's (2017) and Guptill's (2011) research.

As for more general findings unrelated to the initial phase of research, it was found that there was a connection between the age of the performer and the type of venue they were playing at. The questionnaire data indicated that most of the younger players (aged between 18-25) were performing in the small, non-dedicated venues that the supporting research has suggested is detrimental to player performance, whereas the older generation of players perform at corporate events, weddings, or theatres,

where access is less of an issue and the work environment is less taxing. This is to be expected, as players with greater skill and experience are usually able to perform at a more mature venue. That said, it could be argued that younger, less experienced players should not have to be at a disadvantage regarding their work environment when compared to the older generation.

Another noteworthy finding was how opinions regarding the overall playing experience of their instrument were contradictory among those involved in the experiment. Most questionnaire respondents felt that the sound, feel, and quality of an instrument (and relating accessories) was far more important than the ability to be mobile, however some questionnaire respondents (and most interviewees) argued for products with increased portability as a function. Two of the interviewees mentioned that the quality of sound is determined primarily by the player (it must be noted that both interviewees, coincidentally, gave the same example musician). Furthermore, all the interviewees felt that the equipment brought to a gig is determined by the music that is being played. Similarly, all interviewees felt that for practice situations (where sound is not a priority), drum kits designed for portability were sometimes essential, as they are cheap, lightweight alternatives to traditional drum kits.

Finally, one interviewee mentioned how the culture of live music has changed in recent years. He stated that, between 10-15 years ago, arriving to a performance with a particularly sized drum kit (for an example, a drum kit with a kick drum less than 18 inches in diameter), it would be assumed to be a 'Jazz' sized kit, with little to no use outside of the Jazz and Bebop genres. However, the interviewee mentioned that with the current drumhead and shell venting technologies available, it is possible to create either larger or smaller sounds with a wider variety of drum sizes. Hence, he believes that the attitude around drumming has changed, where now it is valued to be able to bring fresh and unique sounds to the music, whereas before the sound of a player was limited by what drum kit suited the genre. Hence, this presents several design opportunities, as today it is more acceptable to have a unique drum set layout than it previously was.

LIMITATIONS

As mentioned previously, the online mediums chosen for the questionnaire were limited to an Australian-only sample space. While it can be argued Australia has a highly diverse musical culture (highlighted by questionnaire and interview responses), international respondents may have differing/opposing views when compared. Furthermore, for the purpose of this report, 33 questionnaire responses and 4 semi-structured interviews provided suitable data, however a greater number of responses and interviewees would be required for further study into the field. The data collected from the questionnaire was also

skewed towards a drummer's perspective, as the questionnaire itself was shared on both a drummer's forum and a general musician's forum. Finally, this topic of study is not a popular subject topic within academic fields – as a result, a relatively small amount of academic material exists for the purpose of supporting primary research.

RECOMMENDATIONS

The following mock-ups are based off the found pain points shared amongst both interviewees and survey recipients. These concept ideas, while rough and unresolved, have the potential to provide solutions to the targeted issues discussed in the previous chapter.

CARRY-ALL BACKPACK

Figure 12 - Carry-all Backpack mock-up

Figure 12 (above) includes a rough sketch of a 'Carry-All Backpack' concept. The concept incorporates features from mountaineering backpacks (such as hip-based weight transfer), and a carry handle located above the centre of the load space to act as a balanced carrying point if required. Limitations of the design include sizing of the load space, and a weight limit dictated by the strength of materials chosen for weak points (body straps, etc.). There were no mandatory safety standards available for this class of product from the Australian Competition and Consumer Commission (ACCC)(ACCC, 2020). However, there are several size standards that exist for musical equipment sizes – as an example, using SONOR's SQ2 drum configurator, kick drum sizes range from 16-26 inches (SONOR, 2020). Therefore, the Carry-All Backpack must be able to carry large objects without causing inconvenience to the user. Furthermore,

several sizing standards from the Measure of Man and Woman would apply to parts of the product that contact the user directly (Dreyfuss, 2002).

MATRYOSHKA DRUMS

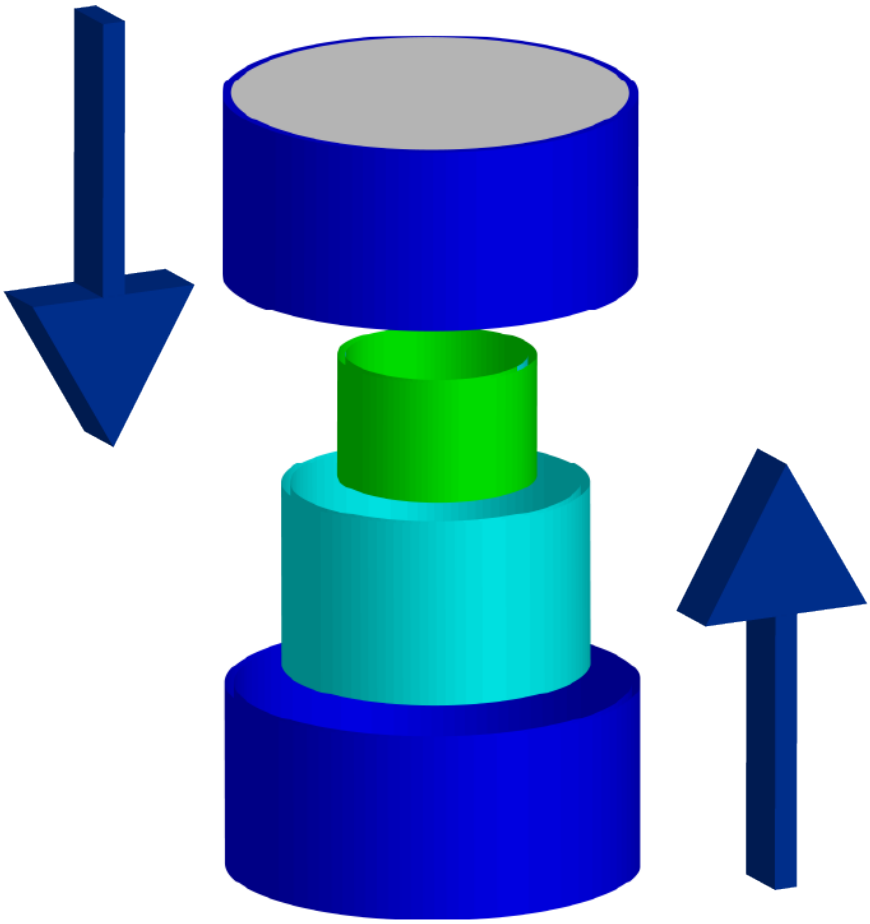


Figure 13 - Matryoshka Drum concept mock-up

Matryoshka dolls have been made since the 1890's, originating in Russia (Ferguson, 2015). The overall concept – repeating, smaller objects housed within a primary shell – could be applied to drum kit design. Similarly to the Carry-All Backpack, constraints to the design are primarily the existing drum kit size standards set in place by manufacturers (SONOR, 2020). Furthermore, shell composition (materials, layering, etc.) would also limit the design as to ensure quality of sound (SONOR, 2020).

HELPER APPLICATION

Figure 14 – Mock-up of the Helper application

The Helper application would address the issues of musicians struggling to load in/out of venues without the assistance from others. The Helper application aims to connect nearby musicians, primarily those who are not performing, to a musician that may require assistance, similarly to an Uber service. While a positive concept, there are several limitations to the application – payment may not be reliable, and the success of the concept is largely dependent upon widespread use by live music communities. However, given appropriate testing, the application could enhance the user experience of small-time gigging musicians with little to no external support.

STAIR-PRO TROLLEY

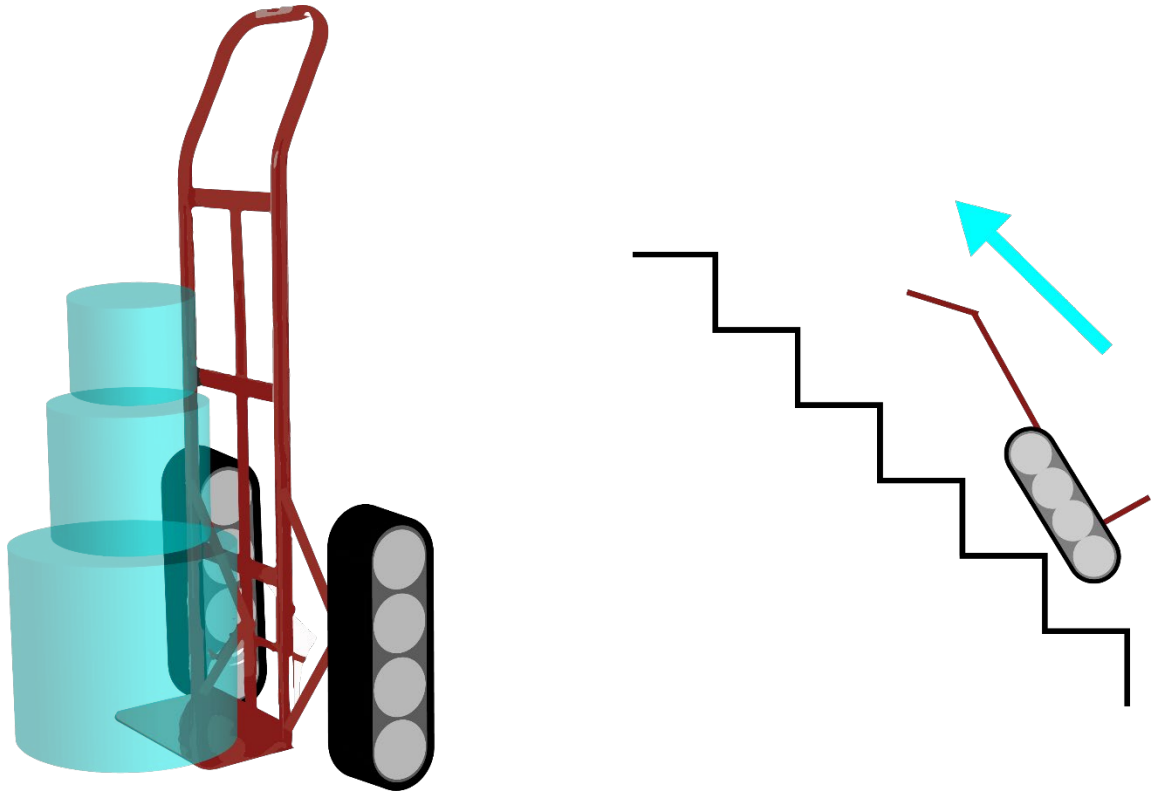


Figure 15 - Stair-Pro trolley concept mockup

As supported by the findings, one of the primary obstacles faced by gigging musicians are flights of stairs. Therefore, a product that eases the process of traversing stairs (while in keeping with existing standards of commercially available trolleys) would be graciously accepted into the musician community. As with the Carry-All Backpack, several ergonomic standards would apply to the product (Dreyfuss, 2002). However, limitations of the product include weight limits dictated by material choice (again similarly to the backpack concept).

DESIGN PROPOSAL

DESIGN INTENT

The findings from the experiment have shown several key areas that could be improved upon through design intervention. Limited access to venues (due to obstacles such as stairs, crowds of intoxicated patrons, or lack of close parking) was a primary pain point found, however musicians are unable to counter these pains due to a lack of support or the nature of the job. It was also found that due to the nature of specific instruments, handling equipment during the load in/out process of a performance can be physically taxing, and compounds injuries attained through a career of performing live music. Therefore, several recommendations can be made with the intent of enhancing musician health and wellbeing where possible.

AIMS

The aim of this project is to enhance musician wellbeing during periods of active live performance, through unique product or service design.

OBJECTIVES

- Develop a product that, while enhancing portability, still retains the essential characteristics of a traditional instrument that musicians' value
- Connect musicians to allow for more effective performance and greater outreach for larger audiences
- Reduce the number of users required to shift gear from one location to another
- Reduce chance of long-term injury to users through innovative product design

JUSTIFICATION

Evidence found through research suggests that young musicians are often limited to the venues they perform at due to their experience level, preferred playing style/genre, and the popularity of the band they may perform with. Furthermore, these venues they are limited to are usually not dedicated music venues, resulting in difficulties with access while carrying necessary musical equipment in and out of the venue. Finally, due to budget constraints for most younger musicians, the equipment they own (and vessels used to contain the equipment) is not often optimised for the ways in which younger musicians use them. Secondary research supports the theory that this results in health complications in the future, which are a detriment to the performance of the musician. Furthermore, regardless of the age, experience, or budget of a musician, the results from the experiment show that there are still issues with certain aspects of live performance, that are accepted by the musicians as 'part of the job'.

CONTEXT

The design solution will be suited for live performance and will adhere to standards regarding musical equipment (drum diameters, lug sizes, etc.) and their related accessories. These standards will apply universally to international musical equipment.

KEY CRITERIA

MATERIALS

The materials used in the construction of a musical instrument or related accessory are vital to the core function of the product.

- The materials must not compromise quality of sound
- The materials must not compromise structural integrity of the product (if designed with strength as a primary function)
- Material must allow for production of different size products

DURABILITY/RELIABILITY

The durability of the product is crucial to the quality of the performance of a musician.

- The product must not fail to function under normal or stressed operating conditions
- The product must last for the expected standard of current musical equipment

COST

The cost of the product will determine how accessible it is for certain audiences.

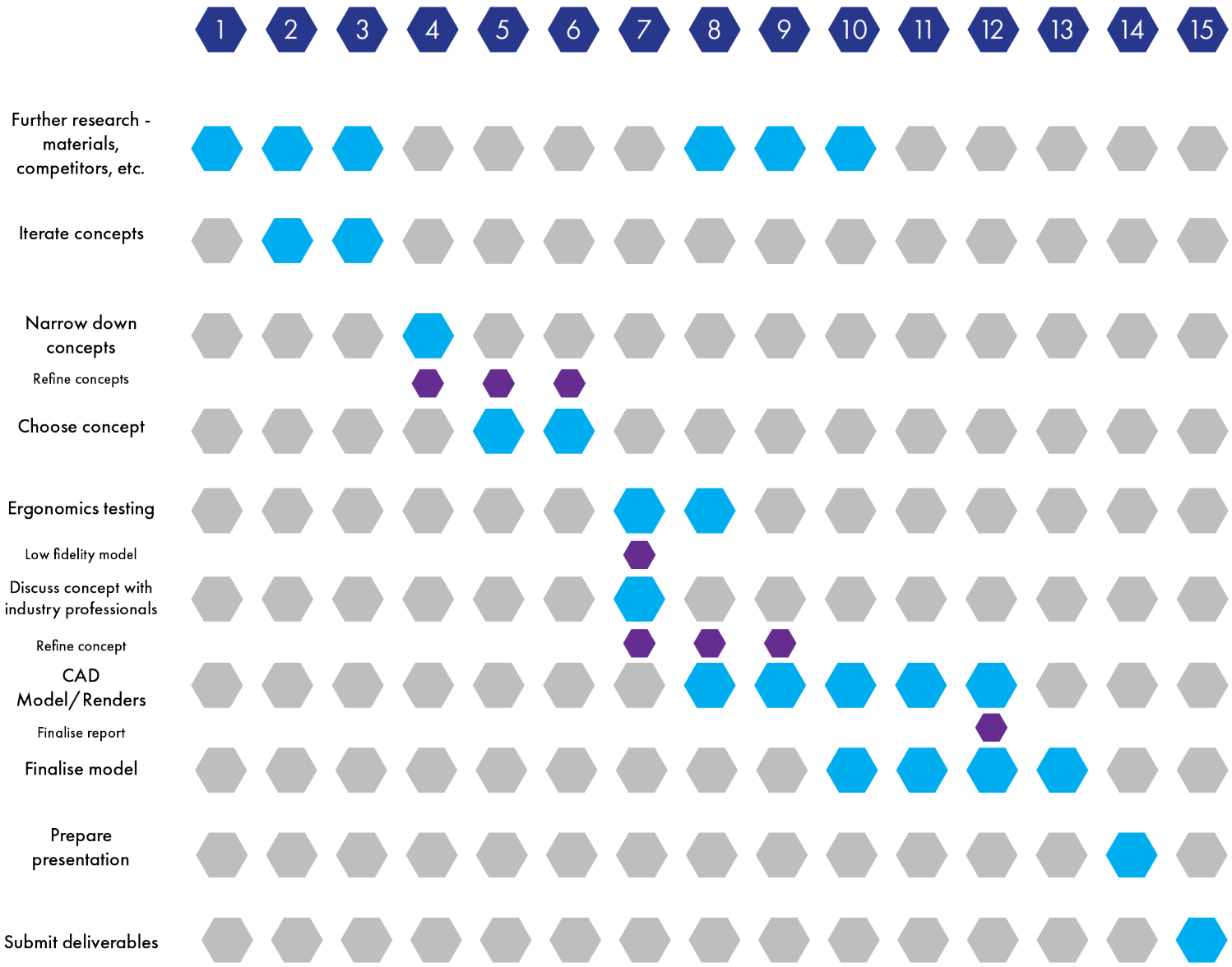
- The cost of the product must allow for access to a broad range of users
- The cost must not risk economic instability for the manufacturer

CONVENIENCE

Convenience will be measured based off the product's ability to enhance the wellbeing of a musician.

- The product must enhance convenience or assist in the process of loading in/out of a performance venue
- The product must not detract from the playing experience due to compromises made

DESIGN SCHEDULE



DESIGN JUSTIFICATION

INTRODUCTION

To summarise from the design proposal, the targeted issues chosen to be focused on were access problems (stairs, crowded/cramped environments), distance, and the requirement for assistance with gear for some users. After several months of concept iteration, refinement, and prototyping, the Drum Roll was developed. The Drum Roll is modular drum case system, with an integrated trolley component, and aims to solve the highlighted issues for drummers who may not have the support of a full-time road crew, but still remain active in a local music scene. The Drum Roll should enable drummers to more efficiently move their gear over (or through) arduous terrain and crowded environments, while offering superior protection for the gear inside.

The following chapter provides justification for the features and overall design of the Drum Roll, while also detailing how it will improve the experience of drummers and percussionists within the chosen context.

Figure 16 - The Drum Roll.s

FURTHER RESEARCH

STANDARDS

DRUM SHELL SIZES

According to DW Drums, standard drum sizes vary greatly between drum types (DW Drums, 2020). Below is a table of the most common drum sizes (all sizes in inches, DEPTHxDIAMETER):

TABLE 2 – COMMON DRUM SIZES

RACK TOM	FLOOR TOM	SNARE DRUM	KICK DRUM
7x8	13x15	4x14	16x20
8x10	14x14	4.5x14	18x20
9x12	16x16	5.5x14	18x22
11x13	16x18	6.5x14	18x24

The table above only includes the most popular drum sizes - there are a far greater number of drum sizes available from DW Drums (DW Drums, 2020). Sizes beyond those listed, however, are usually made to order, or are custom built (DW Drums, 2020). Therefore, for the purpose of the Drum Roll, it should be assured that the product is able to contain the most popular sizes of drums, before attention is given to more unique sizes.

STANDARD AUSTRALIAN DOOR SIZES

The most common door size for Australian buildings is 2040x820x35mm (Build, 2020). Given the design of the Drum Roll, the width number (820mm) is most important, as this number will determine if the product can physically enter or exit doorways in clubs, bars, or pubs (see Figure 16). According to build, other Australian standard door widths range from 520mm to 920mm (Build, 2020). While uncommon, the Drum Roll would not fit through the smallest door sizes, however it is safe to suggest that most door sizes in modern or renovated local venues would be of the larger variety.

Figure 17 - Standard Australian Door Size.

COMPETITORS

GATOR CASES – FULL KIT SET

Figure 18 - Gator Cases Full Kit Set (Gator Cases, 2020)

The Gator Cases full kit set includes five bags sized appropriately for a standard five-piece drum kit. The set is constructed of nylon, with soft straps incorporated as handles, and a zip to open and close the case (Gator Cases, 2020a). The average asking price for this particular product was $239 AUSD (BetterMusic, 2020). While the product is reasonably affordable and lightweight, soft bags do not offer adequate protection for more active gigging drummers. Drums contained within soft bags are still at risk of damage from blunt force, or sharp objects.

HARDCASE – FULL SET

Figure 19 - HARDCASE Full Set (HARDCASE, 2020)

The HARDCASE Full Set is a set of glass-reinforced polypropylene drum cases suitable for use in touring and gigging applications (HARDCASE, 2020a). These cases offer superior protection when compared to soft cases, however they are more expensive – the asking price for a HARDCASE Full Set is $679 AUSD from Drumtek Australia (Drumtek, 2020). Furthermore, these hard cases are bulkier, more awkward to carry, and cannot be collapsed like a soft nylon case.

ULTRACASE DRUM VAULT

Figure 20 - Ultracase Drum Vault (Ultracase, 2020)

The Ultracase Drum Vault is a mobile drum cabinet system, that enables an entire drum set to be stored and relocated (Ultracase, 2020a). The Ultracase, while highly protective, is a very large product, hindering mobility. Furthermore, its target market is more biased towards professional, high-level performance, as is highlighted by the price - $3200 USD, plus a $429 accessory shelf (Ultracase, 2020a). Converted to Australian Dolllars, this is a $5000 product, arguably beyond the financial reach of most active gigging drummers who play in local pubs, clubs, and bars.

MATERIALS

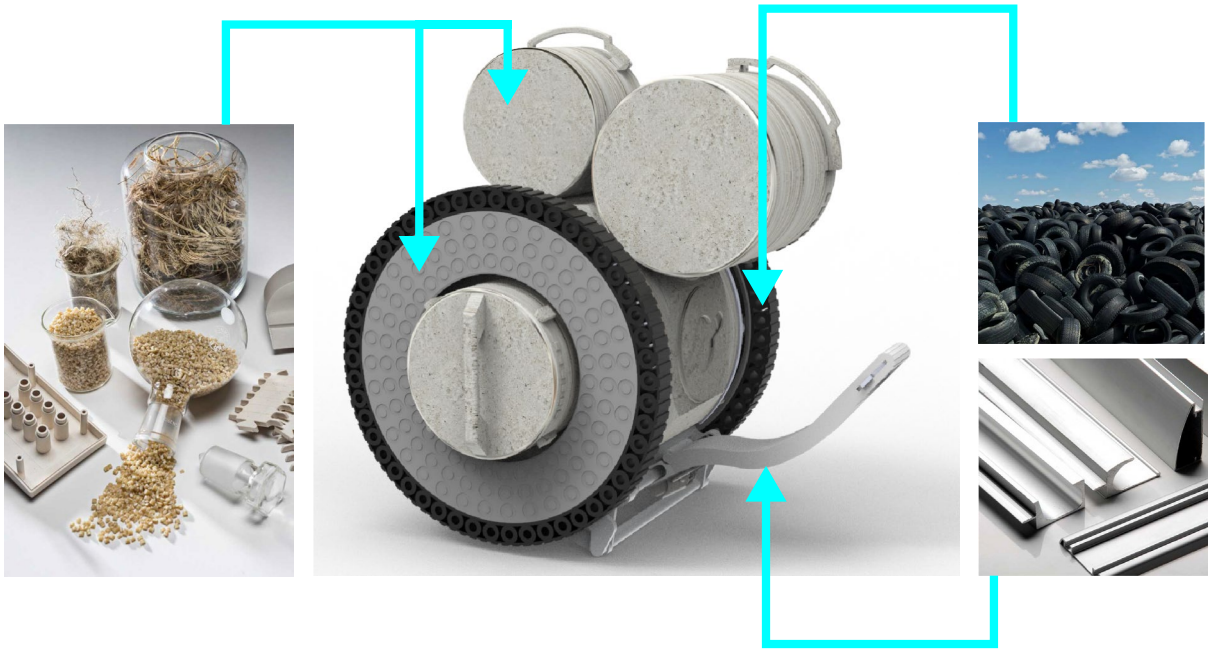


Figure 21 - Materials used in the Drum Roll.

BIOLITE, by TRIFILON

Biolite is a form of bioplastic, designed to have superior mechanical properties to standard glass-fibre reinforced plastics, while having a substantially reduced impact on the environment. Biolite is reinforced by hemp fibres, which when bonded with polypropylene, creates a recyclable, strong, lightweight plastic material for semi-structural applications (Trifilon, 2020). It was decided that Biolite was the most appropriate material for the main body components of the Drum Roll, as it is a more environmentally conscious choice of material when compared to the glass-reinforced plastics used in the HARDCASE products (see Competitors chapter). Given the Drum Roll's design and use, Biolite should provide sufficient protection against blunt force impacts, sharp objects, and weather.

CONTEXT, SYSTEMS, SCENARIO

PEOPLE

As highlighted throughout the experimentation, the key users for the chosen context are drummers, who are active performers in local music venues. These individuals do not have their own road crew; therefore they are required to supply their own gear and organise transport themselves. Although gear requirements differ from performance to performance, more extreme cases require very large amounts of gear that is not practical for transport. Therefore, secondary users include bandmates, friends, or family of the drummer that are able to assist with transporting gear. That said, assistance from others (while most always welcome), is not always readily available, therefore the Drum Roll aims create a solution to this issue.

ACTIVITIES

The Drum Roll is designed to move a collection drum shells (arguably the most expensive components) of a drum kit, with only one user. The user will either push or pull the Drum Roll (ensuring the safety handle is held), from their mode of transport to the designated venue. The Drum Roll, while designed to carry a collection of shells, is not designed to carry the hardware required to set up a complete kit, due to sizing restraints. However, it was decided that drum-related hardware would not be involved within the scope of the project, as there are already a number of products that exist for storing and moving hardware. Therefore, assuming a full kit is required, the user can choose to pull/push both the Drum Roll and their hardware case of choice or make two separate trips between transport and venue. While this does increase the total number of trips, the Drum Roll is designed to reduce the number of trips made for shells alone, which can be up to 4 (depending on the size of the kit).

When at the venue, the user disassembles the Drum Roll into the individual cases, ready for shell removal. Once set up, the Drum Roll can be re-assembled and stored in a designated storage room for musical equipment. Other activities involved in the live music scene (aside from performing) are drinking, dancing, and general socialising.

TECHNOLOGY

The Drum Roll is a purely mechanical product, with no form of electronic technology incorporated into the design. Therefore, it was ensured that the primary technology was in materials selection and product manufacture.

The main body, wheel rim, and case components of the Drum Roll are made from a hemp-reinforced polypropylene named Biolite, by Trifilon (see Materials chapter). Biolote will ensure sufficient protection against blunt force impacts, sharp objects, and weather ingress. Biolite is suited for injection moulding, therefore all plastic parts will be produced using standard injection moulding processes. The handle assembly (including brake and roll stop mechanical parts) will be extruded, welded and milled from 6061-grade Aluminium. This grade of aluminium was chosen for its availability, mechanical properties, and corrosion resistance. Within the context of live music venues, there is the possibility of liquid spillage (alcohol, soft drink, water), therefore aluminium would provide the necessary corrosion resistance towards these hazards. Finally, the tyres of the Drum Roll would be made of recycled automotive rubber.

DESIGN PROCESS

Figure 22 (below) highlights the documented design process. The Double Diamond framework was utilised to more easily highlight the design process to both designers and non-designers (Design Council, 2020).

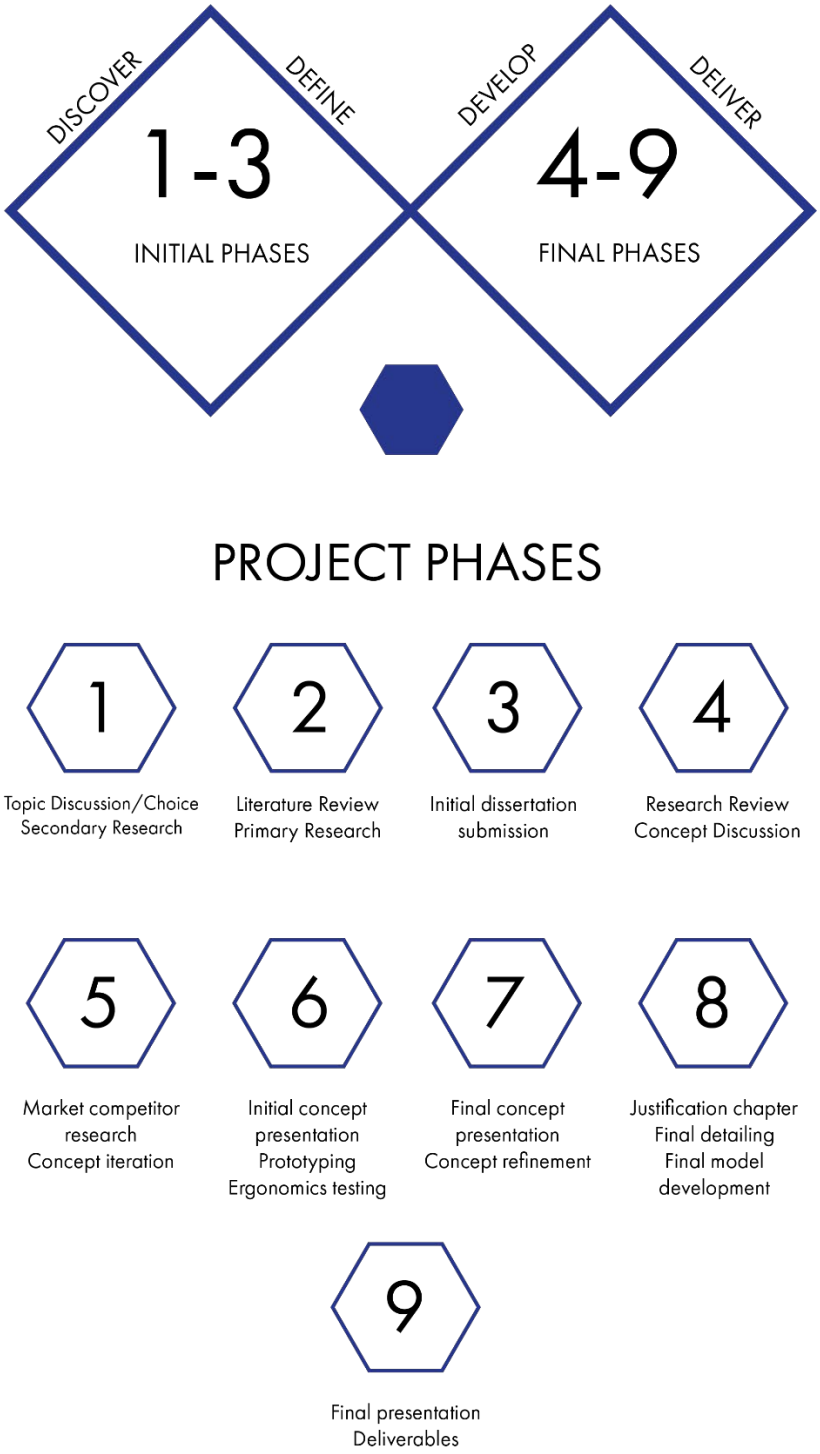


Figure 22 - Design Process

DESIGN VALIDATION

To validate the Drum Roll and its features, a number of methods were utilised throughout the development process. Firstly, thorough investigation was made into existing market solutions in regard to features, functions, and materials. Furthermore, author experience in the field with existing solutions proved to be invaluable. With the research conducted into existing solutions, it was possible to justify the Drum Roll's viability amongst the competition, from a business standpoint. There has been very little innovation within the market of drum storage and transport since the introduction of the hard and soft case, aside from materials development. Therefore, the features of the Drum Roll are unique.

During the development process, it was ensured that contact between industry professionals remained constant. Through phone conversations and social media messages, ideas were shared between both the designer and drummer, with the purpose of finding what features were necessary, and what features needed improvement/removal. Stephen Fischer, drummer for *His Merry Men/Nomika*, gave positive feedback towards the wheel assembly and snap lock features of the Drum Roll, and preferred how the wheels rotated independently from the main body. He also noted how exhausting drumming equipment was to move and liked the Drum Roll's ability to move more equipment in one attempt.

Testing with foam models was made to ensure the ergonomics of the product were resolved. Using foam, handle prototypes were made, in order to find the most comfortable handle form for the drum cases. Tutor feedback was essential throughout the design process – weekly meetings with the tutors during the semester assisted with fine detailing, and design decisions such as materials choice and manufacturing. This was also supported by the feedback from both classmates and tutors during presentations made.

BUSINESS CASE

As discussed in the Design Validation chapter, the Drum Roll is a mechanical product, with no electronic features. This aligns the drum roll with the current market solutions, all of which lack any form of complexity. Soft cases (assuming an average cost) retail at or around $240 AUSD, while hard cases are priced higher, at near $700 AUSD (see Competitors chapter). These products do not, however, have the features and functionality of the Drum Roll (primarily, the ability to connect drums to a main body, and the included trolley component). This results in forcing users to carry each drum independently, over long distances and over arduous terrain, ultimately resulting in injury. Therefore, the Drum Roll would provide the user with a product that not only protects their gear appropriately but offers advantages that its competitors cannot match. If priced accordingly, the Drum Roll has the potential to sell at a highly competitive rate.

BIOLITE USE – END OF LIFE

As discussed in the Materials chapter, Biolite is a far more sustainable product compared to glass-reinforced plastic alternatives through its hemp fibre use. Therefore, from a business perspective, the Drum Roll is the only design in the market that fully realises its end of life. All materials used to create the Drum Roll are either fully recyclable, or biodegradable, however it was also ensured that the Drum Roll is designed to last the lifetime of the owner. While this is seen as a sub-optimal business model, it was found from the experiment that most drummers keep their equipment for many years and appreciate a design of high quality and durability.

FINAL DESIGN DISCUSSION

The initial design proposal was aimed at enhancing the wellbeing of active gigging musicians, who do not have the support of a paid road crew. While the details of how to enhance wellbeing were lacking and did not focus on a particular user group (drummers), the basic principle of wellbeing enhancement can still be applied to the final design direction. The following discussion aims to highlight key aspects of the Drum Roll that were implemented into the design after further research and prototyping, in regard to its features, market competitiveness, and sustainability.

FEATURES

The Drum Roll is a modular, mobile drum case system. In keeping with the industry standards, each drum case is designed to hold the most popular drum sizes, although more case size options would be available as optional items. Because of the snap-lock feature of the Drum Roll, users have the option to use each case independently (as with standard drum cases) and attach each case to the main body when more drums are required. This option creates a 'two in one' type feature that would be welcomed by the target user group. When only essential gigging items are required (usually a snare drum, kick pedal, cymbal set and sticks), users also have the option to store these items within the main body, and use the bulk of the trolley as a tool for both superior protection easy guidance through crowded environments. The large diameter airless wheel assembly allows the drum roll to traverse terrain such as grass, dirt, gravel, rocks, and stairs, with minimal effort and minimal damage to the equipment housed inside. Regarding ergonomics, it was ensured that all handles do not cause pinch points, and that they are comfortable to use for most hand sizes. Finally, the braking system of the drum roll automatically engages if the user were to lose grip of the handle by use of a spring-loaded mechanism. This assembly also doubles as a roll stop, which prevents the Drum Roll from rotating when in a stationary position.

MARKET COMPETITIVENESS

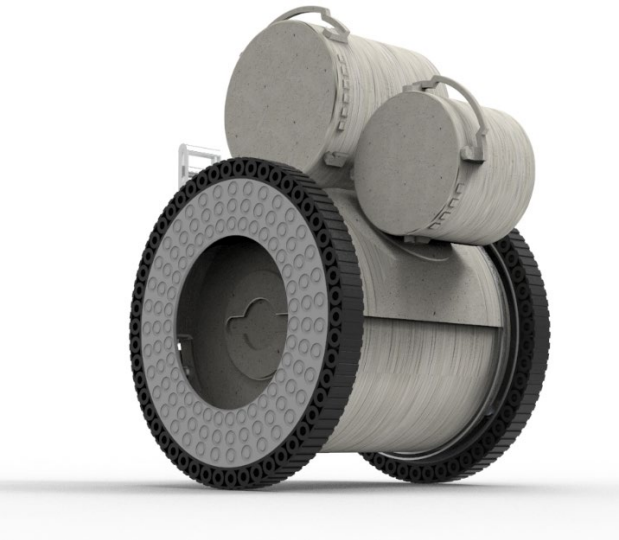
The features discussed above place the Drum Roll in a unique position within the drum storage and transport market. While it would be priced above a standard set of hard cases, the Drum Roll provides a superior set of features, while also ensuring injury amongst drummers is reduced significantly. Current market solutions offer a more 'band-aid' approach to the issues highlighted throughout the investigation phase, and therefore issues such as sustaining injuries and awkward handling are never truly resolved. The Drum Roll is a complete package, with a number of functions which go beyond just storing drums. Therefore, it could be safely assumed that the Drum Roll would be a highly competitive product.

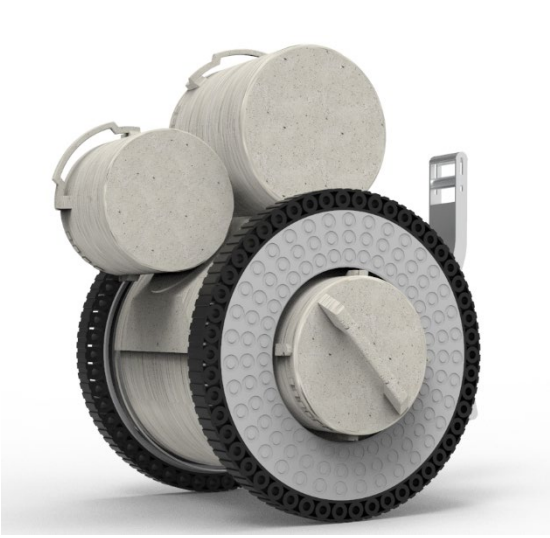
SUSTAINABILITY

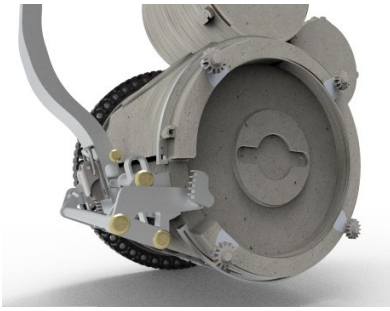
The choice of materials used in the Drum Roll (Biolite, 6061 Aluminium) were chosen for their mechanical properties, light weight, and their sustainability. Biolite is a degradable plastic, and farming of hemp can also assist in meeting emissions targets due to its effective absorption of CO2 (Trifilon, 2020). When compared to more common glass-reinforced polypropylene, Biolite is lighter, more aesthetically unique, and has a substantially reduced impact on the environment. Finally, the use of Aluminium for the handle and brake assemblies further reduces the overall weight of the product (when compared to steel), and aluminium recycling is already commonplace within the industry.

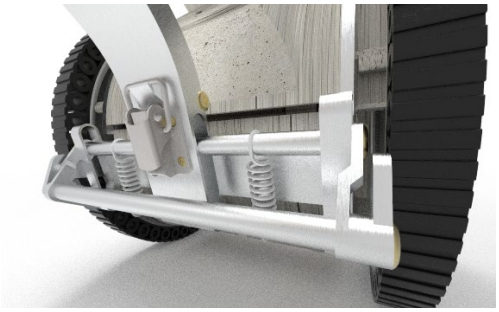
CONCLUSION

After thorough research and investigation, it has become clear that there are several issues with live music performance, that are accepted by the wider music community as part of the natural process. Therefore, the aim of this project was to to recommend a design intervention that could both provide a solution for musicians and highlight the necessary action that must take place to ensure a musician's mental and physical health is not at risk for future generations. The product was designed over a period of 4 months, using experience and knowledge from professional musicians within Australia, and the result of which was the Drum Roll – a sustainable, durable, effortless system to move drums. The Drum Roll solves the issues of access (stairs, crowded places) and distance between transport and venue, and prevents musicians (both old, and young) from sustaining injuries while transporting their goods. While exclusively for drummers at this stage, the Drum Roll could be further developed into a more general system for transport of various musical equipment.









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APPENDIX

APPENDIX 1 – RUDIMENTARY DRUM KIT PIECES

1.1 – CYMBALS (IN CARRY BAG)

1.2 – CYMBALS (SHOWN WITHIN BAG)

1.3 – KICK DRUM

1.4 – FLOOR TOM

1.5 – SNARE DRUM

1.6 – DRUMS (IN CARRY BAGS)

1.7 – HARDWARE (HI-HAT STAND, CYMBAL STAND, SNARE STAND)

APPENDIX 2 – INTERVIEW TRANSCRIPTS

2.1 – STEPHEN FISCHER (ORCHESTRAL/JAZZ/FUNK DRUMMER)

Interviewer: Hello! Whats your name?

Participant: Steve Fischer

Interviewer: And how long have you been drumming?

Participant: Oh dear… 26 years.

Interviewer: What would you say is your primary genre of music?

Participant: If funk is a genre, definitely funk.

Interviewer: Okay cool. So, you said you gigged once a month?

Participant: Yes. It feels at the moment I'm not that active as a performer, nut I probably do more than I realise. But I just averaged it out.

Interviewer: Okay, so when you were an active musician, how often would you say you gigged?

Participant: If I were to average it out over a year, maybe 3 or 4 paid gigs a month. Being optimistic.

Interviewer: Okay, and you have in the questionnaire you play at small venues?

Participant: I think it changes, so if you are comparing work vs a hobby, bands for fun or original music might have a gig at the zoo, whereas more corporate events are less likely to be in those sorts of places.

Interviewer: You play in orchestral situations hey?

Participant: Yeah, I also play in the Australian Girls' Choir. That's three big concerts a year in performing arts centres. The access is good in the sense that it is built for performing. It has a loading dock, trolleys, and decent sized lifts.

Interviewer: Okay. You said in the questionnaire that access to venues varies – how would you describe your experiences playing with a full kit?

Participant: It depends. I had health issues in my 20's, so that was a complicating factor. Sometimes it was exhausting, and also very time consuming. If I was playing in my band, sometimes I didn't get any help loading in and out, but I looked at it as the only exercise I was getting. You try to load into storage spots and spaces, but they can be non-existent. Sometimes if I loaded up onto the stage, I'd have to clear the stage of stuff before I actually set up, which was just double handling. So, the smaller the kit, the easier it is to setup, and also reduces double handling.

Interviewer: Okay, so how many kits have you had in the past?

Participant: Well as a professional I had my Yamaha, but then I got the Metro made which was actually bigger.

Interviewer: Okay. Have you ever been curious to know how much it all weighs? I weighed my kit and it was approaching 100kg's of gear.

Participant: Yeah. When you're wanting or having to take a kit on a plane for a festival or something like that, we ended up taking a smaller kit in terms of pieces. Plus we had to take all the drums apart to put them all into one case. There are complicating issues with planes with maximum amount per piece, but also maximum number of bags. If you were putting stuff in a truck on a road trip, you can't get away with just soft bags, so you need hard cases for things like that.

Interviewer: Cool. So have you had any issues with patrons moving in and out of venues?

Participant: I think the last time I played at the Press Club, the DJ started pretty much straight after we had finished. So people end up flooding the dance floor, and there is no other way out other than the front door. Technically the musicians are a service, so there should be a service entry, but there just

isn't. People are naturally in the way, but that's not their fault. The other complicating thing is parking outside – there is a loading zone, but apparently musicians can't actually use the loading zone due to local laws.

Interviewer: Okay. So you mentioned that new products are always being made to meet the needs of musicians – what do you mean by that?

Participant: I think, particularly with drummers, there are lots of advertisements for storage on wheels, so there is enough demand from drummers for the industry to innovate. There was a particular hardware case that came on a trolley with wheels made by Rockbag (hardware caddy). My friend got one, and then I got one, and I had it for 8 years. Even when it was breaking, I was still throwing it down staircases because it was just so convenient to have a handle and wheels on such an awkward thing. Unfortunately, because of the nature of a bass drum, for example, the shape is still awkward, so regardless of if it has wheels and a handle it doesn't work very well. This hardware thing was a long bag, but it was upright. Kinda like a golf caddy. You just grab the handle and lean the thing over, and I could hold onto it and push it down staircases, but bass drum cases are too awkward, and I end up just picking it up by the handle. Unrelated, but from my perspective, guitar cases haven't evolved that much either.

Interviewer: Okay. So you mentioned you have never hurt yourself moving equipment?

Participant: I've cut myself folding up a hihat stand, but I don't think I've hurt myself. I've downgraded the size of my instruments, and I try to employ good lifting techniques.

Interviewer: Understood. Tell me about your downsizing process – what is your reasoning behind it?

Participant: I think partly, convenience is one motivation, part of it for example when I play with the AGC, less is more with that kind of thing. I'm not playing in a style where I have to front up with a particular kind of kit. And I think that the game has changed a bit, as showing up with a drum kit used to be quite a visual thing. Now its really just about what sound you make and what you can add musically. There has always been personalisation, but where personalisation used to mean more and more, now it's just different elements. Most of the time I feel I bring what is needed for some things and what I can get away with for others.

Interviewer: Okay. So How do you feel about things like the pearl rhythm traveller and the tama cocktail jam?

Participant: I definitely feel they don't sound as good as a traditional kit, but I feel the trade-off is less and less than it used to be for all the same reasons I mentioned before. Robert Seawright, he uses the cocktail jam for some things, so it doesn't matter what the kit is, the player is just so good. The other way to minimize the sacrifice is to use electronics, as I can use rubber pads to replicate tom sounds that, at least for practice, are just as good as the real thing. Another good example are my low volume cymbals – they sound excellent for the purpose that they are intended, but I wouldn't use them for anything where I'd need proper cymbals. You need to bring equipment that is appropriate to the music.

Interviewer: So, would you say that drum culture has shifted now that alternative drum setups are seen as cool?

Participant: Yeah well, if you showed up with an 18" bass drum that is immediately a jazz bass drum, and can't be used for anything other than jazz. But now people tune them lower and lower, and the technology has come so far, like different porting and venting in the drum, or different drumheads with integrated muffling to get a bigger/better/punchier sound. 20 years ago, we didn't have the same level of versatility. My 15" kick drum sounded punchier than my 22" for a particular recording session because of the room, so we ended up using the 15. Probably to do with the volume of the kick.

Interviewer: Okay. Just to wrap it up then, you mentioned your health issues in your earlier years. How did that affect your playing?

Participant: I'm guilty of being one of those people that will find a way to play at any cost. I had an autoimmune problem one time that had affected my ankle, but I was allowed to have some leave. I asked if I could go to the valley because my band was playing, and I had a fill in drummer. I had a line in my arm and was walking with crutches. I was just gonna go there and listen, but my bandmate asked if I could or wanted to play a tune. Although I couldn't walk properly, I could play fine, and I managed to get up on the stage and It made me feel normal. It made me feel I wasn't missing out. If its something you love, you try to do it as much as you can.

2.2 – MITCHELL BELLERT (JAZZ DRUMMER)

Interviewer: Hello! What's your name?

Participant: My name is Mitch Bellert.

Interviewer: Lovely. And how any years of experience would you say you have in music?

Participant: I've been playing drums since I was 4 years old, and I've been having lessons from around the same age

Interviewer: So where did you learn drums?

Participant: I started having private lessons at little independent music schools round town, but when I go older I studied with one on one guys and tutors, and then I went to JMI.

Interviewer: And you enjoyed it there?

Participant: Oh yeah.

Interviewer: Excellent, alright. Okay so, what type of venues do you usually perform at?

Participant: Well, obviously nothing now, but usually they would be s bar or a jazz club. So like, front door back door, smallish venues with a little stage.

Interviewer: Would you have to go through crowds of people to access the venue?

Participant: Most of the time if the venue is a bar you have to walk through patrons, pretty much every venue I've played at you have to fight your way through people.

Interviewer: Okay. So you're primarily a jazz drummer – what your setup like?

Participant: Okay so pretty much all my hardware except my stool fits inti a traps case on wheels. I've got a cymbal bag that I just put on my back, it has backpack straps, you can load that in pretty easy. Apart from that, I have my stool, and then I've got a bass drum bag, one tom bag that actually fits my two toms in, and I have a snare hard case. Normally if I'm on my own I can get it done in two trips with a struggle, but usually three.

Interviewer: Okay. You say further down that some venues had sketchy stairs – define sketchy?

Participant: Oh well, you know blackbear lodge? Those stairs out the back are super sketchy. Rickety, a number of stories, they're old, scary and awful. So, like, those stairs, then also most of the time if you're playing in the loft level of any venue, or even downstairs (e.g. walrus club), the stairs are so tall, and the door is tiny that you have to squeeze into.

Interviewer: Not what you'd say is 'optimised' for loading in and out?

Participant: Definitely not.

Interviewer: So, you say that storage device technology hasn't changed in recent years?

Participant: Not to my knowledge, no. you've got soft cases and hard cases and trap cases, and that's about it.

Interviewer: And you have an 18" kick drum, right?

Participant: I have a few drum kits. The one I use for gigs is 18x16.

Interviewer: Are we talking thin with reinforcement hoops?

Participant: Yeah, its birch and has those hoops around the inside.

Interviewer: So, you've not actually hurt yourself regardless of how awkward it is getting in and out of places?

Participant: No, but let's say I have four or five gigs in a row (night to night). By the time that stint is over, you definitely feel you had a workout. Legs hurt, back hurt, its physically tiring. Its definitely affected me when playing gigs. RSI type thing – same movement over and over again.

Interviewer: Okay. Would you be someone who plays through pain if you got an injury, due to your passion?

Participant: Well, when I was younger I did, and I used to, but ever since I started my degree and started studying and being more of a professional with my craft ad my body, I got a lot more serious. A couple of years ago I got really bad RSI in both my arms (repetitive strain industry), and that was from when I got booked a lot more with gigs in a row. Also the level of music was increased as well, and the music was a lot faster and more physically demanding. I really hadn't practiced that as much as I needed to, but I was in the gig so I had to go all out. I ended up with really bad RSI for a couple of months, and then I couldn't play at all. I could still teach, but I went to a hand therapist that made it a whole lot worse, and then I went to a physio who eventually sorted it out. When I had the really bad RSI, I didn't play at all, I didn't even try to because it hurt. I had to reset my hands and my technique and everything.

Interviewer: Would you think about how your equipment attributed to that?

Participant: Oh yeah for sure.

Interviewer: So, how do you feel about products like the pearl rhythm traveller or the tama cocktail jam? Those portable drum kits?

Participant: I mean, its like, they're not a new thing anymore. They were made the best they could be for the time they were made at. I actually use them heaps in the teaching studios I use because they're really cheap. I honestly don't mind how it feels and sounds to play, especially the pearl one. Of course, I'd never use it live because it doesn't sound good, but as a practice tool its perfect. I haven't

actually tried the tama one, and that actually looks amazing. A couple of professionals (Robert Seawright of Ghost Note, etc), uses them and it sounds huge, but he also is incredible drummer.

Interviewer: Yeah understood. So do you think the compromises made to those products are worth the benefits?

Participant: It really would depend on the setting. I think they're really good as practice things, or as a busker, but in saying that there are some companies that make even more portable kits. Have you heard of Reverie? Yeah so they have a few really portable kits, but they sound great because they are made properly and with quality materials.

Interviewer: Okay. Well, thankyou very much!

2.3 – WILLIAM HALSEY (ROCK DRUMMER)

Interviewer: Hello! Whats your name?

Participant: Hi there, I'm Will Halsey

Interviewer: And what do you do for a musical living?

Participant: So I play in a covers band, I also play in a dub reggae originals band, and I also do my own MIDI drum sessions and I help out with various sessions.

Interviewer: Okay, so how many years of experience do you have?

Participant: About 22/23 years.

Interviewer: Okay. So when you gigged, how many times on average would you gig?

Participant: It varies. On average, maybe twice a month, but in certain months (December for example), I'll have 8 gigs, but when its summer here, it will go down to once a month, Its quite seasonal.

Interviewer: So you said you played in pubs and clubs – elaborate on that?

Participant: Most of the venues I play in pubs which an be a bit hot and sweaty. By and large they will have music licences. And then in terms of clubs, usually Jazz clubs, very small music venues. Really nice and intimate. Another really common place id play at is outside, tented, like a wedding or something. Because of the variation, you really have to keep in mind what equipment you take given the setting.

Interviewer: So, you said that access to venues was variable. Please elaborate?

Participant: Sure, so, good question that some venues are on ground level, and that is obviously much easier. For example, if I'm playing at a theatre, you get a good load in bay, its quite straightforward. Some pubs though, you have to go downstairs, and that's a real pain. Access unloading your car is easy enough, but if you've got a bag of hardware, that can be quite taxing. So, when you're going up and down stairs it's a pain. Stairs are usually a problem. Lifts can of course be super helpful.

Interviewer: So, on average, you said you brought a specific number of components and you tend to do it yourself?

Participant: Yeah well, my bandmates are pretty good, and sometimes I'll tactically arrive a little bit late so they could help me out. But there are plenty of times where I am loading in myself, which is a pain. When I was younger, I'd make it my mission to set up everything I owned onstage (all my cymbals, three-sided rack, etc.), and it didn't hurt my body so much. Now though, it's a major chore to pack up and load out once the adrenaline has worn off.

Interviewer: Okay. So you would say you've started taking less and less to gigs as time has progressed?

Participant: Exactly.

Interviewer: That's fair. What about issues with raised platforms or angry patrons?

Participant: Yeah, there used to be a chain of clubs around London where you would play on a Mezzanine floor, with stairs up and down. Then there are some places where as soon as you finish, the DJ will start, which results in you having to pack down and load out through drunk, dancing patrons. After a night of playing for them they are usually quite friendly (sometimes too friendly), and sometimes they'll be dancing in your face on stage as you pack up. Sometimes in situations like that you just want to pack up and go.

Interviewer: Fair enough. So, how do you feel about current drum storage solutions? (cases, bags, etc.)

Participant: There are some really good options now. Not with the cases and stuff but with lightweight hardware. There are good solutions to a degree – drums are, by nature, big and bulky. Hard cases are the way to go if you're moving around a lot, but they are quite heavy. Wheels on hard cases are very useful. There's not much you can do with drums. A 22" mahogany bass drum sounds beautiful but is very very heavy. I'd rather have 2 or 3 hardware bags with a lighter load within, over one huge coffin-type bag with lots of weight in it. They're okay when you're wheeling them around but then you have to pick the bugger up and put it in your car. I go with the little and often kind of approach.

Interviewer: Okay. Elaborate on your 'lower back problems' statement?

Participant: Yeah so, this kind of relates to my previous comment. I used to have a large coffin-like hardware case, with wheels, it was awesome because you could out everything in it but picking it up and putting it into a car resulted in my lower back going out. Its okay at the time, but the next morning it is awful.

Interviewer: Yeah okay. So, you like wheels? You mentioned that many products were missing wheels.

Participant: I just think its quite sensible. When you see bass players with their cabs or amps or whatever, they have a trolley with them, which is really sensible. I've got some cases, which are much smaller than the big coffin case, but they are just bags. Without wheels, they can still get heavy with all the stuff loaded in them. I think even with the smaller cases, it would be sensible to have wheels on them. When I was younger, I'd look like a commando with all the gear I'd have around me travelling on the train to gigs. This was before I was driving. I was bearing all that weight on me. Cymbals are so heavy. Plus, they're awkward – If they have a shoulder strap, they will come off eventually, just because the weight is too much for the material, and then you're left with just a handle.

Interviewer: Okay. Regarding products like the pearl rhythm traveller, and the tama cocktail jam, how do you feel about these products?

Participant: Many years ago, there was a product called the Arbiter Flats. A couple of interesting things about them, they're just a drumhead with a rim. They had this amazing technology where they had only one lug on the drum, so you only had to tighten one lug and it would tune the drum perfectly. I haven't used those flat sorts of drums before. I suppose the problem they have is they don't have much resonance about their tone, and they don't project as much as normal drums, but in terms of practicality, they really come into their own. The one thing I've considered doing, is getting short stack drums from DW. They have their own practicality, but there aren't many manufacturers that case them because they're so short.

Interviewer: Okay cool. I think we'll end it there!

2.4 – SAMUEL MONK (METAL DRUMMER)

Interviewer: Hello! What is your name?

Participant: My name is Samuel Monk.

Interviewer: And how many years' experience with music do you have?

Participant: I've been playing drums for about 10 years now.

Interviewer: Cool! What would you say your favourite music genre to play is?

Participant: Oh, rock and roll man. Primarily rock, but I have experience in a few other genres.

Interviewer: Okay. So, you said you gigged around once a week?

Participant: Yeah, pretty much.

Interviewer: And you said around bars and pubs – elaborate on that?

Participant: Essentially the main spot we play at is the valley in Brisbane, but sometimes we perform around the city, and we've done a few gigs in west end. Essentially, they're little watering hole venues, with some kind of stage and P.A. We just go and play to our friends and whoever is in the bar.

Interviewer: Regarding those venues, how was the access as far as loading in and out goes?

Participant: I've never had any bad experiences particularly, but the gear isn't super protected from patrons in these venues. If patrons wanted to touch my gear, they could. Load in is usually through the front, which isn't an issue specifically, but because the venue is so cave-like it gets very crowded quickly, which isn't optimal for loading in and out at all.

Interviewer: Okay. Have you ever needed to bring a whole drum kit before?

Participant: Most of the gigs I have played have house kits, although Common House doesn't have a house kit. I brought my own kit to that one, and also to a Crowbar gig.

Interviewer: How was getting your drum kit in and out of there?

Participant: Oh, lots of stairs. Crowbar has a nice, guarded instrument storage room backstage. But the stairs are the only way in and out and they suck.

Interviewer: Okay. How do you travel to gigs?

Participant: I usually go by bus, and I bring all the usual gear you would to a house kit gig that I can carry. I actually made the decision to sell my car because I didn't want to pay rego while I was in the city studying, and I thought because I was young and strong, I could carry it all myself. While I'm in Bundaberg I really feel not having a car (no public transport), but where I live in Brisbane is really convenient for public transport.

Interviewer: Okay. You mentioned your difficulties loading in and out – do you ever feel your gear isn't safe in these dark and crowded areas?

Participant: Yeah, to an extent. I think the Wooly mammoth stands out, they make you load in the back, and it involves a shady little alleyway, and often its crowded. Tomcat is the worst experience having to stumble through people – the gear room is right in front where most people are dancing, off to the left of the stage.

Interviewer: Okay. As far as the storage solutions, how do you feel about your drum bags and other gear?

Participant: Currently I like my bags, for what I do with them. That's because I don't have $1000 cymbals – if I was carrying around one of those bad boys I wouldn't be carrying it around in a cymbal bag, and I wouldn't even be taking it to my usual kind of venues. Considering the price, I do like my bags, I have a lot of trust in them, and they're so much lighter and easier to load in and out, especially when I'm strapping them to myself. I think they're a good compromise between weight and portability, and great for the small-time gigging drummer.

Interviewer: Oh okay, do you have a cymbal backpack?

Participant: Yeah I do. Just a typical backpack type, my shoulders take all the weight. The straps are too long so sometimes it is a little awkward, but the weight is centralised. I have to be really careful with keeping my lower back steady, and I end up rolling my shoulders forward to balance it. That said, because it's a backpack, I'm not walking around with a limp like I would a normal cymbal back. I have been quite sore from carrying around equipment like that.

Interviewer: Yeah! You said you've been sore in the questionnaire – elaborate on that?

Participant: Yeah for sure. From memory, lugging gear to and from a gig, especially when I have a number of gigs in one night and I have to move quickly between venues, is very physically demanding and hard to do.

Interviewer: Okay. And you mentioned you dropped your cymbal back on your toe?

Participant: Yeah that was at QUT, outside Z9 at the lights.

Interviewer: You said the cause of that was because the bag was out of date?

Participant: Yeah, the bag was long past its use by date. Essentially the material that case was made out of was a single piece of woven mesh, with support seams running long side. Even the parts where

the straps hooked to which were thicker, the main mesh material wasn't thick enough, so all the material around the thick parts broke. The bag I have now is a lot thicker, with a lot more reinforcement. Its basically more substantial than the last.

Interviewer: Cool. So, you say you could never see yourself playing on an electric kit live – why?

Participant: Primarily because of the music we play live. There is a lot of energy associated with alive drum kit that you really can't achieve on an e -kit. To a certain extent, live kits are more comfortable than e-kits, because they're more open and I can move better. E-kits are much better for practicing and refining your moves to make your live playing as effortless as possible.

Interviewer: I can relate. I used to have an e-kit, before I got my acoustic, and I really struggled with dynamics and movement around proper kits. How do you feel about kits like the pearl rhythm traveller, or the Tama cocktail jam?

Participant: I've played on the cocktail kit, but I haven't experienced the Pearl. To me it really depends on the style. If you're doing something like low-fi funk or chilled RnB, those kits are perfect. A lot of what I have realised is that a lot of it comes down to the quality of the instrument. The materials it's made out of, what quality of steel, wood full of glue or cast in a way that reduced tension. If something is made properly, anything can sound great.

Interviewer: Okay. You said in the questionnaire that you haven't come across a product for true mobile live performance - elaborate on that.

Participant: A lot of it is to do with the music I play. I haven't had a chance to get into the quieter genres of music, so because of that I haven't been looking. They're also not common in music stores.

Interviewer: Cool. I think we'll end it there!

APPENDIX 3 – SURVEY RESPONSES

What is your age?	What is your gender?	What would you deem as your primary instrument?	How many years of experience do you have with your instrument?
18	Female	Keyboard Percussion	5 to 10
18	Male	Woodwind	5 to 10
19	Male	Bass	11 to 20

20	Female	Bass	5 to 10
20	Male	Brass	5 to 10
20	Female	Classical Strings (Violin, Viola, Cello, etc.)	5 to 10
20	Male	Guitar	5 to 10
20	Male	Guitar	5 to 10
20	Male	Vocals	5 to 10
20	Male	Woodwind	Less than 5
21	Male	Drums	5 to 10
21	Male	Guitar	11 to 20
21	Female	Keys	11 to 20
21	Male	Keys	5 to 10
21	Female	Vocals	11 to 20
21	Female	Vocals	11 to 20
21	Female	Vocals	11 to 20
22	Male	Drums	11 to 20
22	Female	Woodwind	11 to 20
23	Male	Auxiliary Pecussion	11 to 20
23	Male	Bass	11 to 20
23	Male	Drums	5 to 10
24	Male	Guitar	11 to 20
27	Female	Drums	5 to 10
28	Male	Guitar	11 to 20
33	Male	Drums	20+
34	Male	Drums	11 to 20
37	Female	Woodwind	20+

43	Male	Drums	20+
49	Male	Drums	20+
50	Male	Drums	20+
	Male	Drums	11 to 20
	Female	Woodwind	11 to 20

Do you tour, gig, or busk frequently? (rough estimate)	What venues do you most commonly perform in? Are they dedicated music performance venues?
A couple of times a year	Concert Halls
three times per week	bars
A couple of times a year	Just the valley mainly, like your basic rics and Tom cat
A couple of times a year	Local bars/pubs
Twice a month	Brisbane Powerhouse, QPAC, St John's Cathedral
A couple of times a year	Outside (on grass or other), usually weddings
Once a week	Often yes if it's venues like Brisbane Arts Theatre, The QPAC Green, Doobop Bar and the Brisbane Jazz Club. If not they are Cafes or Foyers to larger performance halls.
Twice a month	dive bars
Yes	Various live music venues in Fortitude Valley
Not anymore, did in highschool	School music halls
Yep	Regular music venues in the valley i.e. tomcat, greaser, rics, crowbar, zoo etc
Once a week	Mostly the same venues around brisbane
Was multiple times weekly before the Covid rolled out	No. Sheds, theatre halls, bars, pits,

Never	
A couple of times a year	Local festivals or markets
A couple of times a year	Mostly small music venues in Brisbane. But also in restaurants and for a few events (weddings and special occasions)
Twice a month	Yes! Performances hall, concert halls, churches town halls!
Yes	Usually I perform in venues such as bars, however most of these bars have had dedicated performance spaces.
A couple of times a year	Concert and recital halls dedicated to music performances, churches
Twice a month	Yep
Once a week	Pubs & wedding venues. Also corporate spaces
Like twice every 2-3 months	Music bars and pubs
Once a month	Mixture ranging from outdoor areas such as vineyards, farms etc. to dedicated music performance venues
Once a week	Theatres, cafes, concert halls.
A couple of times a year	Woolly Mammoth Mane Stage. It is a dedicated music venue.
yes	pubs and bars
No	Yes. Bars, live music venues.
Once a month	Theatres, concert halls and churches. Only concert halls are dedicated music
Yes	Pubs, clubs, sporting venues, music venues.
Once a month	Yes, Concert halls, Theatres
Yes	Yes
Yes	Triffid, Tivoli, yes
Twice a week	Dedicated music venues - concert halls, churches

How would you describe the load-in access to these venues? (ease of moving equipment in/out of venue to the stage)	List the pieces of equipment you take to a show. How do you get it to/from the venue?

Generally ok, some minor difficulties with larger instruments	Large instruments such as timpani - we put them in their boxed cases with wheels and move them onto a truck. If I was using a drum kit, I would have to disassemble everything, put it into my car, and set it all up for the concert, then vice versa after the concert
Decent. They are bars, so arent typically designed for music and access.	Sax/Clarinet/Keyboard. I take it in a car
Yea its alright, just harder to move through people most the time	I just take my bass with a strap and some leads in my hard case. I drive and park in the china town for $15 and just walk to the venue with the instruments and amps
More often than not, quite difficult to access due to steep stairs and unlit/unsigned areas	Bass guitar and Amplifier, transported by car and carried into the venue
Satisfactory	Multiple trumpets, in one or two cases. Usually transport by car
Generally not particularly difficult, but some havent been that great.	My instrument, stand and chair + string bag. Transported by large car
Often manageable, my equipment can be a challenge to load in if there are narrow corridors or a small green room (Doo Bop, though they provide much of the equipment) or there is a long way to travel (Green Jam) or the band is located on a high mezzanine (Arts Theatre). This is not to say anything negative about my experience at any of these venues, just some of the minor inconveniences I have had when working in their spaces.	My Guitar, Amplifier, Pedalboard and occasionally a music stand
a struggle, because I have noodle arms and cannot carry large amps	guitar, amps, pedals - Usually transported via car

Mostly stairs only, often quite far from loading zones	Instruments apart from PA and basic backline (drum kit minus cymbals & snare, sometimes guitar amps)
For my instrument, we took them into practise rooms then walked onstage with them. For larger instruments like percussion, they were loaded onto the stage prior to stage entry.	Oboe case + oboe
For the most part, rubbish. Have to park miles away, muscle through crowds of drunk punters and more times than not, up stairs with heavy gear	A whole kit unless they have a kit there, or the kit is rubbish. Otherwise pedals, snare, cymbals, stick bag, sometimes seat and a stand or 2. Until recently the train but now a car
Difficult sometimes	Amp, guitar, pedals. Carried on a trolley
Extremely difficult usually. Lugging heavy expensive equipment long distances from your car due to poor parking, accord fields or bridges or car parks, up and down stairs in and out of pits or into instrumental areas, no help,...	For keys, my keyboard, sometimes amp, computer and cords, audio interface, music stand, keys stand, computer stand. Plus Im technically a multi instrumentalist so Im usually equipped with five other instruments on average.
Easy to move equipment in and out	Guitar, microphone, leads and cables. Take it all in my car
A lot of small music venues dont have a very accessible load-in access. Then again, as a singer Ive never really had to move a lot of equipment to venues.	Venues usually provide a mic so I personally donâ€™t bring anything.
Ahh so tricky! Really does depend on the venue - for singers, instruments aren't really an issue its more dresses, costumes makeup ect and having places to keep these/ having close/free/accessible parking nearby	Cello (when playing my cello)! Usually a bag of two with clothes changes makeup ect
The access to most of these venues are arguably poor - one venue in Brisbane required musicians to carry gear up three flights of open-air stairs, with great difficulty.	It depends - if an entire drum kit is required, I have to bring an entire kit. This is approximately 70-80kgs of gear. However, most gigging venues have a

	house kit, and only cymbals, a snare, and pedals are required. This is approximately 20kgs.
Easy	Two clarinets in the same case, music, clothes (usually I need an extra bag to fit my music and clothes in). I normally drive with someone else or take public transport.
Most are okay, but some don't have any loading docks	Timps or marimba, family 4wd. Anything bigger I'd have to hire a van. Anything smaller a hatchback
Great if there is parking.	PA, instrument, mic and speaker stands
Hard to find a parking close to the venue...	Back lines and in a car
Depends on the event, usually straight forward but there can be long treks from parking to the location where I am playing	Weddings and similar : Classical Guitar, PA, Mic, Stand and Sheet Music. Everything else: Electric Guitar, Amp, Pedals
Ranges from easy and flat to many stairs and lots of walking.	Drums, hardware, various percussion instruments, music stand, drum stool. Car.
Horrendous. Narrow staircase at the end of an alleyway.	Guitar, Kemper and wireless rack units in a rack. Guitar in a hard case, rack unit is a wheeled road case. IEM system in a separate road case.
terrible	drum set, microphones and cables, camera equipment
Tight, cramped, often not designed for "load in" scenarios.	6 piece drum kit, plus 7 stands and cymbals. Via car.
Very good for the most part.	Full orchestral percussion: timpanis, chimes, xylophone, marimba, bass drum, piano, drum kit, glockenspiel, rotor toms,

	40 music stands and more. We own a van and trailer, and move it ourselves.
Poor	A drum kit and hardware. Mics, Mixer.
It can greatly vary. Time is lost due to the inconveniences of parking car if unable to park at or near loading bay.	Marimba, Drum Kit or Cajon, Conga, Tabla all by car to loading bay
Variable. Couple have flat street access. Others a steep stair case	4 piece kit and all stands. Couple venues have house kits so just stands stool cymbals. Requires SUV to transport
Good	~7 boxes. Tour van
fine	instrument - i carry it

Describe your experiences with loading in and loading out of the venue regarding moving equipment to and from vehicle to stage. Are they hazardous? Have you had issues with taking equipment in and out of venues?	How would you assess current musical equipment storage devices? (instrument cases/bags, trolleys, hard cases, dedicated mobile shelving units, etc.)
Yes - instruments have been really heavy and difficult to lift, requiring the strength of many people	I think they are pretty good
Theyre not hazardous, but its difficult to get through the crowd and tables.	At the con I think these devices are very helpful!
Theyre not super hazardous, the only concern would be the people who are around late at night in the valley, they might steal or damage the equipment	Only have the cases, some venues have rooms for the instruments but theyre usually all stacked on top of each other because theres not much space
There often isnt access for a vehicle so the equipment needs to be carried, sometimes quite a far distance. A lot of venues have steep stairs and dont accomodate for heavy equipment	Most venues dont provide trolleys so if they are required you need to bring them yourselves. Every musician knows hard cases are ideal and already own them.
Case storage can often be a trip hazard in pit venues or non music-dedicated venues such as St John's cathedral	Useful and necessary

Nah not really hazardous. It can take one to two trips (usually where Im playing is quite far from car parking) which isnt that great for leaving items unattended.	Pretty innovative, but Im excited to see what else is created in the future.
The Arts Theatre mezzanine is quite inconvenient and hazardous to move equipment onto. Doo Bop and the Jazz Club are often fine, though occasionally the backstage is cramped if there is a 19-piece big band loading in. The QPAC Green is quite far from any convenient loading dock and a lack of equipment there means that it can be strenuous carrying a 30kg amplifier around. Cafes and Foyers normally have parking nearby and the lower volume enables me to bring a smaller amp, though storage of cases is often an issue during gigs.	I have no idea of any professional services and would probably borrow from a friend.
The only issues I have is when I have to transport my equipment up a flight of stairs	A mix of soft cases/bags which I can sling over my shoulder and hardcases for more expensive equipment
They are often a bit hazardous with having to carry things like keyboards up stairs, some stairs are also pretty steep. Sometimes it can be difficult getting gear in and out efficiently too if the most suitable parking spot is far away and you don't have much help carrying gear.	Mostly good, sometimes cheaper gear has bad wheels and stuff but the more expensive, tried and true gear options are sturdy and useable. Definitely room for innovation too as bulky (but protective) road cases are naturally difficult to get up stairs.
Very simple. Carried the small case (size of a briefcase) on the bus with me. Carried it throughout the day. Was not heavy or cumbersome.	My instrument case was a very hard case that prevented fall damage. I've had some experience moving drums and their individual cases do not have good handles and are really difficult to move. Perhaps handles are in the wrong spot, or the case could be made a different shape so it could be rolled.

More times than not. Again, stairs. But a lot of the times there's very little space to park so I'm standing in traffic half the time	Good protection factor, but I wish I could clip my cases onto each other and give the whole thing wheels, so I'm not using a pallet trolley and 5 elastic straps
Only venues with staircases are difficult to load into	I have sufficient storage
Yes. Almost every time I go somewhere I have problems. Theres too many stories to tell. Transportation is always hell. Ive been asked to get my keyboard over a two meter drop into a pit five nights in a row in and out- plus equipment; lugged tenor, alto, claro, flute, oboe and bari clari over a football field plus music stands; lugging instruments nightly over a bridge- twenty minute walk - to a venue with no parking for musicians; loading gear onto stages that arent completely safe- with drop off ledges and even once, unstable to the point of collapsing during a performance, injuring the drummer... I could go on	All hard Instrument cases, backpacks, trolleys.
Very safe venues	Not sufficient
Many venues have stairs with no easy way access. aka we have to bring everything up and down the fire escape.	n/a
No issues so far but don't carry a lot of gear around as I'm a classical vocalist we aren't micd!	I don't understand this question sorry!
As stated previously, some venues have particularly poor access, involving many flights of stairs, tight corridors, or busy entrances. On occasion, one must avoid bar patrons while carrying multiple heavy items - this risks injury to both yourself and others, especially when some are heavily intoxicated.	Most of the equipment I carry come with carry bags - these bags are fairly generic in nature and do not differ wildly from manufacturer to manufacturer. Hard cases are hard, and soft cases are soft. Hard cases offer greater protection at the cost of heavier weight.

Thankfully I havent had any issues	Depends on the instrument. Ideally, clarinets should be stored in humidity and temperature controlled conditions, but this isnt always the case with modern storage solutions, especially when touring or visiting unfamiliar concert halls.
Some have been. I once had to wheel timpani 2 blocks uphill in CBD Brisbane to the rehearsal venue as there was no where else to unload. I almost had a timpani roll!!!	
Sometimes. Never had issues because I am cautious	Great. I think people dont invest enough in quality cases and trolleys - they make transporting gear so much easier
Its the worst part of the job but Im not a pro so most venues are the same...	Decent
Distance is the biggest hazard when you are carrying a 33kg amp because they don't have a backline.	Good
Have had to bump out a full drum kit and hardware down a ladder to get outside.	Some good, some bad
Any time heavy gear needs to go up and down stairs is a hazard. Unfortunately most venues in Brisbane are old buildings that weren't built with this in mind.	There's plenty available. There will be something out there that does what you want it to. There's always a compromise between weight, protection and storage space, though.
never unsafe, but always inconvenient	i dont use them, because they add weight and size, and have to be stored somewhere during the gig
Yes. Often venues are not overly accommodating regarding musicians loading in, ie having to take gear through a functioning bar. Temporary parking near a load in area can be difficult to find, if it is there at all.	They have improved.

Most of the time it's fine but as a performing musician it's never ideal to move stuff before performing, nor afterwards in one's concert outfit. I have experienced completely black backstage conditions and lifted timpanis many times.	Good but expensive
Yes almost always issues,	Cases take up a lot of room, make it harder to carry large heavy drums.
Thankful for trolley if available. Last year I spent c.$200 on my own metal, 4 wheel, collapsible trolley. Worth it :) No bad experiences; but Im always early to avoid rushed setups.	Expensive, but I build my own shelves so $$ can go towards soft cases. Big $$ are required when flying. Flying is annoying, time consuming & risky.
Usually require assistance. Couple venues have dedicated parking so easier there	Mix of soft bags and hard cases
Thin ramps to stage. Other than that no	Cant get better
n/a	fine

Have you injured yourself due to strains from moving equipment? What was the cause of the injury?	If it was due to poor design, how would you improve the product?
No	
No	I dont understand the question, sorry!
Nothing major but probably just grazes on my hand from rubbing against other equipment	Just have more space
Omg YES. My instrument is quite heavy and bulky and have injured my should from the awkward position carrying it up steep stairs forces upon my body.	It was moreso due to the venues layout, rather then the equipment itself.
No	

Yes, lifting my instrument at awkward angles to get it out of the car, hurt back	I mean I dont think theyre going to be creating a specific aid for cars or a specific car to aid the transportation of my instrument, so its just working around it.
No I haven't	It would likely be from a heavy amp. Maybe I would equip it with wheels and a handle - like a travel suitcase.
I havn't injured myself yet	-
Never had a serious injury, just aches and fatigue, but I guess I'm relatively early in my career too. I think there are definitely ways that things could be designed to be better.	More carry straps/backpack style strappings on instrument cases to distribute the weight across shoulders instead of all on one side for instance. Ideally actually comfortable, ergonomic straps too instead of just bits of rope that causes other injuries while avoiding others.
Negative commander.	N/A
I almost constantly have a sore back from lugging stuff up stairs with no help from guitarists Bloody pat That and more stuff needs wheels	Wheels. Just wheels on everything
No	
Yes. - ankle sprains from travelling long distances with heavy equipment. Has happened multiple times. - back injury from getting keyboard into pit two meters below floor level, only after getting it down three flights of in-house stairs and a ten minute walk from my car.	
No	?
Luckily I have never been injured for these reasons.	n/a
No	

I have had my fair share of bruises and scrapes thanks to the combination of carrying heavy equipment through confined spaces - I feel the ergonomics of the carry bags could be improved on.	Like I said, the ergonomics of the carry bags and cases are awful. Handles are awkwardly located and do not fit all hand sizes. Some are also incorrectly sized for the weight of the product - this leads to painful handling.
Nah	
Yes - a sprained rib joint from lifting gear at Queensland Conservatorium. I had to take two weeks off playing. On another occasion, a sprained wrist from assembling tubular Bells had the same outcome	Wheels
No	-
No	
Yes, strained back	I just need a trolley or wheels on my amp
Yes. Many bumps and bruises from cases banging into legs.	More padding, more durable wheels.
Not seriously, but plenty of sore backs. Usually due to lifting heavy gear into awkward places.	Not much can be done to cases etc without greatly increasing price.
no	-
A 22" bass drum is awkward no matter what type of case you carry it in. No injuries, but certainly been put in awkward positions.	
No, it's good exercise	Timpanis are the hardest to move and they could use handles as you're not meant to hold the most convenient part, the rim.
Injured my knee lifting a speaker into the back of a truck after a gig. Probably user error.	A movable platform on the back of the truck?
No injuries due to regular exercise focusing only on bodys core.	-

No injury - stands are worst to lift. 24 inch bass drum always going to be awkward	Na
no	
no	n/a

Have you used instruments that are aimed towards enhanced portability and light weight? What are your thoughts on them?	Do you feel there are compromises made to the product to enhance portability?	If so, do you feel the compromises made negatively effect sound quality and the overall playing experience?
Yes - they are pretty good	A little bit	Not as stable
I havent used instruments, but I have used cases which are designed for portability, and theyre very helpful!	It honestly depends on the product. If it is a case, for example, then no. But if youre making a keyboard more portable, there are often times corners that have been cut.	I dont believe keyboards have their sound quality compromised, but the playing experience is just not as nice as other keyboards!
Not really, but it sounds cool	Probably	I dunnooooo
I used to use a guitar that was much lighter and therefore easier to transport however I would rather the one I use now as its better quality despite its difficulty to transport.	Often yes	Sometimes
Yes - usually very poor quality instruments of little to no use in the professional world	No	
Havent ever owned them, but the sound quality is lost. Most commonly, fibre glass is used instead of wood	Im assuming product means instrument?? And yes, absolutely. The sound quality is not as full and diverse, theyre	Yes, but depends on the vibe. If its being played as an electric version of the instrument, no

	ugly, the strings dont resonate as well	one really cares about the tone and sound quality
Not really. I like the initiatives but they are often costly.	I find that Gig Bags for Guitars, while lighter, often fall apart quickly and do not feel so secure. Guitars can be chambered to reduce weight.	They often leave me worrying about the security of my instrument in between. Yet I have not experienced this on stage. The Chambered guitars can also have this connotation of being "inauthentic" when used, though I have not experienced this first hand.
I've tried more portable amps but have always returned to 'less portable' equipment	yes	yes
Mostly good! I think with guitar cases there are some soft-hard cases that I've seen that have protective padding enough to keep the instrument safe in car/train rides but wouldn't be enough for planes. As most of the stuff I do is car travel this isn't an issue. Smaller, lighter keyboards are good too (maybe a 61 key MIDI controller fired by a computer or iPad will do just as fine as the heavy, ultra realistic electric piano?). Additionally, I've always been impressed by nesting drum kits or at least drum kits with 18" kicks -	Sometimes cheaper 'portable' products are just plainly cheap products so whether or not the cutting of corners is to enhance portability, it still means that they're not great. For very physical instruments like drums, the materials used in their construction really impacts the sound too so it's often a compromise between the sturdiness or durability of the instrument vs portability.	Definitely, often you have to compromise what songs you want to play or even how you want to perform the songs. For example, my band tends to avoid playing songs that use more interesting percussion because it's too difficult to bring a bunch of extra percussion gear for only one or two songs. Same for songs in guitar tunings - it's too interruptive for our band's performance style to spend ages going back and forth between tunings in a set so the ideal is swapping guitars but this is again more gear to carry. And additionally the

especially considering my style of music leans more to jazz where the sound of smaller drums is preferred to the large, deep drums that metal bands probably use.		same goes for keyboards - going with a more compact 61 key will suit most things but sometimes those extra things are really special to your performance.
Yessir. I have a small MIDI controller which is only 32 keys. This is far smaller than a keyboard and infinitely lighter. Can fit in any bag.	Reduced amount of keys and additional buttons, but performs very well for my needs.	The keys are smaller and have a different tactile response which is annoying sometimes, but overall sounds the same.
I did use a pearl rhythm traveller for a while when I was travelling but as a punk drummer it just sounded too small	Definitely	Definitely
No	No	
Nope.	I have little experience with such	
Havent given it much thought	Yes	Possibly
n/a	n/a	n/a
Only in music shops. I think they are a fun, niche product, but their sound leaves a lot to be desired.	Certainly. all drums are shallow and only have one head. Either that or they dont look at all like a drum kit.	Of course. These products do not feel like real drums, and their sound can be lacklusture. Using only one head on a drum reduces tonal quality.
Yep. Some are fine but the bestgear usually isn't portable. It's important to have a professional bump in team who aren't musicians, who can access proper WH&S protection		Yep

No	-	-
No	Definitely... for drums the sound is the main issue... playing a portable bop kit/small sizes feels and sounds like a toy	Yea
I have, they generally lack quality tone or are expensive		
Yes, they work for some gigs. E.g. electric drums, Roland octapad. But not for all.	Absolutely.	Yes, but sometimes there is no other option
My Ormsby Goliath is arguably designed like that, and it's great. It's one of the few that doesn't make sacrifices for the sake of portability, though.	In the case of the Goliath, no. In the case of most others, yes.	In the case of the Goliath, no. In the case of most others, yes.
ive reduced what i take and picked equipment that is easier to move and carry, quick set up	no	no
No.		
Yeah we have fibreglass timpanis and they're much lighter without a sacrifice in tone	Not in the case of timpanis	
Yes. A have a small kit. Can be ok for some gigs. Needs good mics and sound for them to work.	Yes	Yes
Ive only used smaller drum sizes for the sake of a small rehearsal venue. The performances require a solid	Hmmm There can be but if sound is the priority portability shouldnt matter.	Yes. My instruments sound miles better on stage than they do at home/rehearsal and thats because thats what they are built for.

sound (even if miced up) so I need the full size instruments.		
I have a bop kit which is compact and lighter. Still sounds good	Yes	Potentially
No	Size (= depth of tone in drums)	no
n.a.	n/a	n/a

APPENDIX 4 – INTERVIEWEE SURVEY RESPONSES

What is your age?	What is your gender?	What would you deem as your primary instrument?	How many years of experience do you have with your instrument?
24	Male	Drums	11-20
19	Male	Drums	11-20
40	Male	Drums	20+
37	Male	Drums	20+

Do you tour, gig, or busk frequently? (rough estimate)	What venues do you most commonly perform in? Are they dedicated music performance venues?	How would you describe the load-in access to these venues? (ease of moving equipment in/out of venue to the stage)
Twice a week	Jazz Clubs/Bars	Mostly in through front door on to stage. Some venues have stairs out the back which are difficult to navigate a drum kit through.
Once a week	Bars/Pubs.	Depends on the night and venue. Most venues load in through the public entrance. Most have loading zones near entrance, but a few will involve stopped a block away and carrying gear. Most have backrooms to store gear.

Twice a month	Pubs and clubs which are music venues	Variable!!
Once a month	Typically venues such as the Brisbane Jazz Club or Doo Bop plus performing arts centres (either school or community) for session type work, and venues such as The Bearded Lady and Black Bear Lodge for original music.	This varies. Both jazz clubs mentioned have house drum kits, typically other venues that double as bars/clubs do not. Some venues have a secondary access around the back that provides a shorter, more direct route to stage and storage areas with fewer hazards.

List the pieces of equipment you take to a show. How do you get it to/from the venue?	Describe your experiences with loading in and loading out of the venue regarding moving equipment to and from vehicle to stage. Are they hazardous? Have you had issues with taking equipment in and out of venues?	How would you assess current musical equipment storage devices? (instrument cases/bags, trolleys, hard cases, dedicated mobile shelving units, etc.)
Bass drum, tomx2, snare, hardware, cymbals, rug, stool. With my car and my hands.	Some venues have had sketchy stairs, and sometimes lifting heavier on to a stage.	It hasn't drastically changed since about the 1940's, it would be time for some innovation. Some companies however are designing compact drum kits but they sacrifice tone and resonance for size.
Honestly I just load it all up on me and bus to the venue. Used to own a car which made things really easy, but	We always leave sometime to sit with gear on the curb if were waiting for a car and generally find that the public respects us, although people can be unpredictable when theyâ€™re on the piss. Generally theres bouncers and theres police in the valley if something ever went down.	Depends what you buy and where you play. I was very picky about my cymbal case and is perfect for what I need. I trust my gear in most places but thats

decided that Im young and could save a lot of money carrying my gear on public transport. Ill sponge off my mates car if I can though haha. -Snare -Double Kick -Cymbals -One extra cymbal stand -Auxiliary bag with tambo, sticks and spare felts/nuts -Throne (if I have to)	Load in areas can be dark and shady looking, but thats the necessary atmosphere for a lot of night venues.	because I trust myself and my quality of bags/cases.
At least 4 piece drum kit, hardware and cymbals. Drive equipment in car, lift and shift by hand.	Generally it's problem free. Some venues have stairs which is problematic.	Cases and bags
Up to a whole drum kit, hardware, cymbals plus occasional electronic gear such as a small mixer and in-ears,	Some venues such as The Press Club have additional complications of no parking directly outside venue, and upon finishing playing, usually a DJ starts up and people crowd dance floors leaving only above one's head as a place to carry gear from stage to outside.	I think to answer this question, you get what you pay for? New products are also always being developed to attempt to meet needs of musicians, drummers in particular.

and/or possibly fold-back speaker.		

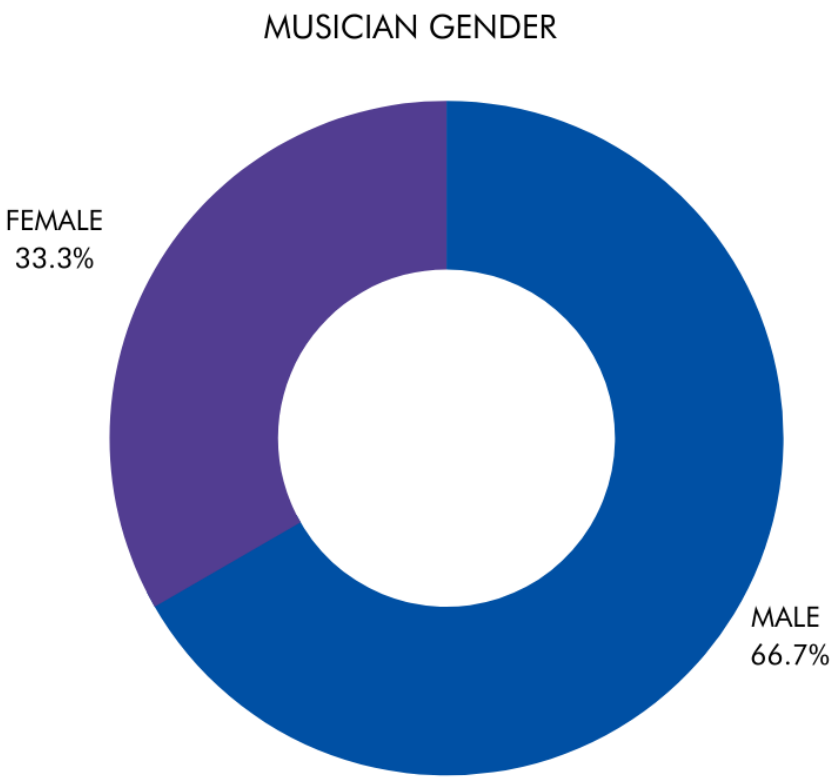
Have you injured yourself due to strains from moving equipment? What was the cause of the injury?	If it was due to poor design, how would you improve the product?
No	N/A
Haha. Maybe been a bit sore the next morning, but thats mostly because when you play 2 high energy shows in a row and cart all this stuff around it just wears you out. I try to lift safe so cant say Ive ever seriously hurt myself. One time my previous cymbal bag broke and landed on my toe and that fucking hurt.	Design wasnt great, but it was also well past itâ€™s expiry date and I was still using it. Double, triple or quadruple stitching soft cases goes a ling way. Metal pins are also good, but Ive had some times where theyre the only thing left hanging. Thick interwoven material and supporting plastic/cardboard makes a huge difference for soft cases. Dont have a lot of experience with hard cases.
Lower back problems have occured	Hardware cases in particular can be cumbersome. Many are not wheeled for example
Generally not, or not that I can think of, but certainly have been in some situations that are potentially hazardous and risky, sometimes self-induced for lack of patience in doing multiple trips to cars, or due to cars not being able to be parked in loading zones - fun fact, even if you are participating in a commercial activity, your vehicle for transporting gear cannot park in a loading zone, I was told whilst working for the local city council. To be a commercial vehicle, rear seats must be removed and the car registered as such.	I think generally with larger musical instruments, the size of the instrument itself is already award. However, in my experience of drums, it'd be nice to have affordable products/cases that offered the protection of a hardshell and the convenience of straps etc. - maybe this exists?

Have you used instruments that are aimed towards enhanced portability and light weight? What are your thoughts on them?	Do you feel there are compromises made to the product to enhance portability?	If so, do you feel the compromises made negatively effect sound quality and the overall playing experience?
Yes, I have a small 'jazz' sized bass drum and light weight hardware that has been excellent.	yes	yes so far.
I own an electric drumkit but cant really see myself gigging in it. Only ever seen a person play an electric live once and it was exceptionally bad math-core. My pearl cymbal stands are a great balance between lightweight and strong, but I still wouldnt class them as super portable. Havent met a stand Ive liked more than my own yet though haha.	For drum hardware, definitely. But there is a happy medium for sure.	To an extent. I havent come across super mobile/lightweight gear meant for live performance, at least not for drums. Small electric kits are definitely different to play on and no compromise for performing on.
I've used light hardware before they seem to be very good now	Yes, light hardware I feel has restrictions on what it can house	Not that I've experienced
YES - the size of my gigging setup certainly has decreased over time, consciously. I am now even incorporating electronics (as sampled instruments get better and better) to reduce this size again. Products such as	Not really - as above, unless in more extreme conditions... that is my experience anyway.	No, overall. Actually this is a really interesting question. I now use an extremely small bass drum for example.. now is the sound compromised, in one way or another, yes! and a few years ago, you couldn't (culturally) get away with such things. Now, it seems more

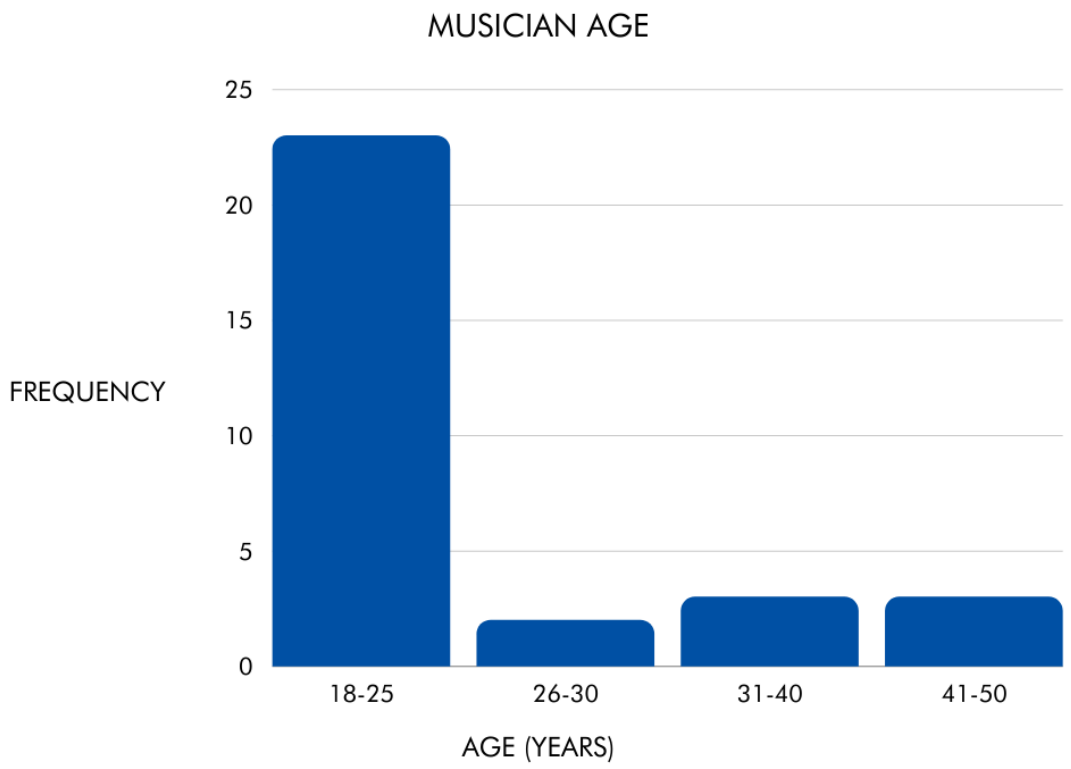
super-lighweight hardware for drummers is also changing the game. Part of it is culture too.. we never really needed heavy double-braced stands with counterweights for most situations, but still when I was growing up, this kind of stand was considered superior and desirable - now it's the opposite.		celebrated that the desired sounds might be different to the 'norm' and more alternate setups (for a variety of reasons) becoming mainstream.

APPENDIX 5 – SUMMARY CHARTS (SURVEY)

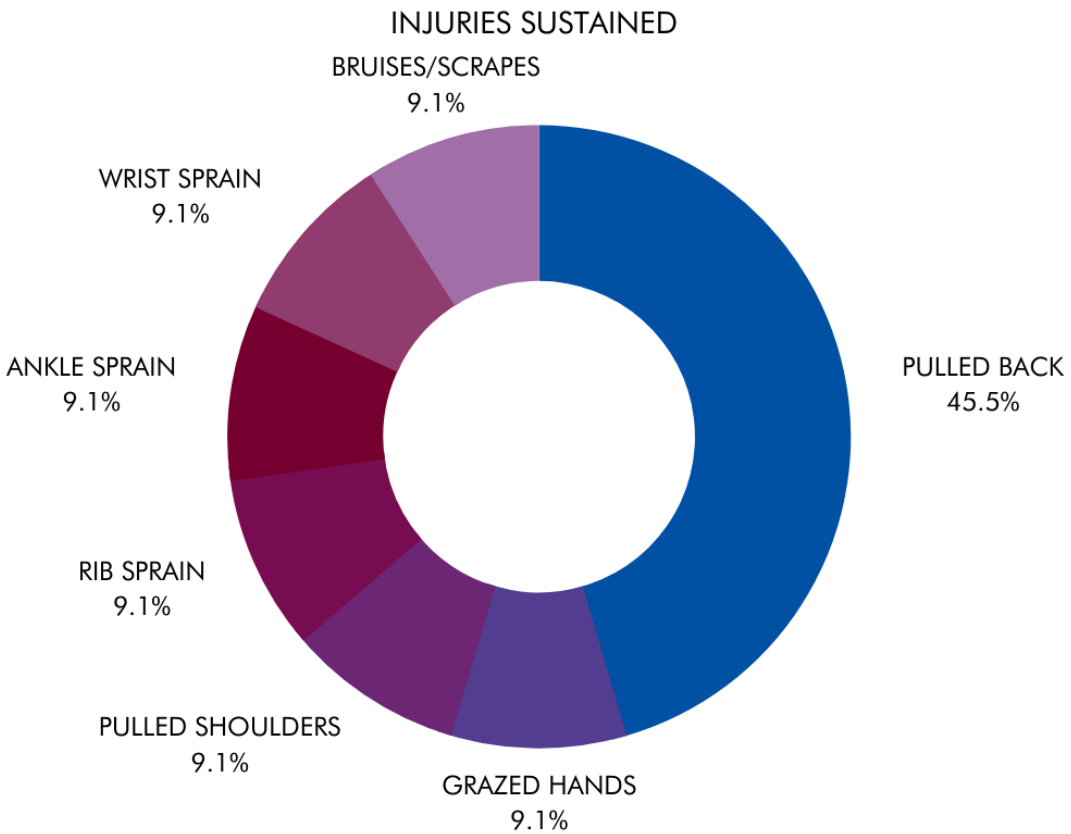
5.1 – MUSICIAN GENDER



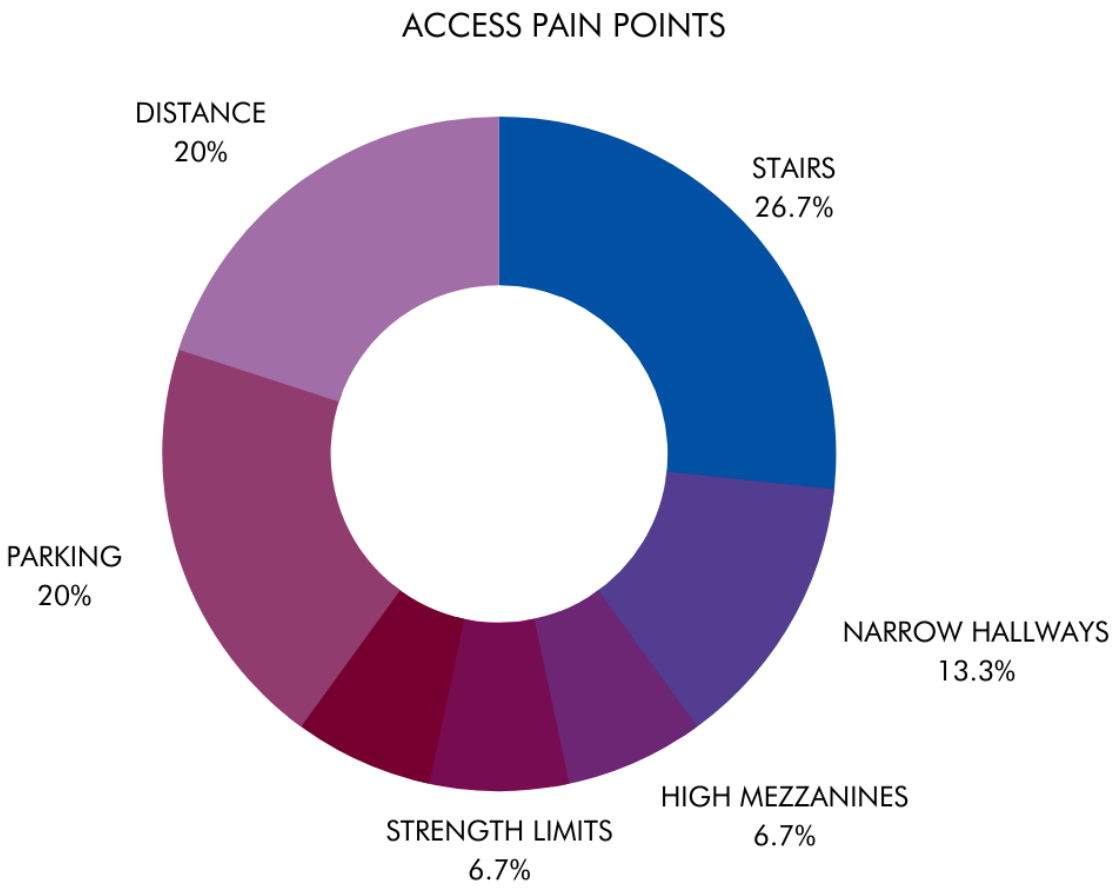
5.2 – MUSICIAN AGE



5.3 – INJURIES SUSTAINED



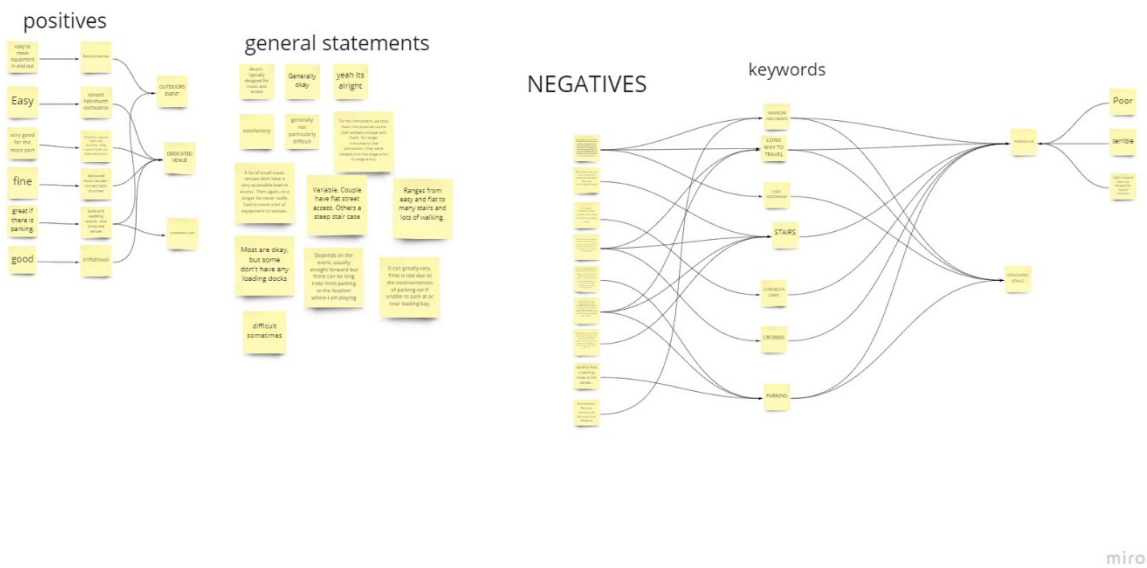
5.4 – ACCESS PAIN POINTS



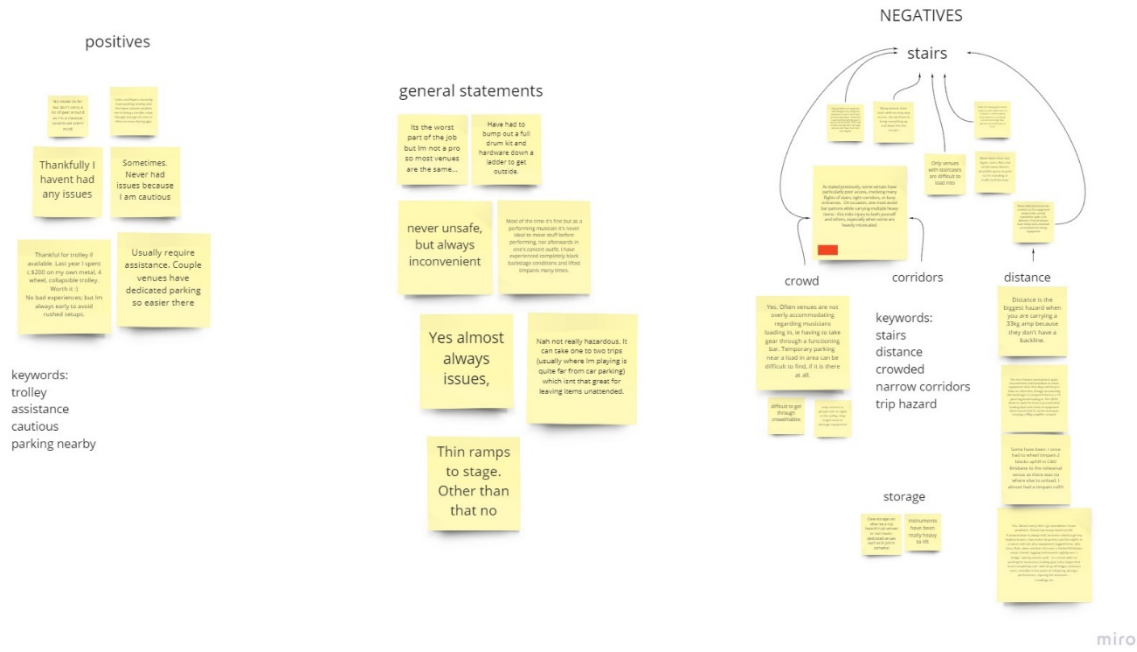
APPENDIX 6 – MIRO BOARDS

6.1 – QUESTIONNAIRE BOARDS

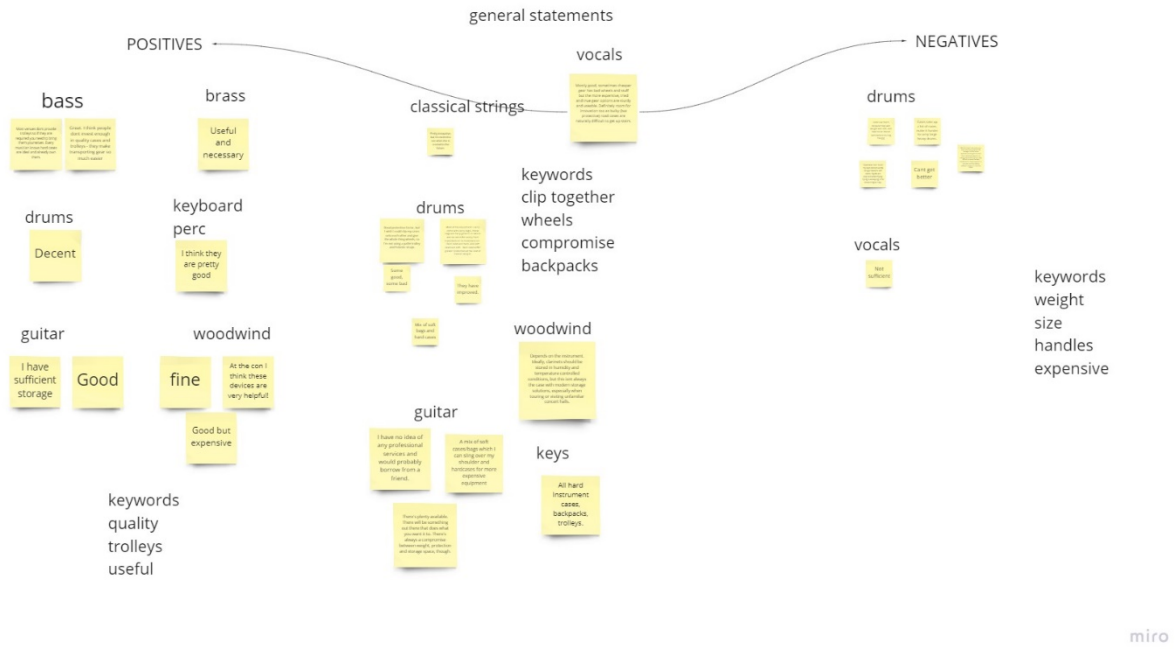
6.1.1 – Access



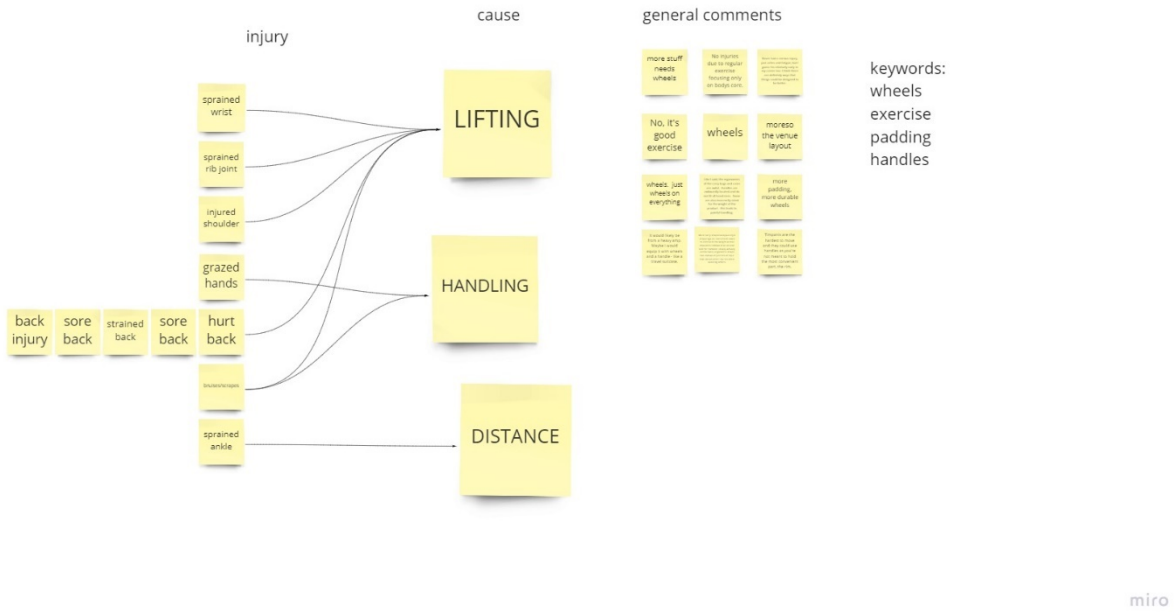
6.1.2 – Loading in/out



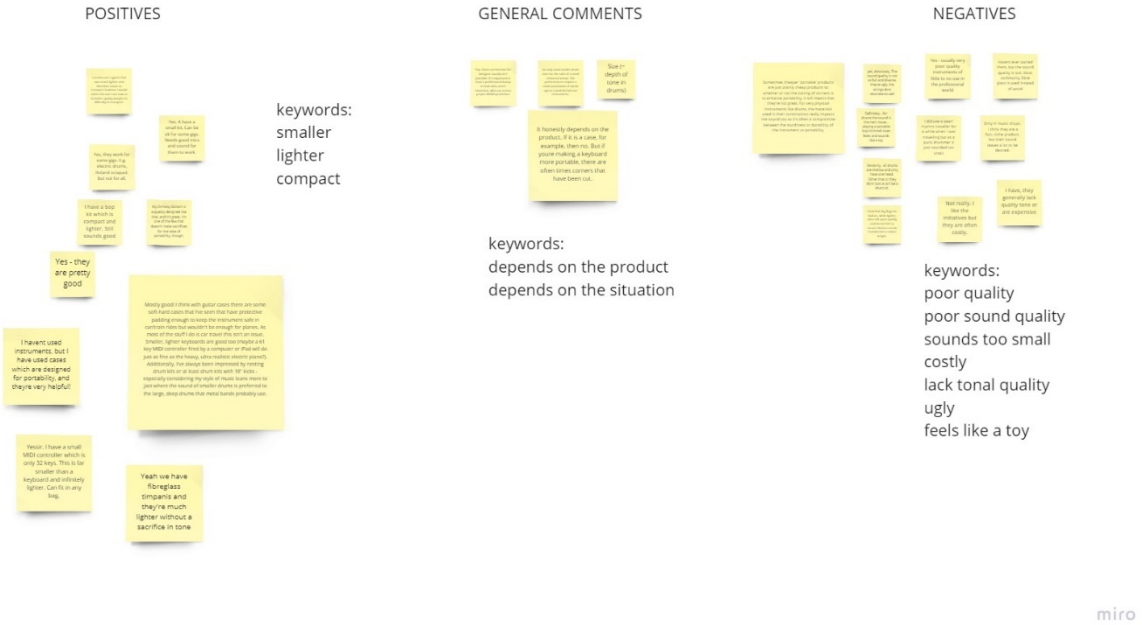
6.1.3 – Current storage solutions in the context of instruments



6.1.4 – Injuries/improvement suggestions

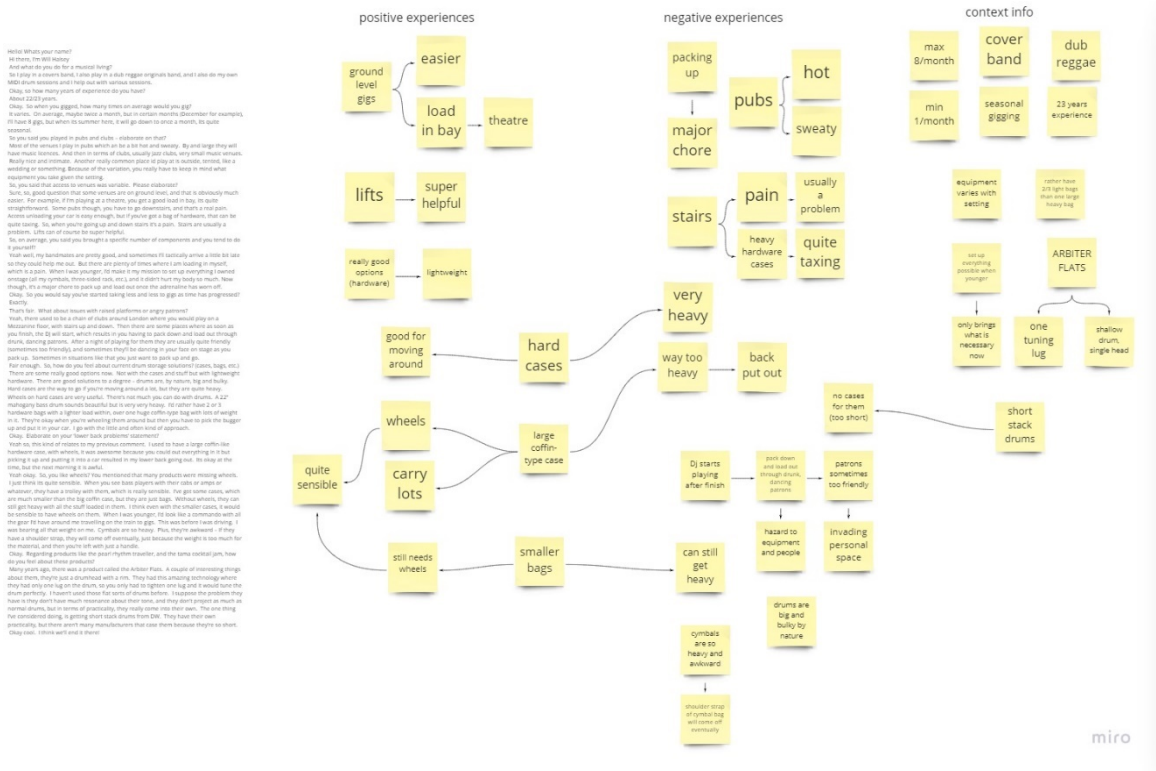


6.1.5 – Portability products

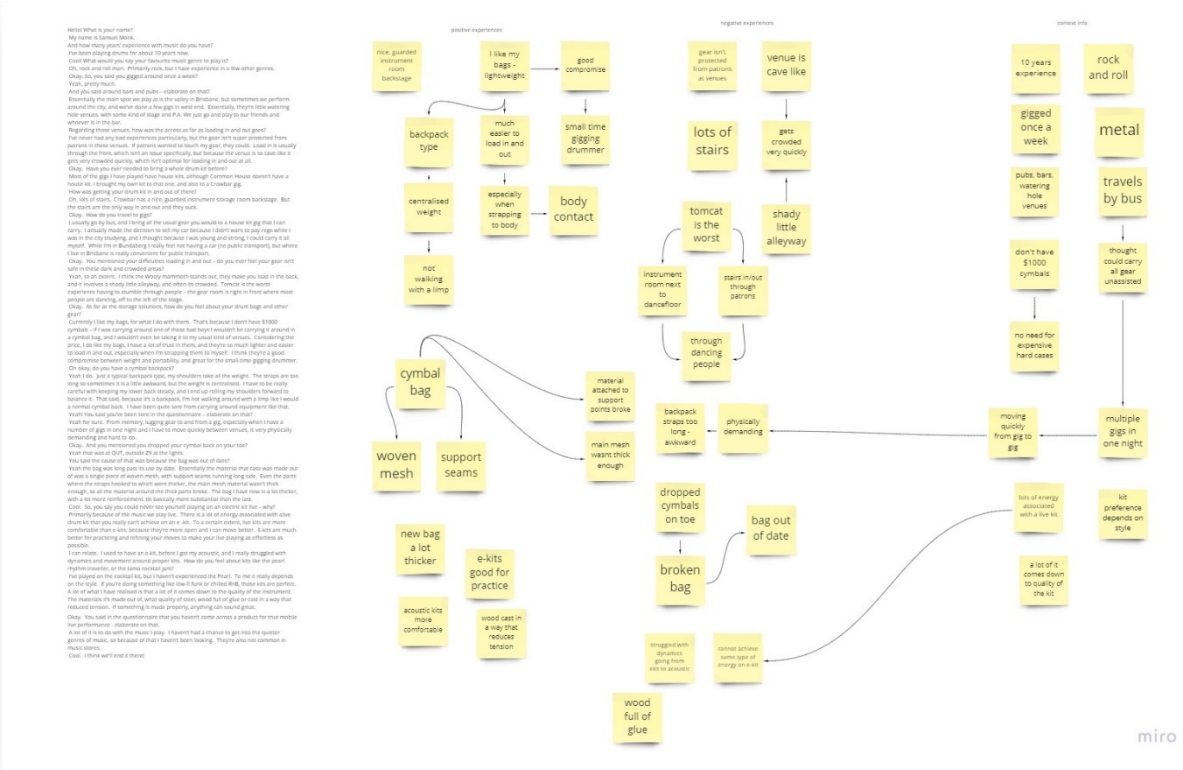


6.2 – INTERVIEW BOARDS

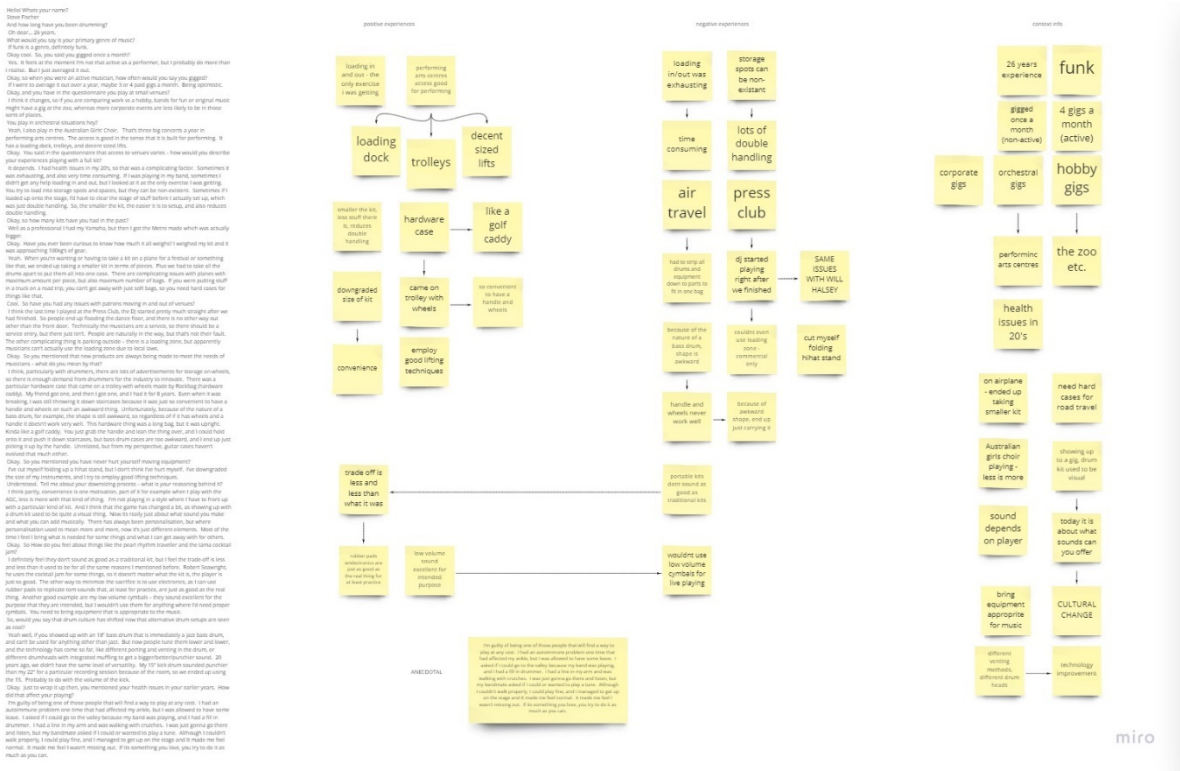
6.2.1 – William Halsey



6.2.2 – Samuel Monk

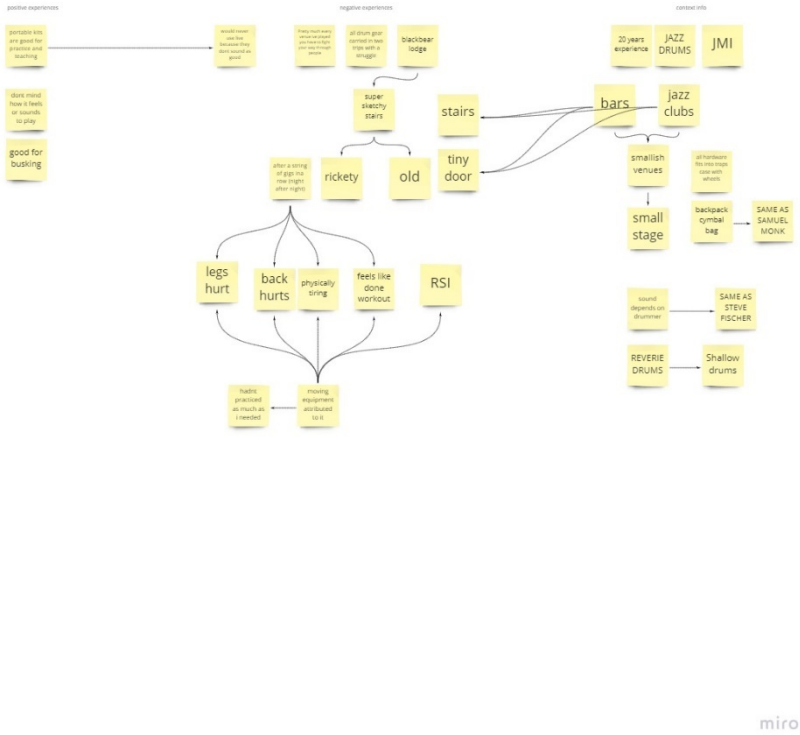


6.2.3 – Stephen Fischer

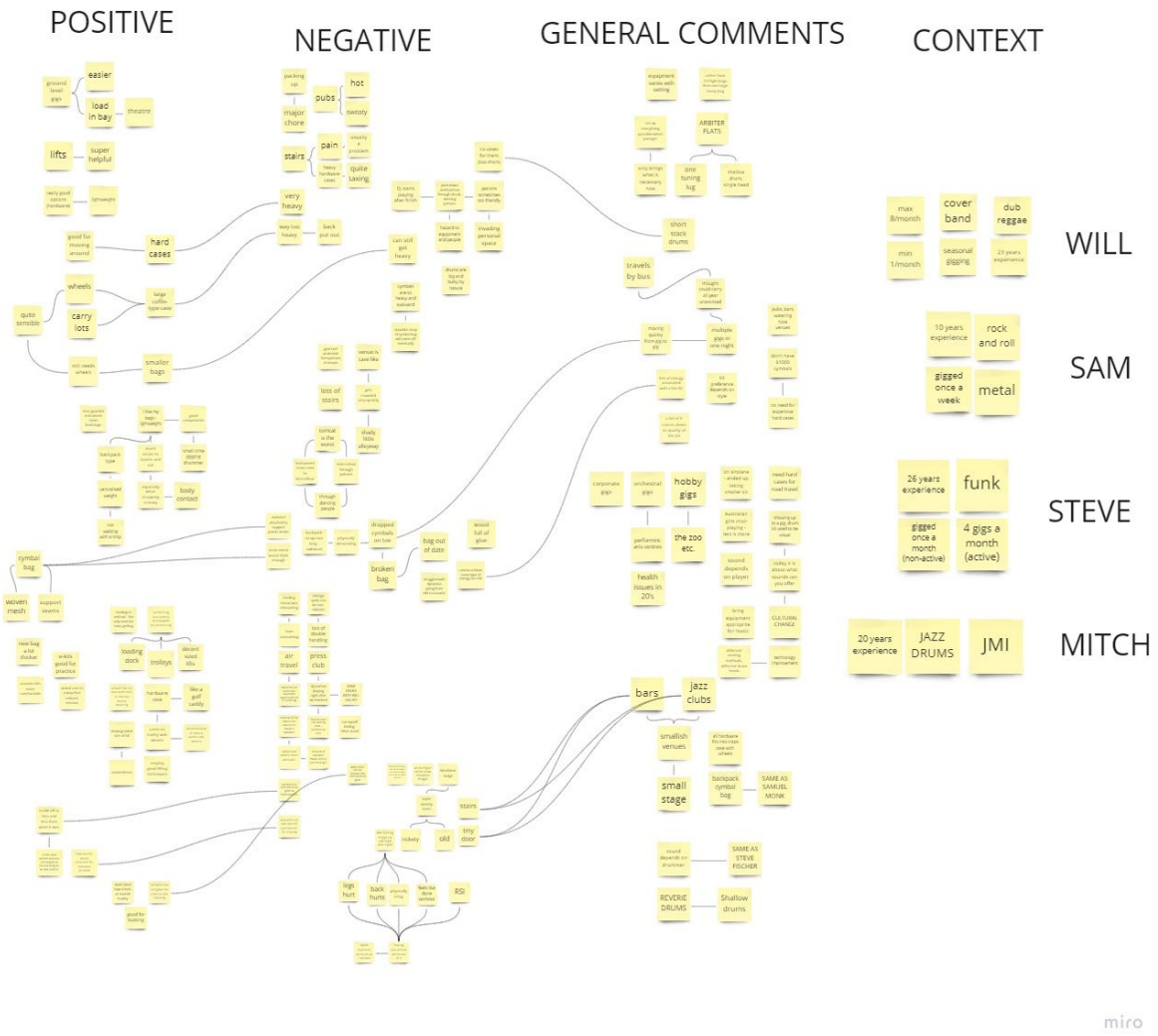


6.2.4 – Mitchel Bellert

Hello! What's your name?
My name is Mitch Bellert.
Lovely. And how any years of experience would you say you have in music?
I've been playing drums since I was 4 years old, and I've been having lessons from around the same age
So where did you learn drums?
I started having private lessons at little independent music schools round town, but when I go older I studied with one on one guys and tutors, and then I went to JMI.
And you enjoyed it there?
Oh yeah.
Excellent, alright. Okay so, what type of venues do you usually perform at?
Well, obviously nothing now, but usually they would be s bar or a jazz club. So like, front door back door, smallish venues with a little stage.
Would you have to go through crowds of people to access the venue?
Most of the time if the venue is a bar you have to walk through patrons, pretty much every venue I've played at you have to fight your way through people.
Okay. So you're primarily a jazz drummer – what your setup like?
Okay so pretty much all my hardware except my stool fits into a traps case on wheels. I've got a cymbal bag that I just put on my back, it has backpack straps, you can load that in pretty easy. Apart from that, I have my stool, and then I've got a bass drum bag, one tom bag that actually fits my two toms in, and I have a snare hard case. Normally if I'm on my own I can get it done in two trips with a struggle, but usually three.
Okay. You say further down that some venues had sketchy stairs – define sketchy?
Oh well, you know blackbear lodge? Those stairs out the back are super sketchy. Rickety, a number of stories, they're old, scary and awful. So, like, those stairs, then also most of the time if you're playing in the loft level of any venue, or even downstairs (e.g. walrus club), the stairs are so tall, and the door is tiny that you have to squeeze into.
Not what you'd say is 'optimised' for loading in and out?
Definitely not.
So, you say that storage device technology hasn't changed in recent years?
Not to my knowledge, no. you've got soft cases and hard cases and trap cases, and that's about it.
And you have an 18" kick drum, right?
I have a few drum kits. The one I use for gigs is 18x16.
Are we talking thin with reinforcement hoops?
Yeah, its birch and has those hoops around the inside.
So, you've not actually hurt yourself regardless of how awkward it is getting in and out of places?
No, but let's say I have four or five gigs in a row (night to night). By the time that sixth is over, you definitely feel you had a workout. Legs hurt, back hurt, its physically tiring. Its definitely affected me when playing gigs. RSI type thing – same movement over and over again.
Okay. Would you be someone who plays through pain if you got an injury, due to your passion?
Well, when I was younger I did, and I used to, but ever since I started my degree and started studying and being more of a professional with my craft ad my body, I got a lot more serious. A couple of years ago I got really bad RSI in both my arms (repetitive strain industry), and that was from when I got booked a lot more with gigs in a row. Also the level of music was increased as well, and the music was a lot faster and more physically demanding. I really hadn't practiced that as much as I needed to, but I was in the gig so I had to go all out. I ended up with really bad RSI for a couple of months, and then I couldn't play at all. I could still teach, but I went to a hand therapist that made it a whole lot worse, and then I went to a physio who eventually sorted it out. When I had the really bad RSI, I didn't play at all, I didn't even try to because it hurt. I had to reset my hands and my technique and everything.
Would you think about how your equipment attributed to that?
Oh yeah for sure.
So, how do you feel about products like the pearl rhythm traveller or the tama cocktail jam? Those portable drum kits?
I mean, its like, they're not a new thing anymore. They were made the best they could be for the time they were made at. I actually use them heaps in the teaching studios I use because they're really cheap. I honestly don't mind how it feels and sounds to play, especially the pearl one. Of course, I'd never use it live because it doesn't sound good, but as a practice tool its perfect. I haven't actually tried the tama one, and that actually looks amazing. A couple of professionals (Robert Seweright of Ghost Note, etc), uses them and it sounds huge, but he also is incredible drummer.
Yeah understood. So do you think the compromises made to those products are worth the benefits?
It really would depend on the setting. I think they're really good as practice things, or as a busker, but in saying that there are some companies that make even more portable kits. Have you heard of Reverie? Yeah so they have a few really portable kits, but they sound great because they are made properly and with quality materials.
Okay. Well, thankyou very much!



6.2.5 – Master Board



APPENDIX 7 – INTERVIEWEE CONSENT FORMS

CONSENT FORM FOR QUT RESEARCH PROJECT
– Interview –

EXPLORING MOBILITY IN MUSIC

QUT Ethics Approval Number 1800000355

Research team

Joshua Sutton	jc.sutton@connect.qut.edu.au	0451 979 112
Rafael Gomez	r.gomez@qut.edu.au	07 3138 4577

Statement of consent

By signing below, you are indicating that you:

- Have read and understood the information document regarding this research project.
- Have had any questions answered to your satisfaction.
- Understand that if you have any additional questions you can contact the research team.
- Understand that you are free to withdraw without comment or penalty.
- Understand that if you have concerns about the ethical conduct of the research project you can contact the Research Ethics Advisory Team on 07 3138 5123 or email humanethics@qut.edu.au.
- Understand that the research project will include an audio recording.
- Agree to participate in the research project.

Please tick one of the following options:

☒ **When this research is published, I am happy to be identified BY NAME.**

☐ **When this research is published, I wish to REMAIN ANONYMOUS with no use of my name or identifying details.**

Name Mitch Bellert

Signature 

Date 10/05/20

Please return the signed consent form to the researcher.

IMAGE RELEASE FOR QUT RESEARCH PROJECT

EXPLORING MOBILITY IN MUSIC

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Once the audio is published it will not be possible to withdraw your consent.

If you agree to have your audio used, please complete and sign the consent below, and indicate your preference regarding review of your audio prior to use.

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I **would like to review** audio of me before they are used in this research as described.

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☐ Yes. The best way to contact me for this purpose is by: _____

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Signature

Date 10/05/20

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☐ Yes. The best way to contact me for this purpose is by: _____

Name Samuel Monk

Signature 

Date 1 May 2020

Please return the signed consent form to the researcher.
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CONSENT FORM FOR QUT RESEARCH PROJECT
– Interview –

EXPLORING MOBILITY IN MUSIC

QUT Ethics Approval Number 1800000355

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Date 1 May 2020

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EXPLORING MOBILITY IN MUSIC

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Name Stephen James Fischer

Signature 

Date 2 May 2020

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IMAGE RELEASE FOR QUT RESEARCH PROJECT

EXPLORING MOBILITY IN MUSIC

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Signature 

Date 02 May 2020

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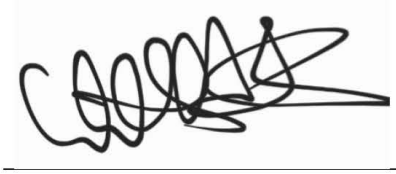
Name Will Halsey

Signature



Date 01 - MAY-2020

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☐ No.

☒ Yes. The best way to contact me for this purpose is by: __EMAIL: willhalsey@yahoo.co.uk

Name Will Halsey

Signature

Date 5th May 2020

Please return the signed consent form to the researcher.
A copy will be provided for your records.