



Improving Safety and Reducing Injuries in the Hospitality Food Service Industry within Events

How can we reduce the work-related injuries within the food and beverage industry?

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DNB311 Part A

Authenticity Statement

This is to certify that to the best of my knowledge, the content of this report is my own work. This report has not been submitted for any subject or for other purposes. I certify that the intellectual content of this report is the product of my own work and that all the assistance received in preparing this report and sources have been acknowledged.

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Abstract

Within this document we will be discussing the safety and efficiency of the hospitality industry specifically regarding events, such as conferences, banquet dinners, cocktails, and exhibitions and how it effect the overall turnover rate of the industry. One of the greatest areas for concern is the amount of food service workers suffering from musculoskeletal disorder relating to lower back pain. The hospitality industry is one of the largest industries in the world worth around approximately 3953 billion worldwide but on the flip side it also has statistically one of the largest turnover rates of employees for all industries hovering around 70-80% annually (Roosted, 2023) . Throughout this report we will be taking a deep dive into why this is the case and if the improvement of safety and efficiency within the industry would be able to drop this percentage at all.

The solution to this problem which will be discussed throughout this report could lie in the creation of new technologies or equipment for food and beverage servers. From initial findings it can be seen that innovation within the hospitality industry has lacked for generations. With better equipment we could be making the jobs of hospitality workers much easy. Take the round drink serving tray for example, when was this invention created and why hasn't anyone iterated on this idea to make the lives of hospo workers easier. Is it a fact of money or just that the current solution gets the job done. Within this report we will look to see if there is any way of making hospitality workers jobs easier, in turn hopefully lowering the staggering amount of employment turnover and keeping skilled workers in the industry for longer.

The solution to this problem discussed through this report will be backed up by academic secondary research, survey results from hospo workers themselves and interviews with high-ranking hospitality employees from the industry. The value this solution will bring to one of the largest industries in the world will be paramount to the success of the industry in the long run.

The importance of this report is integral to keeping the hospitality industry moving towards a better future. Being of the highest grossing industries in the world isn't easy when you have to keep training new staff every few months to make up for the losses of high value skilled employees. So read on if you would like to find out how we will do that. The report will start of by talking about the topic in depth, we will then go over the research conducted and how it backs up the point being made and finally we will talk about the design implication which will be put forth due to the findings from the research.

Table of Contents

1. The Topic		
1.1	Introduction	5
1.2	Lirerature Review	6-11
2. Research		
2.1	Research	12
2.2	Analysis and Findings	13-15
3. Discussion and Design		
3.1	Discussion	16
3.2	Design Implications	17-20
4. References		22-24

Introduction

Throughout this report we will be discussing and going over the safety and efficiency within the food and beverage industry in relation to work related musculoskeletal disorders (WMSD). Within the industry workers perform many repetitive motions and are forced to hold their bodies in certain positions to complete the tasks required of them. In turn it causes many WMSD as reported as affecting 6.9 million Australians in 2014-15 second to only substance abuse disorders. The NDS identifies almost 125000 claims in 2015-16 in relation to WMSD for works compensation claims, of 50% were seen to be serious claims resulting in one week loss of work for the user. These conditions are serious reasons to be concerned especially within the hospitality industry where repetitive physical tasks and motions are most prevalent within the workforce. The lack of innovation around this problem in terms of tools that workers use to get the job done is either resulted from poor lack of judgment and recognition from designers or poor care for workers from employers.

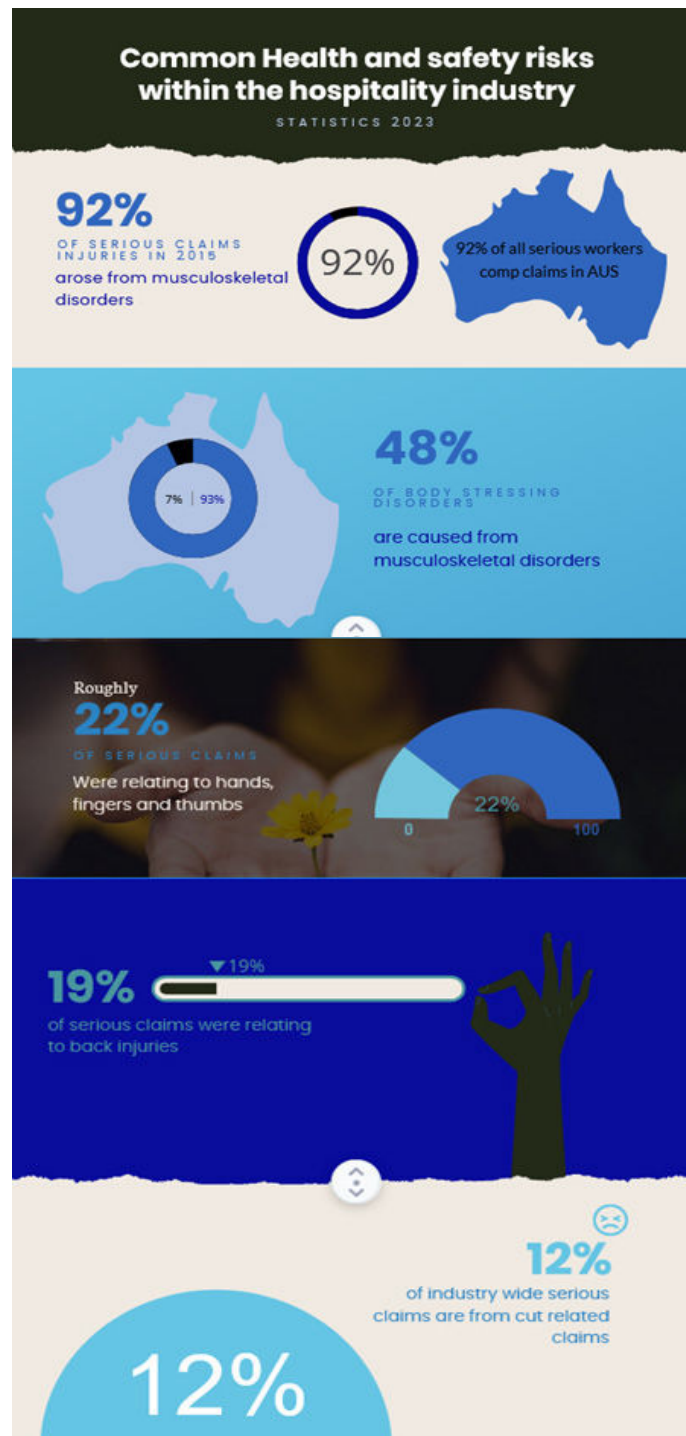
The aim of this project is to understand more about this condition in relation to food service workers and find out a way to make their jobs safer and easier to complete without the cost of WMSD. Throughout this report we will go over a literature review of the topic detailing the already known problems with work related musculoskeletal disorders and all other injuries through academic sources. We will go over what has been studied previously, key concepts in the area and what is the current state of the art in terms of WMSD as well as opposite opinions. We will touch on research methodologies used within this report, why they were chosen and how the research was conducted. Then we will look at how the data was analysed and what were the results. Finally, we will discuss what does it all mean and how does the research relate to the literature review and how it adds knowledge to the research gap as well as what this means for design and the implications around it, problems and opportunities identified due to research and some initial concept sketches on how this problem could be solved from the use of a designed product intervention. Obviously, the whole problem with WMSD in hospitality cannot be solved through one product but hopefully we are able to solve it in some way shape or form.

Literature Review

Throughout this section we will be looking at the current state of research conducted within safety in the hospitality industry. Will be going over common health and safety risks, why these cause labour shortages, frequency of accidents and types of hazards endured, near miss incidents, safety and ergonomics and musculoskeletal disorder due to health and safety issues. Finally, we will identify gaps in research which will then be used to create areas for future research.

Common health and safety risks in the food and beverage industry is vast and ever changing as is the industry. Some risks to safety are much more important and common though and these are the risks we will be going over now. Slips trips and falls are common within the industry and are something that is unavoidable due to the nature of work being conducted. Measures can be taken to avoid such injuries such as good housekeeping and avoiding staff rushing. One is easier than the other though, as staff are often required to rush around to complete their required jobs efficiently. Another major injury risk comes from poor manual handling in the main cause of musculoskeletal disorders which we will get more into later. According to workplace health and safety Australia 92% of serious claim injuries in the hospitality industry arose from musculoskeletal disorders with 48% of body stressing disorders coming from musculoskeletal disorders (Safe work Australia, 2015). They also claimed that the most commonly affected areas of the body were claims relating to the hand, fingers, and thumb accounting for 22% of serious claims with back injuries coming in at a standalone 19% of all serious claims (Safe work Australia, 2015).. They also reported that cuts from glass totalling 12% of all industry wide serious claims. Staff once again are in major rushes to complete their duties making proper manual handling a thought far in the back of their mind. These can cause lifelong musculoskeletal disorders and even have the chance of staff being unable to return to the same line of work. Cuts from broken glassware are another unavoidable risk to servers when carrying trays day in day out to complete their jobs. The way trays are designed doesn't give users the benefit of doubt, one wrong move and users are picking up glass from the floor with the chance of cutting themselves or guests cutting themselves. Finally burns from hot liquids is another common safety risk endured by servers and is why wearing proper PPE equipment is required when completing these tasks.

Literature Review



(Safe work Australia, 2015)

Literature Review

Next, we will touch on current knowledge on what is currently causing staff shortages within in the industry. According to the federal bureau of statistics, as of November 2022, 1 in 10 hospitality employees left or changed jobs (Adams, 2022). That is 10% of all food and beverage workers leaving their jobs for other jobs. This number can be accounted mostly to the covid 19 pandemic which has exacerbated the already physically strenuous task along with low wages that these staff have had to endure. The pandemic had various effects on these workers such as their jobs being minimised or doubled over the pandemic due to the needs of the industry and economic struggles the country was in (Achenza, 2022). This has left a bad taste in hospitality workers mouths, having most re-evaluate their lives and searching for other avenues of work. In turn this is having massive implication for safety within the industry. The loss of experienced and capable employees is putting a strain on the industry and also a strain on workplace safety (Usccg, 2021). This comes down to having to hire new staff with none to very little experience in the industry. Employees are at the highest risk of injury during their first 12 months at a job due to not being familiar with their tasks (Looking Ahead to 2023, 2023). This is exacerbated by the fact that the loss of capable staff makes it harder for employers to train staff in completing their jobs safely as their previous avenue would have been through these more skilled staff members who are now gone.

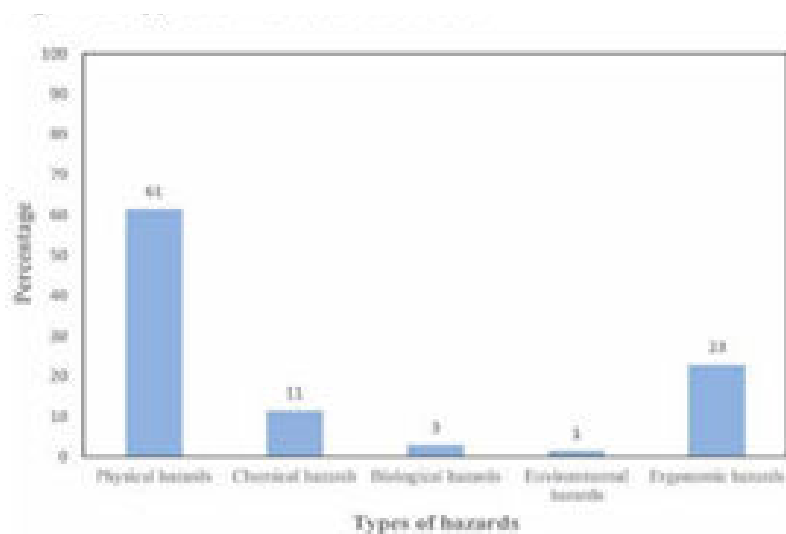


The food and beverage industry has recently seen as increase in the mechanisation of the industry. Seen as having an effect in the increase in work volumes and the increase in repetitive or monotonous tasks. These are usually associated with increased incidence of musculoskeletal disorders (Upper limb/lower back disorders). Another recent trend is the increased noise level within the industry causing many workers to have hearing related impairments. The below table shows types of hazards identified in the industry and their frequency related to each other. (At sparkling beverages)

Literature Review

As can be seen in the above graph physical hazards can be seen as the outlier with much higher frequency rates, with ergonomic hazards coming in second and finally chemical hazards. This graph shows us that physical hazards such as repetitive or monotonous task have a very big affect on the safety and efficiency of the industry. Ergonomic hazards coming in second should show the industry how important having more ergonomic equipment is to the safety of their workforce. From the book occupational health and safety of the food and beverage industry they listed the highest ranked issues within the industry, things such as Ergonomics, considering health, safety and ergonomic issues at the concept and design stage and back injuries as major areas for improvement within the safety framework for occupational health and safety.

Finally, we will go over musculoskeletal disorders (MSD) which are most common in laboursome jobs such as the hospitality industry and those of food service workers. MSDs are high incidence and prevalence problems worldwide. The world health organisation defines the disease as induced or aggravated by work or occupational related tasks such as repetitive motions or physically strenuous lifting tasks. According to the European disease statistics in 2005, work related musculoskeletal disorders accounted for 38% of all occupational diseases (European Agency for



(Musungwa & Kowe, 2022)

Safety and Health at Work, 2019). That same year the UK's health safety executive reported that WMSD accounted for 39% of all work-related injuries/diseases in Great Britain (Peng et al., 2021). While in the US a survey reported 24.8% of lower back pain in employed adults (Peng et al., 2021).. The ministry of labour for Taiwan in 2018 reported that WMSD ranked first for occupational diseases accounting for 37.7% from Taiwan's occupational disease and injury system. Within 2022 workplace safety and health report from manpower, WMSD ranked second in occupational diseases with 340 serious cases worldwide (Ministry of Manpower,2022). WMSD risks for the food and beverage industry have been specifically identified as characterised by having long hours, prolonged standing, repetitive and fast hand movements, leaning forward and carrying/lifting heavy objects.

Literature Review

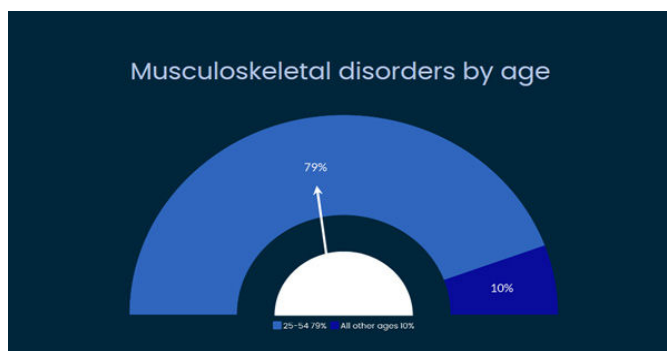
As can be seen on the above table from a Taiwan study around work related musculoskeletal disorders MSD affects a large amount of people approximately 34000 people in just Taiwan alone with a crude incidence rate of 4.33 percent per 100 person years. Beyond the obvious problems this causes for food service workers, employers also endure high costs due these injuries such as absenteeism, loss of productivity, increased health care, disability, and workers compensation costs. This should make it paramount to employers to making the job less risky and safer by implementing ergonomic solutions.

	MSD incident event occurrence	Total Person-years observed	Crude Incidence rate / per 100 person-years
Male			
20-24	13 914	382 654.42	3.64
25-29	5954	151 908.45	3.92
30-34	3985	86 222.31	4.62
35-39	3157	61 101.71	5.17
40-44	2635	44 378.29	5.94
45-49	2209	33 894.25	6.52
50-54	1529	22 083.49	6.92
55-59	732	8620.17	8.49
60-64	198	2234.82	8.86
All	34 313	793 097.91	4.33
Female			
20-24	12 497	368 056.84	3.40
25-29	6425	148 229.05	4.33
30-34	5417	100 331.89	5.40
35-39	5316	78 754.21	6.75
40-44	5387	65 927.25	8.17
45-49	4428	44 648.07	9.92
50-54	2235	22 023.51	10.15
55-59	536	5091.19	10.53
60-64	157	1191.43	13.18
All	42 398	834 253.44	5.08

Abbreviations: MSD, Musculoskeletal disorder.

MSD incident rate event occurrence.
<https://doi.org/10.1002/1348-9585.12214>

As can be seen from the graph and backed up by the CDC the age groups between 25-54 accounted for 79% of all WMSD cases.

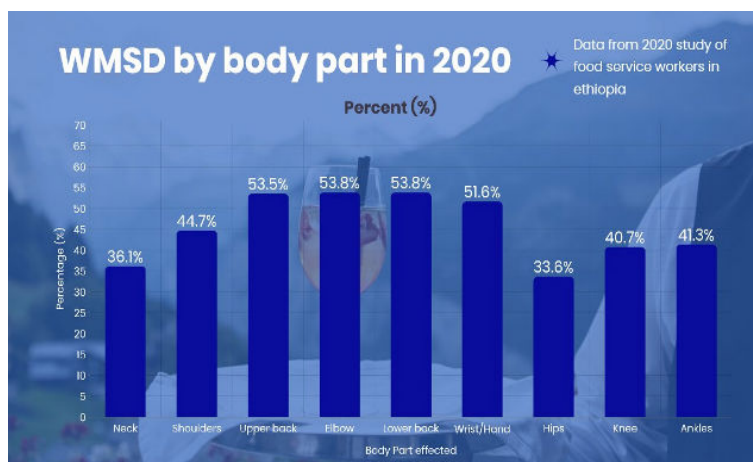


Literature Review

More male than females were affected as were more white than Hispanic employees (CDC,2023). The manufacturing and services industry such as food service workers accounted for half of all WMSD cases. The institute of medication estimates the economic burden causes by these diseases' accounts for 45 – 54 billion worldwide annually due to compensation costs, lost wages and lost of productivity. Liberty Mutal the largest workers compensation insurance provider believes that MSD injuries cost employers 13.4 billion annually.



Throughout this literature discussion section, we have discussed many factors relating to safety in the food and beverage industry. Information that can be found that could impact safety has been discussed though there are some areas of research that were hard to find or non-existent. These research gaps I will be undertaking myself for the next section of this report. These gaps include information specifically relating to Events side of the food service industry as this is an area where I believe there could be some major safety problems. Other gaps are things such as how these safety risks effect workers efficiency in return, how injuries/MSD affect the industry, how the industry should be investing in more ergonomically centred equipment, what service item causes the most harm within the industry and reason for labour shortages beyond physically strenuous tasks.



Research

Within this section we will be going over the primary research methods and methodologies used, why they were chosen and how research was conducted. This information is all relevant data when trying to understand how the gaps in the research were able to be closed with insider information.

As for this report the methods used to gather insider information was a survey and interviews. The survey was chosen to gather quantitative information from hospitality workers specifically in the events food service sector. The information was gathered through sending the survey to specific participants in order to get the information wanted from the right people. The reason it was sent to specifically events food service workers was due to the lack of secondary research out there in correspondence with such specific types of work. The tool used to conduct this survey was google forms as it has a free and easy system to understand and set up survey. The first question in the survey asks them whether or not they are happy with their data being used within a research report as to gather this information ethically. Survey questions were aimed around gathering information from a broader range of users while the interviews were used to gather specific longer answer information from users.

As for interviews, this method of research was chosen to gather more qualitative data from users in the events food service sector. Users chosen were long time members of the industry with over 5 years of experience within specifically the events food service sector. To gather information efficiently a recorder was set up to gather audio data from interview and later transcribed into text for easier data analysis. Total amount of interviews conducted was 2 and both users signed off on the consent form for the use of data within a research report. Both were happy with audio recording but did not consent to audio recording being submitted into assessment rather transcription. Interviews were chosen as they were able to give a more in depth understanding of the events food service sector in relation to health and safety. As well with the opportunity for expanded discussion not possible from a survey format of data gathering. All interviews were face to face interviews and were very helpful in gathering qualitative data.

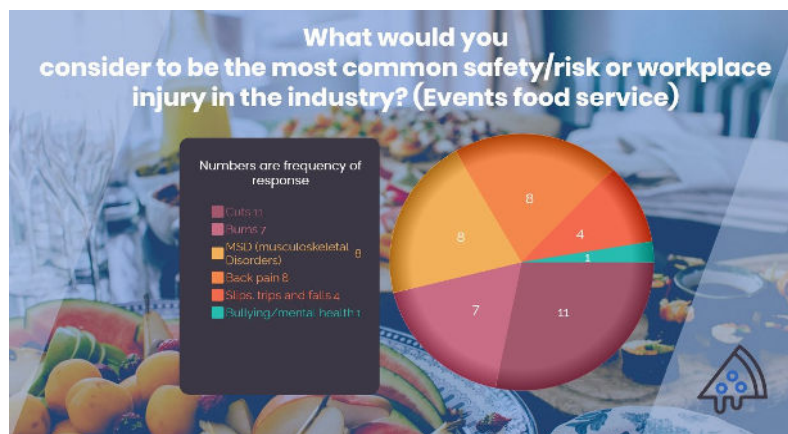
Overall, these are all relevant facts in how primary research was conducted, methods chosen, why they were chosen, type of information gathered from research type and how they were gathered ethically. Next, we will go over all relevant data gathered through these interviews.

Analysis & Findings

In this section we will be going over all primary research data gathered through surveys and interviews in order to close the gap in research identified through the literature review. First, we will go over how the data was analysed followed by the results supported by graphs and charts to better visualise data given. We will go over the most relevant data gathered and why, finished off with a brief summary of finding and how this helps close gap in the research.

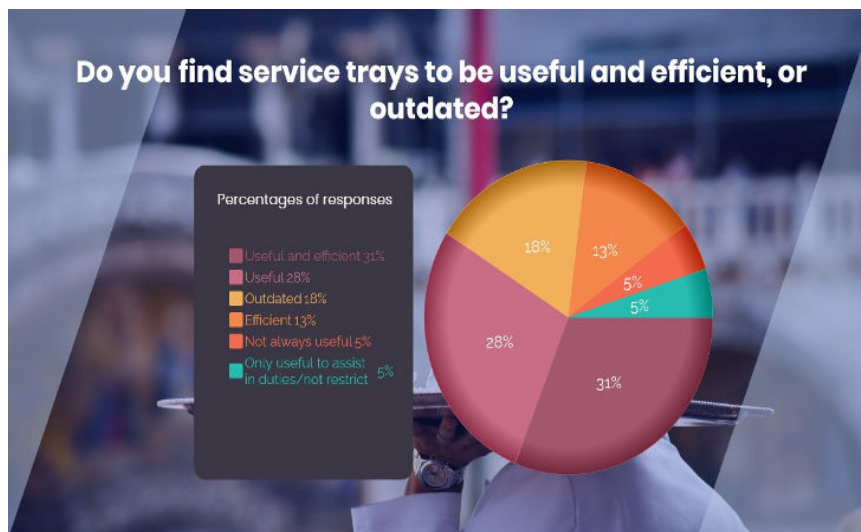
Data from the survey was analysed using an excel spreadsheet to gather counts of most frequent answers to questions. Through excel I was able to categorise even open answer questions into specific categories of answers to gain a frequency number for the answers telling me what the most common answer is attained through each survey question. For example, things questions such as “what would you consider to be the most common safety/risk or workplace injury in the industry?” were answered with freely worded short answer sentences. In which I went through all answered and categorised them into specific areas such as cuts, burns, MSD related ect giving them a frequency number. Other questions were just multiple choice in which they were easier to gather data for being that they were already categorised and numbered with frequency/percentage of answers.

We will now go over the results of such survey. Through the survey we asked questions specifically to food service events employees about safety risks and injuries sustained as well as glass-ware handling related questions to gather more specific information tied to health and safety within events food service. Firstly, it should be mentioned that there were 22 responses to the survey. Most relevant data will be discussed as some questions came back somewhat inconclusive. One of the more intriguing questions asked throughout the survey was “what would you consider to be the most common safety/risk or workplace injury in the industry?”. This question was asked to gain specific insight into the injuries sustained within the events hospitality sector.



Analysis & Findings

As can be seen in the pie chart above the majority of answers related to cuts, followed closely in second by musculoskeletal disorders (MSD) and back pain which relates closely to MSD. Slips, trips and fall and mental health coming last but still massive injury risks. This shows us that MSD related injuries are frequent and major problems within the events food service industry and something that still hasn't been completely resolved within the industry. Cuts and burns also being major factors for health and safety. Due to there being a lack of research online about the use of service trays, some questions were aimed at gaining quantitative data about the use of service trays and their safety. Firstly, it was asked as to whether service trays are useful, efficient, both or outdated. Through this question 18% of respondents said that they were outdated ways of transporting beverages.



Another useful piece of data is that 28% of respondents found them to be useful but not efficient. 95% believe trays to have a slight learning curve and 64% have spilled a drink on a guest. While 36% believe that injury risk has added to the labour shortage in the industry.

Next, we will go over data gathered from the 2 insider interviews conducted on food and beverage employees within the events sector. Data analyses for these interviews was completed through identifying and labelling meaningful segments of text, transcription of audio, grouping similar meaningful segments into categories and organizing them into themes that capture ideas or patterns in data. Finally, I analysed both interviews side by side to gather there themes and find out what both interviewees share as common viewpoints to get the most out of the data.

Analysis & Findings

To get the most relevant information from both interviews I will go over the main themes that share a relationship between both interviewees. Firstly, both interviewees believe that safety risks have detrimental effects on the hospitality industry and that these risks can lead to reduced efficiency, increased turnover, and potentially negative impacts on the industries reputation. Both interviewees believe that cuts, slips trips and falls as well as lower back pains are major hazards within the industry in terms of safety and efficiency. They go on to say that the food service side of the industry has high susceptibility to lower back injuries due heavy lifting in awkward positions. It is believed that reducing risks in the industry can lead to increased productivity and efficiency with completing tasks. In terms of ergonomic investments both interviewees see importance in investing in ergonomically healthy products and believe they can go on to reduce injury rates, makes tasks easier and closes the skill gap if implemented properly. In turn it was found that physical strain is a major reason for staff turnover rate and interviewees believe that ergonomically healthy products that could reduce this strain could also reduce staff turnover rate in the industry subsequently. They believe that the most harmful service tools in the industry are trolleys and service trays. With service trays in particular being quite harmful especially in cocktail events in relation to lower back pains/injuries. Finally, in terms of reducing harm to user's, interviewees believe that answer to reducing back strain when using trays comes down to distributing weight more efficiently to reduce strain.

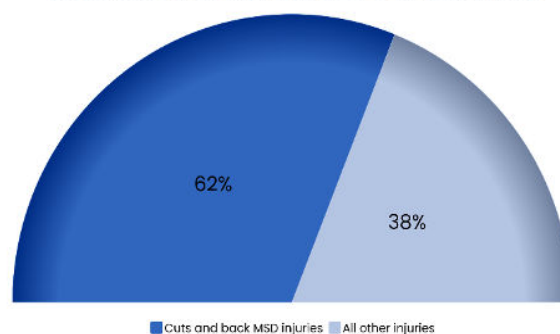
To summarise the main findings found help to close the gap in research identified within the literature review and help to give a better understanding of the nature of safety and efficiency within the events food service industry. Information gathered gives us a greater understanding on what is causing the lower back pain in employees of the specific industry and hopefully helps in creating an opportunity for design in significantly reducing the musculoskeletal disorders caused by these problems and creating a safer workplace for these users.



Discussion

Overall, what the research conducted both primary and secondary is telling us is that musculoskeletal disorders mainly within the back region and cuts from broken glass are the two main injury concerns within the industry. Between those two injury concerns lies approximately 62% of all injuries within the hospitality industry. Primary research conducted relates to the content in the literature review by addressing the same safety concerns but on a deeper level. How these injuries occur and why including 2 expert interviews which go into much greater depth of why and how these injuries occur. The primary research conducted also fills vital gaps in the research which were unable to be found in up-to-date databases. Such gaps include information specifically targeting safety within the hospitality events industry. Very little exists online for information regarding this specific sector and the expert interviews within the research are conducted by experts in this sector as well as the survey participants are specifically within the events hospo sector. Other research gaps addressed within the primary research include how safety risks affect efficiency rates of workers in return which was heavily discussed through the two expert interviews. How safety risks affect the industry in return, how or should the industry be investing in ergonomically safe products, what service item/tool creates the most harm in the industry and the reason for labour shortages beyond the thanks being physically strenuous. These gaps in the research have all been discussed and explored through the survey and expert interviews which help to give us a greater overview on what are the biggest problems. Things such as discovering how the service bar tray in certain events/shifts such as cocktails can and are very much almost deadly items which workers are required to use to complete their jobs. Injuries in industry are responsible for reduced efficiency and increased turnover, how to distribute weight more effectively to reduce injuries within the industry and make glassware fall and break off of trays less often. Next, we will talk about design implications and possible innovations within the industry that could affect these problems in a positive manner.

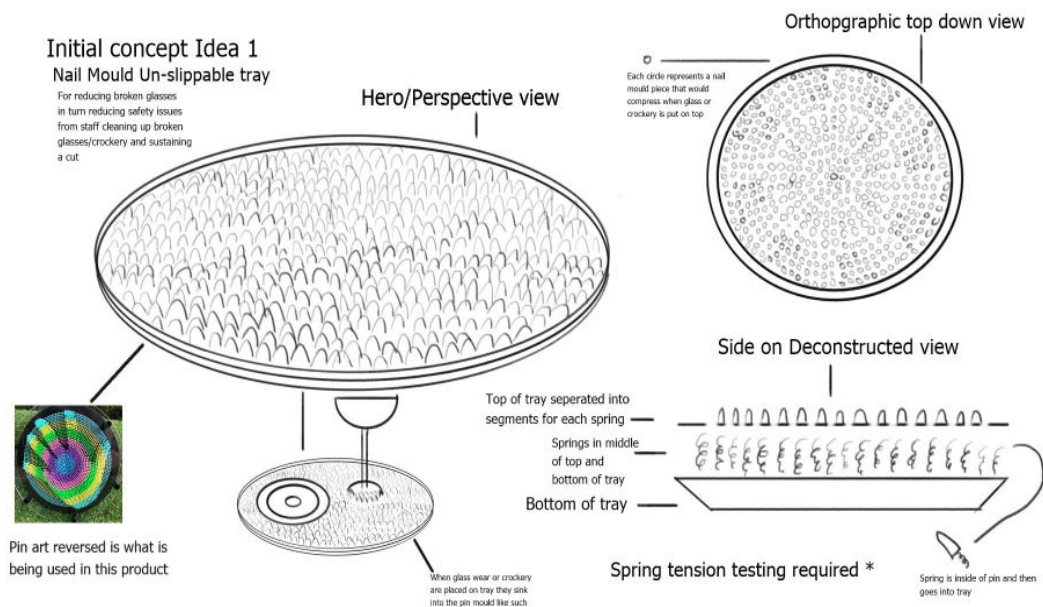
Cuts and MSD in the back compared to all other injuries



Design Implications

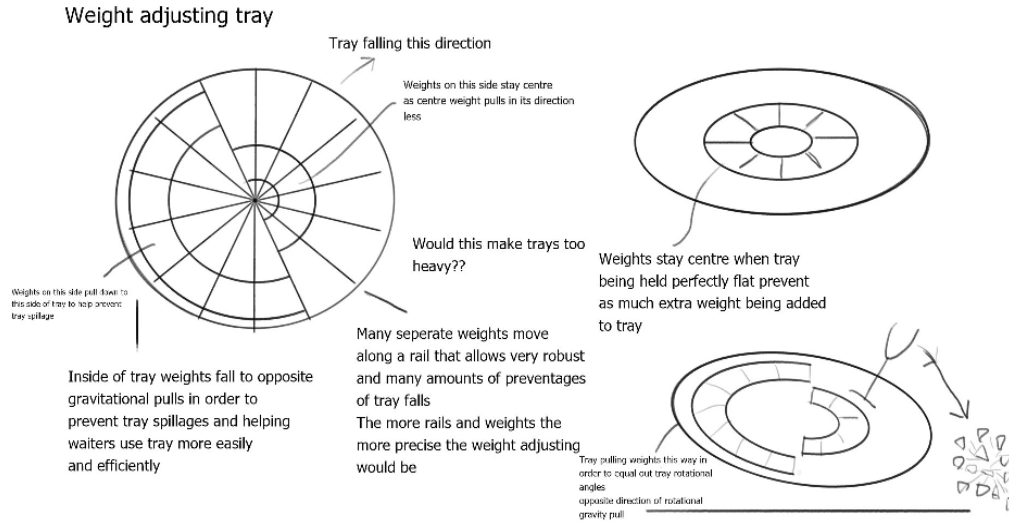
The finding detailed throughout this report show that there needs to be a design intervention into the service bar trays used within the industry. Findings have shown that between cuts from broken glass and extensive carrying of tray during cocktail events causing lower back musculo-skeletal disorders in employees being major areas of concern. The design implications formed within this report will be focussed on designing mechanisms within trays that not only improve the ability for servers to not drop or slip glassware off trays resulting in broken glass they must clean up but also reducing lower back strain caused by carrying trays for extended periods of time. Design concepts will be a combination of concepts aimed at both safety problems which will be aimed down into one concept from each safety consideration to create and form into one tray design.

As for cuts from glassware I have created multiple different alterations to mechanism that help users keep glassware on trays.

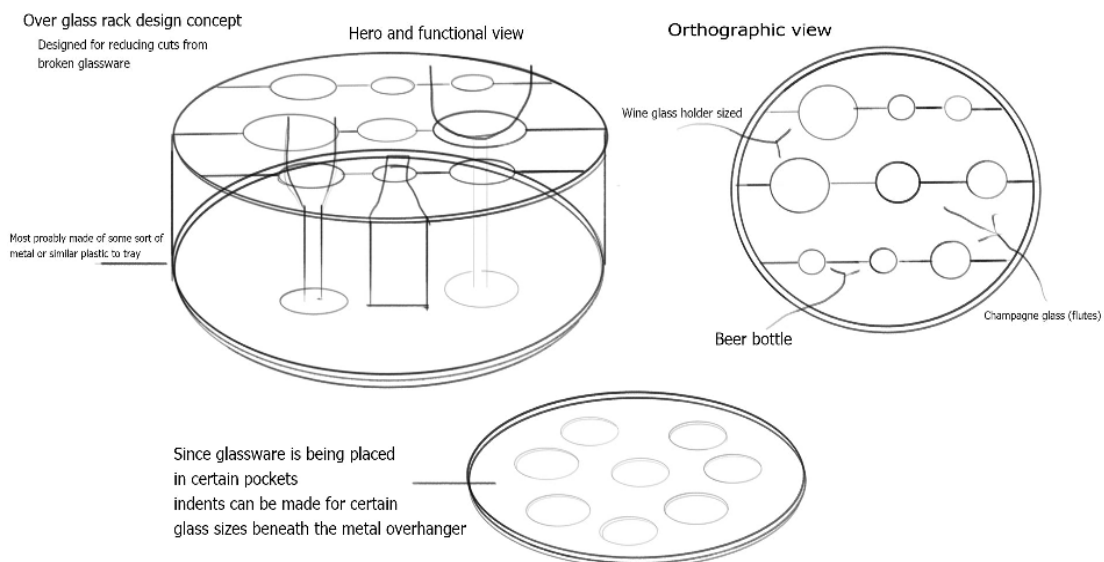


As for the first concept we have a tray similar in shape to usual but with many pins sticking up and out of tray by spring mechanisms similar to a pin art pictured above. When glassware is placed onto tray pins are pushed down underneath creating a divet that the glassware can sit into reducing slipping and falling due to this. This also allows glassware or plates no matter the size to be placed on and into its own sized divet. This design approach was chosen to allow it to be used universally with any sizes and many different companies and not all workplaces have the same sized glassware.

Design Implications



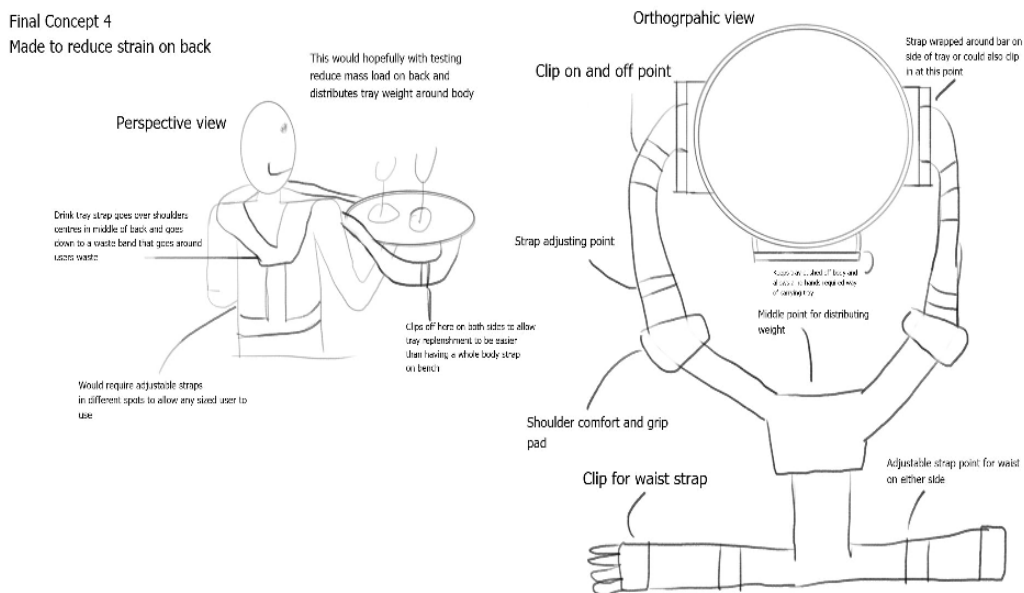
The second concept created for reducing cuts from glassware is the weight adjusting tray design. This design allows for weights to be placed inside the tray along electronic guide rails. So, if the tray is tilting in one direction the weights would fall to the opposite side of the tray to equalise it out back to a 180-degree angle. Testing would be required with this concept, but it has strong potential to be a great way of reducing fatigued users from tilting a tray a little too much that glassware falls off of it. Weight may make tray heavier overall though being major downside of this concept.



Design Implications

Final concept for reducing glassware breakage is the simplest and least innovative the of the bunch but comes with all the functionality required probably for a reduced cost over the others. Bottles/glasses are placed into a guide rack that sits over top of tray and holds glasses around the top stopping them from being able to tumble over. Requires slight extra effort for people to grab drinks off trays but also reducing the amount of drinks spilled down the backside of guests. Different holes are designed for different sized glasses such as wine, champagne, and beer bottle. Since glassware is being placed in certain spots on tray divets can also be added to the bottom of tray making it absolutely foolproof when it comes to drinks falling over or slipping off.

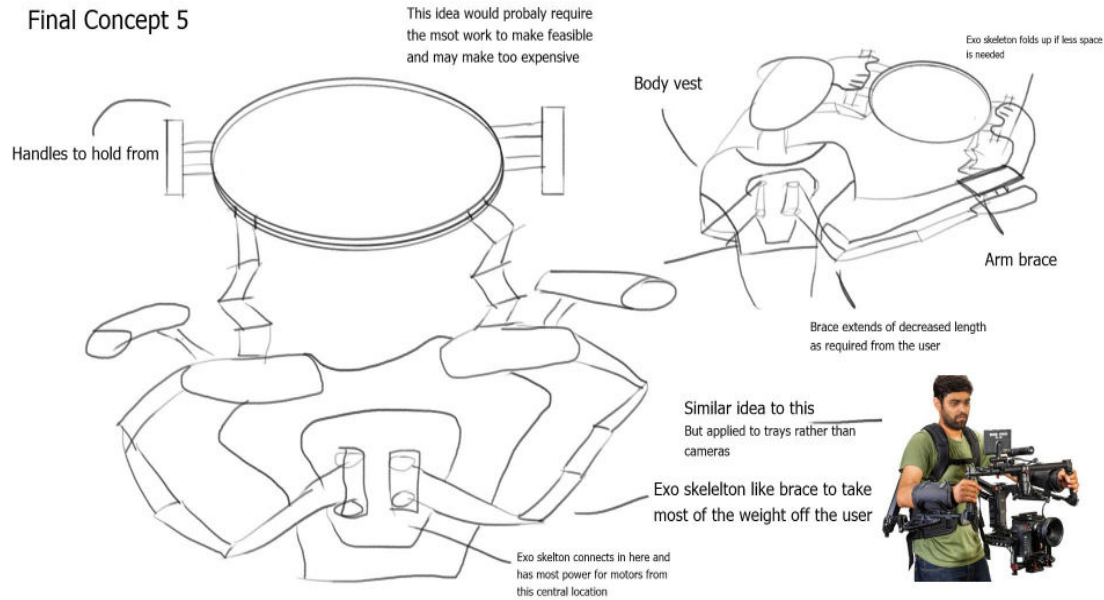
These next few ideas are aimed at reducing back strain caused by extensive tray carrying which can result in musculoskeletal disorders.



This concept adapts a tray with a full body strap for distributing weight more safely throughout the body. This concept would allow weight to be shared between the shoulders, back and waist area reducing overall weight on back for users. Fully adjustable for all body types and can be clipped off from waist to allow easier replenishment of drinks. Strap would be put on employee before commencement of shift and only clipping on and off tray through shift to avoid time wasted between taking a whole-body strap on and off and resizing. Concept also has possible functionality of allowing users to carry tray hands free with a plastic push off point which stops tray from pushing into body and possibly bumping.

Design Implications

Final Concept 5



Another possible concept but with a much more out there mechanism behind it is using an exo-skeleton motor like system similar to body camera stabilizers used in the film industry. It would allow the user to hold the tray of drinks with very little effort and would also stabilize it enough as to not allow the tray to spill over. Although this is a good and cool idea it may be too expensive for the hospitality industry to implement into their budget for a tray. This idea would fix 2 problems in one but would also be the most work to make possible. The verdict on this one is a good idea but tough to implement in a cost effective manner.

Conclusion

Throughout this report we have gone over a literature review detailing all of the current knowledge surrounding food service health and safety and what is common within the industry. We then dived deeper into primary research through surveys and interviews which allowed us to gain a deeper understanding and fill some of the gaps in research identified in the literature review. Finally, we went over how this information could inform a product design and many different concepts of these ideas generated that could reduce the health and safety problems surrounding the food and beverage service industry. A concept or mix of concepts will be chosen to go forward with and design as my capstone project.

References

- Chang, K. (2023, August 17). Superconductor scientist faces investigation as a paper is retracted. The New York Times. <https://www.nytimes.com/2023/08/15/science/retraction-ranga-dias-rochester.html>
- ERGO Inc. (2014, October 6). Ergonomics for servers - Carrying trays - Ergo Consulting. Ergo Consulting. <https://ergoconsulting.ca/blog/ergonomics-for-servers-carrying-trays/>
- Usccg. (2021, September 20). How to combat labor shortages and skills gaps in food manufacturing. USC Consulting Group. <https://www.usccg.com/blog/how-to-combat-labor-shortages-and-skills-gaps-in-food-manufacturing/>
- Madeleine Achenza. (2022). Staff Shortages. News. <https://www.news.com.au/lifestyle/food/restaurants-bars/industry-desperate-for-200000-more-workers-ahead-of-peak-season/news-story/d494914ad92791ed238dfe3fc5c1a2eb>
- Government of Canada, Canadian Centre for Occupational Health and Safety. (2023, June 13). Food and Beverage Servers. https://www.ccohs.ca/oshanswers/occup_workplace/foodandbeverage.html
- 6 Ways to Augment your food and beverage workforce | Rockwell Automation. (n.d.). Rockwell Automation. <https://www.rockwellautomation.com/en-us/company/news/blogs/6-ways-to-augment-your-food-and-beverage-workforce.html>
- Safe work Australia (2015), Work Health and Safaety in the Accomodation and Food Services Indsutry. <https://www.safeworkaustralia.gov.au/system/files/documents/1702/whs-accommodation-food-services-industry.pdf>
- Adams, D. (2022, May 25). One in 10 workers changed jobs in the year to February, ABS says, giving credence to 'Great Resignation' claims. SmartCompany. <https://www.smartcompany.com.au/finance/economy/abs-job-change-data-great-migration/>
- Musungwa, T., & Kowe, P. (2022). Effects of occupational health and safety management systems implementation in accident prevention at a Harare beverage company. Cogent Engineering, 9(1). <https://doi.org/10.1080/23311916.2022.2124638>
- European Agency for Safety and Health at Work. (2019), Work-related musculoskeletal disorders: prevalence, costs and demographics in the EU. https://osha.europa.eu/sites/default/files/Work-related_MSDs_prevalence_costs_and_demographics_in_the_EU_report.pdf
- Peng, C., Hsieh, H., Li, M., Liaw, L., Wang, C., Pan, C., & Wu, M. T. (2021). Gender differences and site-specific incident risks of musculoskeletal disorders among 224 506 workers in the food and beverage service industry in Taiwan: A 15-year Nationwide Population-Based Cohort Study. Journal of Occupational Health, 63(1). <https://doi.org/10.1002/1348-9585.12214>
- Ministry of Manpower, (2022). Workplace Safety and Health Report. National Statistics. <https://www.mom.gov.sg/-/media/mom/documents/safety-health/reports-stats/wsh-national-statistics/wsh-national-stats-2022.pdf>

References

- Roosted. (2023, March 13). 8 Reasons for employee turnover in hospitality - Employee Scheduling app. Employee Scheduling App. <https://www.roostedhr.com/8-reasons-for-employee-turnover-in-hospitality/#:~:text=Most%20HR%20experts%20agree%20that,around%2070%2D80%25%20annually.>
- CDC. (2023). Work-Related Musculoskeletal Disorders & Ergonomics | Workplace Health Strategies by condition | Workplace Health Promotion. <https://www.cdc.gov/workplacehealthpromotion/health-strategies/musculoskeletal-disorders/index.html>
- 2022 State of the Australian Hospitality Industry Report: Looking ahead to 2023. (2023, February 7). Lightspeed. <https://www.lightspeedhq.com.au/blog/state-of-the-australian-hospitality-industry/>
- Manufacturing, C. (2016, April 20). How many wine glasses break and other things you always wanted to know about wineries. The CAMBRO Blog. <https://blog.cambro.com/2016/04/20/how-many-wine-glasses-break-and-other-things-you-always-wanted-to-know-about-wineries/>
- Ron Tomic, (2022),Retail, food & beverage industry worker shortage risks. <https://www.marsh.com/au/industries/food-beverage/insights/retail-restaurant-food-beverage-companies-worker-shortage-risks.html>
- Wikipedia contributors. (2023, October 20). Emotional labor. Wikipedia. https://en.wikipedia.org/wiki/Emotional_labor
- Rupnur, R. (2023, January 16). Hospitality Market Size, Share & Trends Analysis | Industry Report. <https://www.linkedin.com/pulse/hospitality-market-size-share-trends-analysis-industry-ram-rupnur/>
- Sönmez, S., Apostolopoulos, Y., Lemke, M. K., Hsieh, Y. J., & Karwowski, W. (2017b). Complexity of occupational health in the hospitality industry: Dynamic simulation modeling to advance immigrant worker health. *International Journal of Hospitality Management*, 67, 95–105. <https://doi.org/10.1016/j.ijhm.2017.08.006>
- Peters, S. E., Nielsen, K. M., Nagler, E. M., Revette, A. C., Madden, J., & Sorensen, G. (2020). Ensuring Organization-Intervention Fit for a Participatory Organizational Intervention to Improve Food Service Workers' Health and Wellbeing: Workplace Organizational Health Study. *Journal of Occupational and Environmental Medicine*, 62(2), e33–e45. DOI: 10.1097/JOM.0000000000001792
- Cantrell, N. (1991.). Correlates of Non-Institutional Food Service turnover. FIU Digital Commons. <https://digitalcommons.fiu.edu/hospitalityreview/vol9/iss2/6>
- Dorn, D., & Dorn, D. (2017, September 28). 5 Things Employers Can Do To Address Musculoskeletal Disorders. DORN. <https://www.dorncompanies.com/things-employers-can-address-musculoskeletal-disorders/>
- Waiting Staff Health and Safety (2001) <https://www.srsl.biz/docs/Food%20Safety/FD05%20-Waiting%20Staff%20Health%20and%20Safety.pdf>
- Tegenu, H., Gebrehiwot, M., Azanaw, J., & Akalu, T. Y. (2021). Self-reported work-related musculoskeletal disorders and associated factors among restaurant workers in Gondar City, Northwest Ethiopia, 2020. *Journal of Environmental and Public Health*, 2021, 1–9. <https://doi.org/10.1155/2021/6082506>

References

- Witham, K. (2019, October 9). The physics of springs: How manufacturers understand spring design. Automated Industrial Motion. <https://aimcoil.com/the-physics-of-springs-how-manufacturers-design-springs-that-work/>
- Workplace safety and health report | The ISSN Portal. (2023, August 5). <https://portal.issn.org/resource/ISSN/2424-7782>
- Zhang, T. C., Torres, E., & Jahromi, M. F. (2020). Well on the way: An exploratory study on occupational health in Hospitality. *International Journal of Hospitality Management*, 87, 102382. <https://doi.org/10.1016/j.ijhm.2019.102382>
- Gysen, B.L.J. & Paulides, Johannes & Lomonova, E.A.. (2011). Generalized Harmonic Modeling Technique for 2D Electromagnetic Problems Applied to the Design of a Direct-Drive Active Suspension System. 10.6100/IR719773.
- Encyclopædia Britannica, inc. (2023.). Electromagnetic suspension. *Encyclopædia Britannica*. <https://www.britannica.com/topic/electromagnetic-suspension>
- Leaf Group. (2023.). The history of serving trays. eHow. https://www.ehow.com/about_5519142_history-serving-trays.html
- Milligan, P. (2012, August 20). The magic tray: Cups and plates can be tilted up to 45 degrees with invention. *Daily Mail Online*. <https://www.dailymail.co.uk/sciencetech/article-2190642/The-magic-tray-Cups-plates-tilted-45-degrees-invention.html>
- News, I. C., Bose, & Name*. (2016, February 19). Why Bose's electromagnetic car suspension system never made it to market. In *Compliance Magazine*. <https://incompliancemag.com/bose-electromagnetic-car-suspension-system/>
- Wikimedia Foundation. (2023, August 13). Safetray. *Wikipedia*. <https://en.wikipedia.org/wiki/Safetray>