THE FUTURE OF ANAPHYLAXIS CARE IN THE YOUNG

A Research Report by Aengus Daly

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Executive Summary

Summary

The western world is becoming more allergic. Currently, the western world is experiencing the second wave of allergic disease, which has presented itself in people suffering from life-threatening food allergies. At least 1- 40 children (Allergy 2014) are suffering from one serious allergy. There is a need for a device that provides a calming life-saving experience. There is a growing market for products like auto-injectors to become as readily available as inhalers, which became popular during the first wave of allergies 50 years ago when asthma and hay fever were being diagnosed.

Providing a caring, comforting, and safe experience is what is required despite the first auto-injector being around the mid-1970s there is yet to be major improvements and development to cater to the users mental and physical wellbeing.

This project will focus on redesigning the auto-injector device to be more comforting to a younger demographic providing a reassuring experience.

CW1 Review The Design Opportunity

1.1 INTRODUCTION

The western world is becoming more allergic. At least 1 in 40 (Allergy, 2014) children suffer from at least one serious allergy in the UK, otherwise known as 'Anaphylaxis' a severe allergic reaction which could be fatal without the life-saving drug Epinephrine and the accompanying device known as an auto-injector. Current market solutions have proven to be a cause for concern. This report will inform the finding of research for the project and is comprised of insightful data and information I have gathered. The report's aim is to support the project and prove its validity.

1.2 QUESTIONING THE PROBLEM - APPENDIX G / H

Comparing current market competitors and highlighting areas of concern and what the product does well proved useful in identifying the major flaws auto-injectors behold. A further deeper dive into the inner workings of an Epipen, proving useful in identifying the major problems the most prescribed auto-injector on the market holds. Providing further support for problems the users have and how they could be solved.

1.2 RESEARCH PLAN DISCUSSION - APPENDIX A.1 / A.2

The research plan developed provides an initial overlook on questions that at first glance were deemed necessary to delve into, however as time progressed questions slowly began to be eliminated on the premise that they provided no substantial evidence to support my question or none at all. A revised research plan was constructed to show a more accurate understanding of the process the project required.

1.2 RESEARCH TIME PLAN DISCUSSION - APPENDIX B.1 / B.2

The research time plan constructed in the form of a Gantt chart provides a visual schedule to adhere to. Setting out goals in which to complete the methods outlined before reaching the deadline. At first glance much like the research plan, the initial research time plan contained research methods that were going to be used however overtime the methods were eliminated and not used, and therefore so had the designated time slots. A more accurate Gantt chart was created demonstrating the true process undertaken.

1.2 WHERE IS THE MARKET - APPENDIX E.1 / E.2

These are the stats gathered to support the argument that there is a market for an auto-injector for a younger demographic. The personas developed demonstrates a deep understanding of the potential user outlining their issues, wants, and goals.

- 6 - 8% of children are thought to have food allergies (Emine Saner, 2018)
- 72% increase in hospital admissions for children with severe allergic reactions over the last 5 years (ITV news, 2019)
- 40% of children in the Uk have been diagnosed with an Allergy.

RESEARCH SUMMARY AEIOU Analysis

ACTIVITY

2.1.1 ARE PEOPLE ABLE TO INJECT APPROPRIATELY AND SUCCESSFULLY EASILY?

Through task analysis (Appendix J) and breakdown analysis (Appendix H), they identified problems with current market competitors showing clear problems that could potentially inhibit the appropriate and successful use of an auto-injector, from a lack of clear instruction or intuitive designing etc.

2.1.2 IS IT THE ACT OF INJECTION THAT FRIGHTENS AND CAUSES PANIC OR A GENERAL FEAR OF NEEDLES?

Through desk-based research, there was a clear underlying factor that inhibits the user's ability to inject and that is the uneasiness and general fear. Stats such as 1 in 10 people have a fear of needles and having an injection of any kind (Taylor, 2019). 63% of children in one study aged 6-17 years old reported a fear of needles (Orenius, 2018)

2.1.3 ARE PEOPLE ROUTINES AFFECTED BY CARRYING AN EPI-PEN?

Through user personas (Appendix E.1 / E.2) one of the major concerns of any auto-injector but mainly the Epipen as it is the most prescribed is the bulkiness and general ability to carry the product on the user themself.

ENVIRONMENT

2.2.1 WHERE ARE THEY STORED FOR PROPER USE?

There are many locations an auto-injector can be stored for safe use, but to maintain the product's dose, it needs to be stored in a cool dark place at room temperature. However, this is can be unachievable considering the need for the demographic constantly moving and having to take the device wherever they move too.

2.2.2 WHY ARE EPI-PENS/AUTO-INJECTORS IN GENERAL PLACED IN STRATEGIC LOCATIONS?

Through user personas (Appendix E.1 / E.2) and product breakdown (Appendix H) they highlight problems involving the auto-injector's general form and question the feasibility of device transportation and therefore placing a pen in a strategic location that is readily available helps combat this problem. In addition 'Australia, Canada, USA, and the UK have all reported national shortages of EpiPens, with some countries being entirely out of stock of the junior version.' (The Lancet Child & Adolescent Health, 2018)

RESEARCH SUMMARY AEIOU Analysis

INTERACTION

2.3.1 HOW DAUNTING ARE THEY FOR THE USER, FROM CARRYING AND INJECTING?

Through a questionnaire (Appendix K), user personas (Appendix E.1 / E.2), and product breakdown (Appendix H), and market competitors (Appendix G) a clear link began to form demonstrating a deep fear for users to inject themselves but also to be injected by a second party. This is concerning mainly due to the product's nature being a life-saving drug delivery device.

2.3.1 COULD ERGONOMIC FEATURES IMRPOVE TIME TO USE AND USER INTUITION?

Through the task analysis research method (Appendix J), many factors were highlighted however, one of the major insights was the lack of ergonomic features implemented into the Epipen and the Epipen Jr. This supports the need for ergonomic design implementation.

2.3.1 GRAPHICS AND VISUAL DISPLAY OF INFORMATION TO MAKE IT EASIER TO UNDERSTAND?

Inforgraphic stimulation provides an intuitive approach at demonstrating the correct use of a product, the problem with an Epipen is the instructions provided can be miscommunicated and easily misunderstood which can lead to its incorrect and inappropriate product use. See appendix H for a product brekdown outlining the problems.

OBJECT

2.4.1 WHY ARE EPI-PENS AND AUTO-INJECTORS IN GENERAL SO BULKY?

Using a sourced image on appendix H showing a complete product disassembly, a typical Epipen houses many components hence the reason for a bulky design, such as the spring-loaded mechanism the inner housing for the epinephrine dose. Dissecting the device allows for a complete restructure to what is important and how it can be reimagined.

2.4.2 HOW CAN THE PRODUCT BE BETTERED USING ERGONOMICS?

Looking into product materials under Appendix L, using materials such as textured rubber provide a better contact-based grip which prevents any slipping. Using a task analysis (Appendix J) looking past the structured set routine on how to use the device you can observe how the user holds the device and learn how to better their grip for comfort and instinctive handling.

2.4.3 PINCH POINTS AND PRESSURE POINTS FOR BETTER INJECTION AND INTUITIVENESS?

Looking into product materials under Appendix L, using materials such as textured rubber provide a better contact-based grip which prevents any slipping. Using a task analysis (Appendix J) looking past the structured set routine on how to use the device you can observe how the user holds the device and learn how to better their grip changing the points of pressure and pinching.

RESEARCH SUMMARY AEIOU Analysis

USER

2.5.1 WHO ARE THE SECONDARY USERS OF AN EPI-PEN/AUTO-INJECTOR?

Stakeholder mapping (Appendix I) proved to be the most effective way of brainstorming potential secondary users and understanding the interaction they could potentially have with an Epipen or auto-injector of any kind, from the stressful and confused nature of a public citizen compare to the trained, speedy and understanding interaction a paramedic would have.

2.5.2 WHAT ARE THE PSYCHOLOGICAL EFFECTS FROM USING AN EPI-PEN AND AUTO-INJECTOR?

Secondary desk-based research was most effective in helping understand the psychological effects auto-injector devices have but more importantly needles in general especially for young children. A child user persona (Appendix E.2) helped embody these concerns and provide a face to help empathise and understand better.

- Over 50% of a 94 people study from Plymouth university showed symptoms for avoidance and PTSD after suffering an Anaphylactic shock and using an auto-injector. (Man Cheung Chung, Walsh, and Dennis, 2011)

2.5.3 HOW CAN THE EFFECTS BE ELIVIATED OR MANAGED BETTER?

Developing a CMF / Mood board (Appendix F) identifying what makes a functional utilitarian product less so and provide a comforting stigma. Products that utilise imagery that children find comforting and friendly have a positive effect. An example being the use of a rocket ship on a lamp completely changes the aesthetic and makes it more friendly and inviting and something a child would want to keep around.

CONCLUSION

3 CONCLUSION

This research has informed my project clearly outlining the need for my product proposal for an auto-injector targeted towards the younger demographic of children between the age of 5 years old to 16 years old. There is a need for a product that caters to the mental and physical wellbeing of a young anaphylaxis sufferer. For the young demographic auto-injectors can be quite scary, daunting, and fear-inducing. There are many identifiable problems with current market solutions such as device size, intuitiveness, and ease of use. There is a need for a product that can be used instinctively, easily but most importantly safely.

DESIGN BRIEF

4 DESIGN BRIEF

To design and make an auto-injector device for young anaphylaxis sufferers between the ages of 5 and 16 yeards old, to combat the panic before, during and after the onset of an anaphylactic shock. The product experience should be reassuring and universally understood for the easy, safe and rapid use required.

DESIGN SPECIFICATION See Appendix D

FUTURE PLAN Planning ahead

6.1 TRANSLATING RESEARCH INTO DESIGN IDEATION AND DEVELOPMENT?

The insights gathered from the research will be translated into potential solutions mitigating the effects of the problem areas. The research will be used as a constant reference point to evaluate the potential designs.

6.2 WHAT WILL BE TESTED AND MODELLED?

Material plausibility is an essential test to ensure the materials mentioned are capable of achieving the designated function, mainly textured rubber to ensure it has the ergonomic grip benefits mentioned in the research. Creating ergonomic grip handle models to test product usability, utilising anthropometric data to create a range of child-friendly model designs. Aesthetic models will also be created as the CMF slowly begins to encompass the product design process.

6.3 MECHANICAL PROTOTYPES?

Mechanical testing will be required to test various trigger mechanisms for product comparison and potentially developing new drug delivery mechanisms, this must be completed before CMF and general aesthetics come into modelling, as they could potentially be inhibited by any potential mechanism.

FUTURE PLAN Planning ahead

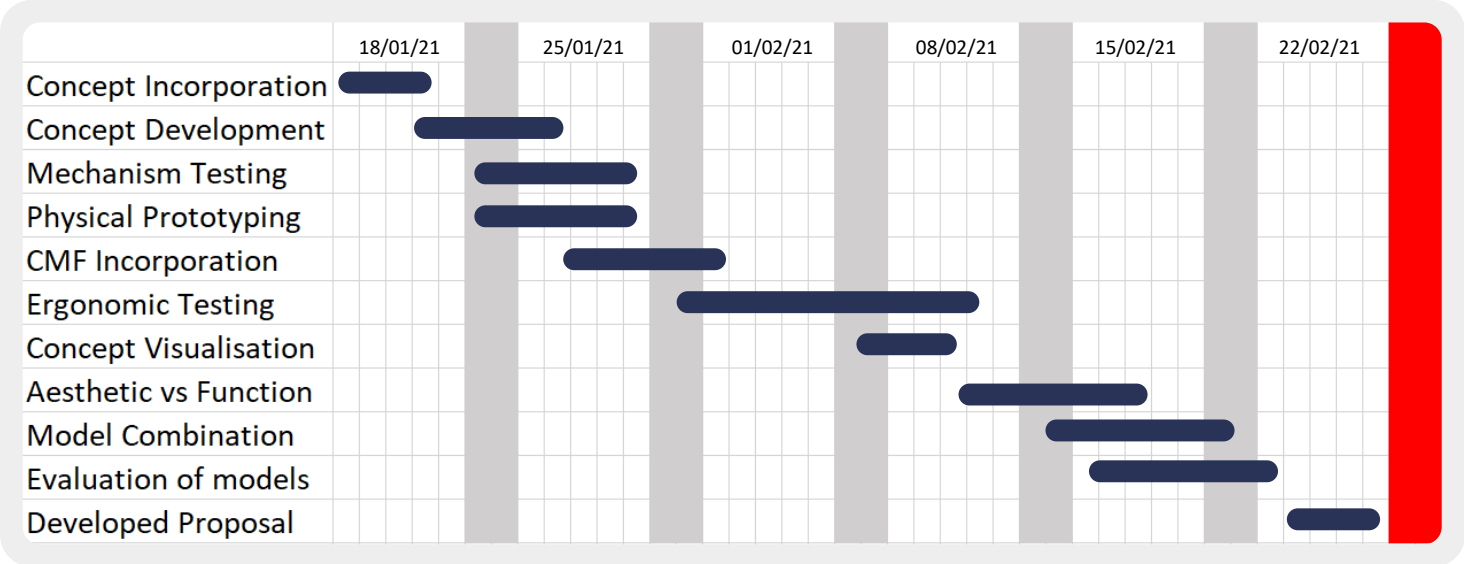
6.4 AESTHETIC MODELS AND FULL PROOF PRINCIPAL MODELS?

Once mechanical testing has been completed the next stage would be to implement the mechanism desired into the ideation process and develop an aesthetic design around the mechanism as a product as life-saving as this, function comes before form and aesthetic. Once completed the next stage would be to develop full proof principal models to accurately show the final product in its final form.

6.5 EVALUATION AND FEEDBACK FROM THE POTENTIAL MARKET?

Feedback from the market is most valuable once the model's mechanism has been developed to understand whether the product can be utilised in its market before heading further into product aesthetics, as the function of the device is more important than its aesthetics.

6.6 FUTURE PLANNING GANTT CHART



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APPENDIX A.1 Research Plan

DESIGN / PRODUCT AREA

An Auto-Injector that caters for the mental and physical wellbeing of the user before, during and after use?

ACTIVITY

Are people able to inject appropriately and successfully easily?

Is it the act of injection that frightens and causes panic or a general fear of needles?

Are people routines affected by carrying an Epi-Pen?

What are the major causes of Anaphylaxis?

What is the average time of use? from taking the pen out

What are the affects of an EpiPen/Auto-Injector after its initial use?

ENVIRONMENT

Where are they stored for proper use?

Why are Epi-Pens/Auto-Injectors in general placed in strategic locations?

Are there factors affecting use in certain environments?

INTERACTION

How daunting are they for the user, from carrying and injecting?

Could ergonomic features imrpove time to use and user intuition?

Graphics and visual display of information to make it easier to understand

What is the average time for someone to figure out how to use an EpiPen?

The lack of translation and ease of use in other countries?

The psychological impacts?

HOW I WILL FIND OUT?

PERSONAS

MOOD BOARD

ONLINE RESEARCH

COMPETITORS

ONLINE QUESTIONNAIRE

TASK ANALYSIS

EPI-PEN BREAKDOWN

SHADOWING

INTERVIEW

FLY ON THE WALL

STORYBOARDING

OBJECT

Why are Epi-Pens and Auto-Injectors so bulky in design?

How can the product be bettered using ergonomics?

Pinch points and Pressure points for injection for better intuition?

Ease of access to people, worldwide shortage, why?

Clothing and the effect they have on use?

USER

Who are the secondary users of an Epi-Pen/Auto-Injector?

What are the psychological effects from using an Epi-Pen and Auto-injector?

How can the effects be eliviated or managed better?

The average cost per person and the use before expiration?

Are elderly people able to use?

APPENDIX A.2 Revised Research Plan

DESIGN / PRODUCT AREA

Auto-injector for the young catering for their mental and physical wellbeing

ACTIVITY

Are people able to inject appropriately and successfully easily?

Is it the act of injection that frightens and causes panic or a general fear of needles?

Are people routines affected by carrying an Epi-Pen?

ENVIRONMENT

Where are they stored for proper use?

Why are Epi-Pens/Auto-Injectors in general placed in strategic locations?

INTERACTION

How daunting are they for the user, from carrying and injecting?

Could ergonomic features imrpove time to use and user intuition?

Graphics and visual display of information to make it easier to understand

OBJECT

Why are Epi-Pens and Auto-Injectors so bulky in design?

How can the product be bettered using ergonomics?

Pinch points and Pressure points for injection for better intuition?

HOW I WILL FIND OUT?

PERSONAS

MOOD BOARD

ONLINE RESEARCH

COMPETITORS

QUESTIONNAIRE

TASK ANALYSIS

USER

Who are the secondary users of an Epi-Pen/Auto-Injector?

What are the psychological effects from using an Epi-Pen and Auto-injector?

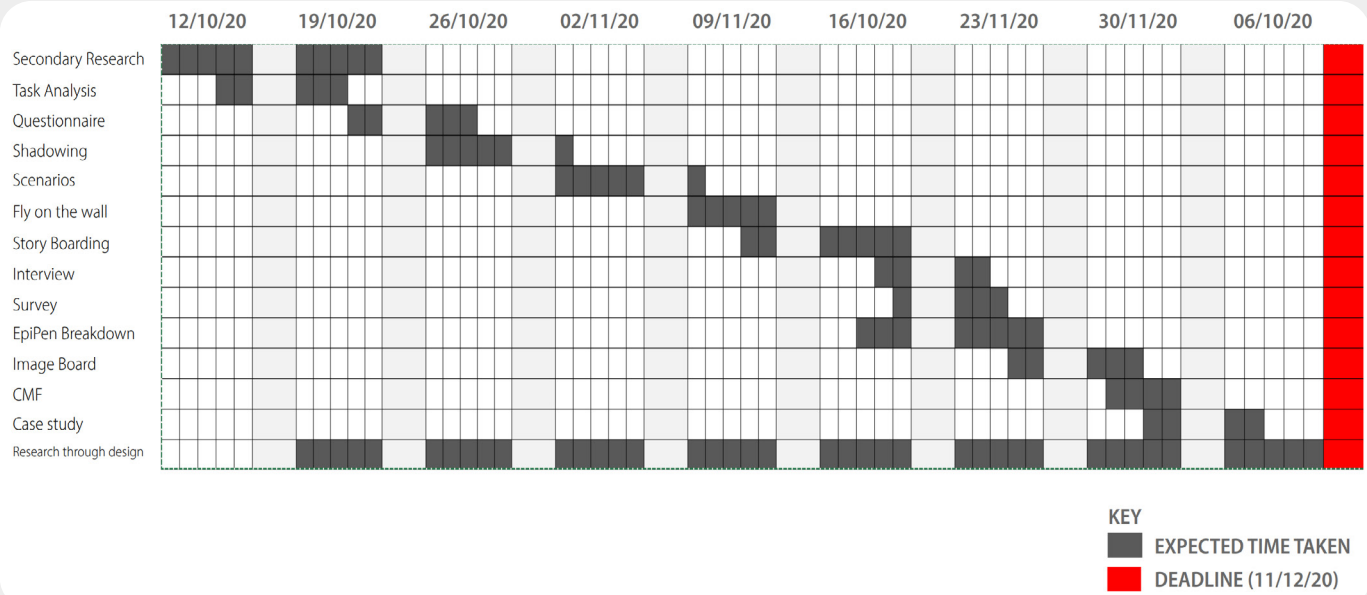
How can the effects be eliviated or managed better?

WHAT I DID / FOUND / WORKED WELL?

I created a Research Plan to help organise, the questions I deemed necessary to address at the time I created a Research Plan to help organise, the questions I deemed necessary to address at the time along with the supporting research methods I believed would provide the best results. Upon researching the said questions, I began to understand some were irrelevant, and therefore a revised research plan was created to be more accurate and better utilise my time.

I found some of the questions I tasked myself to research further, were in fact slight iterations of previous questions or no longer central to my investigation. Overall, what I found to be most effective was separating every question under an AEIOU heading, to provide a strategic and all-encompassing approach to researching.

APPENDIX B.1 Gantt Chart

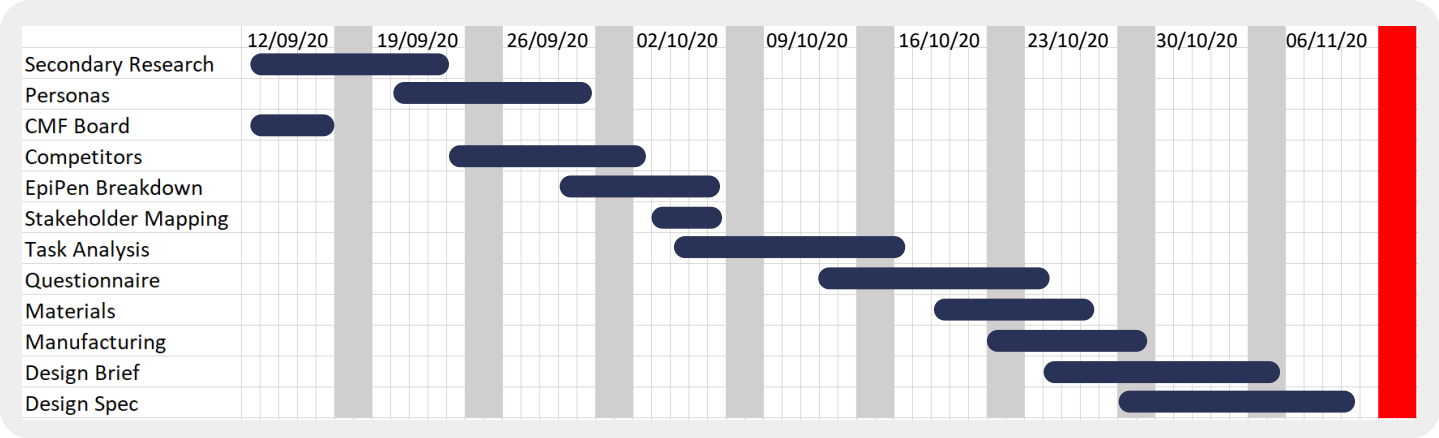


WHAT I DID / FOUND / WORKED WELL?

I created a Gantt chart to help visualise my project schedule and create designated time slots to perform certain research techniques I deemed necessary. Each of the greys rows designated specifics tasks and denoted the time I estimated I would need to perform said task.

Despite creating this Gantt chart, I discovered some of the tasks I put in there to complete were not undertaken as they were no longer apart of my research plan. Upon this discovery, the overall effectiveness of the Gantt chart was mediocre due to the simple reason, it is hard to plan the future when researching parts of the research plan changed my point of view or perspective deeming others unnecessary.

APPENDIX B.2 Gantt Chart Revised



WHAT I DID / FOUND / WORKED WELL?

I created a revised Gantt chart to help accurately demonstrate my project schedule on a visual scale. Creating designated time slots to perform certain research techniques I deemed necessary. Each of the blue rows are designated tasks I undertook and the time denoted it took for to achieve / perform said task.

I found it difficult to complete tasks in tandem with one another, therefore my Gantt chart seems to depict a fairly linear design almost stair like, completing tasks one after the other.

APPENDIX C Design Brief

To design and make an auto-injector device for young anaphylaxis sufferers between the ages of 5 and 16 yeards old, to combat the panic before, during and after the onset of an anaphylactic shock. The product experience should be reassuring and universally understood for the easy, safe and rapid use required.

APPENDIX D Design Specificaiton

FUNCTIONAL

The product must deliver the life-saving drug above effectively and properly, to make it the most effective design.

REASSURING

The product should provide the life saving drug effectively and reassure the user of its effectiveness rather than guessing.

SAFE

The design must have safety features preventing accidental use unlike current market products.

INEXPENSIVE

Currently and worldwide shortage on auto-injectors due to price, therefore the product must be cost effective.

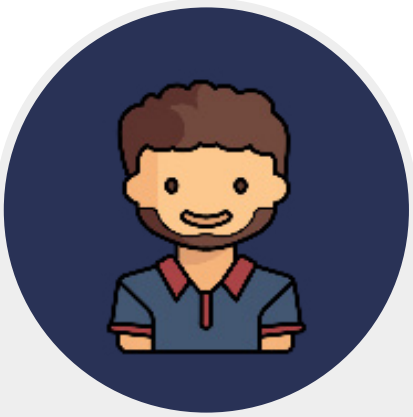
COMFORTING

The product should provide a comforting aesthetic, rather than scaring the user from product use.

EASY TO USE

Must be designed for ease of use. An intuitive design for time critical situations, ergonomic features for simple use.

APPENDIX E.1 Persona - The Parent



CLIVE JOHNSON

AGE: 32 YRS OLD
OCCUPATION: ELECTRICIAN
AREA: WARWICK

Clive Johnson is the young parent of a recently diagonsed Anaphylaxis sufferer. His young child is 6 years old and has a severe food allergy to nuts. Like most parents he is terrified by the possibility of his child suffering an allergic reaction and his child not being able to get the help needed in time.

PROBLEMS

Not child friendly - provides no reassurance of safety for his young child.
Bulky design - large product hard for anyone to carry on themselves at all times
Unclear information - they provide no real instructions, making it difficult for an untrained user to help in a time critical situation.

GOALS

Easy to use - a new type of auto-injector that is intuitive, easy to understand and use without second guessing.
Helpful design - rather than hindering his childs daily life, Clive wants an auto-injector thats easy to transport and hold at all times.
Reassurance - a product that provides comfort while in use

INSIGHTS

Trust - it is clear from a parents perspective, trust is difficult to have in the untrained due to the unituitive design.
Form - for a range of products that are supposedly life-saving they difficult to self-carry and keep on the user.
Clear - Epi-pens provide no confirmation or reassurance of correct and proper use to the user, which isn't safe or comforting

WHY WAS IT NECESSARY?

It was important to produce a persona of a parent to understand their perspective on a range of topics such as their motivations, their actions, their issues wants, and goals. In order to help steer my project in the right direction.

LINK TO RESEARCH & GANTT CHART

This persona links to all questions under the interaction and user sections of the research plan, as well as secondary research under the Gantt chart

WHAT I DID?

I created the user persona Clive Johnson, the parent of a young anaphylaxis sufferer and Epipen Jr user. In doing so I gathered insights into the issues they have as shown above. Through desk-based research, I was able to gather clippings of parents' concerns with Epipens and Auto-Injectors, in general, to help develop and form this user persona.

DID IT WORK? HOW WELL?

Through creating the user persona and desk-based research I was able to discover insights into what would make my product a successful design in the eyes of a parent, which is essential being they could be considered a primary user.

Overall, creating the user persona was effective as it supported research already conducted and just cemented areas of concern that I should work upon for a successful product.

APPENDIX E.2 Persona - The Child

ABIGAIL HARDING

AGE: 8 YRS OLD
OCCUPATION: STUDENT
AREA: KENT

Abigail Johnson has only just been diagnosed with anaphylaxis and prescribed with an Epi-Pen Jr. Unfortuantely she is allergic to nuts, shellfish and milk all of which are faily common food products. Therefore the fear of falling into shock and then using the Epi-Pen Jr is terrifying and always on her mind.

PROBLEMS

Scary - since her first use of an Epi-pen Jr the thought of it being used on her again is terrifying and constantly scary.
Remembering - having to always remember where her auto-injector is, is problematic especially when going out or to school.
Unclear Information- having to show club leader, friends and teachers how to use, is annoying and constant.

GOALS

A new way? - for someone with a fear of needles, is it possible to deliver the dose another way instead of a needle, or just calmer?
A constant reminder - a way to make it easier to remember to carry her Epi-pen Jr on her at all times with ease and assisstance.
Clearer design - clearer instructions, or even a dummy one for practice.

INSIGHTS

Drug delivery - for children with a fear of needles and injections, would it be better to find a new way to deliver the drug?
Reminder - children are notoriously forgetful and parents may forget too, how can this be combatted and make it easier.
Clear - Epi-pens provide no confirmation or reassurance of correct and proper use to the user, which isn't safe or comforting

WHY WAS IT NECESSARY?

It was important to produce a persona of a child to understand their perspective on their motivations, their actions, their issues wants, and goals. In order to help steer my project in the right direction.

LINK TO RESEARCH & GANTT CHART

Same as Appendix C.1

WHAT I DID?

I created the user persona Abigail Harding, a young anaphylaxis sufferer and Epipen Jr user. In doing so I gathered insights into the issues they have as shown above. This was achieved through desk-based research and it highlighted areas of concern for the youthful user.

DID IT WORK? HOW WELL?

Through creating the user persona and desk-based research I was able to discover insights into what would make my product a successful design for the primary user.

Overall, this user persona was by far the most important as it highlighted concerns which my primary user would have as they experience the problems first hand.

APPENDIX F CMF Mood

WHY WAS IT NECESSARY?

It was necessary to create a CMF board to get a firm understanding of what the aesthetic, type of materials, forms and finishes will be used within the ideation process.

LINK TO RESEARCH & GANTT CHART

This research helps steer the direction the CMF will go and is linked to CMF / Image Board

WHAT I DID?

Pinterest / Pexels / Unsplash were the main source of photography for the CMF/ Image board, to find a broad aesthetic range consisting of children utensils and and children orientated products. Identifying an area of aesthetic I want my ideation process to steer towards.

DID IT WORK? HOW WELL?

What I found was for something to be comforting to a child even as utilitarian as a lamp, changing the form to a rocket provides a childs aesthetic easily. Colour is a big driving point and therefore needs to be utilised in order for it to be desirable by the primary user.

I have since discovered the product needs to be functional but aesthetic and the CMF board shows an achieveable inbetween.

APPENDIX G Competitors

SYMJEPI

The SYMJEPI Injection device is smaller and therefore fits most pockets.

- Smaller design
- Unfriendly
- Less Informative
- Ergonomic

COST - £95

EMERADE

The Emerade Auto-Injector is used to treat acute and severe reactions

- Friendly design
- Less Informative
- Slender design

COST - £45

TEVA

The TEVA Auto-Injector is a very similar design to the EpiPen in terms of colour and form.

- EpiPen knock off
- Colour Coded
- Bulky design

COST - £95

AUVI-Q

The AUVI-Q auto-injector is a thick but shorter product much like an iPhone. Infection is possible.

- Stockier design
- Less Informative
- Easy to use

COST - £na pulled from the market

EPI-PEN

The EpiPen and EpiPen Jr are the most commonly prescribed auto-injector.

- Bulky Design
- Too Intense
- Unfriendly
- Colour coded

COST - £69

ADRENACLICK

The Adrenaclick is another alternative to the EpiPen design, housing a very similar design.

- Medical based design
- Clear and concise
- Effective

COST - £75

JEXT

Jext is an emergency injection which is used to treat severe allergic reactions.

- Informative
- Hard to carry
- Unfriendly

COST - £49

DID IT WORK? HOW WELL?

It was affective in finding areas of improvment, and where I could target during the ideation process to create a good final product as current market products are lacking in certain areas.

It was insightful recognising the products that are successful in certain areas but lack in others clearly showing market gaps that I can target.

LINK TO RESEARCH & GANTT CHART

This was apart of the Object section of the research plan but links mainly to secondary research.

WHAT I DID?

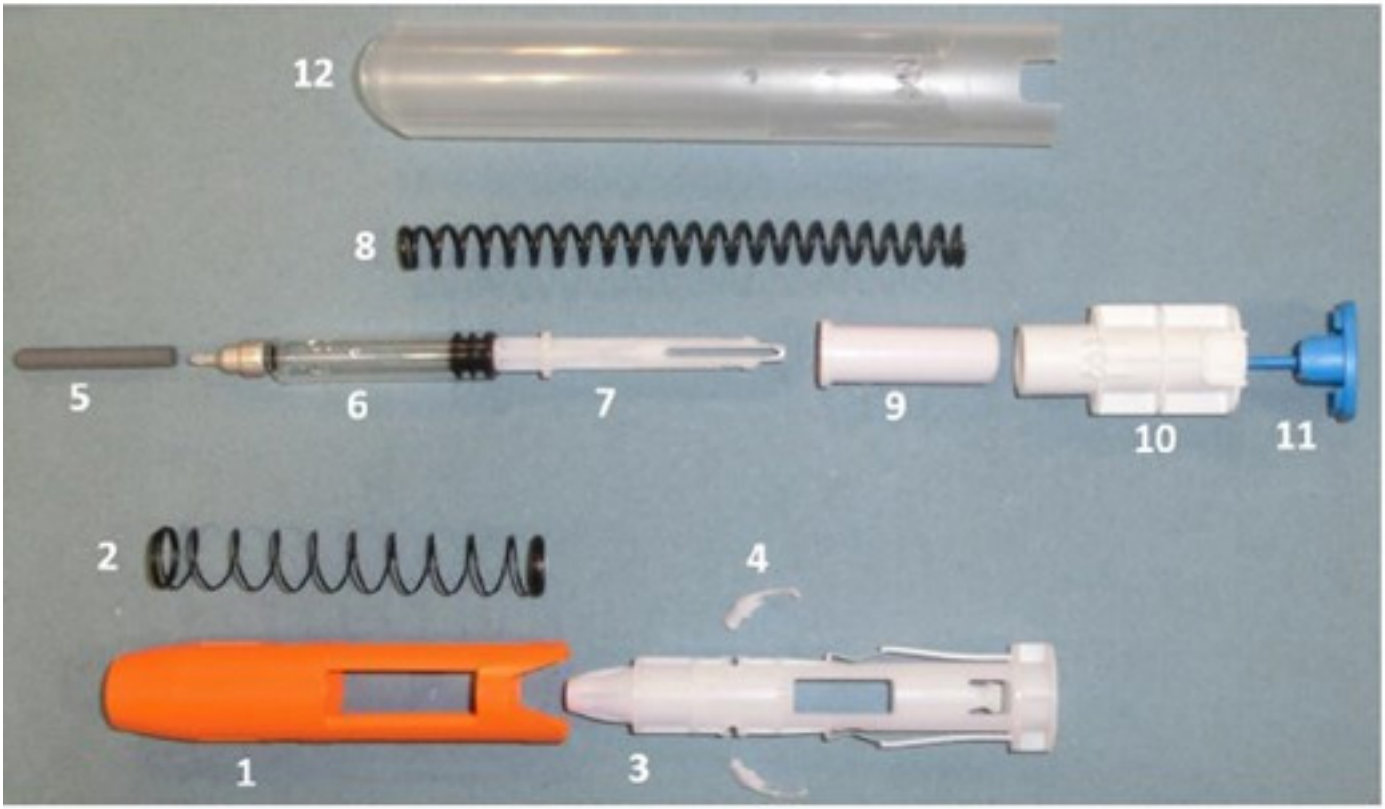
This information was found through using secondary research but also brainstorming potential users to find who has common interest in the product.

WHY WAS IT NECESSARY?

To understand the market landscape and see whether there are any trends between function vs form and general understanding on how successful the current products are.

APPENDIX H EpiPen Breakdown

Rev 2 EpiPen® Complete Device



Rev 2 EpiPen® Part Breakdown

1. Shroud
2. Control Spring
3. Carrier
4. Control Clips
5. Needle cover
6. Cartridge and Stopper
7. Plunger
8. Drive spring
9. Release collar
10. Rear case
11. Safety Cap
12. Housing

APPENDIX H EpiPen Breakdown

WHY WAS IT NECESSARY?

It was deemed necessary so I could delve into the market leader and breakdown all there wrong doings to improve upon and use this information to compliment my own product form.

DID IT WORK? HOW WELL?

Breaking down the EpiPen discussing its negative points helped identify the points I need to improve upon and eccentuate the features during the ideation process to help achieve a successful product.

Overall, I believe it was a successful research method to help identify what I need to add to new alternate auto-injector design.

LINK TO RESEARCH & GANTT CHART

This links to the EpiPen breakdown research method detailed on the Gantt Chart.

WHAT I DID?

Through hands on experience, online research I was able to identify major problems with the EpiPen design and have detailed them on the above image.

APPENDIX I Stakeholder Mapping

WHY WAS IT NECESSARY?

To understand who will be affected by the product, identifying the interactions certain users have as well as the relationship they have with it.

WHAT I DID?

This information was found through using secondary research but also brainstorming potential users to find who has common interest in the product.

DID IT WORK? HOW WELL?

This helped recognise who I am designing for besides the main user, which is why this method was helpful and effective, especially for identifying areas to eccentuate in the ideation such as ergonomic features for better product intuition.

LINK TO RESEARCH & GANTT CHART

This answers questions overarching the interaction section on the research plan.

WHAT DIDN'T WORK WELL?

I think looking further into the relationships and exploring further users would help broaden the range, but opens the question to whether it would be helpful as people would start to have similar interactions

APPENDIX J Task Analysis

Unzip tertiary casing to reach auto-injector if required

Remove auto-injector from tertiary casing is required

Begin to open auto-injector from its secondary casing

Take auto-inejctor out of the secondary casing

Read inforgraphic instruction detailing 'how to use?'

Remove safety cap mechanism and prepare to use the product

Hold auto-injector out for the required distance before use

Injector dose and hold for the required time for proper use

Remove auto-injector safely from the affected party

APPENDIX J Task Analysis Continuation

WHY WAS IT NECESSARY?

Task analysis was essential for understand the main users end goal better, the steps they take to achieve them, the triggers that lead to the task and anything that could disrupt the process or anything that could help achieve the end goal.

WHAT I DID?

Through using a personal EpiPen I was able to demonstrate the process of correct auto-injector use. Photographing the steps taken to achieve the end goal.

DID IT WORK? HOW WELL?

Overall, this method was effective in highlighting aspects of the process I hadn't realised where a struggle, such as keeping your hand away from the bottom end of the product to prevent the needle accidentally hitting the users hand.

The main benefit task analysis provides, is a concrete visualisation of the process helping storyboard, and became a constant reference to look at during the ideation process, identifying better ways to hold (ergonomics) etc.

LINK TO RESEARCH & GANTT CHART

This links to the research plan under the task analysis research method, and likewise for the Gantt chart.

WHAT DIDN'T WORK WELL?

It was effective in identifying the problems untrained users have such as how to handle with care and back up any other concerns I have identified, so it could therefore be deemed a wasted exercise.

APPENDIX K Questionnaire

HOW OLD WAS YOUR CHILD WHEN THEY WERE DIAGONOSED WITH ANAPHYLAXIS?

0-5 Yrs old 0-5 Yrs old 0-5 Yrs old

DOES YOUR CHILD CARRY AN AUTO-INJECTOR ON THEMSELVES?

Yes No

"When she is at school, she has to give it to reception to keep untill the day finishes"

HAVE YOU EVER HAD TO USE AN AUTO-INJECTOR BEFORE?

■ Yes □ No

"It was my first time using one, it was scary and challenging I wasn't certain I did it correctly"

WOULD YOU BE FEEL REASSURED IF SOMEONE OTHER THAN YOU HAD TO USE AN AUTO-INJECTOR ON YOUR CHILD

■ Yes □ No

"I do not believe EpiPens provide that clear cut instructions that make me feel reassured"

DO YOU BELIEVE YOUR CHILD WOULD BE ABLE TO USE AN AUTO-INJECTOR ON THEMSELVES?

■ Yes □ No

"Maybe not because its hard to use, but because I think he'll be too scared to do it"

WITHOUT PRIOR KNOWLEDGE, DO YOU BELIEVE AUTO-INJECTORS ARE DESIGNED INTUITIVELY?

■ Yes □ No

"Yes and no parts are but others aren't, it can be quite hard to use for new people"

DO YOU BELIEVE YOUR CHILD WOULD BE ABLE TO USE AN AUTO-INJECTOR ON THEMSELVES?

"Its large and impratical, wheres he going to put it"

"Its large, scary and confusing, that needs to change"

"The instructions are intense and confusing"

"I'm scared that I'm going to hurt him when I have to use it"

"I think it needs to make more sense, its hard to hold and use if youre smaller"

"I'm not too sure, I think you need to make it friendlier"

APPENDIX K Questionnaire Analysis

WHY WAS IT NECESSARY?

It was necessary to carry a questionnaire to gather primary information to support the need for my product. The information gathered would have been found online as well, but having primary information provides a stronger stance in supporting my chosen product area.

WHAT I DID?

I received a total of 10 responses from a questionnaire I wrote. The questions were targeted so they would strengthen my research topic.

DID IT WORK? HOW WELL?

Overall this research activity provided strong support to my project area, assuring me there is a product market and a need for a better auto-injector. In terms of research effectiveness, it was a background research method that provided support.

Despite this, it was still helpful to compare data and find out the different reasons why parents allow and do not allow their child to carry an EpiPen or feel comfortable with them using it themselves, what it came down to was age. Age is the biggest factor, how can a product be made easier to use and safe for the youthful user.

LINK TO RESEARCH & GANTT CHART

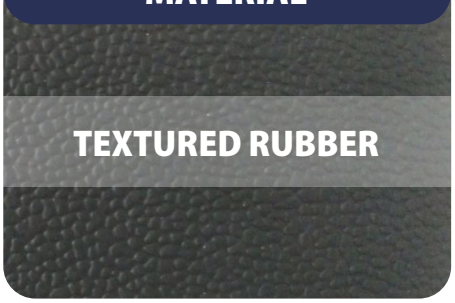
This activity links under the questionnaire section on the Gantt chart, but links to the object and user section of the research plan.

WHAT DID I FIND OUT?

Overall, the results were not staggering, I provided better substance to my target area. The information gathered supported my argument, in terms of the products form, aesthetics, functional inhibitions, and general product intuitiveness

APPENDIX L Materials Research

MATERIAL

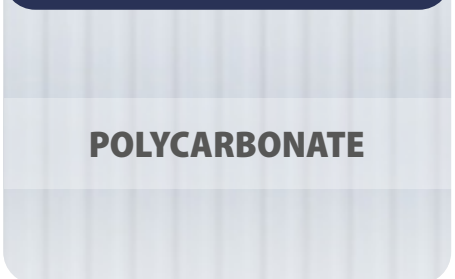


ADVANTAGES / DISADVANTAGES

GOOD GRIP
REDUCES FORCE USED TO HOLD THE TOOL
NON-SLIP
NON-CONDUCTIVE
COMPRESSIBLE MATERIAL
EXCELLENT ABRASION RESISTANCE

POOR OZONE, SUNLIGHT AND WEATHER RESISTANCE
LIMITED HIGH TEMP RESISTANCE
POOR FLAME RESISTANCE

MATERIAL

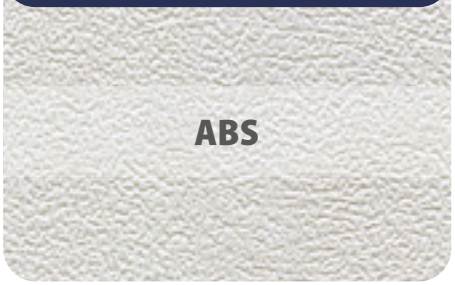


ADVANTAGES / DISADVANTAGES

VERY TOUGH AND DURABLE
HIGH TENSILE STRENGTH
HIGH THERMAL STABILITY
RECYCLABLE
EASY TO WORK WITH
EXCELLENT MECHANICAL PROPERTIES AND STABILITY

POOR ABRASION RESISTANCE
PRONE TO CHEMICAL DEGRADATION

MATERIAL



ADVANTAGES / DISADVANTAGES

EXCELLENT IMPACT RESISTANCE
VERY TOUGH AND DURABLE
HIGH TENSILE STRENGTH
HIGH CHEMICAL AND THERMAL STABILITY
RECYCLABLE
EASY TO DO WORK WITH

POO UV RESISTANCE
POOR ABRASION RESISTANCE

MATERIAL

ADVANTAGES / DISADVANTAGES

WIDE VARIETY OF USES
LOW COST
HIGH TENSILE STRENGTH
LOW TEMP RESISTANCE
WATERPROOF PROPERTY
GOOD ELECTRICAL INSULATION
REALTIVELY STRONG AND STIFF

MAY CRACK UNDER STRESS
HIGHER RISK OF MOULD SHRINKING
LITTLE TO NO UV RESISTANCE

WHY WAS IT NECESSARY?

It was important to research materials so I could carefully consider what the main material should be for the products body but also look into any complimentary materials for hand grips which would support product ergonomics.

WHAT I DID?

Through online desk based research and book based research I investigated materials I believe would best suit the product identifying there pros and cons.

DID IT WORK? HOW WELL?

Identifying the advantages and disadvantages worked well making it easy to compare and identify which material will best suit the product overall.

Overall researching into ergonomic grips material proved useful in terms reasoning why, however I already new the type of material would be useful through personal experience with sports equipment which translates in terms of how to grip the product, this only supported my idea.

LINK TO RESEARCH & GANTT CHART

This links to secondary research as well object / user / interaction based questions on the research plan.

WHAT DID I FIND OUT?

Looking through I identified a couple materials to use through comparing one another. Ergonomic based grip research, it was identified a strong textured rubber would best to suit the product. Main body wise a strong Polycarbonate material would suit the main body, for its aesthetic and functional properties

APPENDIX M Manufacturing Research

MATERIAL	ADVANTAGES / DISADVANTAGES	
INJECTION MOULDING	PRECISION HIGH REPEATABILITY LOW COST PER PART FAST MATERIAL CHOICE LITTLE PLASTIC WASTE	HIGH INITIAL COST SIZE LIMITATION CAREFUL DESIGN NEEDED

MATERIAL	ADVANTAGES / DISADVANTAGES	
BLOW MOULDING	LOW COST HIGH PRODUCTION RATE FLEXIBLE POST EXTRUSION ALTERATIONS	SIZE VARIANCES PRODUCT LIMITATIONS

MATERIAL	ADVANTAGES / DISADVANTAGES	
COMPRESSION MOULDING	LOW COST TOOLING GOOD FOR PRODUCT RUNS GOOD FOR LARGE PARTS PRECISE	GREATER WASTE HIGH LABOUR COST SLOW PROCESS TIME POSSIBLE DAMAGE

WHY WAS IT NECESSARY?

It was necessary to research into manufacturing methods, as you will never be able to fully design a product without knowing what could inhibit its form such as manufacturing methods as some require draft angles etc.

WHAT I DID?

same as Appendix K

DID IT WORK? HOW WELL?

It was useful in identifying the pros and cons of manufacturing methods that I may have to use, but also allows me to fully compare manufacturing methods with materials, and decide which method would best suit what material, helping steer my product further on during the ideation process.

LINK TO RESEARCH & GANTT CHART

This links to the products object section in the Research plan.

WHAT DID I FIND OUT?

I identified manufacturing methods that would work in tandem with the materials I identified in the appendix above. Injection moulding will be used for the main body of the design currently

APPENDIX N Future Gantt Chart Planning