

Major Project Research:

Sexual Stimulation Aid

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Table of Contents:

Overarching Theme of Project.....	p. 4
Chosen Market Sector.....	p. 4
Project Outcome Aims.....	p. 5
Products Available on the Market.....	p. 5 - 8
Outcome of Data Collected.....	p. 9
User Experience Survey.....	p. 10 - 13
User Experience Data Collected.....	p. 13 - 14
Key Demographics.....	p. 15
User Mapping.....	p. 16 -17
Ideation Boards.....	p. 17 -18
Perceptual Mapping.....	p. 18
Product Analysis.....	p. 19 -22
Outcome of Product Analysis.....	p. 23
Deconstruction of Existing Product.....	p. 23 - 30
Problem Statement.....	p. 30
Legislations.....	p. 31- 34
Component Research.....	p. 34 - 40
Components Required.....	p. 40 - 41
Material Research.....	p. 41 - 47
Outcome of Material Testing.....	p. 47
Electronic component Compatibility and placement.....	p. 47 - 48
Primary Research on Holding Vibrators.....	p. 49 - 51
Outcome of Primary Research.....	p. 51 - 52
Ergonomics Research.....	p. 52 - 56
Outcome of Ergonomic Research.....	p. 56

Initial Sketches of vibrator	p. 57 - 71
Body consciousness and incorporating lingerie.....	p. 71 - 72
Questionnaire on how men feel regarding vibrators and lingerie.....	p. 73 - 74
Problem Statement Revised.....	p. 75
What is Sexy Lingerie.....	p. 75 – 77
Lingerie Research Narrowed.....	p. 78 - 83
Outcome of Lingerie Research.....	p. 84 - 85
What is Considered Art Deco in fashion.....	p. 85
Design styling of Lingerie.....	p. 85
Initial Sketches of lingerie.....	p. 86 - 92
Rough Prototype of lingerie with vibrating Pouch.....	p. 93 - 94
Outcome of initial Prototype.....	p. 94 -95
Different options of how the vibrator could attach to the Lingerie.....	p. 95
Apple tag Silicone holder Option.....	p. 95 - 97
Fabric Pouch Option.....	p. 97 - 98
Silicone Clip Option.....	p. 98
Initial Sketches of vibrator with Research Options Incorporated.....	p. 99 - 100
Examples of Kinbaku/Shibari.....	p. 100 – 101
Rough Prototype of Attachment Component with Shibari Lingerie.....	p. 102 - 103
Product Specification Collated Information.....	p. 103 - 104
Manufacturing Methods.....	p. 104 - 105
Three design directions.....	p. 105 - 113

The overarching theme of the project:

Many women feel body conscious during intimate activities such as intercourse with their partners. Alongside this, only 30 - 60% of women in heterosexual relationships climax during intercourse.

This project will be directed towards heterosexual couples and, more specifically, the women within these relationships to heighten their experience during intercourse.

Chosen Market Sector

The World Health Organisation (WHO) recognises intercourse as a part of our overall quality of life, by no means solely for reproduction purposes.

Intimate pleasure can increase mental and physical well-being, relationships and much more. The sex toy market is growing exponentially and is expected to continue growing. In 2022, the sex toy market will be worth £32.7 billion and is estimated to be £71 billion in 2030.

Although the topic of Intimate pleasure has been considered taboo in the past and still is in many cultures, people are purchasing sex toys resulting in a rapidly growing demographic. According to Maslow's hierarchy of needs, reproduction is categorised under the pillar of Physiological conditions, which is one of the most fundamental human needs.

Another pillar of Maslow's research is Love and Belonging, with intimacy and a sense of connection falling under this. This hierarchy of needs establishes a justifiable market, with most adults falling under these pillars.

The research conducted throughout this project would be categorised under inclusivity, sexual well-being, and mental well-being. Scholarly articles explore the benefits of intimate pleasure,

with many opening topics regarding strengthening relationships through intercourse and self-pleasure.

Project Outcome Aims

The project research aims to identify the market gaps within the sex toy industry and produce an innovative outcome appropriately designed for the chosen demographic within the research pack.

An area of focus within the research pack will be hands-free clitoral stimulation vibrators which can be used for self-pleasure and intercourse. The design outcome will target women with their partners during intercourse. The expected outcome will challenge products already available on the market for hands-free self-stimulation and intercourse.

Products already available on the Market



From looking at products already available on the market and selecting the best-selling sexual stimulation aids for women from varying websites, Benchmarking of these products can now be carried out. This benchmarking process will mainly focus on materials, charging time, user time, dimensions, waterproofing and charging.

Beneath is listed the data collected from benchmarking these products available on the market

	Materials		Dimensions	Benchmarking Vibrators - on the market -
Ida Wave	LELO	Body-safe silicone, ABS	63 x 59 x 93mm	<u>Dimension :</u> - The largest product benchmarked is the We-Vibe Nova being 217 x 85 x 39mm. - The smallest product benchmarked is the Plump being 83 x 55mm (volume not size) - The dimensions of the product will further investigated when the electrical components and form are refined.
Gigi-2	LELO	Body-safe silicone, ABS	165 x 35 x 33mm	
G-Slim G-Spot Vibrator	Love Honey	ABS, Medical Grade Silicone	203 x 60 x 60mm	<u>Materials :</u> - 100% of the products benchmarked all used body safe or medical grade silicone. - 85.7% of the products benchmarked used ABS plastic on the shroud and/or shell of product electrical components. - 8.37% of the products benchmarked used body-safe metal. - Not all materials may be specified due to website specifications.
Plump	Vush	ABS, Medical Grade Silicone	83 x 55mm	
Satisfyer Sweet Treat	Satisfyer	ABS, Medical Grade Silicone	105 x 55mm	<u>Thoughts :</u> - ABS Plastic will be researched and used as ^{most} products benchmarked use this. - Body safe Metal will not be used as this is not the right material for my product purpose and demographic. - Medical grade silicone will be researched and used as 100% of the products benchmarked use this material. - Dimensions will be explored when internal of product are selected
Bestvibe Rose Red	Best Vibe	ABS, Medical Grade Silicone	83 x 110mm	
Lush 3	Lovense	ABS, Medical Grade Silicone	90 x 38 x 34.7mm	
The FireFighter	Smile Makers	ABS, Medical Grade Silicone	147 x 45 x 32mm	
Le Wand Deux Cherry	Le Wand	Body Safe metal, Medical Grade Silicone	27 x 116 x 13mm	
Demi Wand	Boutique Bellesa	ABS, Medical Grade Silicone	N/S	
Mimic	Clandestine	ABS, Medical Grade Silicone	101 x 38mm	
We-Vibe Nova 2	Wevibe	Body Safe Silicone	217 x 85 x 39mm	
Lelo Dot	LELO	Body-safe silicone, ABS	60 x 46 x 165mm	
Ina Wave 2	LELO	Body-safe silicone, ABS	200 x 65 x 45mm	

	Charging	User Time	Frequency	Warranty
Ida Wave	2 h at 5.0 V 200 mAh	< 2h	130 Hz	1 year
Gigi-2	2 h at 5.0 V 500 mAh	< 4h	100 Hz	1 year
G-Slim G-Spot Vibrator	N/A	N/S	N/S	90 days
Plump	120 minutes	60 minutes	<50DB	1 year
Satisfyer Sweet Treat	90 minutes	45 minutes	<85DB	90 days
Bestvibe Rose Red	8 h	N/S	N/S	90 days
Lush 3	85 minutes	< 5h	<43DB	1 year
The FireFighter	N/A	< 4h	N/S	2 years
Le Wand Deux Cherry	1.5 h	< 1h	N/S	1 year
Demi Wand	N/S	N/S	N/S	2 years
Mimic	N/S	N/S	N/S	1 year
We-Vibe Nova 2	90 minutes	120 minutes	N/S	2 years
Lelo Dot	2 h at 5.0 V 500mAh	> 2h	133 Hz	1 year
Ina Wave 2	2 h at 5.0 V 500mAh	< 2h	60 Hz	1 year

Benchmarking Vibrators

- on the market -

Charging: - Most products benchmarked require 2 hours of charging.

- The longest charging time - Bestvibe rose red

- The shortest charging time - Lush 3

- I will research into electrical components. I can hope to reduce charging times.

- I will design a product that charges in under 2 hours.

User Time - Most products benchmarked have 2 hours of user time.

- The longest user time - Lush 3

- The shortest user time - Satisfyer Sweet Treat

- Most energy efficient - Lush 3

- I will research and test different electrical components to see which is most energy efficient.

Warranty:

- All products have at least a 90 day warranty.

- The longest warranty is 2 years.

- My product should be functional for at least 2 years

Frequency:

- Categorised under DB and Hz.

- highest DB - Satisfyer Sweet Treat

- lowest DB - Lush 3

- highest Hz - Lelo Dot

- lowest Hz - Ina Wave 2

	Charging type	Buttons	Vibrating Motors	Bluetooth	Price
Ida Wave	Pinhole USB	1	2	Yes	£179
Gigi-2	Pinhole USB	4	1	No	£139
G-Slim G-Spot Vibrator	2 AA Batteries	1	1	No	£14.99
Plump	USB, magnetic charging	1	1	No	£70
Satisfyer Sweet Treat	Pinhole USB	2	1	No	£70.99
Bestvibe Rose Red	Pinhole USB	2	1	Yes	£42.99
Lush 3	Magnetic charging USB	1	1	Yes	£159
The FireFighter	1 AA Battery	1	1	No	£89.90
Le Wand Deux Cherry	USB	3	2	No	£79.95
Demi Wand	USB, magnetic charging	1	1	No	£75
Mimic	USB, magnetic charging	3	1	No	£135.63
We-Vibe Nova 2	USB, magnetic charging	4	2	Yes	£133
Lelo Dot	Pinhole USB	3	1	No	£159
Ina Wave 2	Pinhole USB	5	2	No	£179

Benchmarking Vibrators

- on the market -

Charging type: - 6 out of 10 use pinhole usb charging this can affect waterproof and hygienic qualities.

- 5 out of 10 use magnetic usb charging, this does not compromise hygiene and waterproof spec.

Vibrating Motors: - The majority of products feature 1 motor although 2 motors allow for more power.

This will also use more power meaning the user time will decrease.

- This will be further investigated.

Price:

- highest = Ina Wave 2

- lowest = G-Slim G-Spot vibrator

- Price will vary on component and demographic, most are viewed as luxury products.

Bluetooth:

- 10 out of 14 products do not have bluetooth

- Bluetooth feature correlates to demographic

(example long-distance couples)

Buttons: - Most product have 1 button to make the product easier to use, although this may confuse the user.

- 3 buttons allow for power, setting and modes.

	Modes	Waterproof	LED	Case Features
Ida Wave	10	Yes	No	Satin Storage Pouch
Gigi-2	8	Yes	Yes	Satin Storage Pouch
G-Slim G-Spot Vibrator	1	Yes	No	Packaging box
Plump	10	Yes	Yes	ABS plastic Box
Satisfyer Sweet Treat	7	Yes	No	Packaging box
Bestvibe Rose Red	10	Yes	Yes	Packaging box
Lush 3	10	Yes	Yes	Storage box
The FireFighter	6	Yes	Yes	Packaging box
Le Wand Deux Cherry	15	Yes	N/S	Packaging box
Demi Wand	8	Yes	Yes	ABS plastic Box
Mimic	8	Yes	Yes	Satin Storage Pouch
We-Vibe Nova 2	10	Yes	Yes	Storage Pouch
Lelo Dot	8	Yes	Yes	Satin Storage Pouch
Ina Wave 2	12	Yes	Yes	Satin Storage Pouch

Waterproof: - All the products benchmarked are waterproof.

- Spec of waterproof not specified

LEDs: - 10 out of 14 of the products benchmarked use LED's.

- LED's show when product is charging or low on battery for clarity.

Benchmarking Vibrators - on the market -

Modes: - The majority of the products have 10 modes - 5 out of 14.

- Least modes - G-Slim - G-spot vibrator

- Most modes - 12 wave max cherry

- Modes vary product to product
less modes offer less confusion
more modes offer variety

- This will be further investigated.

Case Features: - 6 out of 14 products benchmarked use storage bags

- Storage bags may get unhygienic after prolonged use and lack of product care.

- 2 out of 14 use ABS plastic box (easy to clean, discreet storage)

	Insertable Length	Weight	Battery
Ida Wave	58mm	102g	Li-Ion 3.7v 520mAh
Gigi-2	94mm	79g	Li-Ion 3.7v 920 mAh
G-Slim G-Spot Vibrator	177mm	N/S	2AA Batteries
Plump	N/A	146g	Lipo
Satisfyer Sweet Treat	N/A	84g	N/S
Bestvibe Rose Red	110mm	150g	N/S
Lush 3	76mm	N/S	N/S
The FireFighter	N/A	N/S	1AA Battery
Le Wand Deux Cherry	N/A	87g	200 mAh
Demi Wand	N/A	N/S	N/S
Mimic	93mm	N/S	N/S
We-Vibe Nova 2	N/S	N/S	Li-Ion Battery
Lelo Dot	N/A	98g	Li-Ion 520 mAh 3.7v
Ina Wave 2	110mm	176g	Li-Ion 520 mAh 3.7v

Insertable Length: - largest insertable length - G-Slim G-spot vibrator - 177mm

- Smallest insertable length - Ida Wave - 58mm

- Depending on the products purpose and function the insertable length and width will vary or not be designed for penetration.

Benchmarking Vibrators - on the market -

Battery: - Most products benchmarked use lithium polymer batteries (most common used in vibrators is 1s=3.7v Batteries).

- Most products that use AA batteries have a shorter user time.

- The battery options will be researched for weight, power and efficiency.

Weight: - Most product weight ranges from 79g to 176g

- No product will weigh less than 179grams

- The electronic components will make up most of the weight of the product. (These components will be researched to meet product specification).

The outcome of the data collected.

After investigating clitoral stimulation products available on the market and analysing the data collected, the research scope is further narrowed.

The clitoral stimulation products benchmarked show that the product must possess the following qualities –

- Must be Waterproof (IPX7 Minimum)
- Must use Body-safe or medical-grade silicone (Platinum grade)
- Use ABS plastic features or internal shell to contain electrical components
- Must Weigh below 175grams
- Have a maximum charging time of 2 hours
- Have a minimum use time of 45 minutes
- Have a maximum frequency of 85 DB and 133Hz
- Have at least one button for product operation
- Must have a PLC of at least 90 days.

These qualities will be further researched to establish whether this is viable for the project outcome.

Data collected shows that none of the products benchmarked had an in-depth specification of electrical components. These will be further investigated, benchmarked, and tested to eliminate features which do not meet the project outcome and specification.

The following electronic components listed will be researched further based on data collection.

- Vibrating motors
- Batteries
- Circuit Boards
- Buttons
- LEDs
- Charging type

User Experience Survey

Creating a user experience questionnaire will contribute to the demographic direction of the project. This questionnaire highlights the user's interaction with product qualities already available within this market sector.

The questionnaire collected 25 responses from varying people. These responses have been collected through QR codes placed within the city and links published on Discord Servers.

All collected responses are anonymous for privacy, which was specified within the questionnaire description.

Here is the description of the questionnaire –

User Experience Survey on Vibrators

This survey is to identify the demographic of people using vibrators and the experience of these products already on the market. All submissions are anonymous for your privacy.

Here is the QR code generated –

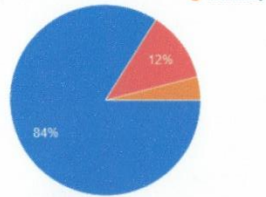


Once all data is collected from the questionnaire, this will be analysed further to refine the research and demographic scope of the project.

User Experience Questionnaire

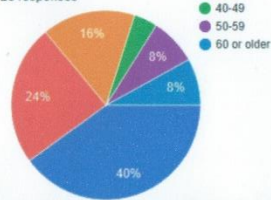
What is your gender?

25 responses



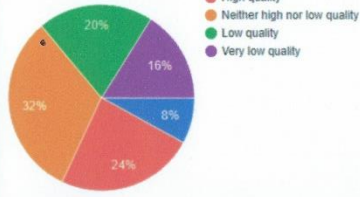
What is your age?

25 responses



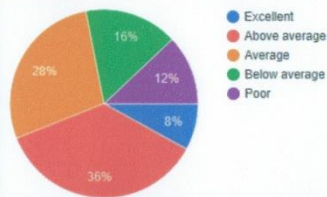
How would you rate the quality of your vibrator?

25 responses



How would you rate the value for money of your vibrator?

25 responses



- User experience Questionnaire -

Gender - 84% of the responses were female.

- I will target the product towards females.

- Research into the viability of a product that can be used with partners.

Quality - 38% of the responses stated the quality was neither high nor low.

- The majority of responses 76% state their clitoral stimulation product below average.

- Motors, charging/user times, material and form all affect the products quality.

Value for Money - 36% said their vibrator was above average for value for money.

- 16% said value for money was poor.

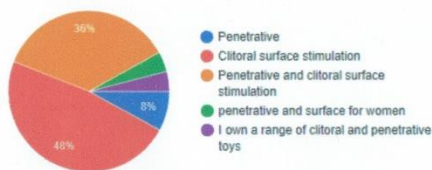
Age - 40% was 18-20 years old.

- 16% was 50+ years older.

- Research older user health problems?

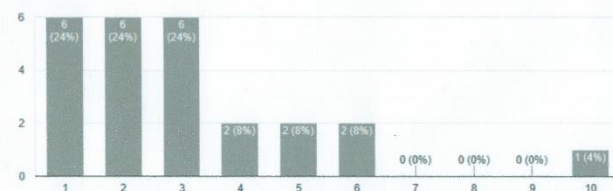
What type of vibrator do you use?

25 responses



How many vibrators do you own?

25 responses



- User experience Questionnaire -

What type - 48% use clitoral surface stimulation, whilst 36% use penetrative and clitoral stimulation.

- Researching penetrative and clitoral surface stimulation in use with partners could be a project direction.

- By designing a clitoral and penetrative product, this will stimulate the whole clitoris.

Quantity owned - Most users owned between 1-3 vibrators.

- This establishes the want of adult pleasure toys with most users owning 1 or more products.

- As most adult pleasure toys vary users will typically purchase more than one according to preference.

Thoughts - Justification of market has been established.

- Product refinement pathways for stimulation have been explored.

What did you like about your vibrator?

Easy to clean and has different settings

It's small and effective

I liked multiple settings and the overall feel of the vibrator. I also like how compact the product is.

Both internal and external

the power of it and how fast it charges.

I like the shape and the feeling the vibrator has

the power

that i can use it with my partner sometimes

the size, sensation

battery

discreet shape and feel

When it works it works!

I like the multiple settings and that everything is body safe

the size, colour of it being black and the overall form

Powerful vibrations

The vibrations and the size

the buttons, charging port being magnetic

the charging speed, size

I like the charging options and size

The multiple types of vibrators you can get and the varying sizes

the size and material

Adjustable vibrations

That it works LOL

it's wand design which is ergonomic and angled as to not hurt your hand! it also has extremely strong vibration frequencies and modes!

- User experience Questionnaire -

Likes regarding Vibrators -

- user's state they like the following.
- Small size, Being both penetrative and surface stimulation, multiple settings, charging speed, powerful vibrations.
- The majority of the user's like the Power and small size.
- The user feedback on the advantages of vibrators is a really useful insight in narrowing my research scope.

Do you use vibrators with your partner, if not why?

I'm single

N/S

yes

I do

Because it restricts the positions my partner and I can do and it causes pain in my arm

I don't have a partner

yes

yes

yes

not in a relationship

yes

I do

My partner wants to go in multiple position and using the vibrator makes this difficult

No partner

Most of the time.

N/A

Yes

Too hard to use with partners

too difficult to use with my boyfriend

I do but find it rather difficult using different positions

n/a

Yes

N/S

Yessss

I definitely will be!!

- User experience Questionnaire -

Use with partner - - Most user's 14 out of 25 use their vibrator with partner.

- 5 out of 25 user's say using the product with their partner is too difficult in multiple positions.

- Exploring how these products can be used with partners in multiple positions could be a design avenue.

- 6 out of 25 do not have partners but still use these stimulation products to benefit themselves,

- By creating a product that can be used with and without partners would result in a modular product?

What did you dislike about your vibrator?
Doesn't stimulate clit and vagina it's one or the other
The loud noise
I disliked the vibrations going through my hands when in use and positioning the vibrator during intercourse with my partner placing strain on my hand.
Loud and the colour
the plastic on the vibrator and how big it is.
how quickly the vibrator runs out of battery and the long charging time
the noise, too large, its annoying to hold
I hate how it takes so long to charge and how fast the battery runs out.
I dislike how you have to clean before and after using.
price, colour and shape
weak, doesn't stimulate whole clit, charging time
doesn't have a good grip and the shape
I disliked how there is nowhere to store it and that you need to clean before and after use.
it is too weak, either feel nothing or super sensitive also it is hard to hold
Hard to use during sex, and broke in less than a year
The buttons are too small and confusing plus i have no idea how to work the app also theres no packaging to store it
charging times, the vibrations are too weak, size is too small
The vibrator is too loud, not the right settings, doesn't stimulate whole vagina
I really dislike the suction types of vibrators
The vibrators I come across have low battery life and long charging times, The vibration settings aren't varied enough
The smell, not strong enough
The twist to turn on bit at the bottom rather than a button
N/S
Too small and not very strong
nothing!!

- User experience -
- Questionnaire -

Dislikes regarding Vibrators - -user's
state they dislike the following:

lack of power, noise, unable to use with partner, strain on hand, colour, too big, hard to hold, charging, user time, price, not stimulating the whole clitoris, storage, cleaning, PLC, buttons and smell.

- from analyzing this data I can tell that my product will need to be powerful, easy to use and have a longer battery life.

- longer battery
- power
- size
- easy to use.

The outcome of user experience data collected

After collecting and analysing the data from the user experience questionnaire created, the research scope is further narrowed. Beneath are listed qualities of products on the market that the users like, dislike, quantity, age, gender, type of clitoral stimulation product and engagement with their partners.

Demographic results of user experience questionnaire -

- Female
- Age 18 to 39 years old
- Used alone and with their partner (heterosexual)
- 1-3 products bought per female on average

Product qualities -

- Average or lower product quality
- Above average quality for the price
- Clitoral surface stimulation and penetrative

Product Attributes -

- Compact Size
- Being penetrative and surface stimulation
- Multiple Settings
- Charging speed
- Powerful Vibrations

Product Disadvantages -

- Lack of Power
- Noise
- Unable to be used with their partner during intercourse
- Strain on hand
- Colour
- Being too big
- Not stimulating the whole clitoris
- Storage
- PLC
- Being too confusing to use

Use with a partner – Wishes to use with their partner during intercourse, although this is difficult in various positions.

Key Demographics

Beneath is listed the segmentation of crucial demographics based on previous data collected.

Key Psychographics -

- Age Range – 18 to 39 years old
- Gender – Female
- Common Job titles – University Students, Freelance content creators, Doctors.
- Appreciates economic values, Emotional values, Form and easy usage.
- Prioritizes intimate connection and value for both sides of the relationship with their partner.

Key Demographics –

- Age Range – 18 to 39 years old
- Gender – Female
- Yearly Income (AVG) - £13,549 - £31,416
- Introvert 50% / extrovert 50%
- A diverse Range of bodies

Key Behaviouristics –

- Intimate pleasure, Comfortable usage
- To use alone or with their partner
- To be used 5+ hours of weekly usage
- Input/ Stimulus – Intimate Pleasure
- Output/ Stimulus – Feeling satisfied after intercourse, feeling relaxed, maintaining intimate pleasure.

Key Geographics –

- Based around the world
- Applicable to Any country
- Applicable to any language

These Demographics are the project's user market.

User Mapping



Bio

Maria studies full-time at a university where she attends lectures 4 days a week. Maria has 20+ hours of self-studying each week which leaves little time to relax. Maria likes to relax and watch Netflix with her partner, where she wants to enjoy intimate time. Maria considers herself an extrovert who loves to go shopping with her friends during her spare time. Maria wishes to heighten her intimate pleasure with her partner to strengthen their relationship.

Feeling

Thinking

Judging

Perceiving

Introvert

Extrovert

Analytical

Creative

- Hobbies -



Goals -

- To graduate from university with at least a 2.1.
- To finish the series of Teen Wolf.
- To become more in touch with her body.
- Find a product which allows for intimate pleasure to be heightened when spending time with her partner.

Frustrations -

- Not having a place to store her intimate pleasure products.
- Finding intimate pleasure toys difficult to use with partner.
- Finding time to relax.
- Not being able to climax.

- Maria Hyles, 20 -

- Preferred Environment -

Maria thrives in many environments, especially open environments, although being in her bedroom allows maria to relax. Maria likes to visit her partner's home, although he lives with his family making intimate pleasure whilst using sex toys difficult due to the noise. Because of this, Maria invites her partner around her accommodation.

- Motivations -

Achievement

Curious

Work-driven

Social

Physical

Emotional intelligence

- Day in the life of: Full-time University student -

“Exploration of her body will open doors”

- Stephan Labossiere

- Opportunities -

- Create a product which can be used with Partners.
- Create a product that will help Maria climax.
- Find electronic components which will be efficient.
- Design a product which is discreet and quiet.

- Frustrations -

- Not being able to connect physically with her partner during intercourse.
- Having to do 20+ hours of self-studying.
- Dealing with pain in the arm and hip using a pleasure toy whilst having intercourse.

0600 - Wake and prepare.

Prepare for university, make breakfast, shower and prepare her bag for university. Makes notes on the laptop from the previous lecture.

0800 - Travels to University.

Puts on the coat and travels to the university. Feeling stressed as Maria needs to catch up on her lectures.

1000 - Lectures.

Takes notes during lecture and looks over assignments handed to her. The assignment handed is due in 2 weeks.

1200 - Coffee Break.

Heads to the local cafe to get an oat milk latte. Thinks about inviting her partner around later to catch up and bond. Makes Lecture notes.

1400 - Return to Lectures.

Returns to the university lecture. Maria thinks about how much student finance she has left for the time. Maria finds budgeting difficult.

1700 - Head home.

Maria returns home and has dinner whilst watching Teen Wolf on Netflix. After dinner, Maria looks for dresses online for a party next week.

2100 - Invite Partner to home.

Messages partner to come around for drinks and a movie. Maria decided to charge an intimate pleasure toy she bought last week.

2200 - Intimate Pleasure.

Maria and her partner decide to have intimate pleasure whilst using the adult product during this activity. Climax was not reached, and the toy made intimate pleasure difficult.

2400 - Study and rest.

Partner leaves, and Maria decides to study. Maria felt that she could not connect with her partner physically as she had difficulty climaxing. Maria heads to sleep.

- Emotions throughout the days -

0600	1200	2100
●	●	●
●	●	●
●	●	●

- Keypoints -

- Optimizing physical connection with partner.
- Ensuring finances are in order.
- Studying enough throughout the day.
- Finding a product which can be used during intercourse.

- Empathy Mapping (Buying Intimate pleasure products) -



- Says -

- What type will be best for me?
- How many functions do I want?
- I need something discreet.
- I need something quiet.
- Do I need something that expensive?

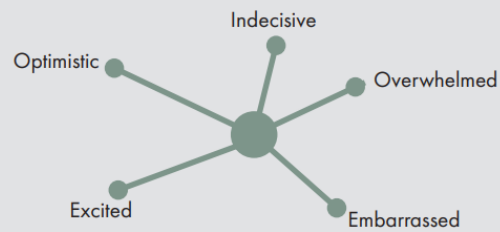
- Does -

- Asks friends.
- Checks reviews on youtube.
- Looks at price points.
- Researches what type of vibrations there are.
- Research for products which can be used during intercourse.

- Thinks -

- I want a product which will make me climax
- Why are all these products so loud
- Is this discreet?
- How do I clean this?
- I want a product which will strengthen my and
- my partners' physical connection.

- Feels -



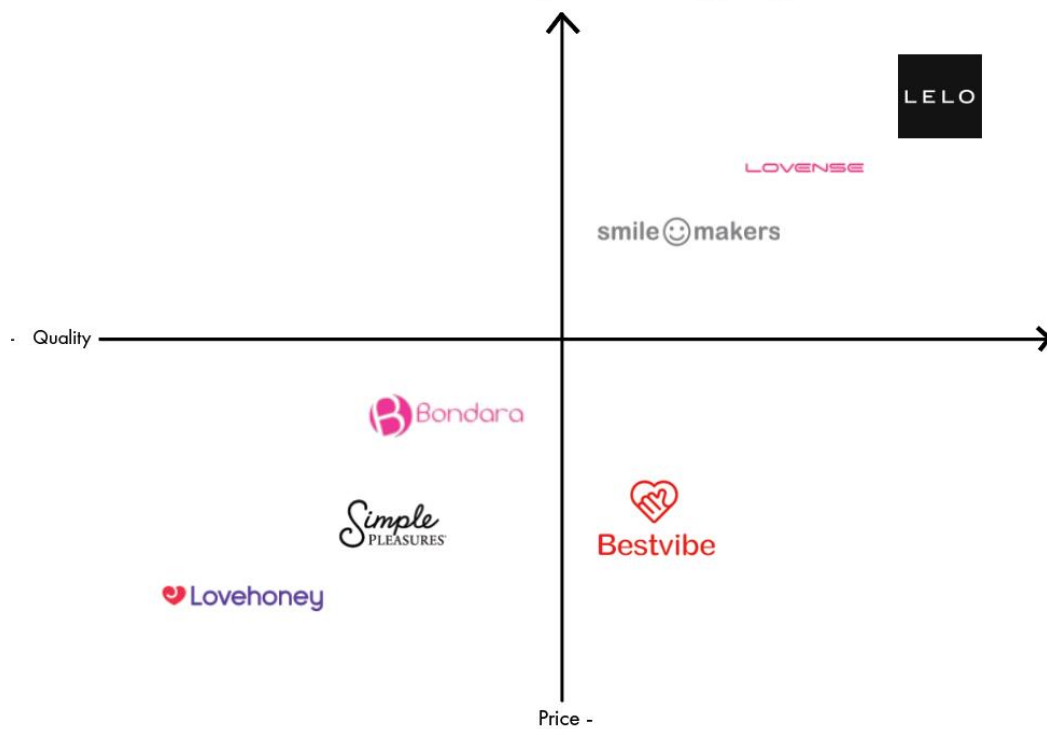
Ideation Boards





Perceptual Mapping

- Brand Perceptual Mapping -



Research into brand perceptual mapping shows that LELO and Lovense are the best companies for selling high-quality products but also at a high price. Bestvibe also sells above-average quality products at a lower price. Research into this will be further investigated to see the products and their attributes from these three companies. These attributes will be taken into consideration for this project's Vibrator design, function, and features.

LELO's best-selling product – LELO DOT



The LELO DOT costs £159 and is designed with a curved tip for the user to place on their clitoris for pin-point vibrations. The rounded end of the LELO DOT allows for the user to have a fuller vibration around a larger section of the visible clitoris. This product incorporates two main forms within the product for different functions allowing for a variety of women to heighten their intimate pleasure experience.

This product is designed to be used for solo play and with their partner, although multiple positions are not viable.

The rounded tip is made from extra soft silicone, and vibrations are not too powerful; the LELO DOT has been designed this way as powerful vibrations can numb the clitoral, preventing women from reaching climax.

The Product features a hole for the user to hold the product. This allows for better grip, although users with dexterity issues may find holding this product difficult. The LELO DOT has 8 varying vibration settings for the user to find the vibration they find best for them.

The LELO DOT has 3 buttons one for power, one for modes and one for the intensity of vibrations. The product is 100% waterproof which I assume to be IPX7. This has a 2-hour user time and a 2-hour charging time.

The design of this product will be taken into consideration when designing the vibrator for this project. Two different forms within this product allow the users to choose which they find best for them.

Lovense's best-selling Product - Dolce



The Dolce by Lovense is a dual-ended vibrator for penetrative and clitoral stimulation. This product has a flexible neck allowing for the product to fit varying-sized vulvas allowing for a diverse product.

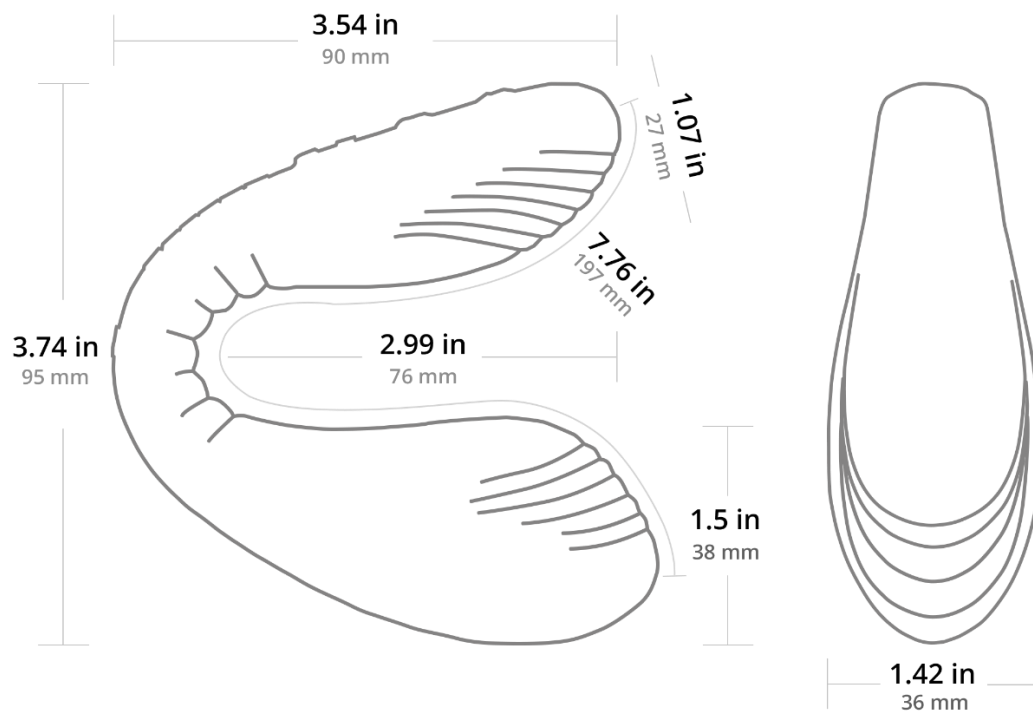
Two motors are used within this product for stronger vibration for both vaginal and clitoral stimulation. This product is IPX7 standard waterproof, which is a standard across most vibrators.

The Dolce Vibrator's external material is made from medical-grade silicone and has small ripple features on the surface for extra stimulation during the product's function. The product has magnetic USB charging, which is becoming a common feature amongst vibrators as pinhole charging can be hard to clean and is more difficult to meet the IPX7 waterproofing standard.

One of Lovense's main features across all its product range is Bluetooth connectivity for long-distance relationships where the partner can control the vibrations for the user. The product has a 1-year warranty and has 1.5 – 2 hours of continuous usage before recharging. This product costs £210 and is marketed as a luxury sex toy.

From researching Lovense's Dolce product, I can see that the flexible neck allows for a form-fitting product which could be a beneficial feature within this project. The rippled surface design also allows for extra stimulation for clitoral and penetrative stimulation.

Beneath is shown a simple ergonomic drawing of the Dolce product, which will be beneficial to the sizing of my product. All vibrators come in various sizes but are generally within a certain range; the dimensions of the product will be further researched throughout this developmental pack.



Lovense's Dolce Product Dimensions

Above is shown the dimensions of the Dolce penetrative and surface stimulation vibrator. The overall length of the product is 90mm, and the height is 95mm the width of this product is 36 mm for the insertable width, and the insertable length is 76mm.

The dimensions provided help lay the foundations of the dimensions of this project which will further be investigated to ensure the project outcome will be the optimal size for a heightened user experience.

Note to self Most vibrators vary in size depending on the product's function, whether for penetrative or clitoral surface stimulation. If the product is intended for use with a partner, can a penetrative product accommodate the size of the partner's genitalia whilst still having effective vibrations?

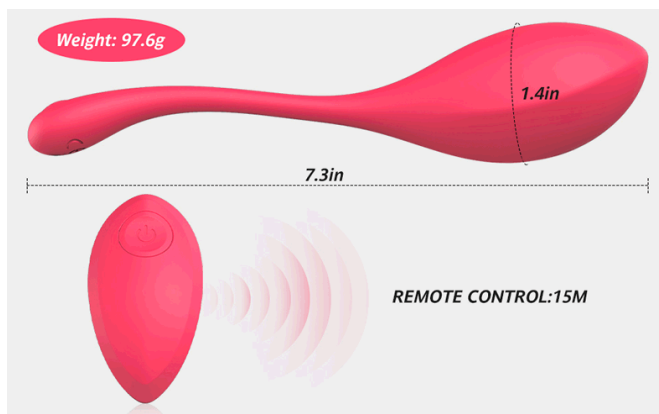
Bestvibe's bestselling product – Rose Red Love Egg



Bestvibe's Rose Red Love Egg costs £30.99, which is relatively cheap for a clitoral and penetrative vibrator. This product has two parts: a remote control for the vibrator. This feature can be used for partners within a short distance. This feature will not be considered within my research pack as my product is targeted towards intercourse rather than short-distanced foreplay.

The vibrator itself also has a power button for intercourse and self-pleasure.

This product has ten vibrating features allowing the user to find the correct mode for them, and it has a flexible neck for positioning, thus heightening the user experience. This product has USB pinhole charging which is commonly used but can result in the product being damaged if exposed to liquids for a prolonged amount of time despite being classed as waterproof but not to IPX7's standard. The Rose Red Love egg has an open button on each part of the product, which can be difficult for the user to change modes.



The dimensions listed help to lay the foundations of my product sizing throughout this research pack.

The diameter of the insertable section is 35.56mm, and the overall length is 185mm. The weight of the product is 97.6g. The product's weight can affect the user experience as a heavier weight can be uncomfortable.

The Bestvibe Rose Red Love Egg product has allowed this research pack to eliminate pinhole USB charging and a separate power remote part for short-distanced foreplay.

The Outcome of Product Analysis

The outcome from looking at three varying products from different companies has concluded the following –

- Curved pointed designs allow direct stimulation without numbing the vulva and clitoris.
- Various vibration patterns allow the user to find a mode which is best for them.
- The standard width for penetrative vibrators is 36mm.
- Rippled surface feature allows for extra stimulation.
- Magnetic USB charging is the new standard for newer vibrators.
- Decided that a Bluetooth module will not be used.

The research on in-depth analysis of vibrators on the market has provided the project with valuable insights which will be considered when deciding the charging type, feature detailing, vibrating pattern amounts, dimensions, and the form of the product.

Deconstruction of Existing Product

After analysing vibrators on the market and gathering information, I am now going to deconstruct an existing product to gain a better understanding of the inner workings and manufacturing process.

Deconstructing a vibrator will allow me to understand the electronic components required and how they work.

I will also be analysing the chassis of the product and how the electronic component is placed and fixed within the chassis. Alongside this, I will also investigate how the chassis fits together and what manufacturing was used to create this.

Analysing the silicone sleeve of the product will also be conducted to gain information on how this coated the chassis of the product. I will also analyse the thickness of the silicone along with the texture.

Beneath is shown the deconstruction of the product –



Removing the silicone sleeve



Here I have cut around the head of the product removing the silicone; I then removed the remainder of the silicone sleeve.

I tried to keep the silicone intact as much as possible to gain a better understanding of how the silicone sleeve was placed onto the chassis of the product.

On the left, you can see the silicone sleeve, and on the right, you can see the internal shell of the product.

The internal shell has m4 screws and screw holes connecting the two sides of the product's shell together.

note to self When designing the internal shell of the component, screw holes will need to be accurate and placed appropriately not to interfere with electronic components. Also, when designing the internal shell, an FEA analysis should be carried out to see if manufacturing is viable.



Side view of product's shell

Here you can see the seam line where the 2 sides of the shell fit together. There are also three buttons which have been cut out of the shell for these electronic parts to fit into.

There is also a component on the product which secures the silicone into place, which is located between the main body and the neck of the product. When deconstructing, I assumed this was done to secure the silicone so that when the user flexes the neck of the product, the silicone does not break.



- Base view of the product

Here you can see where the product charging port is located. This product has a pinhole charging port which allows for higher hygiene standards and waterproof ability than common USB-c ports.

The silicone sleeve has a 0.2mm hole for the pinhole charger to go into, reducing the risk of water and fluids damaging the product.

The silicone sleeve also has a debossed finish around the charging section to signify to the user that this is where the charging port is located.

Also debossed onto the silicone sleeve is the logo of the product along with the CE mark and WEEE mark for electronic disposable.

note to self when designing the product and the design detailing elements, the appropriate legislation markings should be placed on the product allowing the user to know the standard and disposal of the product. Also, semiotics should be used to indicate to the user how the product can easily operate the product.



- Deconstructing the head of the product

I then took apart the head of the shell by unscrewing the product and removing the two tightly fit sides.

The shell features a snap-to-fit joining method which increases the waterproof ability of the product and, in turn, the PLC of the product.



On the left, you can see a DC brushed motor with a counterweight placed on top. When in operation, this counterweight spins, causing the product to vibrate.

The counterweight is fixed to the motor, so this does not slip off during product usage.

The neck of the product is a stainless-steel spring with a foam-like material placed on top before the silicone is applied.

This spring allows for the product to be flexible without compromising strength. The spring also acts to store the wires leading from the body of the product to the head.

The shell of the head is designed to fit the motor with a 0.1mm >/< tolerance allowing for a tight fit so this electronic component does not shift.

note to self When designing the shell of the product, all components should be accurately sized to ensure the design of the shell can contain the electronics without compromising product function, safety and PLC. When designing the shell of the product, a snap-to-fit method would allow for higher water resistance.



- Internal view of the products shell

As shown above is the internal view of the product's shell featuring boss components, strengthening ribs, and electronic component fitting placements.

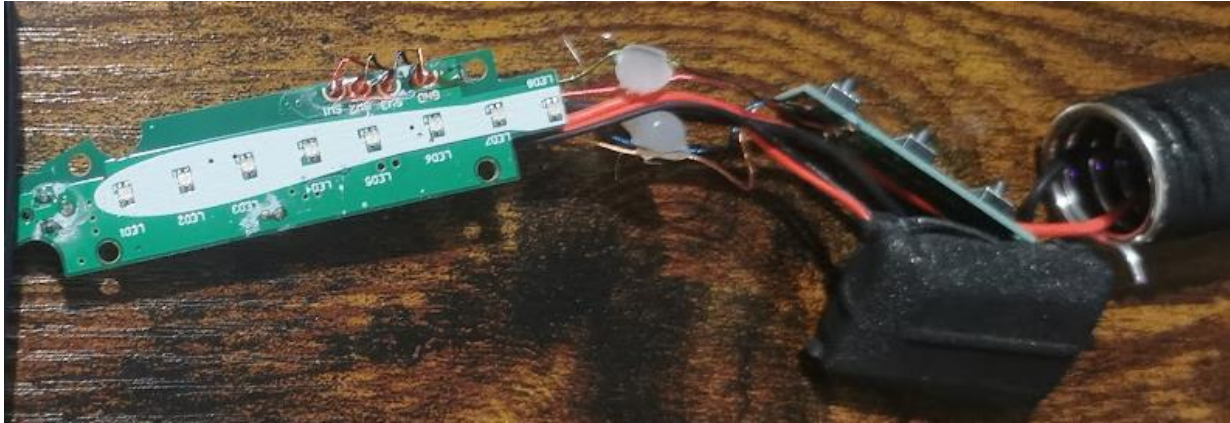
There is also an ABS semi-opaque section which has later been added after the product was injection moulded, so LED lights could be visible to the user to indicate which mode was on and if the product were charging.

As shown to the left are the electronic components within the product, excluding the DC brushed motor. Within this product, there are LEDs, a circuit board, a battery (3.7v), 3 buttons, wires and a charging port.



When the shell of the product was designed, boss holes were made for the electronic components so they would be suspended within the internal shell so these components | would not get damaged.

Glue was also applied to the non-conductive components so they would fit into place without interfering with the other components, which could result in the product malfunctioning.



Back of electronic components and silicone thickness.



Above is shown the back of the electronics where the LEDs were fitted. Here you can also see the adhesive that was applied to the wires.

The battery was shrouded in a foam-like material which I assume was to ensure that the battery had an extra layer of protection to decrease the risk of damage.

I then investigated the thickness of the silicone sleeve, so I took callipers and measured the thickness. The thickness of the product was 2.1mm.

The silicone also featured thicker areas for semantics and to signify to the user the product buttons when in use.

note to self When designing the product, semantic theory should be applied to signify to the user what components of the product are usable and where the product will be charged. This will allow for a heightened user experience through ease of use. Since the thickness of the silicone was 2.1mm, I will test silicone thicknesses ranging from 0.5 to 5.5mm to optimise the feel of the end product.

Outcome of product deconstruction

After deconstructing an existing product and analysing the components and potential manufacturing methods, I gained much useful information which will be applied to my product.

Beneath are listed the key findings from deconstruction –

- M4 screws were used, and boss holes were designed into the internal shell.
- Silicone was 2.1mm and thicker in areas to signify to the user the buttons.
- Appropriate legislation and disposal markings were debossed on the silicone sleeve.
- The design of the internal shell considers the placement of electronic components, screw holes, strengthening ribs, cuts outs for the charging ports and buttons.
- DC brushed motor with fixed counterweight was used.
- Snap to fit method was used to fix the two halves of the internal shell together.
- The internal shell was ABS plastic which was then injection moulded.
- Consideration of electronic placement within the product had a 0.1mm tolerance.
- A stainless spring allowed for a flexible head whilst protecting the wires of the product, which was coated with a foam-like material before silicone was applied.
- A guess of how the silicone was applied to the product was casting then placed onto the product.
- Semi-opaque ABS was later added during manufacturing for the user to see the LEDs when the product is in use.
- Battery within the product was coated in a foam-like material to add more protection.
- Adhesive was used to secure wires within the shell of the product
- The product featured pinhole USB charging.

The electronic components within this product were –

- DC Brushed motor with fixed counterweight
- 1 cell battery (3.7v)
- Circuit board
- Wires
- Charging port
- LEDs
- 3 buttons

What I've learned from deconstructing a vibrator

1. Semantic theory should be applied to the design of the vibrator. This will serve as a universal language to the user on how to operate the product with ease.
2. Legislation should be researched to ensure that my project outcome can meet the standards required for the product to be manufactured and sold.
3. A snap-to-fit joining method for the internal shell is an effective way of protecting electronic components.
4. A stainless-steel spring can allow for a flexible neck of a vibrator.
5. Manufacturing analysis should be carried out when designing the internal shell of the product.
6. Are there more efficient electronic components that will create a better vibrator?

Problem Statement

Women in heterosexual relationships tend to feel insecure during intimate activities. Additionally, only 30-60% of women climax during heterosexual intercourse. I have identified that there is a problem during intercourse; women in heterosexual relationships can have low self-esteem and low satisfaction during intimate activities.

My project aims to help women's chances of climaxing, thus strengthening the intimate life of heterosexual couples.

I will now investigate legislation and standards for vibrators and sex toys to research the requirements for my product and ensure that the product can be manufactured and sold according to the legislation and standards set in place for user safety.

Legislations

Standards for the manufacturing and component selection of adult pleasure toys

ISO 3533-21. This is the International Standards Organisation. Devices with vibration must be risk assessed and consider standards ISO 5349-1, 5349-2 (Mechanical vibration – measurement and evaluation of human exposure to hand-transmitted vibration) and ISO 20643 (Mechanical vibration – hand-held and hand-guided machinery). In addition,

products that use electrical impulses to stimulate genitalia should be qualified by a certified laboratory.

ISO 3533 outlines that the product must not contain any chemical in quantities which are known to be harmful, and a helpful list is provided to assist manufacturers. However, a reference to RoHS may be more useful. Also, in line with GPSD, materials used within the product must be supported with biocompatibility data, for example, ISO 10993-10 (Tests for irritation and skin sensitization) and 10993-23 (Tests for irritation).

This standard contributes to the following Sustainable Development Goals: Good health and Well-being 3 and Industry, Innovation and infrastructure 9.

ICS: 97.170 Body care equipment.

GPSD - General Product Safety Directive. GPSD requires that all products sold within the EU are safe to use. EN61959 Secondary cells and batteries containing alkaline or other non-acid electrolytes. Mechanical tests for sealed portable secondary cells and batteries

REACH - Registrations, Evaluation, Authorisation and Restriction of Chemicals. REACH provide a high level of protection for human health and the environment from using chemicals.

Adult pleasure toys which contain electronic equipment must go through further legislation, such as the following:

ROHS Directive - The Restriction Of Hazardous Substances Directive. The directive aims to prevent the risks posed to human health and the environment related to the management of electronic and electrical waste. It does this by restricting the use of certain hazardous substances in EEE that can be substituted by safer alternatives. (Heavy metals and chemicals)

EMC Directive - Electromagnetic Compatibility Directive. EMC standards specify the acceptable limit of EMI in any electrical or electronic system. EMC standards ensure that a device's operation does not disturb the communication system around it or the devices adjacent to it.

LVD - Low Voltage Directive. LVD ensures that electrical equipment within certain voltage limits provides a high level of protection for European citizens and benefits fully from the single market. It has been applicable since 20 April 2016. LVD covers health and safety risks on electronic equipment operating with an input or output voltage of 50 to 1000v for alternating current and 75 to 1500v for direct current. Example - plug adapters.

Ecodesign Directive. Many types of energy-related products are regulated to ensure they meet specific measures relating to their energy usage. This reduces their environmental impact improves their energy efficiency, and cuts greenhouse gas emissions.

CE - Conformité Européenne. certifies that a product has met EU health, safety, and environmental requirements, which ensure consumer safety.

WEEE Directive - Waste Electrical and Electronic Equipment Directive. The symbol indicates that the product should not be discarded as unsorted waste but must be sent to separate collection facilities for recovery and recycling. The WEEE marking must appear on any electrical and electronic equipment placed on the EU market.

OPSS - The role of the Office for Product Safety and Standards. The Office for Product Safety and Standards has been appointed by Defra to enforce the regulations in the United Kingdom.

These regulations cover all types of batteries, regardless of their shape, volume, weight, material

composition or use, and all appliances into which a battery is or may be incorporated.

Prohibited materials according to - REACH Annex XVII and SVHC list:

Silicone that contains phthalates and BPA

PVC that may contain phthalates and BPA

Thermoplastic Rubber - might contain BPA

Ceramic - might contain lead, cadmium, or chromium

From researching the legislations and standards required for the design, components, materials and manufacturing of sex toys and vibrators, I can now see what is required when designing and selecting the materials and components for my product.

Here are my key findings from this –

- ISO 3533-21 is the legislation I will be referring to throughout the design and component selection of my project.
- RoHS, CE and GPSD will ensure that the material and electric components are safe for use and materials selected are safe for internal and external use.
- This standard contributes to the following Sustainable Development Goals: Good health and Well-being 3 and Industry, Innovation and infrastructure 9.
- EMC Directive, LVD, Ecodesign, WEEE Directive, and OPS legislations check that the electronic components are safe to use and efficient.

I will now investigate material and component research for the vibrator and refer to these legislations and standards where appropriate.

I will base my component and material research on previous research conducted on vibrators already available on the market and the product deconstruction I have previously analysed and researched.

Note to Self When reviewing the legislation, the vibrator will not be designed to be modular and repairable by the user as this will breach legislation's which would cause the product not to be fit for its intended use.

When reviewing the modularity and repairability choices, I realised that magnetic connection could be used with varying motors with different silicone attachments, but this could risk the user's health and cause injury when attaching the different heads to the main body of the vibrator from electrical currents.

Another reason why this is not a viable option is that the product not meeting the waterproof IPX7 standard, which I intended to meet. Alongside this, If this choice was used, the attachment could come off during sexual intercourse with their partner putting the users at risk of electric shocks and distracting from intercourse.

Component Research

Common electronic components used within vibrators -

- DC brushed motors
- Circuit board
- Magnetic charging module
- LEDs
- Wires
- Button Modules
- 1 cell battery (3.7 v)
- ESC control unit

I have decided that the following electronic components will not differ from competitor products –

- LEDs
- Button Module
- Magnetic charging module

I have made this decision as these components do not affect the product's quality greatly, and any improvements I will make for the electronics of the product will be for power, efficiency, size, and modes.

Beneath are listed the advantages and disadvantages of the components that will not be changed.

- Component Research LEDs -

Advantages

- Reduced power consumption
- Improved longevity 50,000 hours +
- Increased efficiency
- Versatility
- Superior lighting quality 135 lumens/ watts
- Customizability
- Eco-friendly contains no mercury or hazardous substances
- Low maintenance
- Low heat Production
- Small form factors
- Instantaneous switch on
- RGB colour options
- Built in design



LEDs – also known as light-emitting diode LEDs, are the most widely used lighting in products and most of the lighting in vibrators and sex toys. To the left are listed the disadvantages and advantages of LEDs.

As LEDs are widely used in vibrators, I have chosen to keep this component the same.

The LEDs I will use within my product are RGB + white strips which will be 5v.

Disadvantages

- Cost
- Voltage sensitivity
- Causes backwards heat dissipation



Once all the electronic components are selected, I will further investigate whether 5v will be compatible with the other electronic components.

- Component Research Buttons-

Advantages

- Cost
- Voltage sensitivity
- Tactile push button
- Versatility
- Can be recycled
- Low maintainance
- Instantaneous switch on
- Variety of sizes
- Soft materials can be placed ontop
- Longevity
- Low voltage sensitivity

Disadvantages

- Non replaceable
- Can be difficult to recycle
- Casted materials ontop can stop the button module from functioning



Button modules will be used within the electronics of the vibrator.

As push buttons are widely used in vibrators, I have chosen to keep this component the same.

Since the size variations of button modules vary greatly, I will decide on the size of the button module once the form and dimensions of the vibrator have been chosen.

The correct dimensions of the module will also be important because if the module is too small, it will be difficult for the user to operate the vibrator easily.

The button module will be exposed to the silicone casting as this component will need to be exposed from the ABS shell in order for the user to operate the vibrator.

The Button module will need to be soldered to wires during the assembly process in order for the component to work within the product.

The number of buttons will be decided later throughout this research pack. The number of buttons will be vital as too many or too few will make the product more difficult to operate.

The tactile button module will allow for the product to switch modes instantaneously and can be programmed, so pressing the button for a few seconds will turn the product on and off. This will be decided during the functions of the products and sequences.

- Component Research magnetic charging -

More specifically known as the Magnetic pogo pin charging module

Advantages

- Stable current transmission when compared to shrapnel connectors
- Space efficiency for the PCB board
- Effective contact point stability
- Longer PLC
- Affordable manufacturing costs
- Fast manufacturing times
- Effective for small sized products
- More hygienic when compared to pinhole USB charging types



Disadvantages

- Less recyclable
- Users can still find the charging difficult to attach
- Can decrease the products aesthetics



Magnetic pogo pin charging modules will be used within the electronic components of the product.

This type of charging module is more hygienic when compared to pinhole USB charging types which have been used previously with vibrators.

The charging module will be exposed to the silicone casting as this component needs to be on the surface of the product in order to be rechargeable.

Magnetic pogo Pin charging modules also come in a variety of sizes. This will be decided once the size of the product has been decided.

Soldering will be required to attach the counter component of the pogo pin magnetic charging module to the circuit board in order for the product to be rechargeable.

As pogo pin charging modules are becoming more widely used within vibrators, I have decided to follow this trend as this component is cheap, fast to manufacture, more hygienic compared to other charging module options and has a longer PLC.

Beneath Research into motors, Circuit boards, Wires, and batteries will be conducted to identify which electronic components will be best suited for the product.

Vibrating motor Research

Previously I deconstructed an existing vibrator on the market. Upon analysis of the vibrator's motor, I realised the type of motor used was a DC brushed motor.

DC brushed motors are the industry standard component selection within vibrators. I have decided to research both DC brushed and brushless motors to explore whether a brushless motor will be more efficient and have a longer PLC.

- Brushless DC Motor -

Advantages

- Higher efficiency compared to brushed motors
- Reduced size
- high torque to weight ratio
- Quieter motor operation compared to brushed motors
- Longer PLC
- Higher speed ranges compared to brushed motors
- Increased reliability compared to brushed motors
- Now available in more compact sizes compared to brushed motors
- Higher energy efficiency compared to brushed motors
- Lower acoustic noise compared to brushed motors
- Greater thermal regulation compared to brushed motors
- better weight to power ratio compared to brushed motors
- Less heat production compared to brushed motors

Disadvantages

- Cost is greater compared to brushed motors
- More demanding to manufacture compared to brushed motors
- requires a control circuit (ESC)



Placed to the left are the advantages and disadvantages of a brushless DC motor.

These qualities are compared to a brushed DC motor. As shown to the left, brushless DC motors are comparatively greater than brushed DC motors.

The brushless DC motor is more compact when compared to brushed DC motors, which is more suited to my intended product size. The compact size does not affect the power of the motor and rather is more powerful when compared to brushed DC motors.

Brushless DC motors are available in a wide variety of sizes without greatly compromising the component's qualities. I will be looking into small Brushless DC motors, which will allow my product to be more compact if required.

Brushless motors require an ESC control module in order for the product to operate. An ESC will be used within the internals of the product.

Placed on top of the brushless DC motor will be a counterweight which will allow for my product to vibrate. I chose to use stainless steel as this is the industry standard used. The weight will later be decided depending on the other components and how much vibrations the product can withstand.

Now I will conduct research into the circuit board of my product. Considering that my product will be compact and small, I will research into compact circuit board which will be capable of the product operating with all the other components.

The circuit boards I will further research are –

- Arduino Nano
- Arduino Micro
- Seeed Studio XIAO SAMD21

I have decided to choose these options to research further as these circuit boards are reliable, can be easy to code and are cost-efficient.

Here are the qualities of each circuit board –

Qualities	Arduino Nano	Arduino Micro	Seeed Studio XIAO SAMD21
Operating Voltage	5V	5V	5V
Flash Memory	32KB of which 2KB used by bootloader	32KB of which 4KB used by bootloader	256KB
Clock Speed	16MHz	16MHz	48MHz
Analog IN Pins	8	12	11
DC Current per I/O Pins	40 mA (I/O Pins)	20mA	35mA
Input voltage	7-12V	7-12V	7-12v
PWM Output	6	7	14
Power Consumption	19Ma	50Ma	80Ma
PCB Size	18 x 45 mm	18 x 48mm	20 x 17 x 3.5 mm
Weight	7g	13g	5g
Programmable in	IDE	IDE	IDE
Price	£19.09	£19.09	£4.53

From the research investigated of the three chosen circuit boards for my product, I can see that the Seed Studio XIAO SAMD21 is by far comparatively greater than the Arduino Micro and Nano.

The Seeed Studio XIAO SAMD21 is much cheaper than the other two chosen options, with a price of £4.53 per circuit board. This price would be lower if batch manufactured, and the component was bought in bulk.

The chosen circuit board for this project is also more compact compared to the other two circuit boards and weighs less.

I have chosen to use the Seeed Studio XIAO SAMD21 as the circuit board for the project as this is more suited towards my project than compared to the other two circuit boards which have been researched into.

I will now research the battery type for my project. Currently, most vibrators feature a 1-cell lithium-Ion battery which is 3.7v.

From the basic research conducted, I have decided to choose a Lithium-Ion battery and will now research whether a 1-cell or 2-cell battery will be used in the project.

I have decided to use a 2-cell (7.6v) which will also be larger than conventional batteries used in vibrators. This will allow my product to operate for a longer time and will also allow for all the components selected to function with the power supply chosen.

The size of the power supply will be chosen later during the development of my product form to ensure the component selection will fit within the chassis of the product.

Components Required

After researching and analysing electronic components which will allow for the product to function and vibrate, I have decided the following components will be used within my project.

- Brushless outrunner DC motor
- Pogo Pin Magnetic Charging Module
- LED's
- ESC (Electronic Speed Control) Module
- Seed Studio XIAO SAMD21 Circuit Board
- Tactile Button Module
- 2-cell Lithium-Ion Battery
- Wires

These components are all compatible with one and another to ensure the product will function correctly. Specific components will be selected later on once the chassis and form of the product have been decided.

Material Research

When revisiting the benchmarked vibrator products already available on the market, the following materials will be a focus area as they are recyclable, durable, cost-effective, and fits the purpose of the product.

- ABS plastic
- M4 Screws

I will further research the advantages and disadvantages of ABS Plastic along with the manufacturing methods available with this material. Material properties of ABS plastic will also be researched further to confirm whether this is a viable material for the product's purpose.

ABS plastic blends will also be investigated to analyse the qualities of the material and whether an ABS plastic blend would be better suited to the product.

- Material Research ABS -

Collecting and analyzing data on clitoral stimulation products on the market has established that ABS plastic will be used within the product.

Research into ABS and ABS blends will be conducted to justify the material properties, functions and sustainability of ABS.

The intended function of the materials within the product would be to contain and protect the electrical components of the products and for the storage case in which the clitoral stimulation product will be stored.

ABS Blends

A variety of ABS plastic blends offer an increase in material properties resulting in thermoplastic alloys applicable to a variety of product specifications.

ABS plastic blends cannot be recycled currently in most areas of the world, which would result in a product in which most of the components are unrecyclable.

Despite the silicone coating not being recyclable within the product, the electronics can be along with the ABS plastic if a non-plastic blend is chosen. According to the product specification set within this project, sustainability should be considered, and materials will be chosen carefully for recyclability factors.

For this reason, ABS plastic blends will not be used within this product due to sustainability factors.

- Material Research ABS -

ABS Plastic

ABS plastic has a vast range of material properties and manufacturing opportunities. Beneath are listed the advantages of ABS plastic properties.

- Widely known for being a medical-grade material
- Good Impact-resistance
- Good Abrasion-resistance
- High Stiffness and Strength
- Highly recyclable
- Lightweight
- High electrical insulation
- High Rigidity
- High dimensional stability
- High surface brightness and excellent surface aspect

Beneath are listed the disadvantages of ABS plastic properties.

- Can burn easily and continue to burn once the flame is extinguished
- Scratches easily
- Poor weather resistance
- Resistance to UV exposure

Beneath are listed the manufacturing opportunities of ABS plastic.

- FDM printing
- Extrusion moulding
- CNC Machining
- Injection Moulding

On the following page, an in-depth exploration of ABS properties will be conducted to justify whether this material will be viable for the product's function or not.

ABS Material Properties - Food-Safe Thermoplastic				
Property	Metric	units	English	units
General				
Density	1.01e3 - 1.21e3	kg/m ³	63.1 - 75.5	lb/ft ³
Mechanical				
Yield Strength	1.85e7 - 5.1e7	Pa	2.68 - 7.4	ksi
Tensile Strength	2.76e7 - 5.52e7	Pa	4 - 8.01	ksi
Elongation	0.015 - 1	% strain	1.5 - 100	% strain
Hardness (Vickers)	5.49e7 - 1.5e8	Pa	5.6 - 15.3	HV
Fracture Toughness	1.19e6 - 4.29e6	Pa/m ^{0.5}	1.08 - 3.9	ksi/in ^{0.5}
Young's Modulus	1.19e9 - 2.9e9	Pa	0.16 - 0.421	10 ⁶ psi
Thermal				
Max Service Temperature	61.9 - 76.9	°C	143 - 170	°F
Insulator or Conductor	Insulator		Insulator	
Specific Heat Capability	1.39e3 - 1.92e3	J/kg °C	0.331 - 0.458	BTU/lb. °F
Thermal Expansion Coefficient	8.46e-5 - 2.34e-4	strain/°C	47 - 130	μstrain/°F
Eco				
CO2 Footprint	9.1e7 - 1.02e8	kg/kg	3.27 - 3.62	lb/lb
Recyclable	Yes		Yes	

From the research conducted on ABS Plastic, I have decided not to use an ABS plastic blend as they are non-recyclable. ABS plastic will be used for the chassis of my product. This has been chosen based on the research conducted on this material.

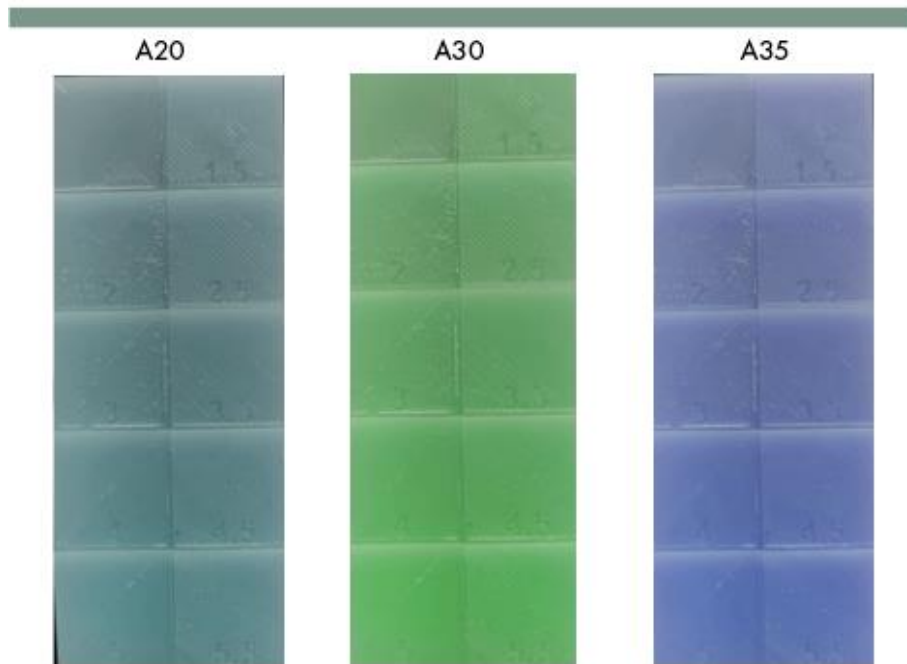
Another material that will be required for the product is Silicone. The grade of the silicone will have to be platinum or medical grade, as this is skin safe and non-toxic. The shore hardness of the silicone can vary depending on how stiff or soft the product should feel.

I have chosen to include silicone within my product as the product's function is to vibrate, and a hard material exterior would be too rough on the user's skin. Silicon will ensure there is minimal risk to the genitalia of the user.

Typically, the silicone used in most vibrators is a shore hardness of 30A in medical grade. I conducted a test on varying platinum-grade silicone shores to identify which would be best suited to my product.

Material Testing

Beneath, I have conducted material testing on different platinum-grade silicone shore hardness. I have also tested different non-toxic safe for skin pigments to see whether this will affect the silicone texture and curing properties.



Here I conducted primary research on the medical grade silicone, which included testing the shore hardness, colour, surface finish, thickness and ways of casting the material.

My research has concluded that 35A shore hardness was best for a soft but firm feel with a 3.5mm thickness.

I used translucent silicone and then added a non-toxic and safe for human dye to test how easily the silicone could be coloured without affecting the material properties.

I also realised that the silicone that cured with air exposure became tacky and grippy, which is not desired. When manufacturing, I have conducted that mould casting will be the most effective and efficient method for even coverage and the end feel of the silicone.

I have now confirmed that a platinum grade 35A shore hardness with liquid food-safe pigment with a 3.5mm thickness will be a suitable material for my product.

I will now conduct material testing on ABS plastic. I will test different wall thicknesses and snap to fit joining structures. For this material testing, I will use a 3D printer to create rapid prototype components. If this product is to be manufactured, injection moulding would be used. The final design of the chassis would go through an FEA analysis and manufacturability simulation report to ensure the product's chassis can be manufactured through injection moulding. The 3d Printed components have test boss holes and strengthening ribs of the same thickness as the wall.

Here I have tested how the ABS plastic chassis would fit together. From deconstructing an existing product, I can see that a snap-to-fit joining method is an efficient method of joining the two halves of the chassis together. I have also focused on the wall thickness of the ABS components to see which thickness will be best suited for my product.

For this, I used 3D-printed ABS plastic. I realised that if this product is going to be batch manufactured that injection moulding would be the most efficient method of production.

The wall thickness of this component printed was 3.5mm. This wall thickness was durable and strong without making the shell of the product too thick which would result in a larger product which would not be cost-efficient.

Designing a snap-to-fit joining method for the chassis worked extremely well, creating an almost seamless joining line. By designing a snap-to-fit joint on the chassis of my product, the user will be able to recycle the product when discarded, allowing for the ABS plastic and most of the electronic components to be recycled.

The only piece of the product that will not be able for recycling is the silicone sleeve.



Now that I have established that a wall thickness of 3.5mm ABS plastic will be optimal for the chassis of my product with a snap-to-fit joining method, I can now collate my finding into the outcome of material testing.

Outcome of Material Testing

From conducting material testing on platinum-grade silicone and ABS plastic, I have now concluded the material requirements I will follow when manufacturing the product.

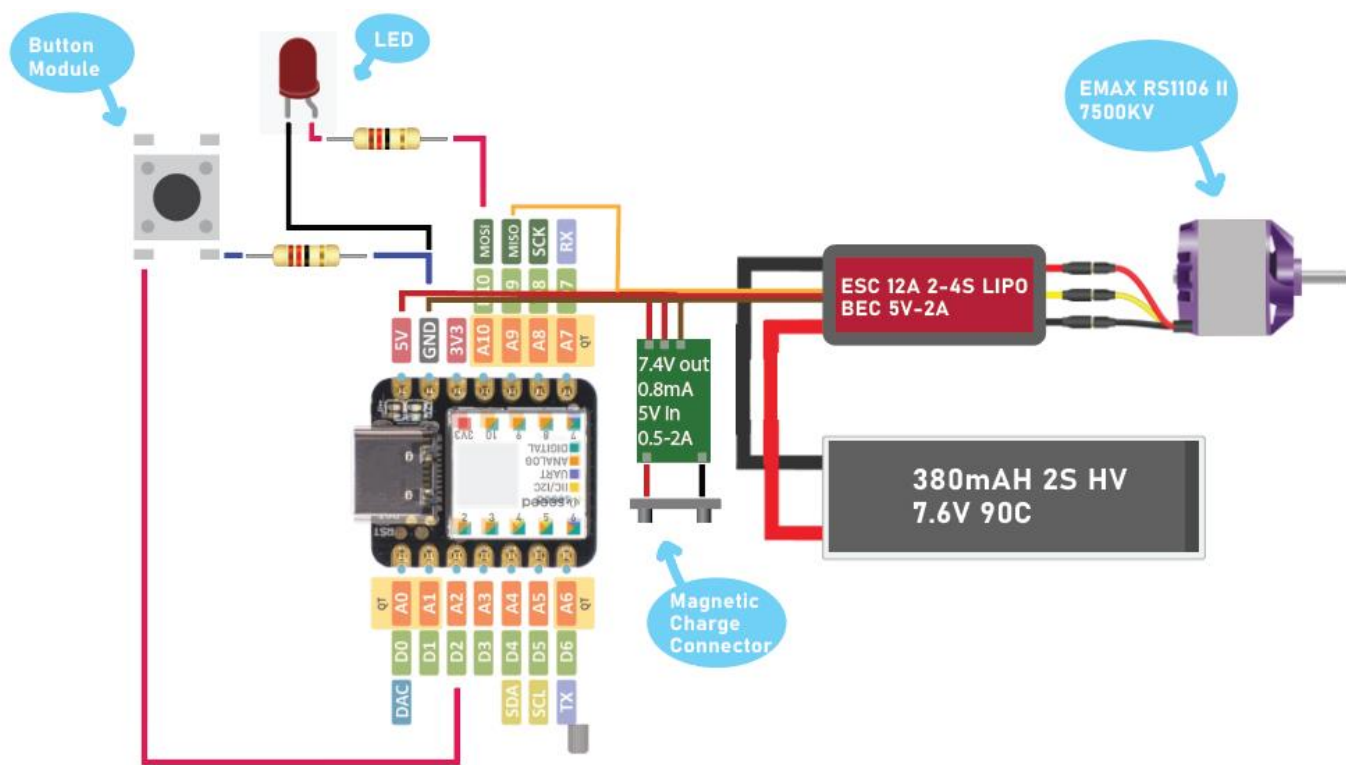
Beneath are listed the key findings from deconstruction –

- ABS plastic will have a wall thickness of 3.5mm.
- ABS plastic chassis will be designed to have a snap-to-fit joining method.
- A snap-to-fit joining method will allow the user to recycle the majority of the components.
- Platinum grade or medical grade silicone will be used.
- The silicone will have a thickness of 3.5mm.
- The silicone can be dyed using non-toxic, safe for skin pigment.
- The shore hardness of the silicone will be 35A hardness.
- Injection moulding will be used to manufacture the chassis of the product.
- Silicone cast moulding will be used to create a silicone sleeve around the chassis of the product.

Now that I have concluded all of the materials and components that will be used within my product, I will now create an electronic component compatibility and placement test. This will allow me to ensure all the electronic components will work with one another.

Electronic Component Compatibility and Placement

Beneath is listed the diagram with all electronic components correctly connected to the Seed circuit board.



As shown above, is the electronic component compatibility layout.

Primary Research on holding vibrators

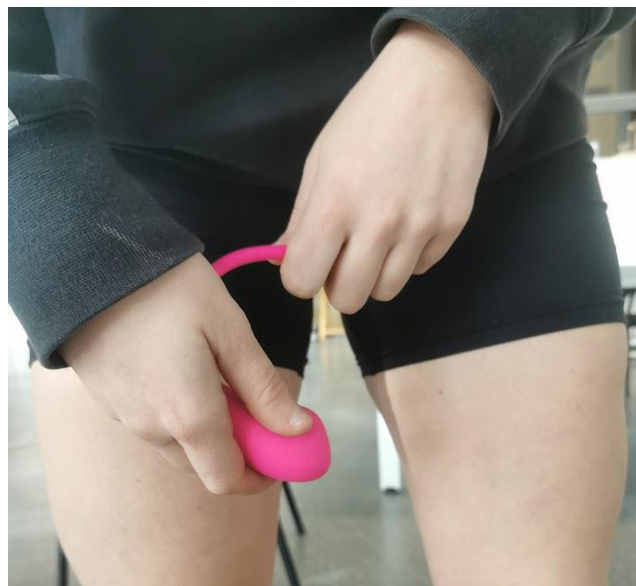
Throughout this next section, Primary research will be conducted on the user interaction with a vibrator and how women would hold the product for clitoral surface stimulation. For research purposes, this is held against the thigh, focusing on how people would hold the product and their feedback on how they interact with the vibrator.



The product used for this research is the Lush 3 by Lovense. The product contained a satin bag for storage, magnetic USB charging, the product, the user manual and the packaging box.

*Note to self – The satin bag felt tacky and prolonged usage without the proper product after use cleaning would result in an unhygienic storage bag *

Beneath will be shown Women one and their interaction with the Lush 3.



Woman One

To justify the want and need for a vibrator to be hands-free when in use with their partner or for solo play, I must first conduct primary research on the user experience of holding a vibrator whilst it is on and gather feedback from the user (This was placed against the thigh rather than the product intentional use for intercourse for this research to be non-explicit).

Woman one held the neck of the product with their right hand and held the base of the product, which vibrates with their left hand. The user said the product was uncomfortable to hold and could see that multiple positions with their partner during intercourse could be uncomfortable and not viable.

Women one also noted that the vibrations also made their left hand numb and tingle, which they said would take away from the sensation of intercourse and clitoral stimulation. The user suggested that the product could be shaped to cover the general area of their vulva to stimulate a larger area of the clitoris whilst being on a lower vibration to stimulate whilst preventing the clitoris to become numb.

*note to self * The design of the outcome of this project could be flatter and designed to cover a larger surface area at a lower vibration to stimulate a larger surface of the clitoris.



Woman Two

Woman two held the product in their left hand, placing the neck by the main body of the vibrator. The user said the product would work for solo play but would be difficult if they were to use the product with their partner as the wrist positioning against the clitoris would become uncomfortable over an extended period of time.

Woman two also noted that the vibrations from the product made their hand ache and tense up, which would take away from intimate pleasure and stimulation with their partner.

The way the user held the product significantly differed from the woman one. Still, the general feedback from holding and positioning the product during intercourse was similar, as the product was uncomfortable to hold and use with their partner.

Both users noted that the vibrations from the product, when being held was uncomfortable in their hand, would take away from a heightened experience during intercourse.

note to self By designing lingerie to hold the product to stimulate the clitoris during intercourse would heighten the user's experience during intercourse with their partner.

Outcome of primary research on holding vibrators

Conducting primary research on how users would hold a vibrator during intercourse has allowed for valuable information and feedback, which has narrowed my design and research scope. Beneath is bullet pointed takings from my research.

- Justification of a hands-free vibrator has been established.
- Would incorporating lingerie into the design to hold the product be viable?
- Would designing lingerie also increase the woman's confidence, thus heightening their intercourse experience if they are body-conscious?
- Will design a flatter and larger product for a larger area of stimulation with lower vibrations creating an effective product?

- Users disliked the vibration of the product in their hand, saying this would take away from clitoral stimulation.

Gathering the research explored so far.

The research conducted so far has allowed me to narrow my research and design scope and open my design thinking process for this project. User experience with primary and secondary research has concluded that a hands-free product would be beneficial for heightening the woman's intercourse experience and increasing the chances of climaxing.

By incorporating crotchless lingerie into the design of my product, the vibrator will be hands-free, and women who are body-conscious will have a heightened experience from feeling more comfortable during intercourse by wearing lingerie.

Ergonomic Research

The dimensions of the product can greatly vary from product analysis research conducted. Since the project direction is to create a hands-free vibrator, ergonomic research on hand positions and sizes will not be conducted.

This research will analyse the average dimensions of the following – Pubic hairline to cleft, the side length of the pubic hairline to cleft, length of base mons triangle, vaginal canal length and vaginal canal diameter.

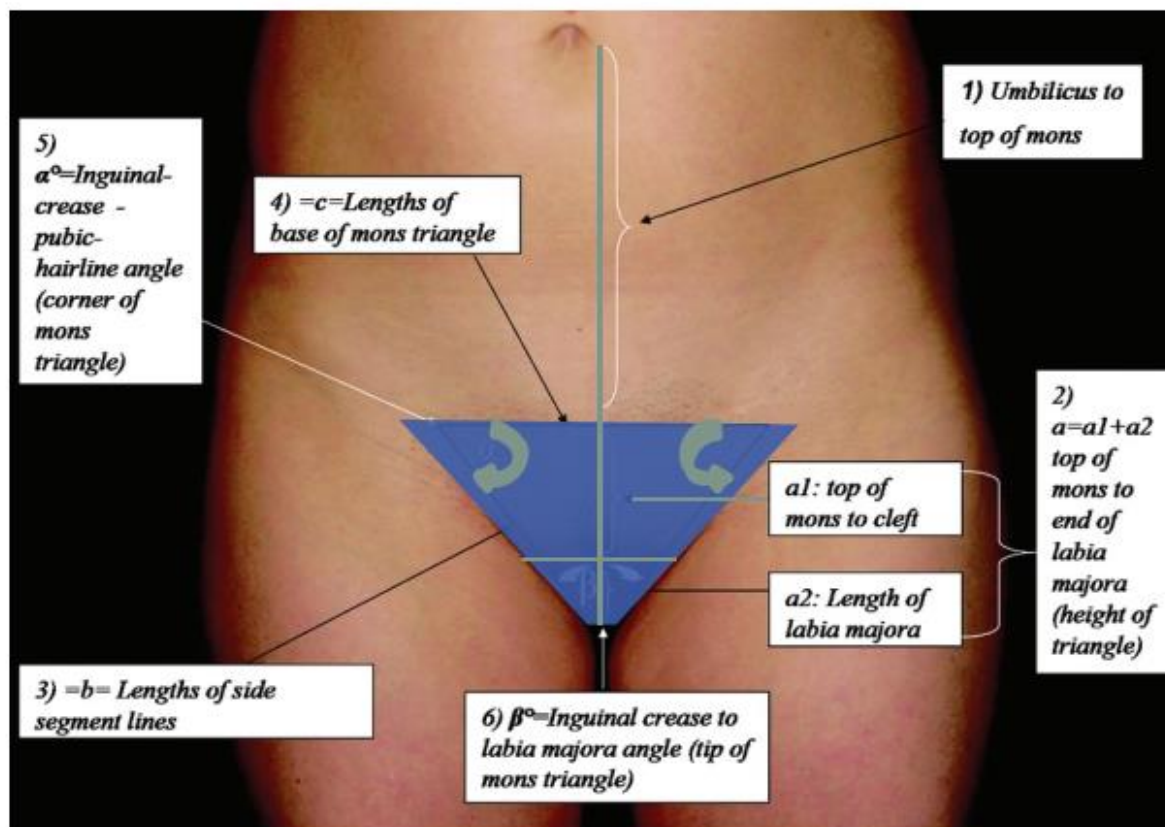
Since the vulva and female genitalia can vary greatly in each individual, the dimensions research will act as the foundations of the size of the product. The vaginal canal and mons pubis curve will not be factored into the ergonomic research as the product will be flexible to meet an angle requirement of 20 degrees for the mons pubis curve and 150 degrees for the flexible neck of the product.

Beneath is shown secondary ergonomic research in which the focus points have been highlighted.

- Ergonomic research -

Table 1. Results of Mons Measurements

Measurements	Female Volunteers (n = 15)			Cadaver Study (n = 13)		
	Mean	Median	SD	Mean	Median	SD
1) Umbilicus to pubic hairline/skin fold (cm)	14	13	2.7	14.5	15	1.3
2) Pubic hairline/skin fold to end of labia major (height of triangle) = a = a1 + a2 (cm)	13	12.5	2.3	13	13	1.5
a1) Pubic hairline to cleft (cm)	8	8	1.5	7.9	8	0.95
a2) Length of labia majora (cleft to end of labia) (cm)	5	4	2.2	5.3	5	1.4
3) Lengths of side segment lines = b (end of labia majora along the inguinal crease up to lateral hairline) (cm)	13	13	2.1	14	14	1.7
4) Lengths of base of mons triangle = c (cm)	16	16	2.3	19	18	2.6

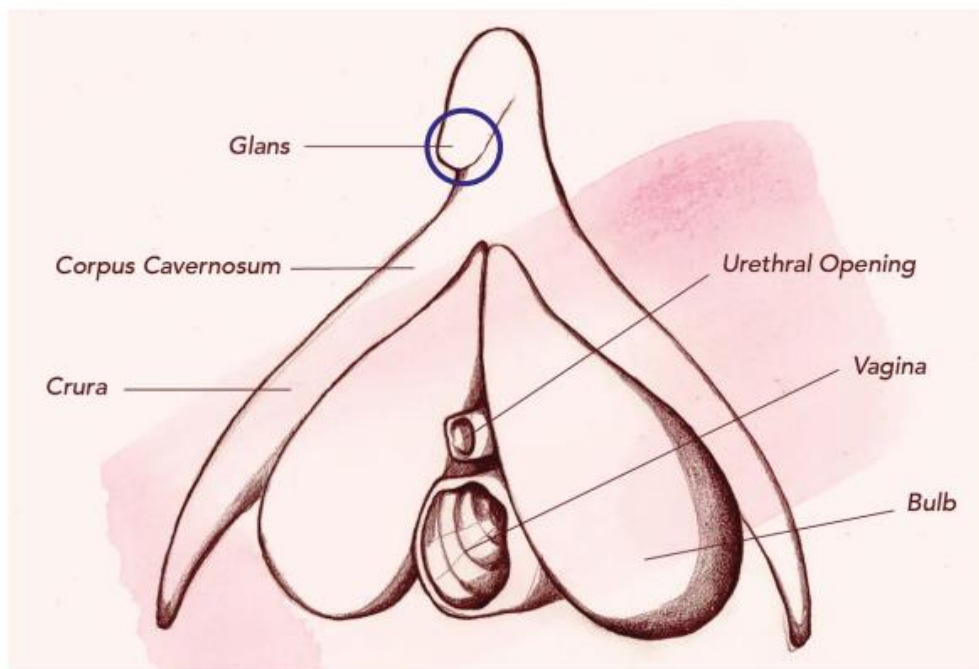
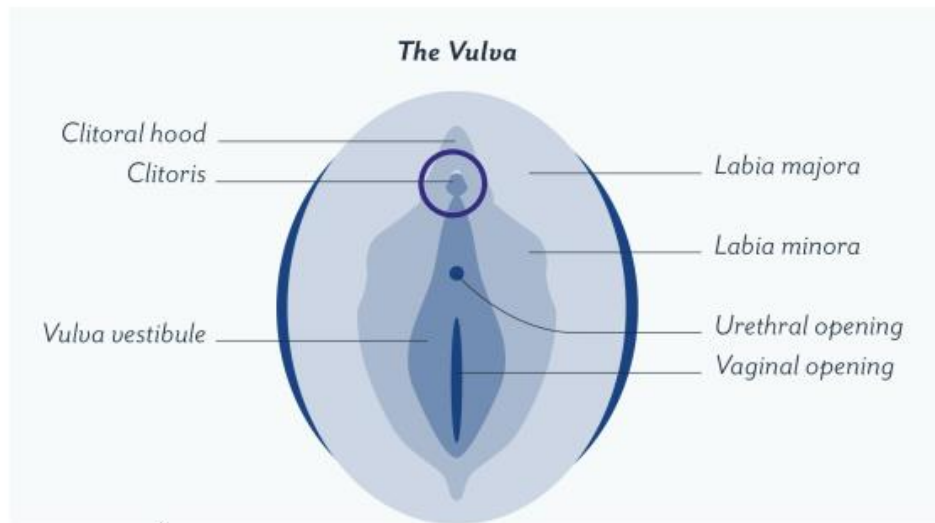


Link to study

https://journals.lww.com/plasreconsurg/fulltext/2010/07000/Measurements_and_Aesthetics_of_the_Mons_Pubis_in.70.aspx

As shown above, this is a study carried out on 15 individuals with an age range of 26-53 years old. Another 13 individuals were also studied with an age range of 60-95 years old. These two age groups were separated to identify if there was a size difference between different ages. It is also noted that the study carried out targeted individuals with a BMI of 18-25, which is a healthy weight range.

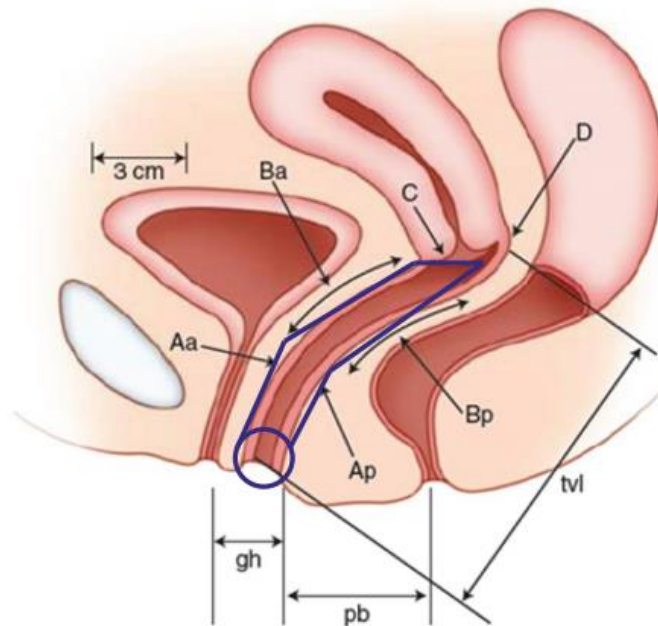
- Ergonomic research -



As shown above, is an illustrated diagram of the vulva and the clitoris. The highlighted areas identify which part of the clitoris is visible in the female genitalia. The clitoris contains many nerves which stimulate the female, which can lead to climax. My product will help to stimulate the visible clitoris and stimulate the large majority of the clitoris through vibrations.

The clitoris is located just below the mons pubis. Because of this, the main body of the vibrator aims to be located just above the visible clitoris area, which will also be on the mons pubis.

- Ergonomic research -



relaxed

- ⇒ length: 3 ½ to 4 inch
- ⇒ diameter: < 1 inch

aroused ("tented")

- ⇒ length: 5 to 6 inch
- ⇒ diameter: 1 ½ to 2 ½ inch
(narrowest at vaginal opening)

stretched

- ⇒ length: 8 to 9 inch
- ⇒ diameter: 2 ½ to 3 inch
(more during childbirth)

Shown above is an illustrated diagram of the vaginal canal length and diameter. The highlighted area is where the vaginal canal is located. Secondary research conducted shows that the vaginal canal length can vary from 8.89 to 22.8> cm. The diameter of the vaginal canal can vary from <2.5 – 7.62> cm.

Outcome of Ergonomic Research

The research conducted on the ergonomics of the vulva and female genitalia has shown the following dimensions, which will create the foundations of the product's dimensions.

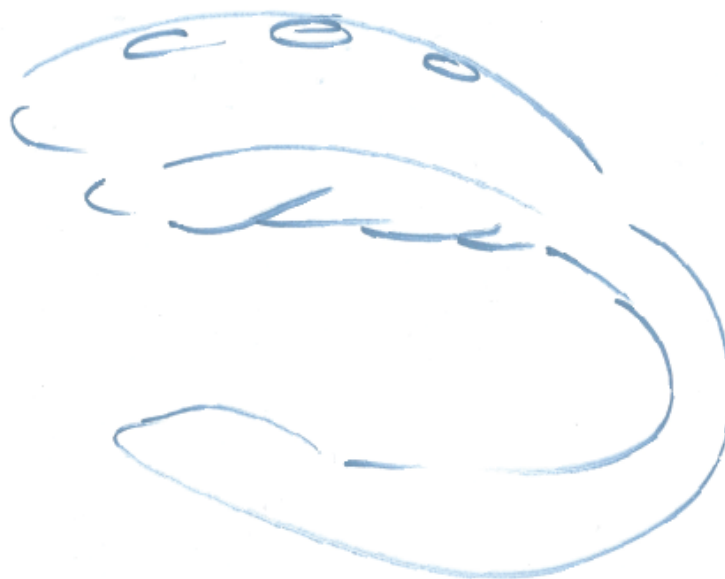
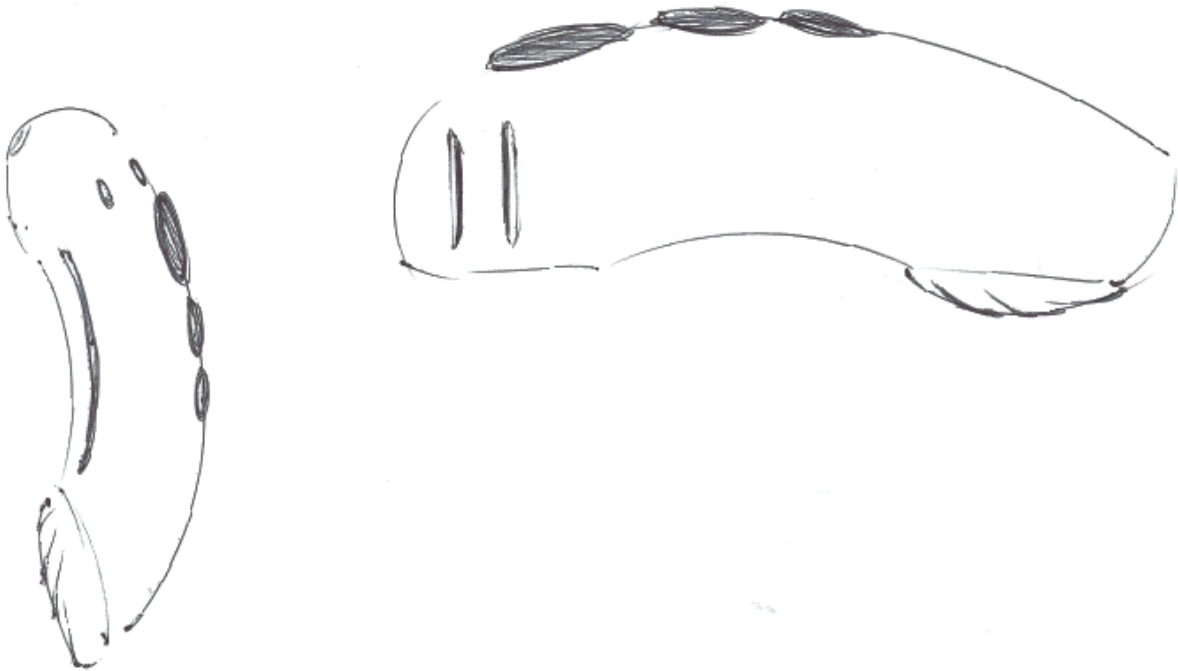
Beneath are listed the dimensions which I will use as a starting point for my product's dimensions.

- Pubic hairline to cleft - 80mm
- Length of side pubic hairline to cleft – 130mm – 140mm
- Length of base mons pubis – 160mm – 180mm
- Length of vaginal canal – 88.9 -22.8>mm
- Diameter of vaginal canal – 25.0 – 76.2>mm

Here are some vital takings from the ergonomic research conducted.

- The angle of the vaginal canal and mons pubis can vary greatly, and the flexibility of the product will meet these angles. The flexibility of the main body should be 20 degrees, and the flexible neck should be 150 degrees.
- The product will lay on the mons pubis and will reach the visible clitoris of the female genitalia.

Initial Sketches of Vibrator



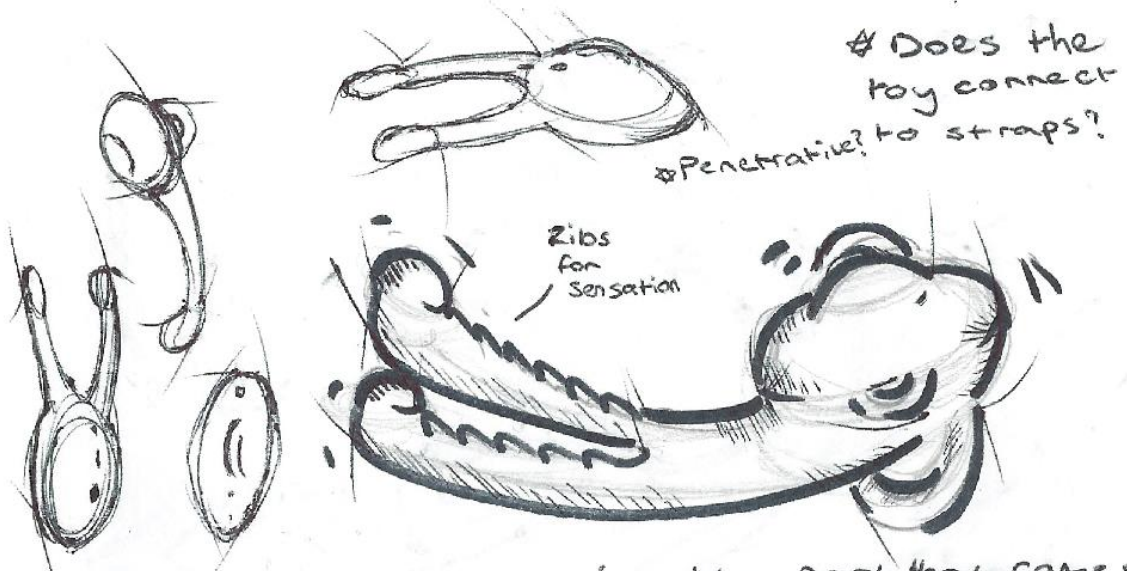












for hands free option the part that comes into contact with the clitoris will need to be supported to not fall away "Gravity".

Initial sketches
speed forming

The sketches include several abstract, organic forms, some with red and black coloring, and a central, more complex shape that resembles a stylized letter 'C' or a winged figure. The sketches are arranged around a central, larger sketch of a stylized letter 'C' or a winged figure, which is colored in red and black. The sketches are arranged around a central, larger sketch of a stylized letter 'C' or a winged figure, which is colored in red and black.

A collection of seven hand-drawn sketches of a hand, showing various views and poses. The sketches are done in dark ink on a white background. One sketch is labeled 'view' with an arrow pointing to it. The sketches include: a top-down view of a hand with fingers spread; a side profile view of a hand with fingers curled; a view of a hand with fingers spread and thumb extended; a view of a hand with fingers curled and thumb extended; a view of a hand with fingers spread and thumb extended; a view of a hand with fingers curled and thumb extended; and a view of a hand with fingers spread and thumb extended.



1. Induction/wireless charging.

charging options
 + uv cleaning case?

X 2. mains electric charging "socket".

3. usb charging

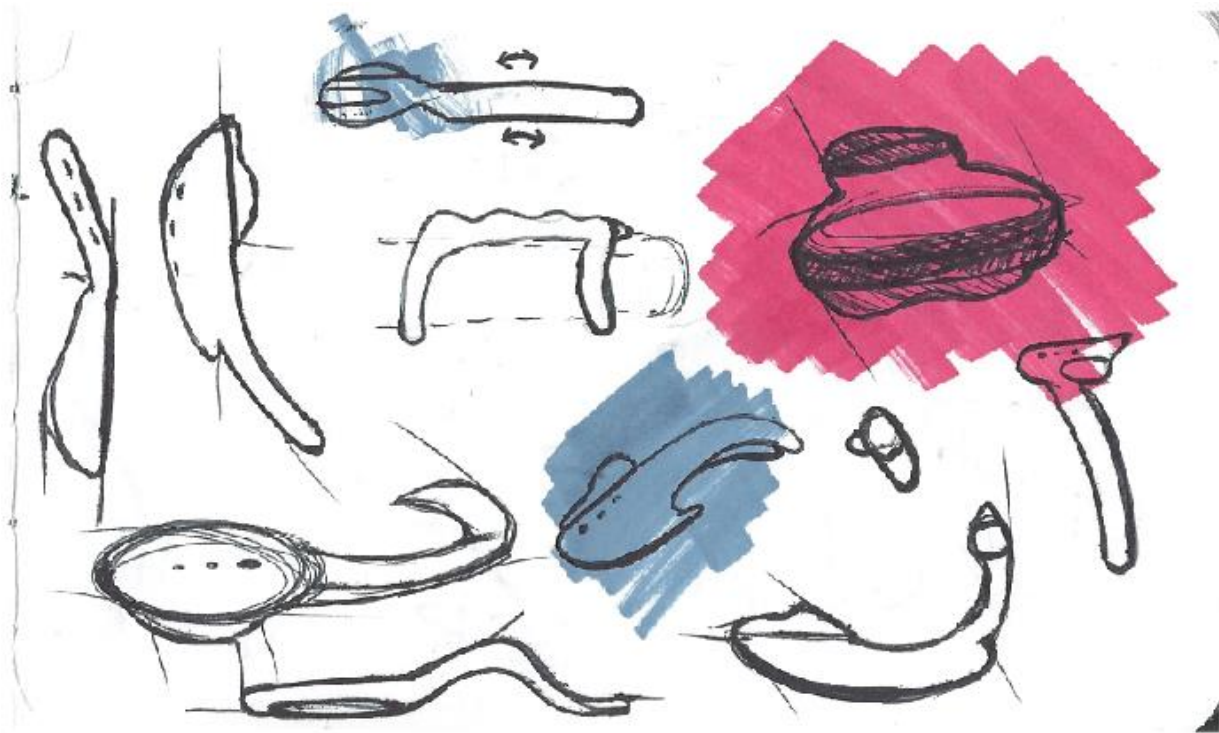


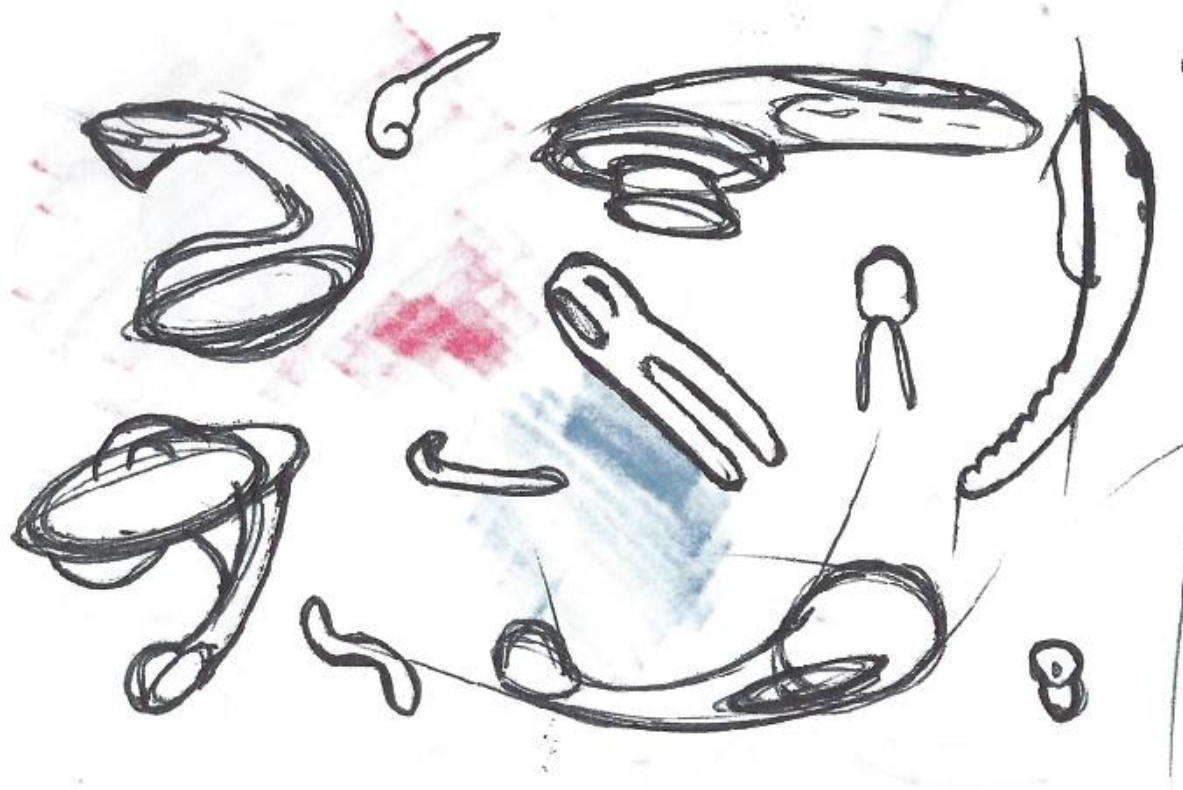
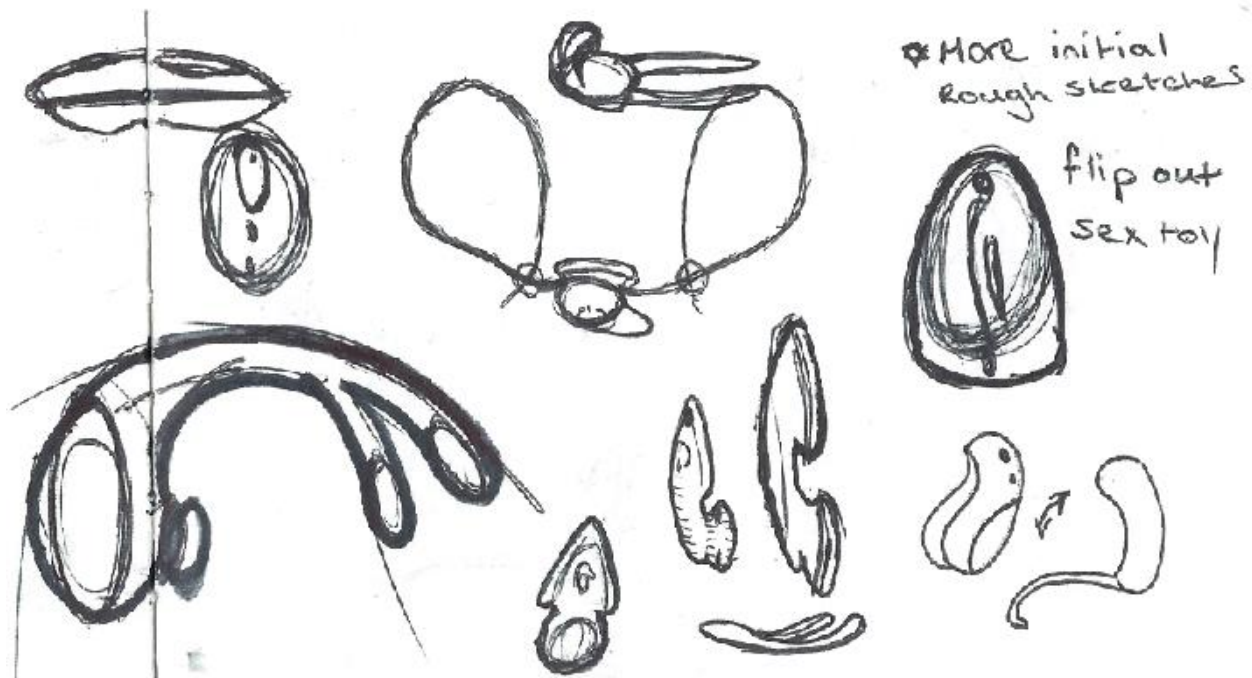
X 4. Battery operated

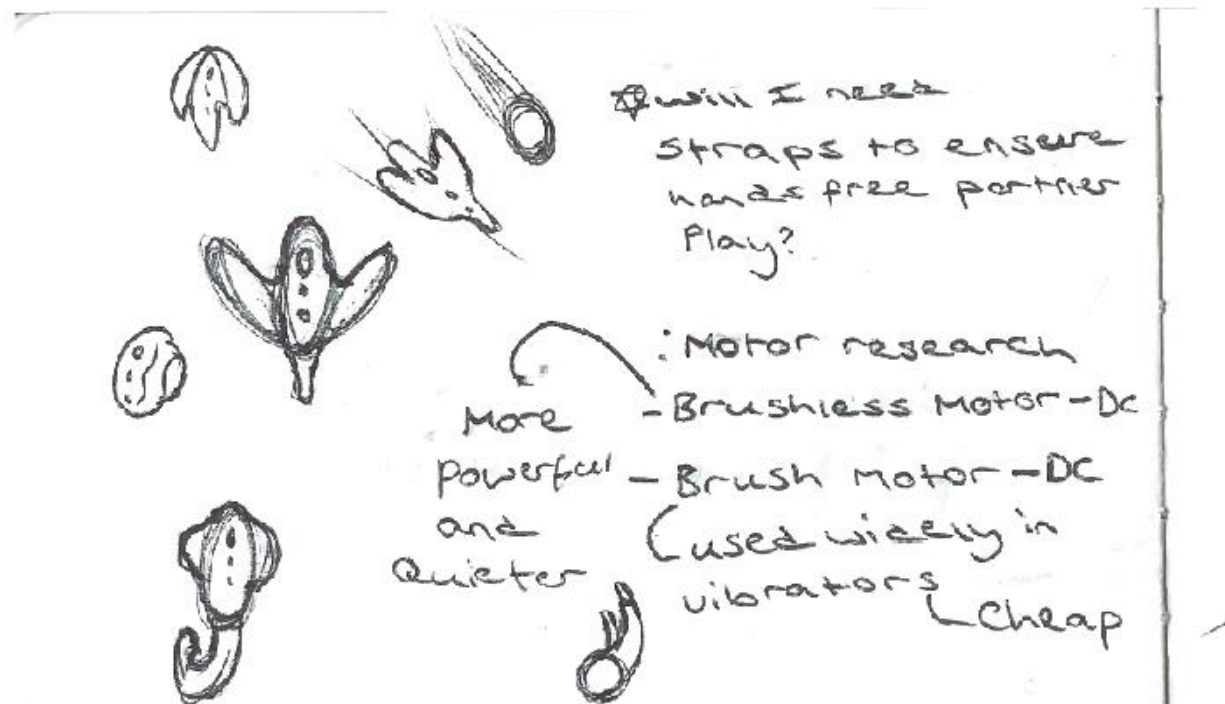
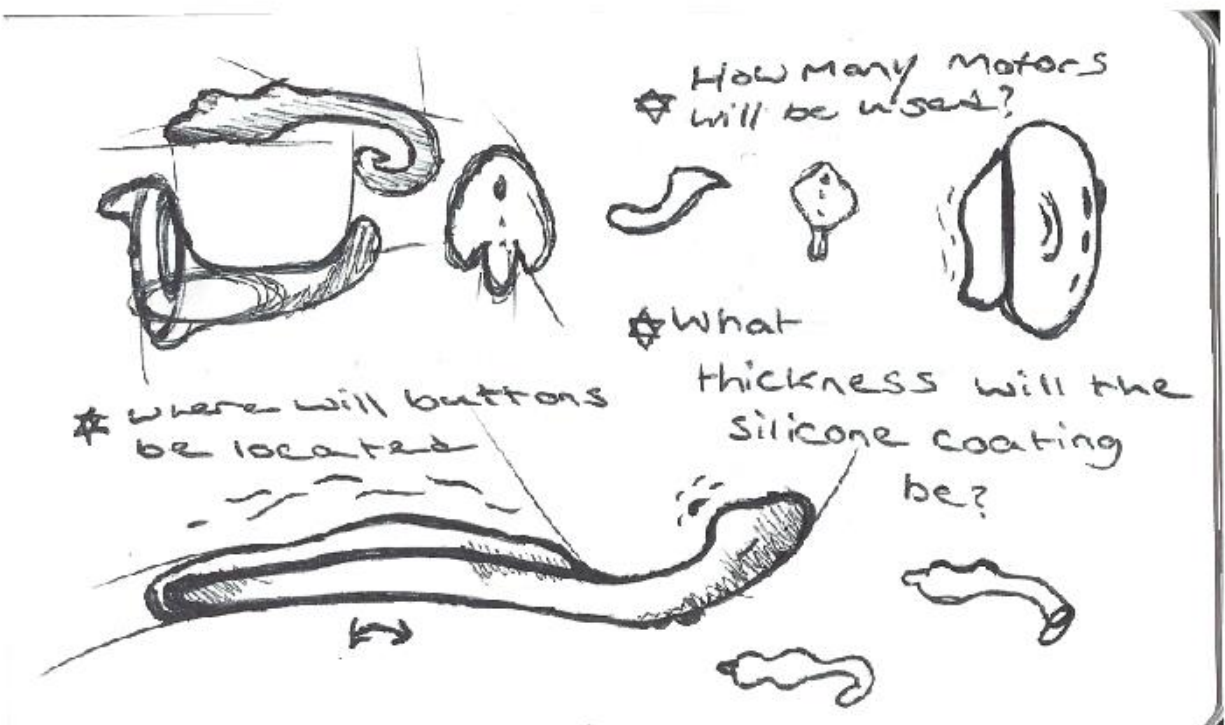
: Option 1 and 3 are best charging options for product purpose.

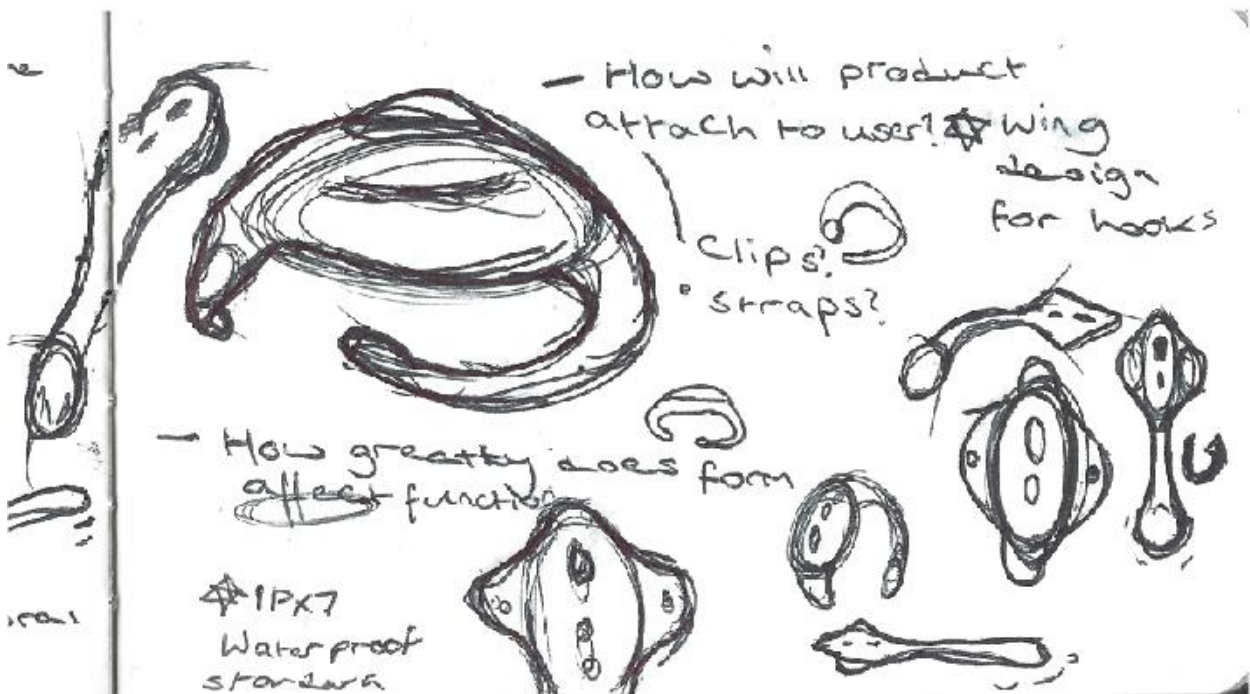
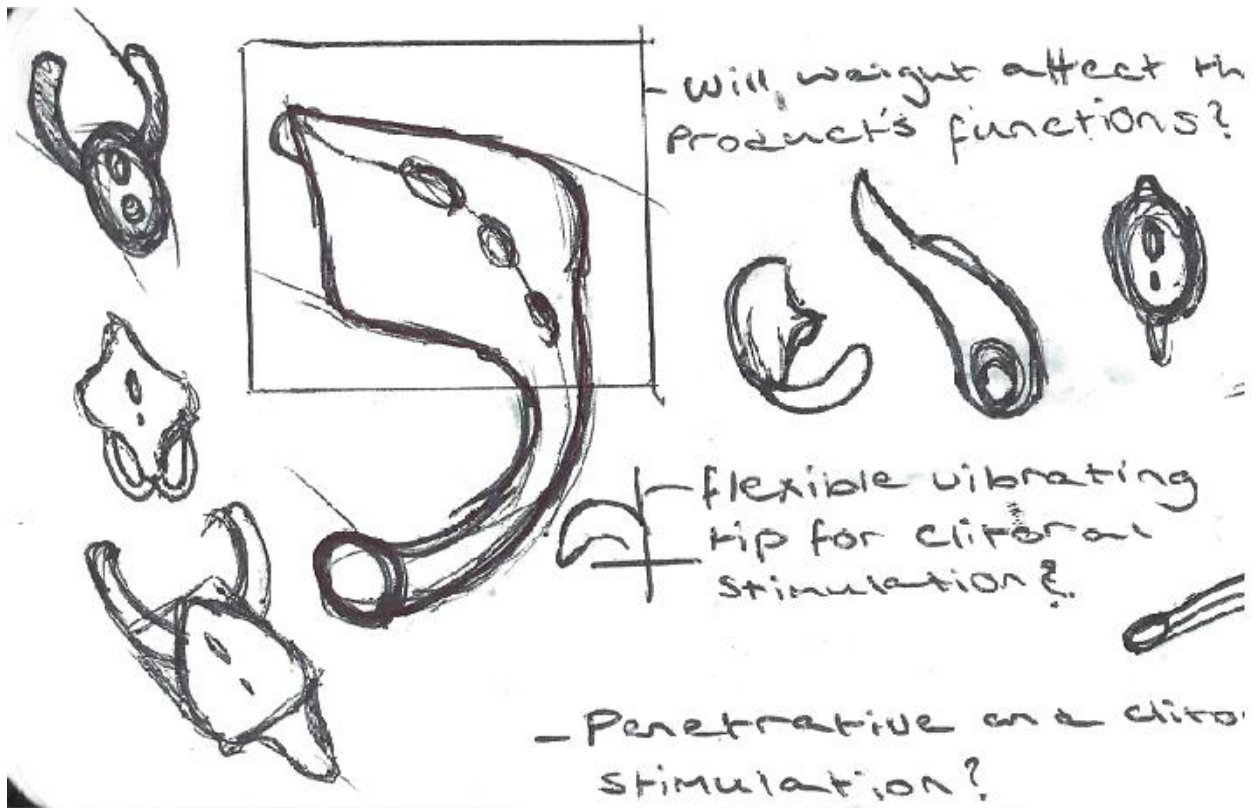
- case will need to be discreet but sleek and appealing.











Party
style
shaped
vibrator?

☆ crotchless
knicker style
harness design

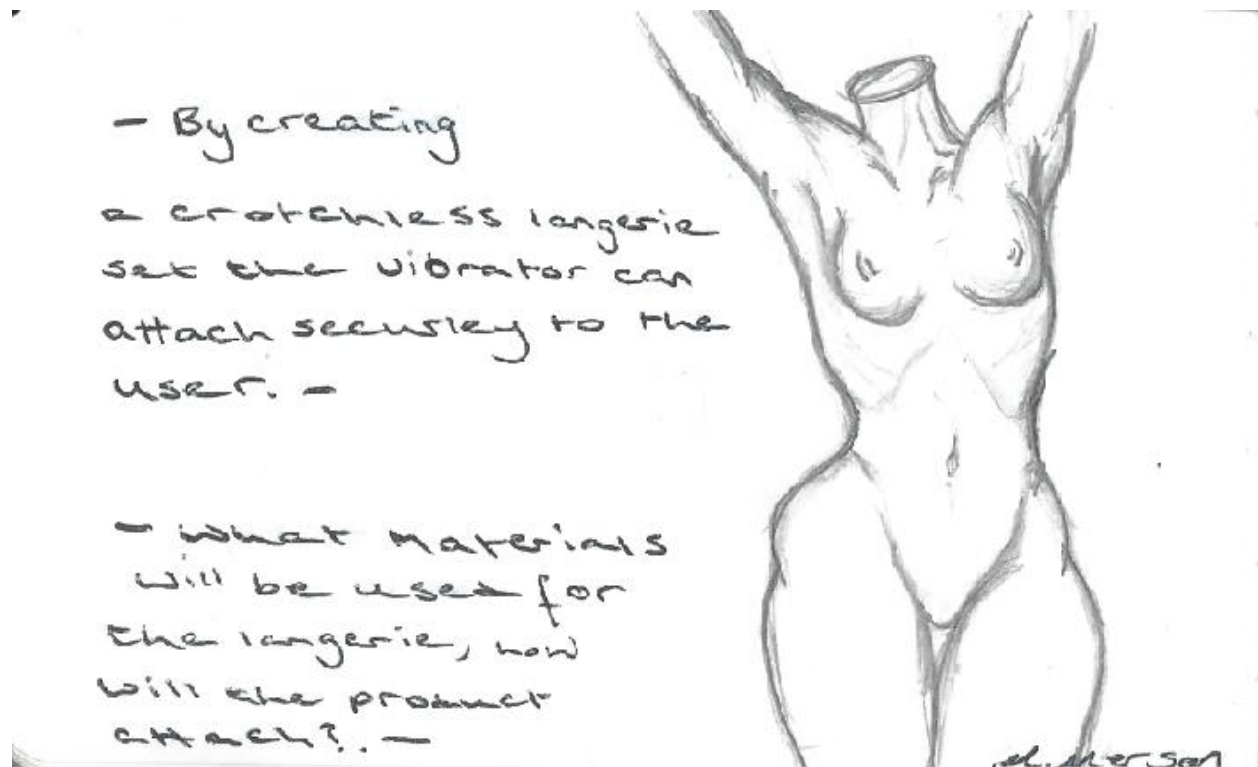


twist and click
for toy?



☆ Two part
toy for
partner play
connecting toy
to harness

Magnets
- caps



- By creating a crutchless lingerie set the vibrator can attach securely to the user. -

- What materials will be used for the lingerie, how will the product attach? -

Next, I will research if a moderate percentage of women feel body-conscious during intercourse or would like to wear lingerie during intercourse to justify the potential for incorporating lingerie into the product, thus ultimately heightening the woman's experience during intercourse with their partner.

Depending on whether incorporating lingerie within my project is viable and justified, research on styles, materials and prices on lingerie will be conducted

Body consciousness and incorporating lingerie into intercourse.

<https://www.psychologytoday.com/gb/blog/married-and-still-doing-it/201812/is-body-image-affecting-your-sex-life>

According to Psychology Today, the conclusion on whether body-conscious thoughts affect sex life is as follows –

If a woman feels unattractive and is body-conscious, this typically results in a lower sex drive and, during intercourse, lowers the chances of climaxing and enjoying intercourse.

A woman's mind can greatly affect the sexual experience during intercourse, and the aim of this project is to heighten this experience.

<https://vmtherapy.com/individual-sex-therapy/self-conscious-body-during-sex/>

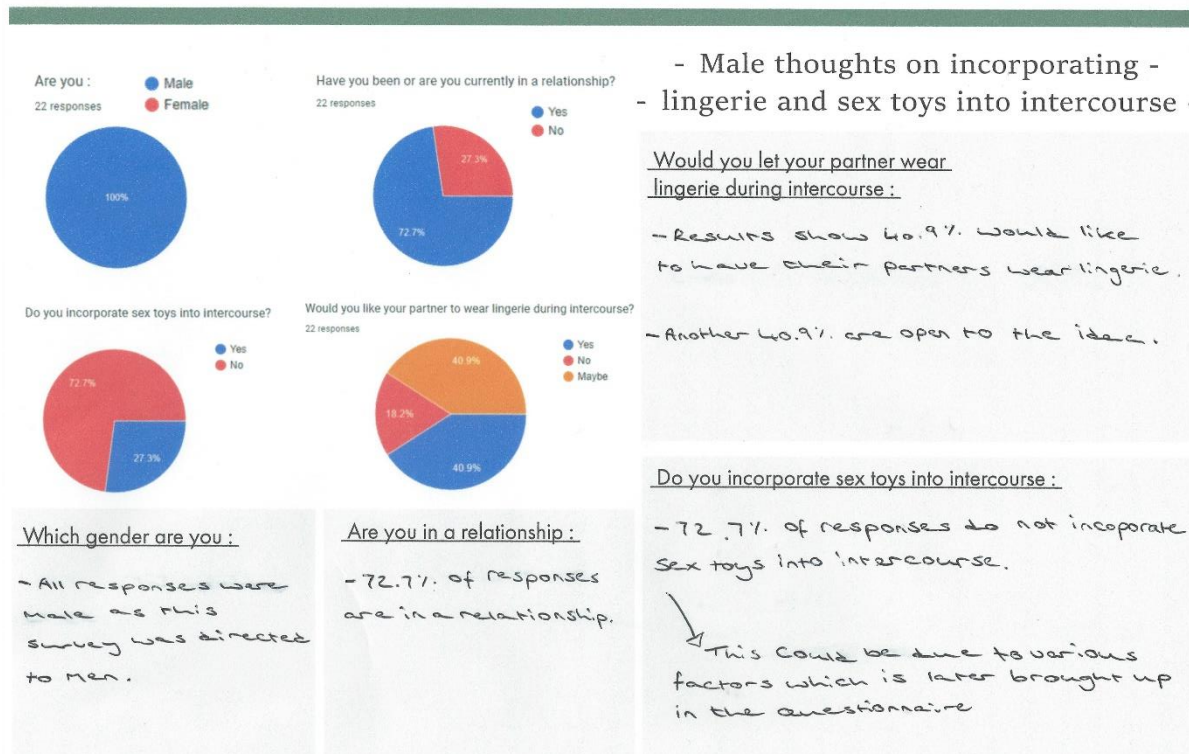
According to VMtherapy, the way you feel about your body has been proven to change your experience during intercourse. The conclusions were that the better you feel about your body, the greater the intimate experience would be.

This justifies that women can feel body conscious during intercourse and dramatically affects the experience during intercourse.

I can conclude that incorporating lingerie into my product will help to heighten the woman's experience during intercourse and boost confidence, thus making the woman feel more desirable. The use of lingerie within my project will also allow for the vibrator to be hands-free, further heightening the experience for women during intercourse with their partners.

Next, I will create a questionnaire on how men feel about incorporating sex toys and lingerie into intercourse, as this project is aimed towards heterosexual couples and depending on how their partner feels about incorporating things into intercourse can affect the sales of the product.

Questionnaire on how men feel about incorporating sex toys and lingerie during intercourse.



What are your thoughts on lingerie?

I like when my girlfriend wears it
 Certain types look good
 It looks really good on women
 It's dope !!
 Good
 Great but prefer my partner without it on
 I personally dislike it
 I like the strappy types which cover only small parts of the body
 No opinions on it
 Love it, really boosts intimate pleasure
 Its expensive
 Its alright depends what color and type
 Prefer without
 If it makes them look better its good
 When for roleplay its fantastic!!
 Not too fussed
 If it makes my partner feel good then im happy
 Pricey
 better without
 Pretty good
 If it looks good then idm
 I love it when my girlfriend wears it

- Male thoughts on incorporating -
 - lingerie and sex toys into intercourse -

What are thoughts on lingerie :

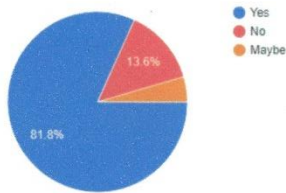
is out of 22 responses like it when their partner wears lingerie.

- other party of the products user experience like lingerie and their partner's wearing it.

- This justifies that lingerie can be incorporated into the project to heighten the women intimate experience as the majority of men don't mind or like the thought of incorporating sex toys and lingerie into intimate activities.

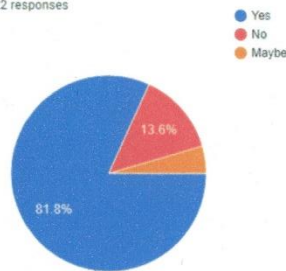
Would you allow your partner to wear crotch-less lingerie during intercourse if they are body-conscious?

22 responses



Would you incorporate sex toys into intercourse if your partner's chances of climaxing increases?

22 responses



- Male thoughts on incorporating -
- lingerie and sex toys into intercourse -

Would you allow your partner to wear lingerie :

81.8% would allow their partner's to wear crotchless lingerie during intercourse if their partner's are body-conscious.

Would you incorporate sex toys into intercourse :

~ 81.8 would incorporate sex toys during intercourse if it increases their partner's chances of climaxing.

Justification of women's partners being open to the idea.

Outcome of men's thought questionnaire

The outcome of the questionnaire on men's thoughts on incorporating vibrators and lingerie during intercourse has been bullet-pointed into the following –

- Most men do not incorporate sex toys into intercourse
- Most men are open to the idea of their partner wearing crotchless lingerie during intercourse if their partner is body-conscious
- Many men will incorporate sex toys into intercourse if it boosts their partner's chances of climaxing
- The majority of men would like their partner to wear crotchless lingerie as it would boost their sexual appeal to their partner.

This justifies that men are willing to incorporate sex toys and crotchless lingerie during intercourse if it boosts their partner's chances of climaxing and weighting the intimate pleasure experience.

Problem Statement Revised

Many women can have feelings of body consciousness and low self-esteem from social media in which women view celebrities' and model's posts where the posts have been edited, resulting in unrealistic standards which the majority of their users believe to be true.

This exposure to unrealistic body standards can result in many women feeling self-conscious during intimate activities, which can further lower the chances of women climaxing during intercourse.

Additionally, only 30-60% of women climax during heterosexual intercourse. I have identified that there is a problem during intercourse; women in heterosexual relationships can have low self-esteem and low satisfaction during intimate activities.

Since I cannot change the way, many women perceive what the perfect female body should look like, I have decided to find a different route to help boost their self-esteem by creating lingerie which can be used during intercourse in use with a hands-free vibrator that can be attached to the lingerie.

By incorporating lingerie into the product, I will further help meet the overarching theme of my project, which is to heighten the woman's chances of reaching climax during heterosexual intercourse.

What is sexy lingerie?

According to the website, seriously sensual, sexy lingerie comes in many varying styles to suit each individual woman. There are varying styles of lingerie on the market, and beneath are a few examples of different types of lingerie.



The corset



Bustier



Bra and panty set



Body Suit



Suspenders



Baby doll



Nightdress



Chemise



Camisole



Bodysuit



Brasserie



Camisole

Thoughts on this – Above are shown varying styles of lingerie, with quite a few covering a larger section of the body.

Touching and sensations boost intimate pleasure, and by narrowing down the styles to brassiere, suspenders and crotchless underwear, the experience of touch and sensation will be heightened during intimate activities whilst making the woman feel more sexually desirable. Beneath, I have looked at lingerie that features suspenders, underwear and brassieres on multiple websites to gain inspiration on how I will design my lingerie.

Lingerie Research (Narrowed)

TOMOE HARNESS BRIEF £180

high-end price range

Art Deco style features

Mesh panel

Total brief + strap cost = £324

Elastic: 88% Polyamide, 12% Elastane.
Mesh: 82% Polyamide, 18% Elastane.

Polyamide can be recycled

soft fabric with elasticity

Thoughts - simple, elegant, strappy.

BORDELLE EDEN Range

color choice compliments multiple skin tones.

for aesthetics and attachments

Hoop rings

strappy design

Elastic: 88% Polyamide, 12% Elastane.
Mesh: 82% Polyamide, 18% Elastane.

Elastane cannot be recycled

overlapping strap design

gold color accents

ART DECO MULTI-STRAP THONG £144



Bordelle Lingerie - Bondage Harness Brief
Crotchless - Cream £170.00

- Overlapping strap feature

- Sheer mesh Panels

- ties to history of underwear

- Bow feature



79% Poliamide, 21% Elastane

24 Karat gold plated details

- Entire set costs = £365

- Thin straps may dig into users skin

- Might not suit multiple skin tones

- cream + gold color scheme

- fasteners to adjust size

- Hard to recycle materials

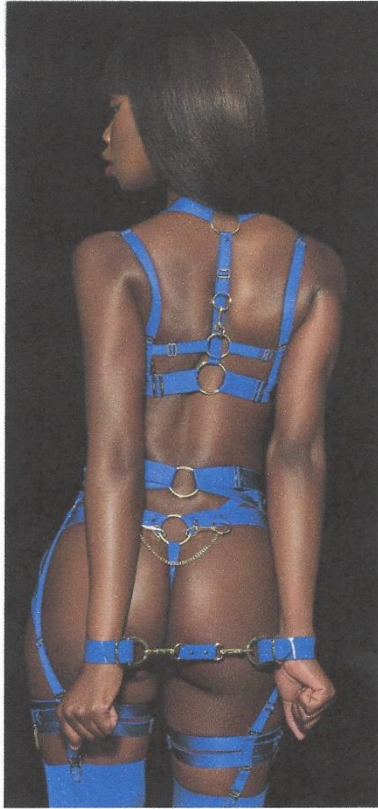


Bordelle Lingerie - Gia Shelf Bra - Cream
£195.00

24 Karat gold plated details

Powermesh fabric: 92% Poliamide, 8% Lycra
79% Poliamide, 21% Elastane





KUKURO ELECTRIC BLUE
3 PIECE LINGERIE SET
£280.00

3-piece - £280
aimed towards
high-end consumer
market.

- ring hoops for accessories to be attached
- Starts from neck to low thigh for full body effect

- gold accents are a recurring

theme



Mesh Panels
for
crotchless
effects.

- Materials were not specified

Should my lingerie
come in multiple
colours?.

- overlapping strap design

- electric blue & gold color scheme

2-tones



(Metal accents can clank
or can be cold causing
a decrease in intimate
pleasure although metal also
can be a symbol of luxury.

Multiple fasteners are
present.





Atelier Amour Douce Insomnie Triangle Bra £79

90% Polyamide, 10% Elastane

- Strappy design

Design seems cheap and tacky

- Black color scheme

- Mesh Panel

thoughts - mix and match sets may result in a uncohesive aesthetic

The design, colour and fit of the lingerie can all affect the intimate experience.

How will the lingerie fit seamlessly in varying sizes

Multiple sizes + fasteners.

Amour Diva Crotchless Seamed Nude Tights £16.40

Fabric: 80% polyamide, 10% elastane

- crotchless tights allows for a seamless fit.

- Cost efficient

- This will have to be in multiple shades to suit a variety of skin shades.

- Will this look cheap?

- Research in crotchless tights.

could fasteners be incorporated.

- how would the vibrator attach to the tights?

this looks tacky.

- also has a lingerie design printed onto the fabric





BORDELLE EDEN Range

KORA MULTI-STYLE HARNESS BRIEF

£279

Elastic: 88% Polyamide, 12% Elastane.

Wide Elastic: 66% Polyamide, 27% Polyester, 7% Elastane.

Mesh: 82% Polyamide, 18% Elastane.

This cannot be recycled and donating lingerie is frowned upon.

Bra and underwear set match.

large gold plated rings for accessories

Thoughts = A lot of lingerie incorporates straps into the design

incorporate straps into design for the vibrator to attach and fasten.



luxury price



Mesh panel

one of Bordelle's best-sellers

Elastic: 88% Polyamide, 12% Elastane.

Wide Elastic: 66% Polyamide, 27% Polyester, 7% Elastane.

Mesh: 82% Polyamide, 18% Elastane.

Quality

Total bra + harness = £735

2 color tones

£456

KORA MULTI-STYLE BODICE BRA



fasteners in multiple places for contour fit.

Zip up bra

3-piece sets most common.

mesh panel

Too many fasteners?





Miriam ECO Bra Black Regular price £36.00

Main fabric: 100% recycled polyester
Elastic: 74% polyamide, 26% elastane

BlueBella
Best Seller

Not 100% eco-friendly
Green washing.

Total price = £52.

Miriam ECO Thong Black Regular price £18.00

Main fabric: 100% recycled polyester
Elastic: 74% polyamide, 26% elastane
Gusset: 100% viscose from bamboo



Strappy design

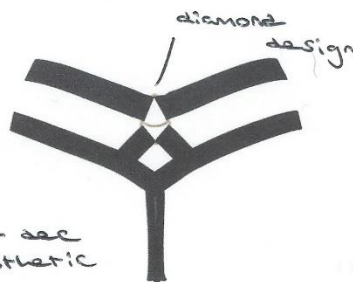
3 out of the 4
materials can be recycled.

a few fasteners allow for
a better fit.



Sheer mesh panels.

For a
seamless fit
you can tailor
or use multiple
fasteners.



diamond
design

art see
aesthetic

elastane is difficult
to recycle.

a few fasteners

Miriam Thigh Harness Black £26

74% polyamide, 26% elastane



Bold?

Color scheme
black + gold

complements multiple
color schemes

Do I want my
lingerie to be made
out of sustainable/
recyclable materials?



ends at
high
thigh
level

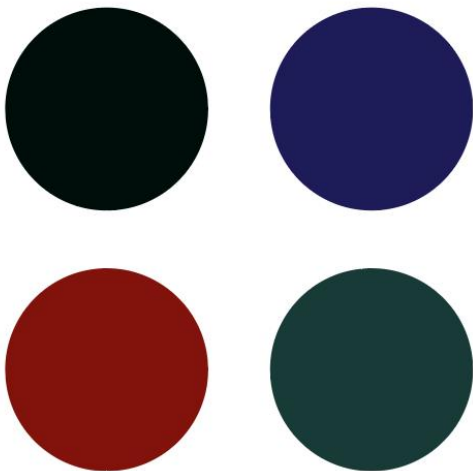
allows for
the outfit to
look like a
whole body
piece.

Outcome of Lingerie Research

By researching best-selling lingerie items on the market, a trend has been identified which can be used for inspiration that will contribute to the design of the lingerie within the project. Heightening the woman's experience is the overarching theme of this project, and the aesthetics of the lingerie can boost or decrease the overall experience of intimate pleasure.

Analysing varying lingerie on the market shows the following.

- Lingerie is targeted as a luxury garment with prices varying from £20 to £300 +.
- The majority of lingerie has one leading colour choice with an accent colour featured in straps, rings and fasteners.
- The use of fasteners allows for a seamless body fit as clothes sizes vary greatly and will not.
- fit everyone perfectly unless the lingerie was tailored.
- The feature of overlaying strap designs in lingerie is a popular trend and results in best-selling pieces currently.
- Many lingerie garments feature Polyamide and elastane, which can be challenging to recycle.
- Bold colours such as blue, red, green and black are typically used, which result in a high sell rate.



From looking at best-selling lingerie from varying companies, I have decided to design an art deco lingerie style which includes a brassiere, crotchless underwear and a harness. I have chosen this as too much fabric, such as a bodysuit, which can take away from the sensations of touch during intimate activities.

What is considered art deco in fashion and lingerie?

According to <https://www.merriam-webster.com/dictionary/art%20deco> the definition of, art deco is a popular design style of the 1920s and 1930s characterised especially by bold outlines, geometric and zigzag forms and the use of new materials (such as plastic).

I will change the materials typically used in Art Deco fashion for a more sustainable alternative which will be researched further throughout this portfolio.

The design styling will be a revamped Art Deco style, with the lingerie featuring strong geometric shapes and zigzag forms. This style is popular with popular lingerie designs today.

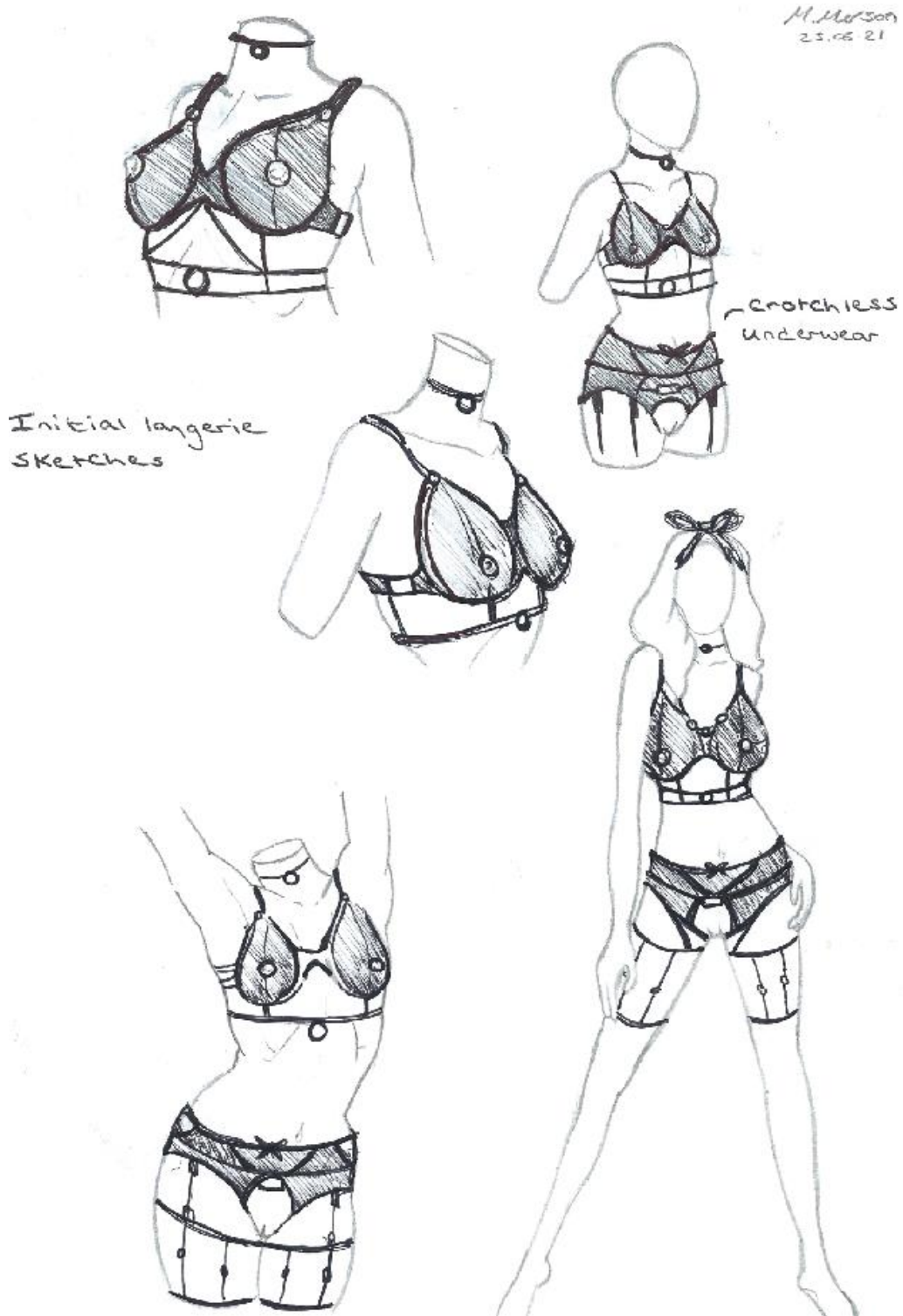
A thought on why Art Deco-styled lingerie is currently popular: Art Deco is known for strong geometric shapes and zig zag forms that can contour the body for a slimming appearance. Also, Art Deco typically follows symmetric patterns, increasing the aesthetic quality of lingerie and the user wearing the lingerie.

I aim to design the lingerie to hold a vibrator during intercourse for the product to be hands-free. I also aim to create an aesthetically pleasing lingerie set which can contour to the body with relative ease for a tailored effect.

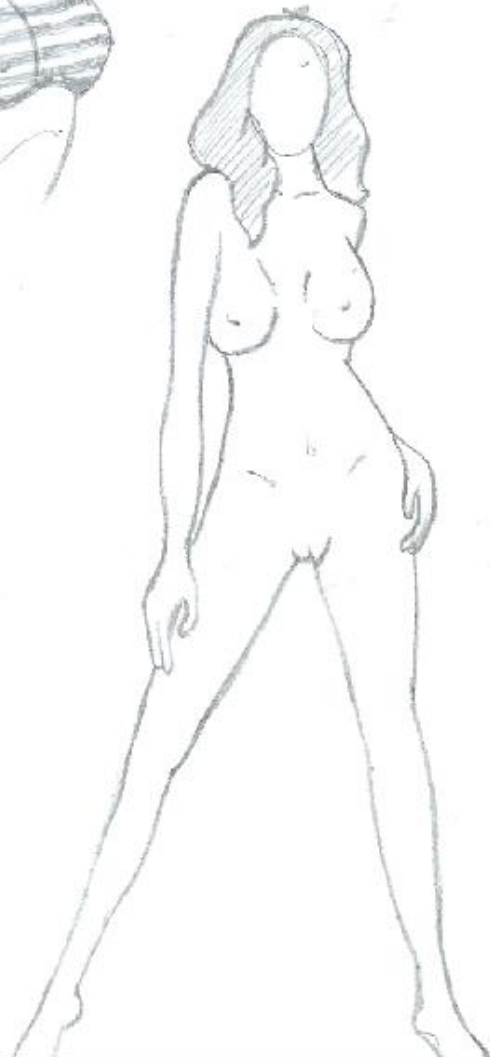
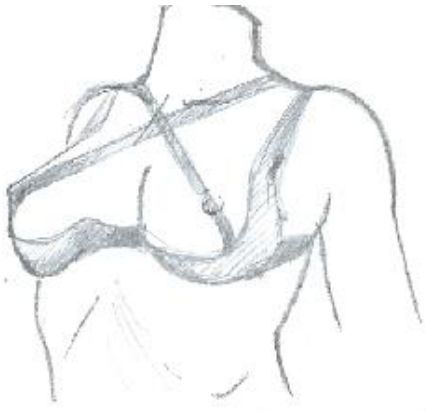
Design styling aims for the lingerie are as follows:

- An aesthetic design.
- Easy to alter for a seamless fit (fasteners?)
- One primary colour with one complimentary colour.
- Sustainable materials which are recycled or can be recycled.
- Bold colours.
- Crotchless design for use during intercourse

Design styling of Lingerie



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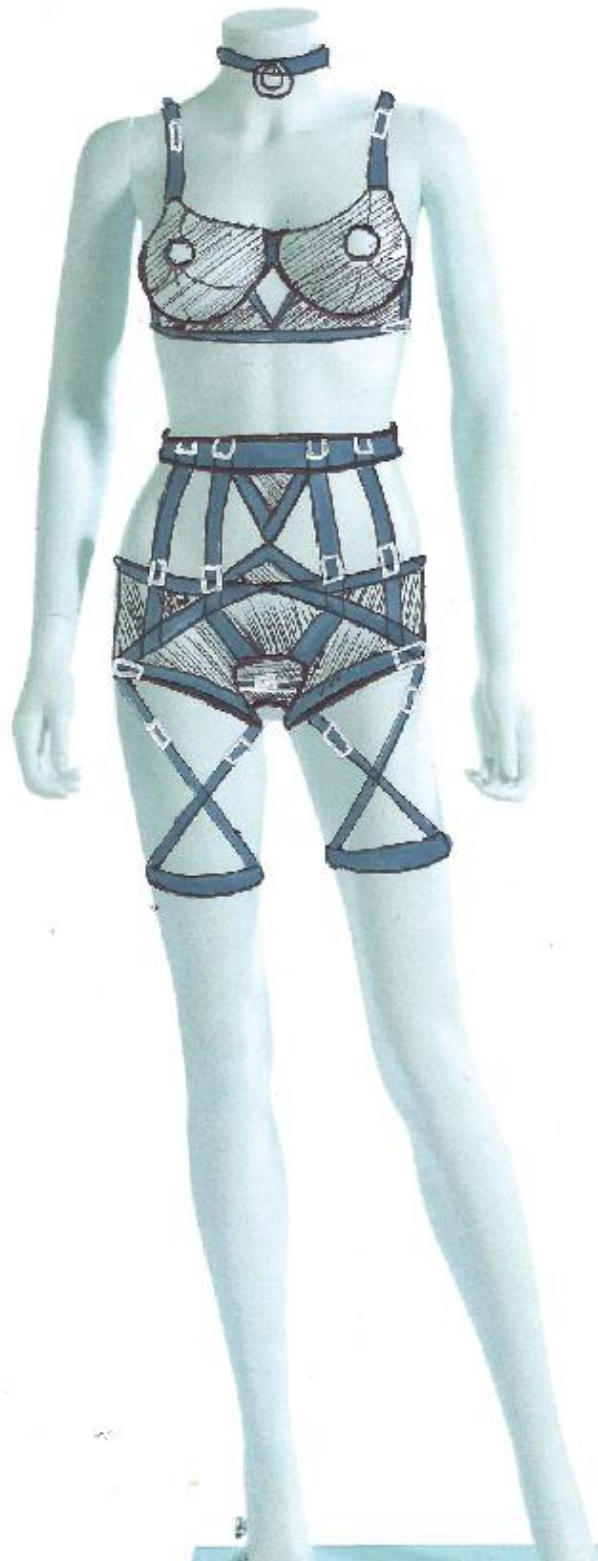
- Initial lingerie design -

Key:

Mesh

Fabric

Fasteners



- Initial lingerie design -



- Initial lingerie design -





- Initial lingerie design -





- Initial lingerie design -



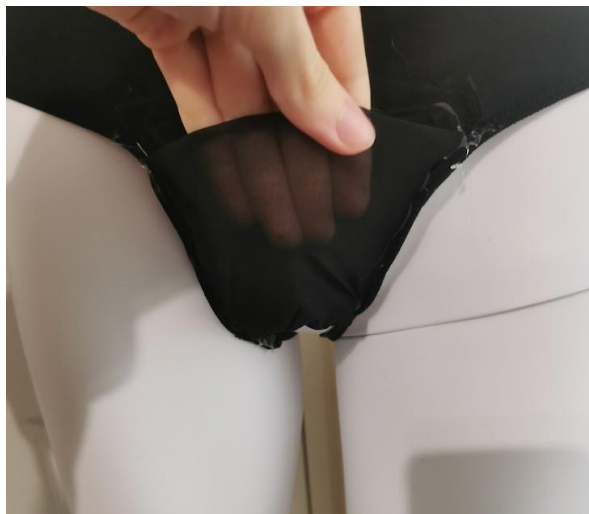
Rough Prototype of lingerie with vibrating Pouch

After sketching varying types of crotchless lingerie, I decided to create a quick prototype of how the vibrator could be held, allowing for the product to be hands-free.

Beneath is shown the process of making the quick prototype to gain a deeper understanding of how the lingerie could keep in place the vibrator on the mons pubis and extend to the visible clitoris of the female genitalia.



As shown above, the first three steps of creating crotchless underwear with a vibrating pouch. I first cut out the mid-section of the underwear and then took the scrap fabric to create the back of the pouch for the vibrator to be held in place.



I then took a mesh fabric and attached it to the front of the underwear to create a pouch. After this, I added a hole for the neck of the product to go through, which would allow the vibrator to stimulate the female genitalia.

The form of the vibrator will allow for the product to fit snugly in the pouch of the crotchless lingerie. This will allow for the main body not to move around so freely.

Also, by adding fasteners to the front of the pouch, the user can adjust how tightly they want to product to be pressed against their genitalia, allowing for stronger vibrations.



Here is the pouch finished with a vibrator placed in it. Here you can see that the form of the product will greatly affect its function and aesthetic qualities of the product. When designing the vibrator's form, the dimensions should relate to the ergonomic research and pouch dimensions allowing for a form-fitting product.

Outcome of Initial Prototype

From reviewing the rough prototype created, the following notes will be taken. This will allow for my three project aims to be refined directions which can then be tested and analysed. Further adjustments will then be made during the manufacturing of the product if needed.

- The vibrator form should fit snugly in the pouch and be designed to the ergonomics of the female genitalia researched.
- A fastener will be added for a form-fitting experience, also allowing the user to adjust how tightly they want the vibrator to be pressed against their genitalia.

- By adding a hole to the pouch, the neck or secondary form of the vibrator can be placed to the user's visible clitoral area allowing for adjustable placement resulting in stimulation.

Different Options of how the Vibrator Could Attach to the Lingerie

When reviewing the prototype made with the fabric pouch, I realised that there could be a more efficient method of the vibrator being hands-free whilst still being incorporated with the lingerie.

I will now research possible ideas for the vibrator to be held in place whilst still being incorporated with the lingerie.

Apple Tag Silicone Holder Option



Researching has led me to be inspired by the apple tag silicone holder. Shown in the picture located to the left is a silicone sleeve where the apple tag can be placed into.

This allows for the product to be in place securely and can be removed with ease.



Here is another design for the apple tag silicone holder with two holders placed on either side. This design of the holder attaches to pet collars which is a similar form to underwear with the strap design.

Note to Self Will the silicone holder option be comfortable and aesthetically pleasing? Can the material be placed overtop, allowing for comfort and a more aesthetic look whilst still being a snug fit for the product?



Here is an apple tag holder where fabric is used.

From research conducted, this option is made purely from leather rather than having a silicone base and then being covered in fabric.

My thoughts from this are that if a silicone base could be manufactured with a fabric covering, this securing option could be a more efficient method than the fabric pouch previously prototyped.

My takings from this – Looking into a silicone holder option has allowed my design thinking process to evolve with ideas of a silicone sleeve for the vibrator to fit securely into with a fabric coating to make the lingerie more aesthetically pleasing.

Fabric Pouch Option



underwear with built-in punches has been designed previously to hold vibrators in. Typically, these underwear options are not crotchless.

The underwear fabric can be stretched out, making the vibrator to be held loosely within the pouch resulting in an inefficient product.

This option is very aesthetically pleasing but not as effective when compared to the apple tag silicone holder option.

Another product that has been designed is the Venus butterfly hands-free vibrator made by Love honey. The vibrator attaching mechanism is very efficient but, in my opinion, is not aesthetically pleasing.



Located to the left is the Venus butterfly hands-free vibrator. Here the vibrator has to be attached to a secondary button to allow the vibrator to function, which can interfere during intercourse.

The way the vibrator attaches to straps placed around the legs is very efficient and aesthetically pleasing.

If the strap design was altered so the vibrator could fit snugly with the silicone apple tag holding option, would this be an efficient design?

My takings from this – From researching the Venus butterfly hands-free vibrator, the research has taken away the strap design that replaces the need for underwear which could be translated into my design directions potentially.

If the strap design element and the apple tag holder element were combined and designed to hold the vibrator, which does not require a hand-held power module, would this be a successful product?

Silicone Clip Option



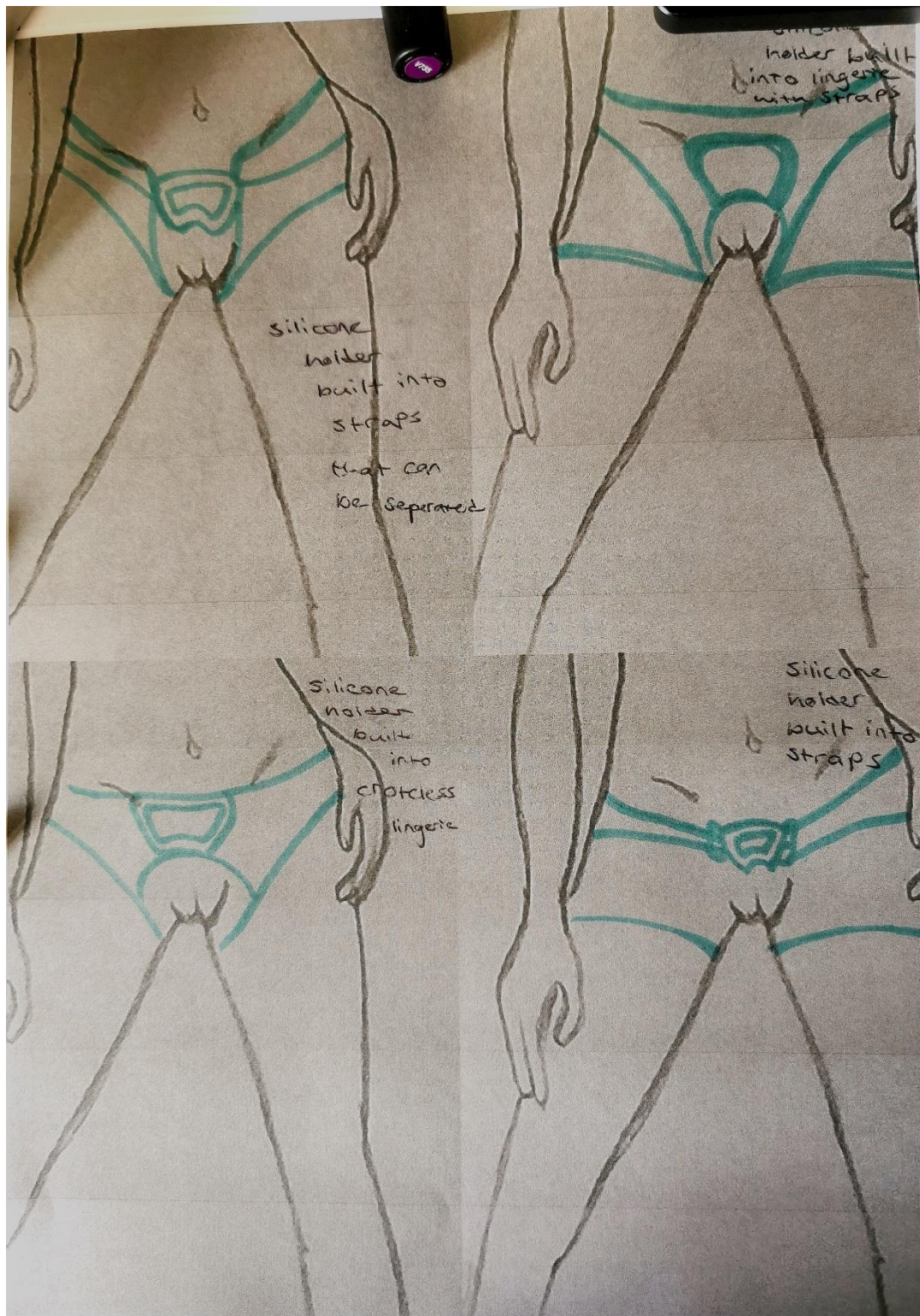
Here is a jet clip for securing garments. Typically made from ABS plastic, this clip option could be useful for attaching the vibrator to the lingerie.

Suppose this clip design could be redesigned with the incorporation of the apple tag holder and strap design from the Venus butterfly hands-free product. Could the vibrator be attached to the lingerie in an efficient and aesthetically pleasing way?

My takings from this - The form of this clip could be designed into the vibrator allowing for the product to clip onto the lingerie and also to be used without the lingerie in a different form where the two prongs could be placed around the visible clitoris of the female genitalia to create subtle but rapid vibrations. This reminds me of the Lelo Dot vibrator and how the form is rounded and has a curved point where the user can have pinpoint stimulation or a general vibration around the female genitalia.

note to self if the jet securing clip was designed into the vibrator, the amount of securing clips required would need to be 2-4 clips which could take away from the product. If one jet clip was designed into the vibrator, the product could be used similarly to the Lelo Dot, but if 4 clips are designed, this could make the product difficult to use and take away from the product's overarching purpose.

Initial Sketches of vibrator with Research Options Incorporated



What I've learnt from researching different vibrator attachment methods to lingerie-

From researching different attachment methods, I have discovered that by using an attachment method similar to the apple tag silicone holder that the attachment component can be also used for Kinbaku/ Shibari, which is used for rope tying.

This is a sustainable option once the lingerie has worn down or the user cannot use the garment anymore.

This also increases the demographic of the product.

Examples of Kinbaku/Shibari





Shown above is Shibari/ Kinbaku. This is a style of lingerie which is used during foreplay and intercourse.

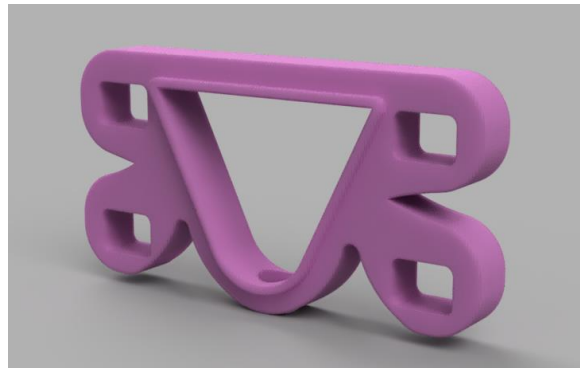
Thoughts regarding this option for the holding attachment to be placed to –

- Can be minimal and aesthetically pleasing.
- More sustainable than other material options used for lingerie.
- Can be designed with clips, so the user doesn't spend a long amount of time applying.
- Might be cheaper to manufacture.

When reviewing the research of Shibari / Kinbaku, I believe this lingerie option could be an innovative design method which is sustainable and more cost-efficient.

Rough Prototype of Attachment Component with Shibari Lingerie

Here I made a rough component of how a vibrator could be attached to the lingerie with a snug fit. This component also allows the user to use the component/product with Shibari Lingerie.



Here is a rough component I designed which can be attached to lingerie through clips and tied to Shibari lingerie.

This component and method of attaching the product to lingerie are quite unique, in my opinion. When used with Shibari, lingerie is a more sustainable and cost-effective option when compared to standard lingerie material and pricing.

I believe this will be a viable design option to continue throughout the design process of the project.

Product Specification Collated Information

Beneath is listed the gathered product specification throughout this research pack –

Beneath are listed the dimensions which I will use as a starting point for my product's dimensions.

- Pubic hairline to cleft - 80mm
- Length of side pubic hairline to cleft – 130mm – 140mm
- Length of base mons pubis – 160mm – 180mm
- Length of vaginal canal – 88.9 -22.8>mm
- Diameter of vaginal canal – 25.0 – 76.2>mm

Beneath are the vibrator specifications -

- Must be Waterproof (IPX7 Minimum)
- Must use Body-safe or medical-grade silicone (Platinum grade)
- Use ABS plastic features or internal shell to contain electrical components
- Must Weigh below 175grams
- Have a maximum charging time of 2 hours
- Have a minimum use time of 45 minutes
- Have a maximum frequency of 85 DB and 133Hz
- Have at least one button for product operation
- Must have a PLC of at least 90 days.

Beneath is the legislation specification –

- ISO 3533:2021

Beneath is the Electrical component required specification –

- Brushless outrunner DC motor
- Pogo Pin Magnetic Charging Module
- LED's
- ESC (Electronic Speed Control) Module
- Seed Studio XIAO SAMD21 Circuit Board
- Tactile Button Module
- 2-cell Lithium-Ion Battery
- Wires

Beneath are listed the materials required for the Vibrator and Silicone components –

- 35A platinum-grade silicone (3.5mm)
- Safe for human nontoxic silicone pigment dye
- ABS Plastic (3.5mm)
- 40 A platinum-grade silicone (for attachment component)

Beneath is listed the specification of manufacturing methods for this project.

Manufacturing Methods

All the research collated so far has given me the different manufacturing methods to produce the vibrator, lingerie, and holder for the vibrator.

These manufacturing methods have been researched previously within this developmental pack, and this is all the manufacturing methods collected into one section.

Beneath are listed the manufacturing methods that will be used for each component along with the material.

Manufacturing methods for the vibrator –

- ABS plastic shell – Injection Moulding
- 35A medical grade Silicone Sleeve, holder for the vibrator – Mould in casting (ABS shell will be suspended with pins inside the mould before silicone pouring)

The electronics assembly of the vibrator will be soldered by hand and fitted into the ABS shell by hand. This will ensure that the electronics are fitted correctly. The wires will be attached to the ABS shell with an adhesive to make sure the wires do not interfere with any other electronic components.

The circuit board will be programmed to set the vibration modes and power on/off operation.

Manufacturing methods for Lingerie / Shibari

- Fabric (Polyamide, Bamboo Viscose, Recycled Polyester) - Sewing pattern cutting machine (CNC) (fabric lingerie)
- Fabric – 100% cotton (Shibari Lingerie)

The assembly of Lingerie will be sewn using sewing machines operated by people to ensure the quality of the Lingerie is high.

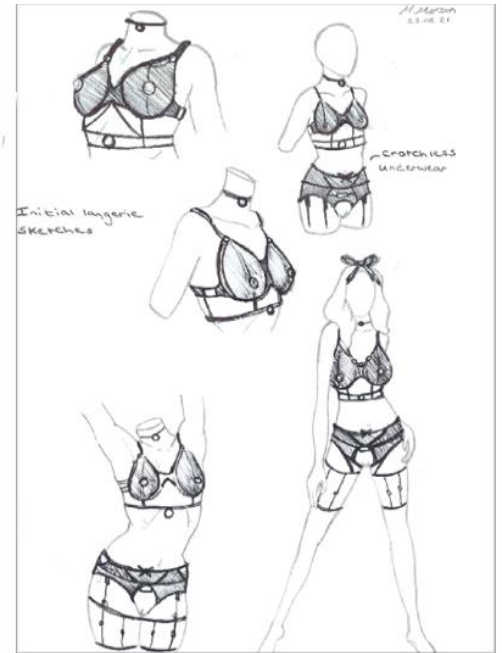
Three Design Directions

The research conducted throughout this pack has led me to three design directions. The manufacturing methods and components of the vibrator have not changed in each design direction, but the form has.

Also, the attachment component for the vibrator to lingerie differs in the design directions along with the lingerie.

The product's aim is to create a vibrator which will be attached to a crotchless lingerie set so heterosexual couples during intercourse can have a heightened experience where the female can be able to go in a variety of positions with their partner without placing strain and discomfort on their hand. By making a hands-free vibrator, the experience of intimate pleasure will be heightened, which in turn can increase the chances of the woman climaxing during intercourse.

Design Direction One –



This consists of two main components, the first component of this is a crotchless lingerie set made from Polyamide, Bamboo Viscose, and Recycled Polyester.

This Lingerie set is designed with new-age art deco design styling in black fabric with gold accents for the fasteners of the lingerie. The lingerie is designed to be crotchless with a mesh fabric pouch to store the vibrator in during intercourse.

The second component of this direction is the vibrator. Which features a ribbed tip for clitoral stimulation. The vibrator is designed to be used during intercourse and for self-pleasure, with the main body of the vibrator also being ribbed, which can be placed on top of the clitoris and the tip, which can be insertable for internal stimulation.

The advantages and disadvantages of this design direction are as follows –

Advantages –

- Can be used internally and externally
- Is aesthetically pleasing
- Ease of use
- Ribbed design feature
- Lingerie is easy to put on

Disadvantages –

- Loose securing method for the vibrator to lingerie attachment
- Lingerie will need to be washed by washing machine after intercourse
- The Lingerie will have a shorter PLC compared to the vibrator
- The vibrator can only be used with the specified, designed lingerie set
- Not as sustainable compared to design direction two

This design direction is not as innovative as design direction two, in my opinion, as products with mesh pouches have been previously designed.

This design direction has a few advantages with aesthetically pleasing qualities which can boost women's self-esteem during intercourse.

I believe this could be a good design direction to take forward and further refine.

Design direction Two -

Design

Direction Two



As shown above, this is design direction two.

This consists of three main components; The components are the following –

- Vibrator
- Shibari Lingerie
- Silicone attachment component

The lingerie is designed based on the Shibari rope-tying lingerie style. This lingerie is made from 100% cotton, which is far more sustainable when compared to the design direction one.

The lingerie can be altered, and the styling can vary depending on the application method allowing for a versatile lingerie option. However, this is much more time-consuming to apply compared to design direction one.

This lingerie option is not commonly available on the market and is a more innovative and sustainable option compared to conventional Lingerie on the market. I believe this lingerie option can be very aesthetically pleasing, and the design could be refined further for the user to apply the lingerie with ease easily.

This lingerie option is also much more cost-efficient when compared to design direction one.

The second component of this design direction is the Silicone attachment which joins the lingerie to the vibrator. This is an innovative option which securely stores the vibrator with ease. This component will be made from 40A shore platinum-grade silicone.

This component can be disconnected and washed under a tap after use allowing the aftercare of the component to be more efficient than the lingerie option of design direction one.

This component is further refined and could attach to both Shibari lingerie and conventional crotchless lingerie.

The vibrator component of this design direction features two main stimulation forms. The neck allows for clitoral stimulation during intercourse with ribbed design styling, and the second form is two prongs which can be used during self-pleasure and vibrate around the visible clitoris area.

When used for self-pleasure, this vibrator can be insertable and still allow for direct clitoral stimulation with the two design forms.

The advantages and disadvantages of this design direction are as follows –

Advantages –

- Ease of Use
- Easy to clean
- Aesthetically pleasing
- Innovative
- Ribbed
- More sustainable compared to design direction one
- More cost efficient
- Insertable and external stimulation
- Can be used on Shibari and conventional crotchless lingerie (adaptable)

Disadvantages –

- Currently is time-consuming to put the Shibari on
- Not the industry standard design of lingerie
- The silicone component may be not as aesthetically pleasing compared to conventional lingerie.

This design direction has the most potential to continue throughout development and manufacturing.

Design direction Three-

Design

Direction Three



As shown above, this is design direction three.

This consists of three main components; The components are the following –

- Vibrator
- Lingerie
- Silicone attachment component

This consists of three main components, the first component of this is a crotchless lingerie set made from Polyamide, Bamboo Viscose, and Recycled Polyester.

This Lingerie set is designed to have soft pastel design details in a soft teal colour with gold accents for the fasteners of the lingerie. The lingerie is designed to be crotchless with the silicone component attachment to place the vibrator in securely.

The second component of this direction is the vibrator. Which features a ribbed tip for clitoral stimulation. The vibrator is designed to be used during intercourse and for self-pleasure, with the main body of the vibrator also being ribbed, which can be placed on top of the clitoris and the tip, which can be insertable for internal stimulation.

The vibrator component of this design direction features two main stimulation forms. The neck allows for clitoral stimulation during intercourse with ribbed design styling, and the second form can be used during self-pleasure and vibrate around the visible clitoris area.

When used for self-pleasure, this vibrator can be insertable and still allow for direct clitoral stimulation with the two design forms.

The third component of this design direction is the Silicone attachment which joins the lingerie to the vibrator. This is an innovative option which securely stores the vibrator with ease. This component will be made from 40A shore platinum-grade silicone.

This component can be disconnected and washed under a tap after use allowing the aftercare of the component to be more efficient than the lingerie option of design direction one.

This design direction takes inspiration from the first and second design directions and merges the two together.

The advantages and disadvantages of this design direction are as follows –

Advantages –

- Ease of use
- Easy to clean
- Aesthetically Pleasing
- Innovative

- Ribbed
- Insertable and external stimulation
- Lingerie is easy to put on
- Vibrator is attached snugly to the lingerie

Disadvantages –

- The silicone component may be not as aesthetically pleasing compared to conventional lingerie.
- The Lingerie will have a shorter PLC compared to the vibrator and silicone attachment component
- Not as sustainable compared to design direction two