











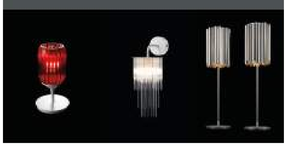
inspiration board

LED light project november 2015

Kirsten Mason
PRODUCT DESIGN

benjamin hubert

tom kirk



ingo maurer

LSA glass

inspiration board

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Kirsten Mason
PRODUCT DESIGN

Ryan

- Male
- Aged 7
- Interests:
  - Playing with his toys
  - Watching television
  - Football
  - Science

Key Needs & Objectives

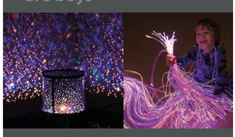
People with autism find it difficult to process everyday sensory information and so my light needs to stimulate senses

Those who struggle with this information can become stressed or anxious and so my idea needs to calm the user

As supporting a child with autism causes financial strain the product needs to be fairly inexpensive

i'm One of 700,000 people in the United Kingdom on the autism spectrum.

75% of diagnosed children are boys



> 1 in 100 in the population

Ryan was diagnosed with ASD at the age of 2 after his parents noticed changes in his behaviour. Since then he has been receiving all sorts of treatments. Studies show:
'A stable, structured evironment rich in stimuli could help children with autism, by providing a safe haven from an overload of sensory and emotional stimuli. In contrast, an environment with many unpredictable, changing stimuli could make their symptoms worse, raising anxiety and fear and making these children retract into a bubble.' says Kamile Markram.
However, many pieces of this equipment can be expensive and with financial strain already on the family from treatments it can be extremely hard on the family.

Autism is four times more common in boys than girls. Only one in five children diagnosed with Autism is female.

user persona

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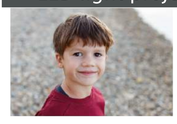

autistic people find sensory information difficult to process

lighting stimulates these senses

when they struggle they become stressed/anxious

by interacting with my light the user will be calmed

Having a controllable light with a remote will allow the user to interact whenever they wish . All people with autism are different and so being able to adjust the brightness and the colour of the light will mean the light is personal to each user.

The squeezable part allows the user to interact and enables them to control and calm themselves. Also by using a phosphorescent pigment this part will glow in the dark helping the child to get to sleep, the light will fade as not to keep the child up.

interacting with the light

user interaction

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PRODUCT DESIGN

what is phosphorescence?

- effect in which chemicals re-emit light they absorb
- recharged when exposed to light
- may store light for several
- trap electrons in a high state of movement
- when light comes in contact with material light photons/energy is transferred
- relatively inexpensive
- forms: powder, gel, liquid or gas
- can be mixed with paints, candle wax, glue and plastics
- pigment is mixed into medium and applied to surface
- e.g. copper-activated zinc sulphide used in novelty toys
- e.g. strontium aluminate used in safety signs
- may store light for several

existing products

Low Density Polyethylene

- comparable to HDPE in compostion
- more transluscent
- less rigid and chemically resistant
- softer material
- can be used for squeezy plastic bottles and flexible applications
- more expensive than HDPE
- commonly recycled

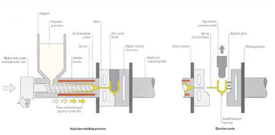
technology scenario

LED light project november 2015

Kirsten Mason
PRODUCT DESIGN

injection moulding

- rapid production identical parts
- good with tight tolerances
- accurate tools and high pressure are essential for excellent surface finish
- cycle time varies depending on size and time for polymer to resolidify
- clamping pressure is maintained to minimize warpage/shrinkage
- tools are generally aluminium or tool steel
- good heat dispersal within tool is essential for steady flow of polymer
- cycle is usually between 30-60 senconds
- least expensive tooling consists of two halves
- this process is used for a diverse number of everyday products



- examples- shopping baskets, stationary, garden furniture, keypads etc.
- almost all thermoplastics materials can be injection moulded
- pigments can be added
- examples- thermochromatic, phosphorescent and regular colour ranges
- inserts and snap-fits can be moulded for assembly
- draft angles are necessary to decrease stress in corners
- thermoplastic can be directly recycled
- commonly mass produced short term products
- snapfits and fasterners make more convenient to disassemble
- therefore disposing of part with minimal environment impact

Costs	Typical Applications	Suitability
• Very high tooling costs but depends on complexity and number of cavities • Very low unit costs	• Automotive • Consumer electronics and appliances • Industrial and household products	• High volume mass production
Quality	**Related Processes**	**Speed**
• Very high surface finish • Highly repeatable process	• Reaction injection moulding • Thermoforming • Vacuum casting	• Injection cycle time is generally between 30 and 60 seconds

technology scenario

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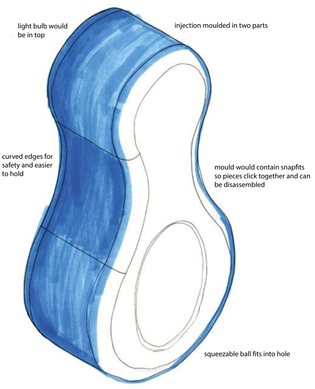
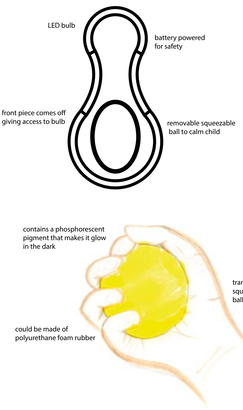
PRODUCT DESIGN





ideation board

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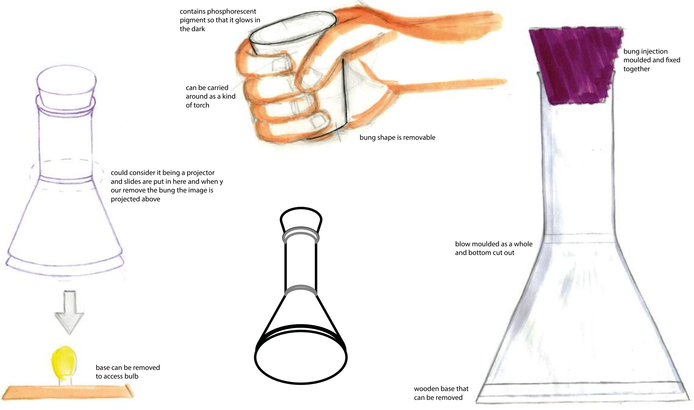
PRODUCT DESIGN



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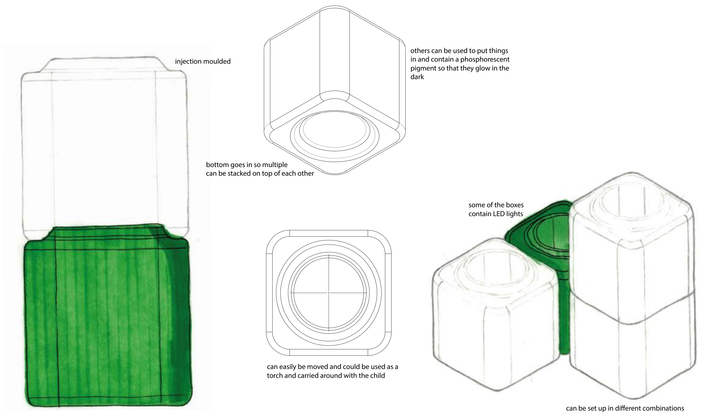

ideation board

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PRODUCT DESIGN

Idea	Aesthetics	Feasibility	Ease of Use	Ability for further development	Stimulation of senses	Sustainability	Total
	2	2	2	2	2	2	12
	1	3	2	1	2	2	11
	2	3	2	2	2	2	13

Key:
- Very good- 3
- Good- 2
- OK- 1

The totals are close as each design scores differently on different areas. However I have decided to continue with the third design, which I will develop to try and improve some of these areas.

Areas to develop:
- could try and include more senses
- think about the materials

evaluation matrix

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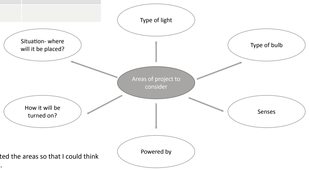
PRODUCT DESIGN

Redefining the problem

- **Problem: sensory lighting for people with autism**
- To improve the life of people with autism through designing a light which stimulates the body to act as a result of the stimulus.

Areas	Ideas Selection				
Type of light	Bedside light	Lamp	Torch		
Type of bulb	LED's	CFL			
Senses	Visual	Auditory	Tactile		
Powered by	Sun/Solar	Mains electricity	Battery	Water	
How will it be turned on?	Switch	Remote	Touch sensor		
Situation	Bedside	Desk			

I completed a range of mind maps of the areas specified in the table above, doing this allowed me to look at different criteria that I would consider when designing ideas. I am able to pick an option from each area which will give me a range of designs that I can develop.



I started with a mind map of the areas I needed to consider and from here I seperated the areas so that I could think about the positive/negative aspects in relation to the reason I am desiging the light.

research
LED light project november 2015

Kirsten Mason
PRODUCT DESIGN

The 16-year-old from Wirral has been using the app Brain In Hand, to plan daily activities, including coping logging her stress levels according to a traffic-light system. Pressing the red button puts Bethan through to her support worker to get immediate advice and reassurance.

Kate says: *"Bethan struggled with stress and getting from A to B, for a long time. Since she got the app, she managed to sit her GCSEs and is managing life in a completely new college environment, without her mum taking her to the school gates."*

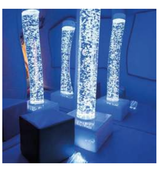
Manchester-based lighting company Valuelights, part of the LSE Retail Group founded in 2011, recently ran a competition to raise awareness of how LED sensory mood lighting can have a positive, calming effect on children with autism. Research has brought to the public's attention numerous positive associations between colour and mood. Harsh lighting, flickering and humming lights can be very distracting and sometimes painful, so it's advised to use adjustable lighting.
https://www.autismparentingmagazine.com/sensory-mood-lighting-can-help-calm-and-soothe/

Biometric wristbands now being developed in the US short-circuit communication difficulties by recording an autistic person's heart rate, sweating, temperature and other stress responses in real time. These readings, combined with information from cameras, can act as a "window into the body" of an autistic person, to enable the identification and modification of problem areas. The bands are expected to be available commercially within three years.
http://www.theguardian.com/social-care-network/2015/oct/01/assistive-technology-autism-autech-biometric-wrist-bands

Sensory lights & autism, Technology, 2015

MEDIATE lighting- Child enters the black space where the lighting is low but colourful. When the child steps on the sensors the sound of a footstep, amplified, reverberates around the space. A series of cameras project a silhouette of the child on to the screens and as the child moves closer the image gets bigger. If the child touches the screen, it will react in different ways making bursts of colour or rippling shapes because of other cameras. Some children have been so fascinated by the environment that they have been reluctant to leave and anecdotal reports suggest that many leave the space feeling calmer.
http://www.culture24.org.uk/science-and-nature/technology/art20255

Winner Simon Knuckley said *"The lights are absolutely fantastic. As soon as the bubble lamp arrived my son was taken with the warm glow... The noise of the machine makes him hum along and when the light blue LED light comes on he smiles and giggles." "Ensuring Kian's sensory needs are met is so vital. It's great that he can get happiness simply through lighting!"*



research- PESTEL
LED light project november 2015

Kirsten Mason
PRODUCT DESIGN

A new study shows that social and sensory overstimulation drives autistic behaviours. The study offers new hope with therapeutic emphasis on paced and non-surprising environments tailored to the individual's sensitivity.
Autistic brains may be hyper-functional and thus require enriched environments that are non-surprising, structured, safe, and tailored to a particular individual's sensitivity.

"A stable, structured environment rich in stimuli could help children with autism, by providing a safe haven from an overload of sensory and emotional stimuli. In contrast, an environment with many unpredictable, changing stimuli could make their symptoms worse, raising anxiety and fear and making these children retract into a bubble,"
says Kamila Markram.
http://www.sciencedaily.com/releases/2015/06/150602164024.htm

Sensory rooms offer untold opportunities for stimulation, communication and social interaction.
A range of equipment and techniques can be used to provide different types of stimuli, for example:

- visual input (sight)
- auditory input (sound)
- tactile input (touch)
- olfactory input (smell)
- proprioceptive input – vibrating surfaces

Most young people with autism experience difficulties with communication and social interaction, whether they communicate through verbal language or by other means. For these children, sensory items and activities are highly motivating and therefore create useful opportunities for them to initiate and take part in communication. Sensory products encourage communication through the use of facial expressions, eye gaze, vocalisations, gesture, body movements, pointing and speech.
https://senmagazine.co.uk/articles/articles/senarticles/feeding-the-senses

Sensory lights & Autism, Social, 2015

Gross and/or fine motor coordination problems are also common when these three systems are dysfunctional and may result in speech/language delays and in academic under-achievement. Behaviourally, the child may become impulsive, easily distractible, and show a general lack of planning. Some children may also have difficulty adjusting to new situations and may react with frustration, aggression, or withdrawal.

Evaluation and treatment of basic sensory integrative processes is performed by occupational therapists and/or physical therapists. The therapist's general goals are:
(1) to provide the child with sensory information which helps organize the central nervous system,
(2) to assist the child in inhibiting and/or modulating sensory information, and
(3) to assist the child in processing a more organized response to sensory stimuli.
http://www.autism.com/symptoms_sensory_overview

research- PESTEL
LED light project november 2015

Kirsten Mason
PRODUCT DESIGN

- The total costs per year for children with ASD in the USA were estimated to be between $11.5 billion - $60.9 billion. This significant economic burden represents a variety of direct and in-direct costs, from medical care to special education to lost parental productivity.
- On average, medical expenditures for children and adolescents with ASD were 4.1–6.2 times greater than for those without ASD. Differences in median expenditures ranged from $2,240 to $3,360 per year with median expenditures 8.4–9.5 times greater.
- In 2005, the average annual medical costs children with ASD were $10,709 per child, which was about six times higher than costs for children without ASD ($1,812).
- In addition to medical costs, intensive behavioural interventions for children with ASD cost $40,000 to $60,000 per child per year.

http://www.cdc.gov/ncbddd/autism/data.html

Autism, Economical, 2015

Today's economy is rough on families around the country, but there are some who are impacted more than others. Having a child with autism is an emotional, physical, and fiscal feat. Parents of autistic children have additional expenditures that can turn a middle-income family into a low-income family in a matter of months.

The severe financial strain associated with the diagnosis does not help the fact that the families with autistic children generally earn 28% less than families with non-autistic children.
Typical costs include:
Loss of one parent's income
Specialty schooling
Special activities
Special equipment
Lacking health coverage
http://www.myasdf.org/site/media-center/articles/the-financial-impact-of-an-autism-diagnosis/

- 35% of young adults (ages 19-23) with autism have not had a job or received postgraduate education after leaving high school
- It costs more than $8,600 extra per year to educate a student with autism.
- In June 2014, only 19.3% of people with disabilities in the U.S. were working or seeking work.
- Of those, 12.9% were unemployed, meaning only 16.8% of the population with disabilities was employed.

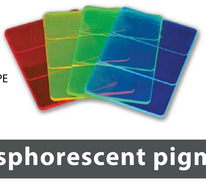
http://www.autism-society.org/what-is/facts-and-statistics/

research- PESTEL
LED light project november 2015

Kirsten Mason
PRODUCT DESIGN

RTP company

I needed to research further into phosphoresence and doing so I found RTP Company. This companyoffers various phosphorescent compounds for polymers. The company utilizes a class of phosphorescent pigment based on strontium oxide aluminate chemistry.



This phosphorescent pigment will be added to LDPE and then injection moulded to create the bung shaped piece of my light.

phosphorescent pigment

- after glow period is up to 10x longer than ZnS based pigments
- free of hazardous substances
- increases in luminescence/afterglow with longer activation time
- RTP offers a variety of colours
- examples violet, white, yellow etc.
- the pigments are chemically inert
- environmentally safe
- glow time varies up to 12 hours depending on environment/application

research
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PRODUCT DESIGN








ideation board

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PRODUCT DESIGN

3 different sized models to find a good size
- 1st = 19cm
- 2nd = 26cm
- 3rd = 30cm

The total height of my product will be 26cm, including the height of the bung when it's in place.




From developing three different sized models I was able to see what size would roughly be right for my light. It gave me an idea of what size would look the best in the type of environment the lamp would be used in. I have decided that the rough height of my product will be 25cm as I need to also consider the top piece which needs to fit comfortably into a child's hand.

ideation board

LED light project november 2015

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PRODUCT DESIGN

it will act as a stress relief for the child

this will be injection moulded out of LDPE so that it is squeezable

bung contains phosphorescent pigment which is completely safe for children

the pigment will allow the part to charge when in light and store this for when it is dark

this part will be clear to allow the pigment to function

removable bung

will be a cream colour that will allow light to pass through easily

main part will be blow moulded

this part will be polypropylene with a textured finish

a remote control will be used to adjust the features of the light

this makes the light work best for the different children and their different autistic preferences

will be battery powered LED light that changed colour and is controllable

the base will be made out of recycled cork so that is soft and contrasts with other materials

top pulls off base to give access to LED's

	Cost of components?	Safety	Aesthetics	Components affect size?	Portability/ moving?	Better life?
AC (Mains)	1	2	2	2	2	1
DC	2	1	1	1	1	2

proposal outline

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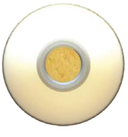
PRODUCT DESIGN









design visuals

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PRODUCT DESIGN


product narrative

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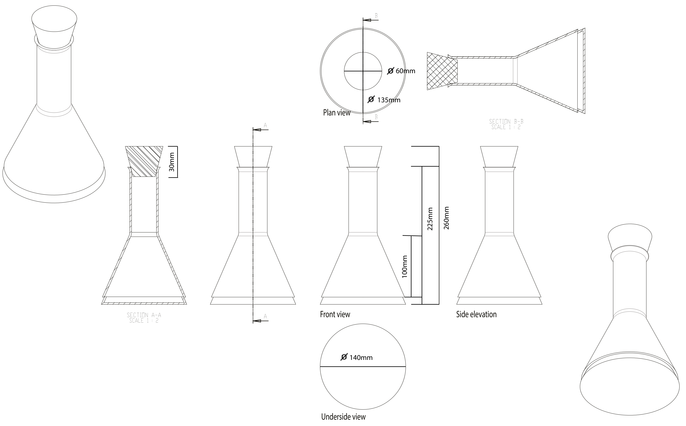

orthographic

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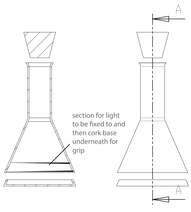

Section A-A

LDPE containing phosphorescent pigment

- cheap material
- extremely easy to mould
- can be transparent allowing addition of pigments
- has squeezable property
- lightweight
- high resilience

polypropylene with textured finish

- low costmaterial
- easy to mould
- good wear resistance
- pigments can be added for colour
- lightweight

DETAIL B

cork base

- soft material
- give light grip on surface
- will return to shape when under pressure
- lightweight
- durable
- it has hypoallergenic properties

exploded assembly

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PRODUCT DESIGN

appearance model

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