# FOOD AND NUTRITION

## PROJECT LOG

MONA SHARMA

# CONTENTS



# BRIEF

Following the research phase and the outcome of three design concepts, develop the chosen concept to produce a further self-directed, finalised design.

The selected concept is the 'food scanner'.

# FURTHER RESEARCH

# RESEARCH SUMMARY

Consumers would like to know more about what they are eating.

Smaller households mean smaller or fewer appliances.

Lifestyles are becoming more busy, so the convenience of preparing, cooking and eating is becoming more necessary - and retailers are becoming aware of this too.

Cooking healthy meals is important to many - but consumers are hesitant to cook more (varied) meals due to time limitations, and wanting to know more about what they are eating yet not being able to.

A variety of ingredients is important, and popular. Consumers are becoming more willing to try new flavours and ingredients.

Busy lifestyles have lead to shorter mealtimes, and snacking is on the rise.

The association of snacking to be unhealthy has lead to an increase in healthier snacks, therefore increased health awareness.

The association between organic foods and healthy foods has lead to an increase in organic produce sales, and also gardening sales - growing own food means that the consumer knows how the food was grown, what was used to grow it etc.

Growing food at home is becoming popular due to sustainability issues and greater health awareness.

The use of technology allows for different methods of food production, of which can be used at home in time, too.

A trending increase in awareness of being healthy, it's importance, and how food plays a large role as part of it.

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## THE DIAGNOSTIC USER

A concept where the user would like to know what is going into their food, how much they need and why they would benefit from it.

# FOOD SCANNER

Initial inspiration?

Magnifying glass

Why?
To allow consumers to know more about what they are eating, providing more information than is supplied on the label of food packaging.

It would also encourage consumers to be more aware about what they are eating, so that they can make healhtier choices when cooking or snacking.

A small device that works in conjunction with the smartphone also means that consumers can become more knowledgable about their diet, even whilst being on the go.

Changing from literal inspiration to using the form of a magnnifying glass as a tool. it was decided that having a more organic form that fits the palm would be most discreet and comfortable. The research allowed the form to move on from a window to see the food through, to using a traffic light system found in nutrional value labels, to using the IR-spectroscopy technique (as discussed eariler in the report) to analyse the food.

The user holds the scanner over the food and presses the button.

The scanner scans the food and then sends the results to the user's smartphone wirelessly, where they can be accessed via a dedicated app. This eliminates the requirement for a screen.

The app relays information to the user about what is in the food, if there are any unhealthy additives, the nutrional values and so on.

The casing of the device could even be made from a hygienic polymer, for food and health safety.

Ideally, the device would give information on the amounts of many substances including : fats, sugars, proteins, carbohydrates, salts, fibres, vitamins and minerals, as well as calories. Emphasis would be put on caloric, fat, sugar and salt information, as according to Mintel (2015), these are the most popular factors considered when buying or preparing food.

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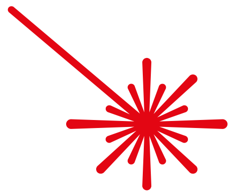
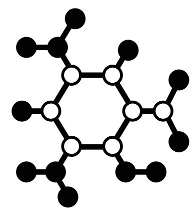
# HOW IT COULD WORK

Infra-red spectroscopy is a method of analysis used in chemistry. Here is a brief explanation of the process, supported by definitions from CGP (2009).

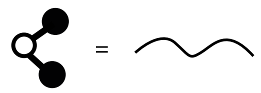
To identify organic molecules, a beam of infrared light is passed through a sample (of food).



The light is absorbed by bonds in bewteen atoms in the molecules, increasing their vibrational energy.

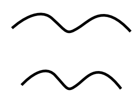


Different bonds between different atoms absorb different frequencies of light.

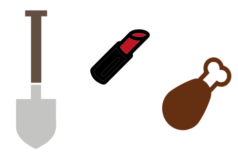


Using a spectrometer, a spectrum of data is produced, showing what frequencies of light the bonds are absorbing.

Different wavelength values are associated with different types of bonds, which in turn determine the types of molecules in the sample, and therefore what is in the foodstuff.

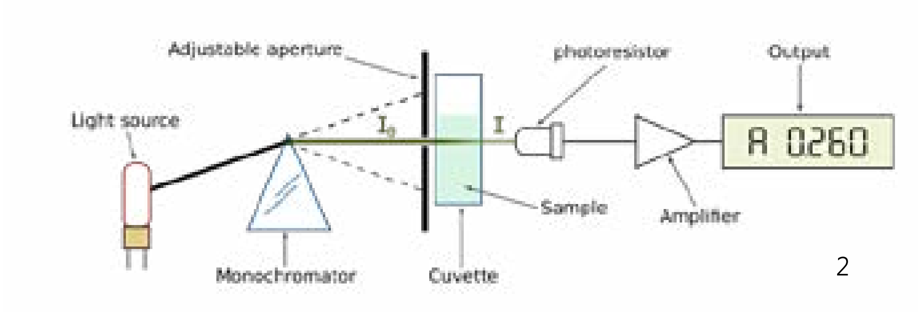



It is used in many industries including agriculture, textiles, cosmetics, medical, polymer, and pharmaceutical, as well as food.



It is widely accepted as a method of quality assessment in the food industry, due to the following benefits: minimal sample preparation, rapid analysis, being able to preserve the sample without damaging/ using it up, therefore saving time and reducing costs (Nilsson, 2012). It's a commercial method that is used frequently.

A diagram of the internal process, simplified:

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# TUTORIAL/DROP IN

The first tutorial raised a number of questions, relating to the technology of the scanner. Other factors such as when and where it would best work were discussed, as well as what might happen when different types of foods were involved. The following questions were considered afterwards:

Is it affordable as a household product?
Technology does get cheaper over time.
Think of the kind of person it would be most suited for - would the product just be for pursuing an interest in food, would it be better to aim it towards users with specific dietary needs?
How 'medical' is the product?
How would it work with dishes containing different foods on the same plate, or blended foods, like soup?
Would proportions of ingredients and portion sizes affect the results?

Does infra-red spectroscopy work on a small level?
Is it feasible?
Would it require calibrating?
W hat way does it scam? from above, closeness etc.
If it's not feasible, are there any other methods that measure the content of nutrients in substances?

Bear in mind that this idea is based on the assumption that the food is ready to eat. Are there any opportunities in the preparation of food where healthier choices can be made instead?



# IS IT VIABLE?

A current spectrometer:

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Technicalities

Using a spectrometer means that a lot of calibration and setting up is required - it is a relatively precise piece of scientific equipment that is generally used by chemists. As it is scientific equipment, testing samples would mean that many depending factors must first be considered, or the results would not be accurate/incorrect.

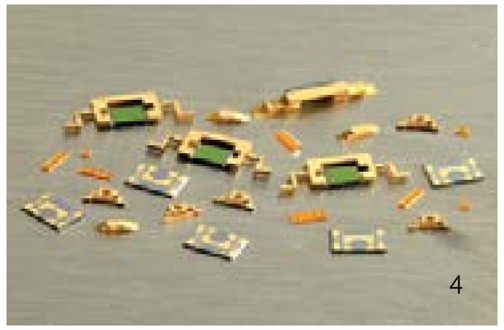
This would include accurate and thorough preparation and portion/testing sizes, any contamination, maintenance of the device, and health and safety issues - for example the laser causing eye damage if used incorrectly.

Making this technology suitable for regular consumer use would mean that many of the technical aspects and any interfaces would have to be brought down to a level that is easier to understand and more inclusive. However, this comes at the cost of inaccurate results, leading to incorrect data, misinformed conclusions and ineffective results in the long term. This makes the product less worthy of production.

Cost
The average cost of a spectrometer, such as the one above, is approximately £2,000. This is due to the techonology required, and the accuracy that it has to be built to. As the proposed concept is to be designed for personal use, it hardly seems sensible that a 'new to the market' product could be sold for more than £2,000, let alone £100.

Size

Furthermore, the size of current machines due to the technology required, is fairly large. As the image may suggest, the machine is slightly larger than an A3 scanner. This leads to the obvious question of if the concept is viable at all, as it needs to be a much smaller product to meet the research requirements.



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Smaller optical spectrometers (see right) that could easily fit into deisred size for the concept are available, but they are certainly far from being commercially available. They are a very recent techonological development, therefore very expensive and most likely still not powerful enough to test for all the desired substances.

Therefore it has to be said that the food scannning device concept must be re-thought. The technology required for it is not available now or in the near future, for it to be a viable product.

It can be said that the concept will remain a handheld device that encouarges and educates a user that is interested in maintaining or improving their health, through maintaining a good diet. Such a device would ideal for the growing market and interest in health.

Once the technology becomes readily available, the originaal concept can then be pushed forward.

# ~~FOOD SCANNER~~ RE-THINK

As the initial concept is not viable, another more realistic concept must be generated.

It would be good to look at existing devices, systems and services that are deisigned to help people to track their health.

The device will remain to be something that helps users make better food choices, or know about their food, so looking at existing products and technologies that track levels of substances in other systems could be used for inspiration. This would also mean that the end result would be more realistic and understandable.

Features such as the device being able to find out every ingredient in a dish of food may have to be omitted or replaced, in order for the device to still work as a helpful, educational and approachable product.



# THE HEALTH CONSCIOUS NOVICE


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Administrator

Sue is a health conscious office worker. She is aware of the health risks associated with her current busy, yet sedentary lifestyle. Her tight schedule means that she doesn't feel that she has enough time to exercise or go to the gym, and tries to make up for this by cycling to work and eating healthily.

She has become more aware of what is in her food and has recently started to cook/prepare her own lunch, for several reasons: to know exactly what is going into her food, how much of each ingredient is in it, the provenance of food, and how fresh it is.  It is also cheaper and allows her to learn new, creative recipes.

Taking more of her own food to work has meant that she does not go out for meals with friends as much as she used to - not mainly because it costs more, but because she has become wary of what is in prepared food, and how much of it there is. Even if a meal claims to be healthy, organic or low calorie, she still would like to know how much salt, sugar or fat there is, so she can make better choices in terms of portion size, or know what to eat less/more of in her next meal of the day.

This would mean that a way of being able to track and record what is in her food during the day could be ideal too, in order to be able to refer back at a required time.

Her busy lifestyle also means that she doesnt have much time to learn about new technology. Intuitive, approachable products that work around her are better.

# RECORD


Looking at some areas and methods of recording information. These methods could be applied to the device to help the user understand their food intake or track their health. Presumably the device will be electronic, so more realistic options from this diagram could be graphs, charts and logging, provided that there is a screen.



# APPS

ShopWell, by YottaMark Inc. (2015) is an app made to help users acheive their nutrition goals. It helps to manage weight and health conditions, such as high blood pressure and diabetes.

Barcodes on food packaging can be scanned through the app at home or in store, to find out whether or not it would help the user meet their health goals, and suggest foods that would have greater benefit.

It has reward system for users who provide feedback and complete 'missions'. Missions are way of providing feedback to companies that want to know what user think of their products, specifically health products.. In turn, they reward customers with gift vouchers.

It helps and teaches users about their dietery needs, avoiding unwanted ingredients such added sugars and fats, avoiding allergens and scanning foods in the supermarket or at home. It acts as a personal nutrition expert.

ShopWell™

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The Food Scannner iPhone app by DailyBurn (2015), utilises the iPhone's camera to scan barcodes on the food eaten throughout the day. It is a fast way to find foods and track calories eaten throughout the day. It works from a base of 200,000 foods and is powered by Occipital RedLaser techonolgy.

Although it is capable of storing and tracking helpful data, it must be taken note that that not everything has a barcode, for example fresh fruit and vegetables and that sometimes a whole pack of food is not eaten in one sitting, for example homemade dishes.

Eat This Much, by Eat This Much Inc. (2015) is a website that creates meal plans to help meet diet goals. It can be personalised for personal food preferences, budgets and schedules.

It gives the user a grocery list with everything that they would need for the week. This would reduce the stress of deciding what to eat everyday, and could even help to reduce food wastage.


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# INDICATE


Looking at some areas and methods of indicating levels of things, to help inform the design in terms of of user interaction. These methods share the that fact that thier ultimate purpose is to find out more about something, but they are also quite unique to what they are testing for - for example, oil and fat levels might be seen as similiar substances, but depending on the types and the environment they are being tested in, the methods can be clearly different. Some more relevant methods will be explored, as they may help decide adn reform the original concept.



# WATER CONTENT


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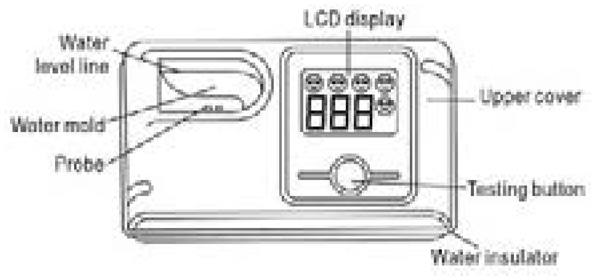
There are many different types of water checkers. They check what impurities are in water, and vary by the user and the intended environment.

How do they work?

A typical home-use water checker (as displayed, for example) uses metal probes to measure the conductivity in the water sample. The lower the conductivity, the more impurities there are. They work on a similar basis to salt meters, but are calibrated to different levels - a water checker can check for substances such as limescale.



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What makes this water checker special?

The water checker here, by Pure-Pro, is a small handheld device that can be used at home, compared more industrial one that need external power sources and greater scientific knowledge. As expected with water checkers, it is waterproof, with the clear ABS outer shell. This model has a simpler, more intuitive interface and only a single button. The interface uses smiley faces as a key, accompanied by a percentage, should the user want to know more.

Furthermore, it's format makes it more straightforward to use at home - instead of it being a device to be inserted into the sample, the sample is placed into the device. This likens to domestic use, for example weighing food using scales.

# FAT LEVEL

One method of measuring fat content in the human body is by using a body fat scale.


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How does it work?

Body fat scales use a technology called Bioelectrical Impedance Analysis (BIA), where a very small and harmless elecrical current is passed through the body. It passes quicker through muscle and slower through fat - this is a result of resistance due to a difference in material properties, mainly density. The resistance is measured and the scale then takes this reading and uses a formula to convert body density data into a body fat percentage reading. Compared to other health tracking devices, it is relatively large due to the power required for the electrical current to pass throught the whole body.


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They can come in two forms: a handheld device that the user holds in fron of them, or a floor scale, similar in shape and format to regular weighing scales.

How much body fat is right?

This depends entirely on the user, their age, gender, height and lifestyle. Some require more fat than others.

# SALT METER

What is a salt meter?

A handheld device used to measure the content of salt in, this case, food. It is powered by button cell batteries, the number depending on it's capabilities and features. It is ideal for anyone to use, including those at home or in the service industry. They are quite cheap, usually costing abotu £10.

How does it work?

The user lowers the meter into (at least slightly) liquid food, whilst simultaneously pressing the power button. Copper sensors at the end of the device attract chlorine ions found in salt (sodium chloride) to effectively close the electrical circuit. The strength of the circuit (current) is determined by the amount of salt in the food - the more salt, the stronger the current, and therfore, the higher the reading. The reading is an interpretation of the current, in this case a percentage. It can be shown in a variety of ways, including a LCD screen or LED bar graph.

How much is too much salt?

Most meters have a percentage scale range of 0.3 to 2.0%. If the reading from the food is higher than 2%, it is advisable not to be eating it. However, for the results to be fully interpreted, the user must know how much their food weighs. For example, a 100g bowl of soup with a 1% reading would mean that 1g would be consumed if the whole bowl is eaten. This would mean that the user may have to carry out extra tasks before eating the meal, just to find out the salt content of their food. Understandably some users care more for their health than others, and would be willing to take the extra step. This kind of user may even already have habits of measuring food, meaning that this device could be of great use to them.

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# GLUCOMETER


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What is a glucometer?

A glucometer is a small handlheld device used by diabetics to measure their blood sugar levels. It is usually powered by one or two button cells or batteries depending on it's capabilities and any other extra features. The price ranges between £6-£60.

How does it work?

Current glucometers work primarily with the use of single-use disposable test strips and a lancet (finger pricker) where the user inserts a strip into a meter, pricks their finger to produce a drop of blood and then applies it to the strip. The paper strips contain a chemical enzyme called glucose oxidase, and an interface to an electrode inside the meter (MIT, 2015).

To measure blood sugar levels the glucose in an applied droplet of blood to the strip reacts with the enzyme. When this chemical reaction occurs, an acid is produced, which means there is an excess of $H^+$ ions. This generates an electrical signal.

The electrical signal is interpreted as a numerical digital readout, giving the user information as to how much glucose is in that sample. The readout relates to the strength of the electrical current - the more glucose in the sample, the higher the strength of the current, the higher the reading (and vice versa).

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Why is a strip required to carry out the test?

Glucose is a type of sugar. It is not conductive like salt, so its quantities cannot be measured through conductivity - it must undergo a chemical reaction in order to force an imbalance in ions, and therefore an electrical current.

Are there any alternative methods of measuring glucose?

Currently, there are no other methods. All require a sample of blood to be applied to a test strip. Further progression in technology will be required before a non-invasive method can be available, commercially. In the meantime, more intuitive glucometers have been produced, such as the Accu-Chek Mobile.

Its primary selling point is that instead of having individual test strips, it contains a re-loadable 'cassette' - essentially a reel of (fifty) test strips. A small and simple mechanism where the user gains access to the strip means that the reel is turned 'automatically' in response, so a fresh test area is available every time.

# DESIGN DEVELOPMENT

# RESPONSE 1 - PROBE

The initial outcome of the research so far, after changing the deisgn brief: a probe.

**Why a probe?**

This concept orginates from the thought of how many testing procedures require the use of a probe-like devices to measure properties and quantities of substances. This concept measures quantities of sugar and salt.

**Why only sugar and salt?**

Following research into ways of detecting substances in different disciplines of user products, it was further realised and consolidated that to have a deivice that can measure for many ingredients and properties of food. Previous research showed that calories, fats, sugar and salt were the most common quantities that were looked for when choosing food products (Mintel, 2015). Existing/innovative techonologies could not be found for caloric values, and the techonolgy required to measure fats was too large (due to power required) to make a device that was user friendly and 'hand sized'. This left the concept to be a device that measured for sugar and salt, as the electronics and technolgy required is relatively small, simpler and therfore easier to manipulate.

**About the probe**

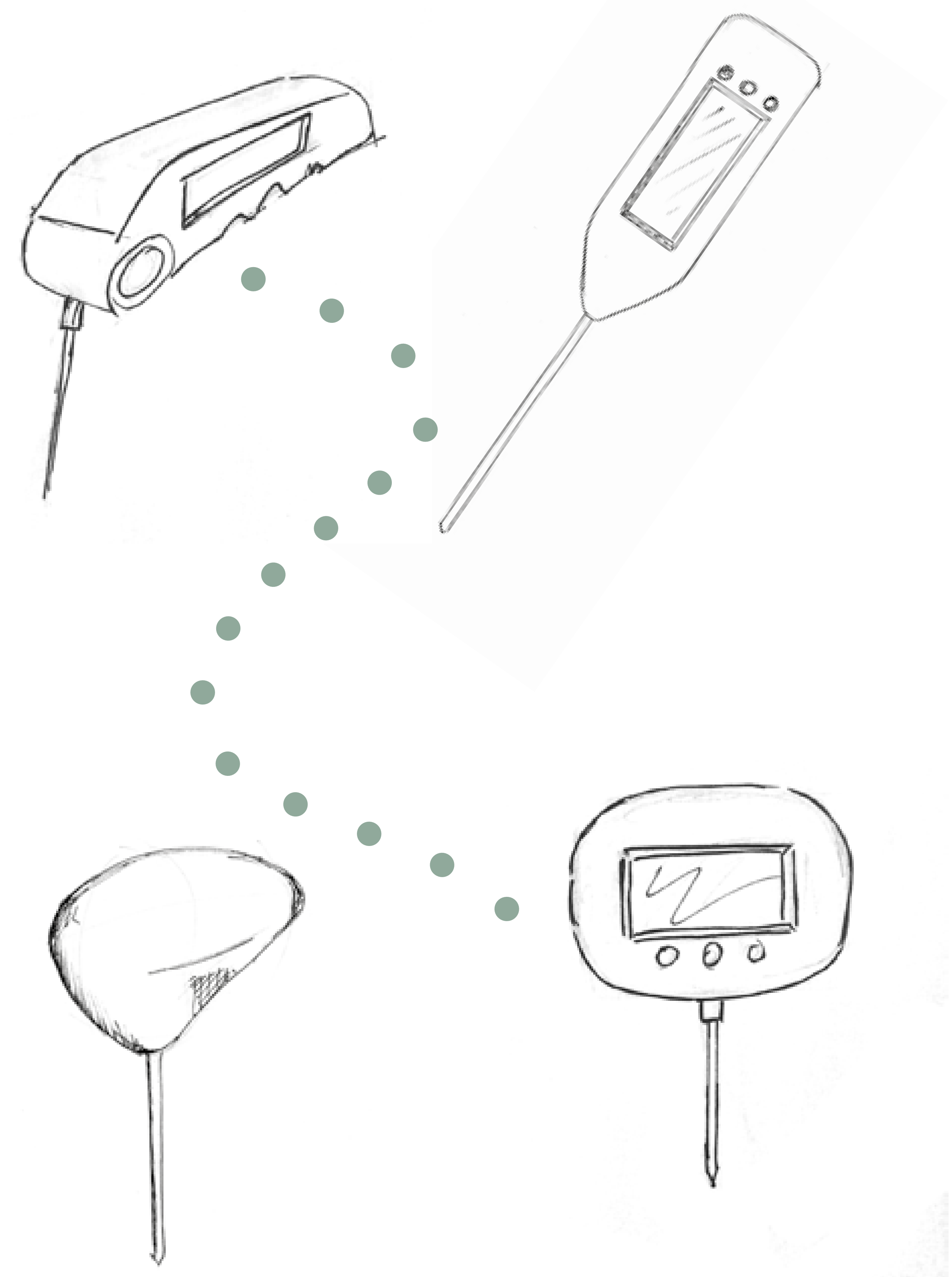
This concept can come in varying forms. The design focusses on the insertion of the metal probe into the foodstuff by the user, and the output interface. A reading of the quantities can be given via a LCD display, most likely as a percentage. There would be a need for a physical and digital interface, working around the user's hand - which would also mean testing a chosen design around and for comfort (ergonomics). The physical interface would require a way of switching between the salt and sugar testing functions, and power (switches, buttons and LEDs could be used), and replacing batteries (button cells would be ideal) would need to be considered, too.

The digital interface would require a straightforward layout so it is easy to understand and interpret for everyday users - complicated, more scientific data such as that found in glucometers, would be off-putting for the user and would not encourage them to pursue their health goals.

The probe itself would be stainless steel, with an ABS shell for the reader - both are easy to wipe clean.

**How it could work**

The metal - possibly stainless steel - probe could easily act as the conductor for salt. It would carry the same principal as the salt meter as researched earlier. Ideally, the sugar levels could be measured using the probe too, although further research will be required for verification.



# TEST

Testing the 'probe' format of one of the design concepts - not so much the æsthetics just yet.

Upon user testing, it was observed that almost immediately, users knew that the device was designed to be 'stuck into things', making the simple format of the interface and single probe successful, proving it to be easy to understand - before saying what the device was for. This, if put forward, could fulfill the brief for the design to be approachable, and therefore more helpful. It also helped to give rough ideal dimensions for ithe device, as it is almost certain that it will remain hand-sized.

However, as soon as users was told that the device was to be placed into food, they immediately apprehensive of the idea of something like that 'poking' at their food.

It was gathered that the idea of a probe was:

a) intrusive to the user - it made them feel more like they were carrying out a scientific experiment, and not just a quick way of checking the food whilst eating

b) rude to anyone else sat at the table, or the environment that they are in, such as a restaurant

c) rude to whoever cooked the food for the user

Therefore, it was concluded that the design should no longer have a probe to 'poke' into food and another format must be found in order to satisfy multiple environments - but still easy to use and understand. There is a strong association with the stigma around medical/experimentative products.



# DESIGN DIRECTION

It has been realised that the idea of a physical probe to test food can be socially unnacceptable; 'rude, strange and awkward' were some of the descriptive words used when asked about given scenarios. The situation can be likened to the stigma associated with users with inhalers, crutches, walking sticks and so on.

The idea of 'probing' food also has strong connotations with science and medicine, where a sample can be tested using probes. Is this something the everyday user would like to asscociate with and feel like they are carrying out when they are about to enjoy a meal?

It could call back to actions that consumers are already familiar with, which would make the product easier to use and to understand for others around them (and less rude), or something completely intuitive, which would maintain user dedication to the product and evoke interest and questioning from others - thus allowing it to be a point of discussion, and educational.

Although the final product may be still have probe(s) for it to be able to function, it could be influenced by and sold with associations of the acts of preparing, cooking, tasting and savouring food - a clear and understandable relationship for a device that is to be used with food.

Therefore, it is decided that the idea of 'probing food' should be forgotten, and better, user friendly concepts should be generated - intuitive designs that work into the act of eating food, without interrupting or damaging the experience for the user or others around them. it could be seen as a device that even increases the overall user experience. It should still definitely be an aid to the user's knowledge about their health, by providing information about sugar and salt content.

**intuitive**
**ɪnˈtjuːɪtɪv/**

*Using or based on what one feels to be true even without conscious reasoning; instinctive.*
(Oxford University Press, 2015)

# INTUITIVITY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Pistachio, by Ototo

This playful serving dish takes the nuisance out of requiring extra dishes when shelling pistachios. it's the kind of food that requires more than one dish, so using the format of an actual pistachio shell has allowed the design to increase user experience. the obvious shape means that its purpose can be easily distinguished.

Lunar baby thermometer, by dyk industrial design

This digital thermometer works in intuitively by shaping the form so that it mimics the well known action of checking body temperature by placing the hand on the forehead. its purpose is still the same, but its intuitivity means that the user experience for the parent and child is much more relaxed and less 'medical'.


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Pencil stylus, by FiftyThree

A device designed to be used in conjunction with a sketching app for tablets. The association between traditional wood pencils and sketching means that the user can feel like they have the precision of hand sketching, with the bonus of powerful graphics, due to the feel of wood, and a simlar form and weight to a real pencil.

Iris, by Mimi Zou

A biometrics enabled camera that follows the eye (and is controlled by) to capture photos exactly as they appear to the user, instead of physical controls. this challenges the common form of the camera, so it performs as a tool that is an extension of the human body, not a tool to accompany it.


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# FOOD + ACTIONS

Different foods affect the way the product is used.

There are many ways that food is handled, which means that making one product to suit all would be challenging the norms of how people prefer to eat their food.

Also to consider is the tools/utensils and actions when preparing a meal, eating a meal, and how the food is to be eaten.

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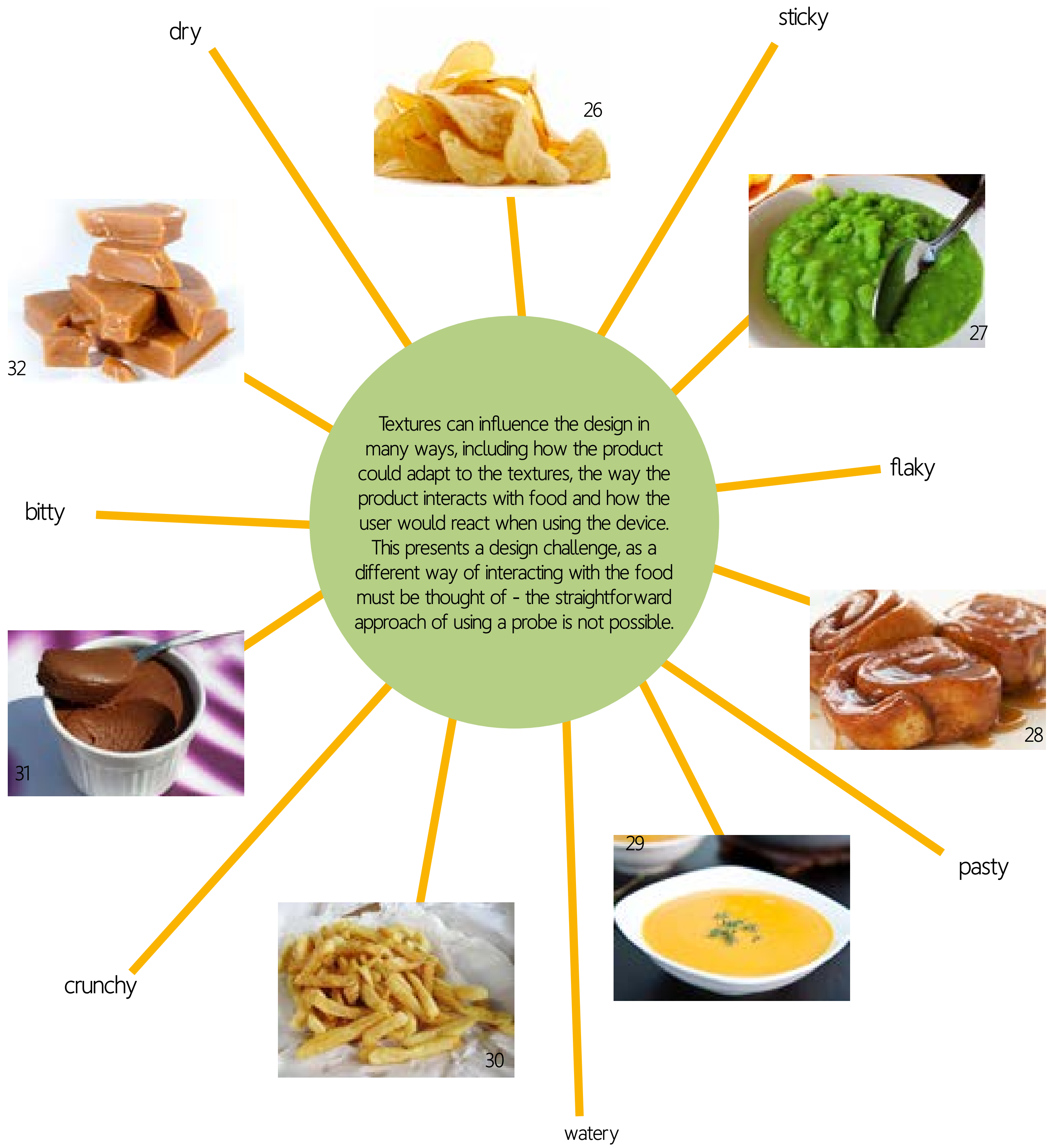
*Also:*

| | | |
|---|---|---|
| cut | core | chew |
| chop | peel | swallow |
| spread | grate | taste |
| roll | mix | savour |
| poke | sieve | bite |
| squeeze | pour | |
| remove | knead | |

What is common throughout is the way it's consumed - placed in the mouth. however the food may be handled before (cut, bitten, sliced etc.), it's 'final destination' is the user's mouth, which is something that is entirely normal for everyone. This observation could be applied to the product in an æsthetic or functional way, to make easier to use and understand, and so that it is accepted as more of an everyday, 'table friendly' product that isnt intrusive, and doesn't have references to medical/ scientific devices.

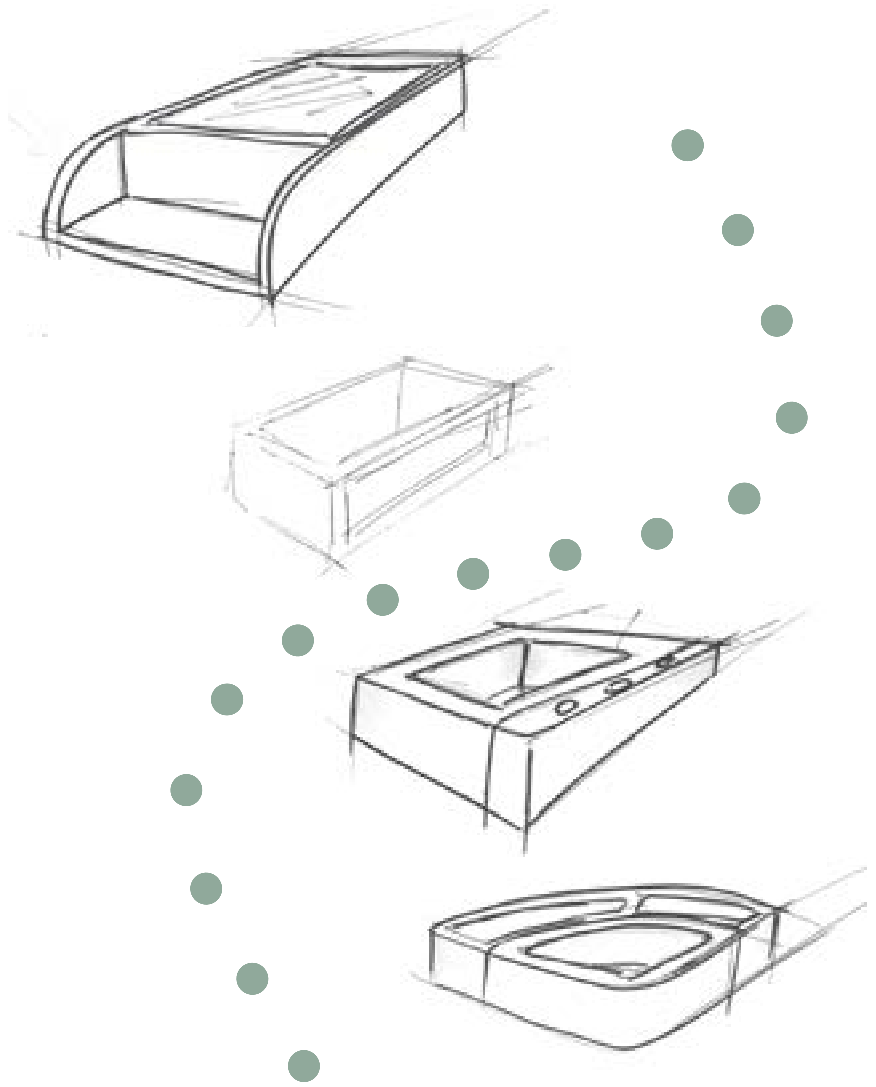


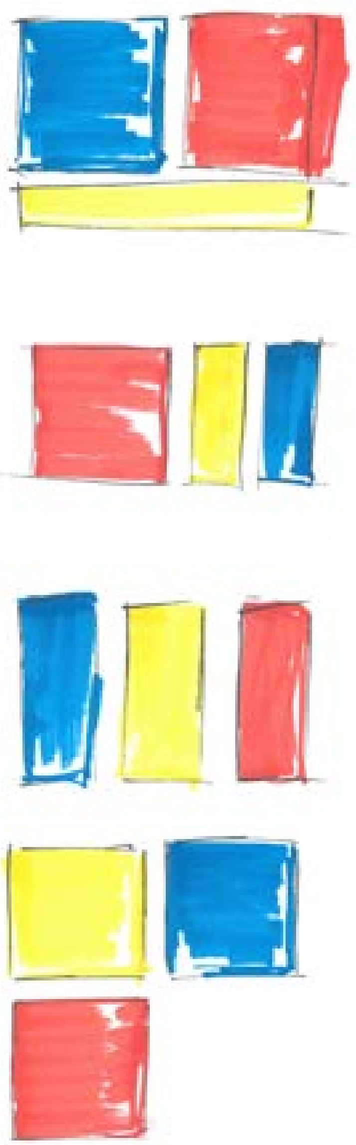
# SENSES/TEXTURE

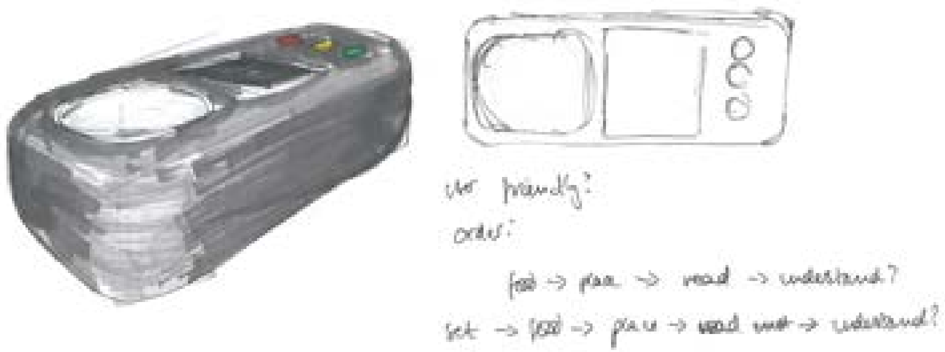



Textures can influence the design in many ways, including how the product could adapt to the textures, the way the product interacts with food and how the user would react when using the device. This presents a design challenge, as a different way of interacting with the food must be thought of - the straightforward approach of using a probe is not possible.

# RESPONSE 2 - PLACE








Thinking about different textures of food further proved that the idea of probe would not work very well.

This lead to the idea of having a small tabletop/handheld device, where a sample cof food could be placed into.

Two prongs could sit in the base of a removable, washable tray, and a small amount of food could be placed into it, similar to putting food into the mouth. This makes the design more intuitive and a bit less like an experiment. A hinged lid could even go over the top to press the food into places, into the prongs.

The red, yellow and blue blocks represent the order and importance of each possible section - salt, sugar, and the LCD screen.

An LED 'traffic light system' similar to those found in food packaging could be used to further help the user understand what the percentages given, mean.

However, it was realised that the prongs system cannot work with measuring sugar. It is non-conductive as it does not form ions, as salt can. This meant that this second (or the first for that matter) response no longer worked. This is also why test strips are used in glucometers - an extra part of the testing process - which means that this device will have to incorporate a similar system, and therfore another concept must be generated.

To make the device more handlheld and intuitive, it could be a good idea to use a cassette sytem for the test strip paper, as found in a glucometer by AccuCheck earlier on. This would eliminate associations with experimenting, further. It is also makes the checking process more efficient.

# DROP IN/TUTORIAL

What are the recommended daily intakes of sugar and salt?
If it is designed for domestic use, could it be made so that one or more person can use it? Presets? How would it differ between users - are there better ways than just controls, such as fingerprint recognition?
The use of probes is a 'behind the scenes' activity - could this be applied in a domestic way, Where the detector is used when preparing food instead?
When is it best to use the detector? if the food has been prepared at home, then what is the point in finding out how much sugar/salt there is in your food?

The detector
What information does it require before it carries out the task? (Does it require any?)
Recommended intake of sugar and salt
Age
Gender
Height
Weight

What kind of data is given to the user?
Percentages
Images that represent this instead?
Is it better to have a screen?
Is something like a traffic light system too basic?

What does the user do with the information?
How does it help?
Does it tell what to do next time? How would that be carried out? Suggestions or improvements to make in the next dish?

Reflecting on the past concepts lead to the decision that it could be good to design the device more for domestic use, which would allow for inspiration from kitchenware/interiior trends, making it a much more interesting and approachable product.



# DAILY INTAKES

| | MEN | WOMEN | CHILDREN |
|---|---|---|---|
| ENERGY | 2500KCAL | 2000KCAL | 1800KCAL |
| TOTAL FAT | 95G | 70G | 70G |
| SATURATES | 30G | 20G | 20G |
| CARBOHYDRATES | 300G | 230G | 220G |
| OF WHICH SUGARS | 120G | 90G | 85G |
| PROTEIN | 55G | 45G | 24G |
| SALT | 6G | 6G | 4G |

# HOW MUCH IS TOO MUCH?

Salt:

What is salt?

Salt is sodium chloride. It has conductive properties due to the type of bond required to hold sodium and chloride ions together.

How much salt?

According to the NHS (2015), adults should eat no more than 6g of salt a day – that's around one teaspoon.

Adults shouldn't eat any mroe than 2.4g of sodium per day, as this is equal to 6g of salt.

Are there different requirements for children?

Babies and children under 11 should have less salt than adults.

The daily recommended maximum amount of salt children should eat depends on age:
1 to 3 years = 2g salt a day (0.8g sodium)
4 to 6 years = 3g salt a day (1.2g sodium)
7 to 10 years = 5g salt a day (2g sodium)
11 years and over = 6g salt a day (2.4g sodium)



Sugar

What is sugar?

All sugars are carbohydrates found naturally in most foods, to sweeten things. It can be found as many different forms, such as: glucose, sucrose, maltose, fructose and so on. Sometimes naturally sweet ingredients can be used, such as honey or maple syrup.

How much sugar?

According to Gluco-Wise (2015), per 100g, more than 22.5g of total sugars is high, and less than 5g is low.

Any different requirements?

Sugar intakes can vary on the person's size, age, annd activity level.
The average man shouldn't have any more thaan 70g, the average woman shouldn't have any more than 50g and a child shouldn't have anymore than 45g (age is a greater dependancy for this category).

# DESIGN SPECIFICATION

A salt and sugar checker.

What must be considered is how the functions work together: each function could work together or separately, depending on the format, order of use and internals.

The internal features will consist of a pcb, a replaceable cassette, an lcd screen, probes, and storage space for batteries.

The device must have a means of replacing the batteries and cassette.

It will be a handheld device.

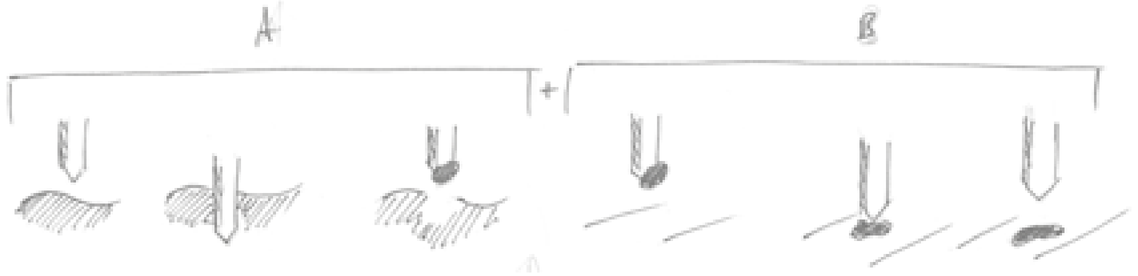
It will be aimed at users that are new to the concept of tracking health and aspire to know more. this would naturally extend to users that have experience in this area, too.

Therefore the design must be approachable, straightforward to use, have a clear order and method of use, and an understandable interface.

It should have an intuitve feel to give knowledge to the user that it is a helpful device intended for culinary use, and so they do not feel as though they are carrying out an experiment.

# RESPONSE 3 - DISTRIBUTE

A way or a mechanism needs to be established for the way the sample of food is applied to the test strip, in order to be able to design the form of the device.



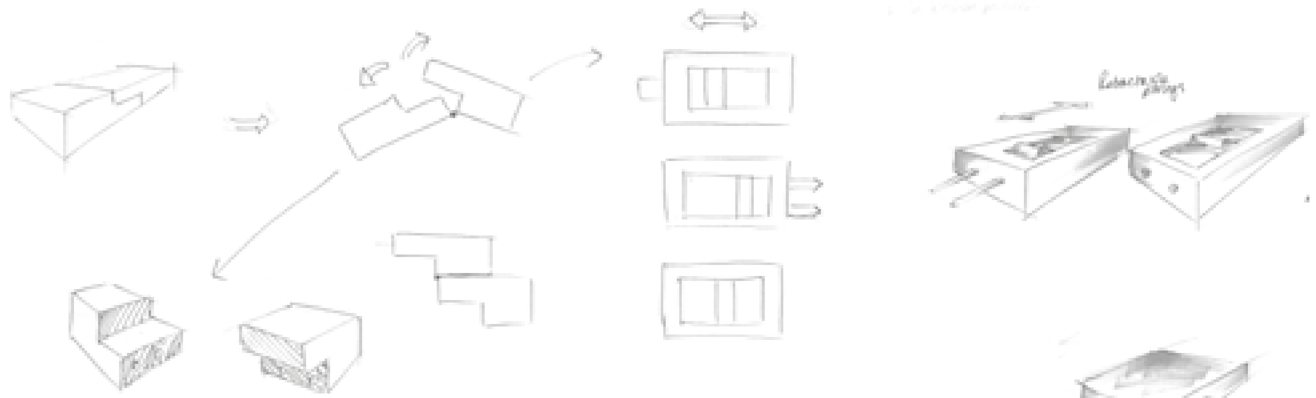

The straightforward would be have a detachable probing tool. The probe would pick up a small sample fo the food, and the user would apply it to the test strip, and wait for the reading.

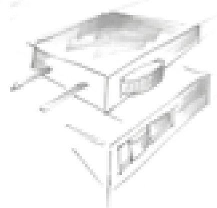
This posed the problem of trying to find an alternative way of applying samples to the test paper, all in one handheld device, to minimise asscociations with experiments.

However, this is much too like a scientific experiment, and as discussed earlier, this is not an ideal scenario to relate to in the middle of meal.

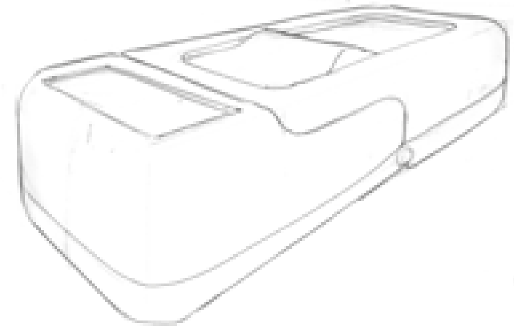
For inspiration and to make the device more intuitive, common actions found when handling food were speculated, such as how food is split.



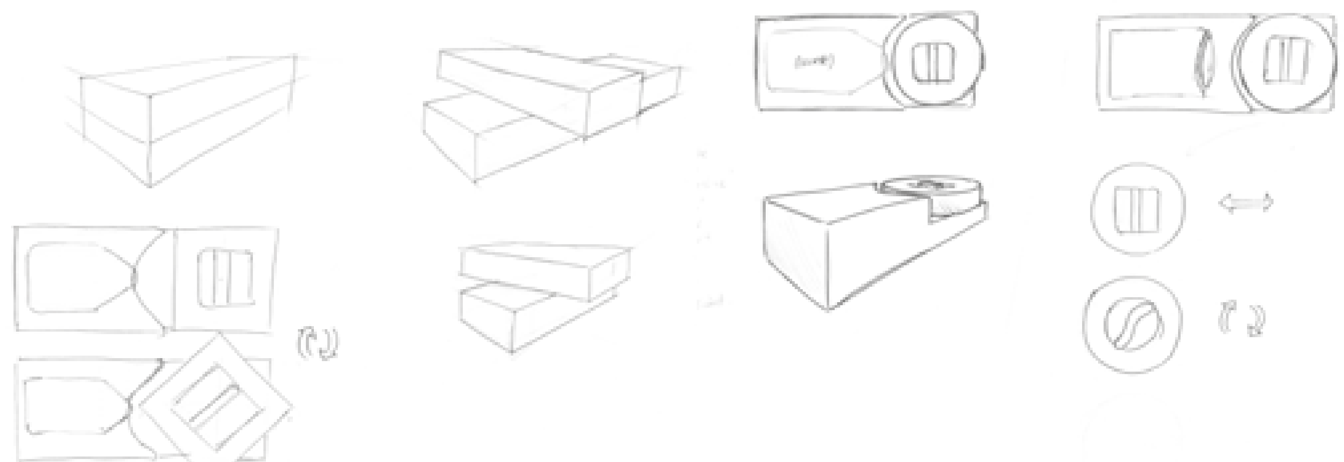


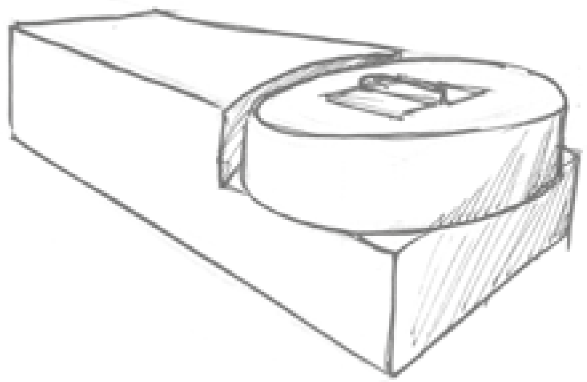


The spliting idea lead to this concept. It is still boxy as æsthetics and trends have not been applied yet - it is designed around the fuctions and theoretical sizes.



A retractable feature was thought of, where if a sliding switch was pushed on way, prongs for salt checking would show. When pushed the other way, prongs for sugar testing whould show. Unfolding or 'snapping' the device and then putting it back together would allow for the prongs to touch the test strip, and the user would see a readout.





An alternative to the snapping concept. Rotate the end to switch between the sugar and salt checking functions, and to power on/off.

# TEST

The size of the device is ideal  - it fits in the hand well - small and large. It could even be recduced in size to make the retractable feature easier to access.

However, when folded back, the device seems very chunky and awkward to hold - even when fully designed and stylised, it would not be much smaller in the hand. The form of the device when folded is not ideal for putting into food.


a


b


c


d



# DROP IN/TUTORIAL

Alternative formats to the snapping system were recommended. A good place to look would be in the kitchen, especially at utensils. If the device is intended for use on food, why not design it to make it feel like a culinary aid, not just something related to food 'actions'? This could provide an even more intuitive solution  - spoons or spatulas could be ideal.

It was reminded that the casstte need not be the same size as existing ones - it can be manufactured according to the design afterwards.

If the design is to be intuitive, is there any need for the device to have a screen? Are percentages important to someone who just wants to know if there is too much salt or sugar?

Other objects/mechanisms that could helpt to influence the functions of the design include: dental floss, tape, swiss army knife, folding car key and chopsticks.

It would help if the devce was aimed for personal use - this allows the user to decide when to use it, further strengthening the fact that it should be a handheld-sized device at the very least.

This point was critical in the decision making, due to lack of time.

# FORM

If it is to be something that will be common in everyday lifestyles, then it is a good idea to initially implement the product in the home, so it can be understood as more of a helpful appliance and not a small gadget. Placing it in the kitchen would strengthen the target use of the product, by placing it in the most popular room in the home, most strongly associated with food.

1Beginning the life of the product here has strong connections with the user, and once accepted and understood, can be manipulated to produce different versions for different users, more advanced versions that supply more information as technology progresses, and also versions aimed specifically at users for inidividual needs (e.g. food intolerances, allergies etc.).

Forms found in kitchen utensils, for example, vary widely. However, they share some common properties.

The most important property could be that they are made from specific materials according to their purpose, such as stainless steel for it's durabilty and ability to withsatnd high cooking temperatures. They are also ergonomically shaped for ease of use. Lastly, many use trending colours and materials to fit in with kitchen interiors. Some are more fashionable, others are more built for purpose.

This utensil set here for example, has a flowing shape that forms as part of the working section of the tool, using branding and and different colours and materials to highlight where the user should and shouldn't make contact, making it more built for purpose than style.

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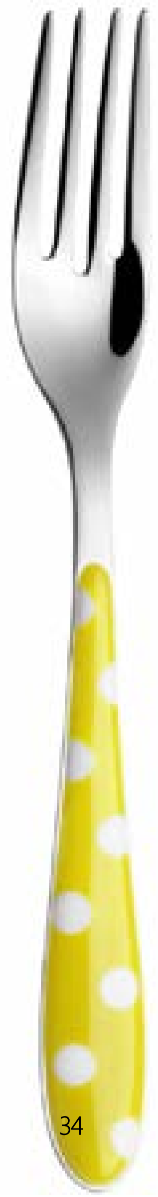
# THE FORK



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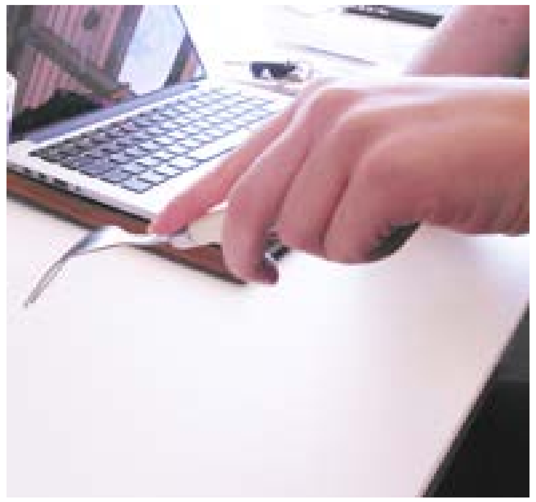
The result of many discussions and debating . It was decided that a fork would be the best format to apply the salt and sugar checking system to. Inevitably, the handle would have to be slightly larger to hold the reel, but probes for the salt checking would be eliminated as the prongs can act as a probe instead - wired into the handle.

This, theoretically, solves the problems of social stigma if used in public, and also is much more intuitive for the user - applying the semantics of an existing product to a 'new' system makes a product much more approachable and easy to understand.

A source of inspiration.

# THE FORK



Materials

For hygiene and durabilty, the majority of forks are made of stainless steel - die-cut, rolled and press formed. These can run all the way through as part of the handle, or an injection moulded polypropylene handle can fit over and snap together.

Points of contact

The way a user holds and uses a fork depends mainly on the type of food they are eating, for example pasta, or , something that requires a knife too.

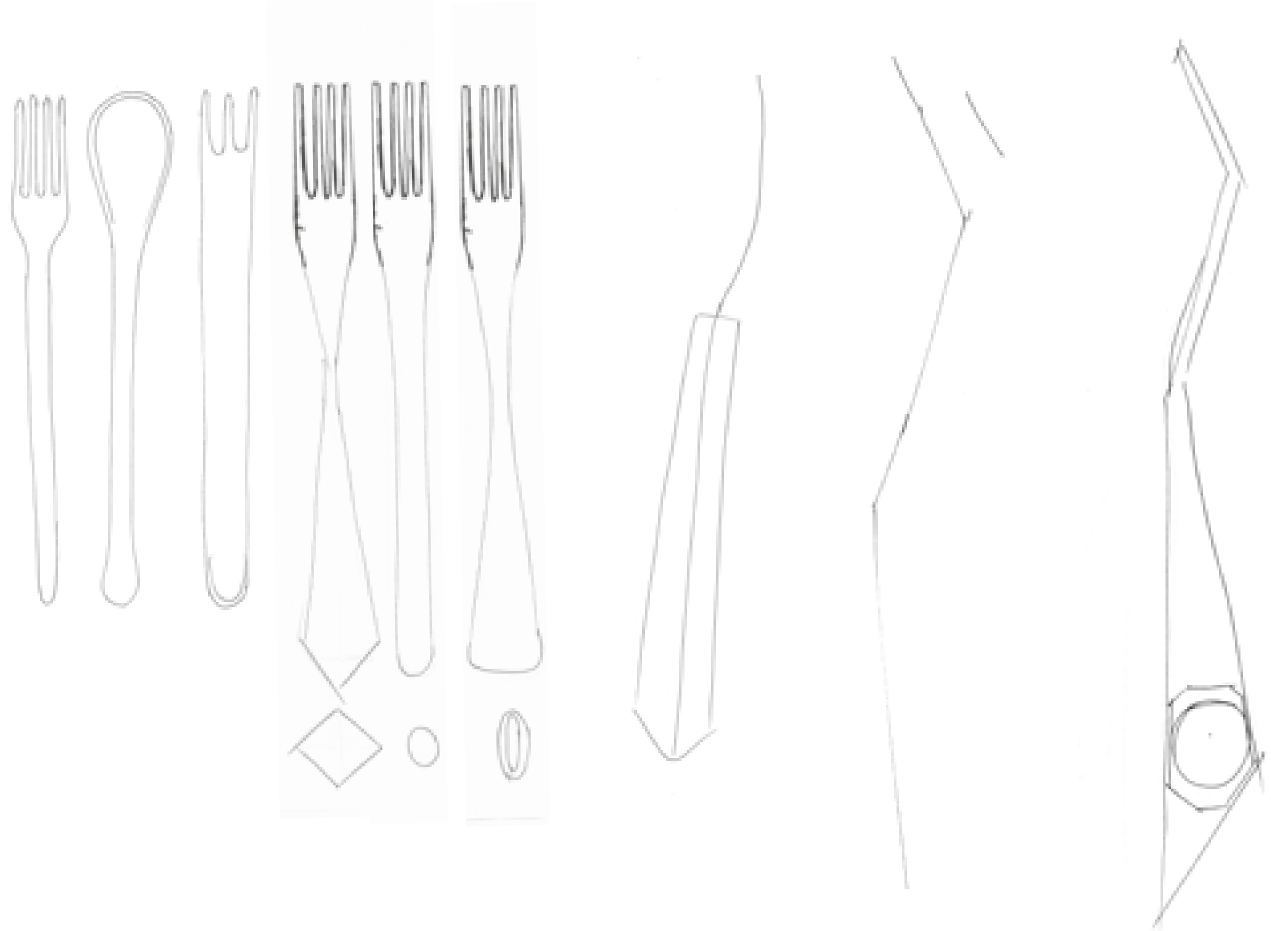
Studying how users holds the fork helps to see where the best or worse places would be for any controls and functions.

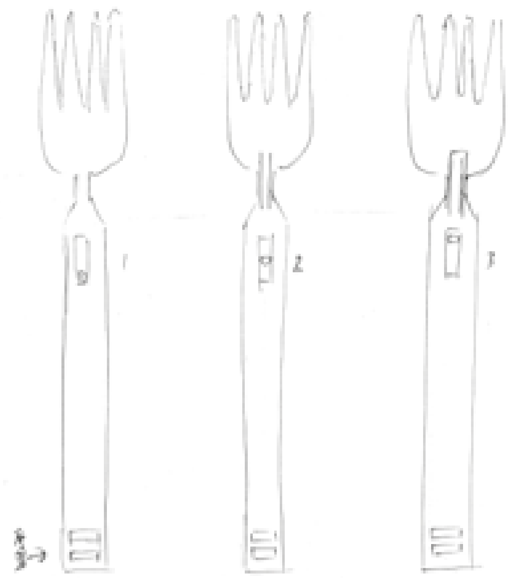
The best places where these controls and functions could exist appear to be right at the neck of the stailess steel prongs, or at the tip of the fork.

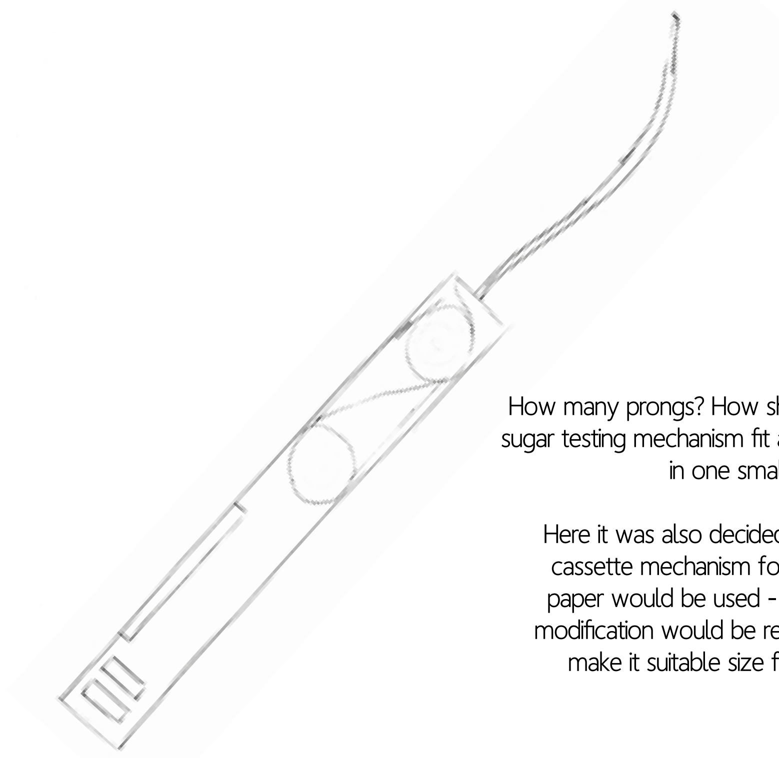
Smaller, more inconspicuous, or inset features could sit on the sides, where the hand covers them for most of the time.



# INITIAL FORMS







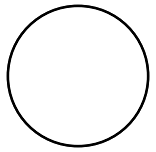
How many prongs? How should the sugar testing mechanism fit and work in one small device?

Here it was also decided that the cassette mechanism for the test paper would be used - although modification would be required to make it suitable size for a fork.

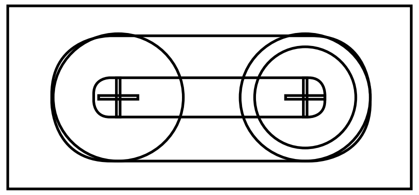
# PARTS

A summary of the parts required
for the fork to work.

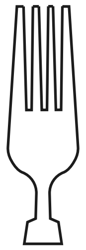
Not to scale.



2x LR44 button cells
approx. 11x6mm

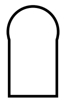


a cassette containing a reel of
glucose test strips, for up to 30x
tests.
approx. 60x20x20mm, subject
to change in size and reduction
(variable factor)



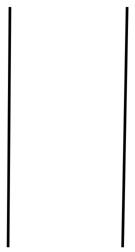
1x stainless steel
fork prongs

an LCD display



LEDs (number
subject to change)

1x PCB

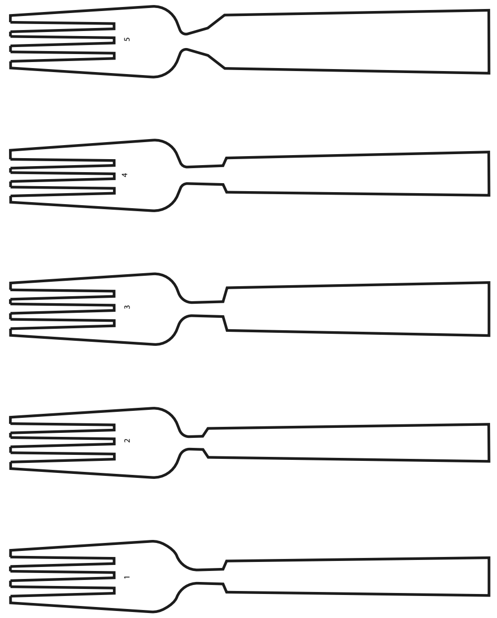


2x conductive metal
probes to check salt

1x handle



# TEST



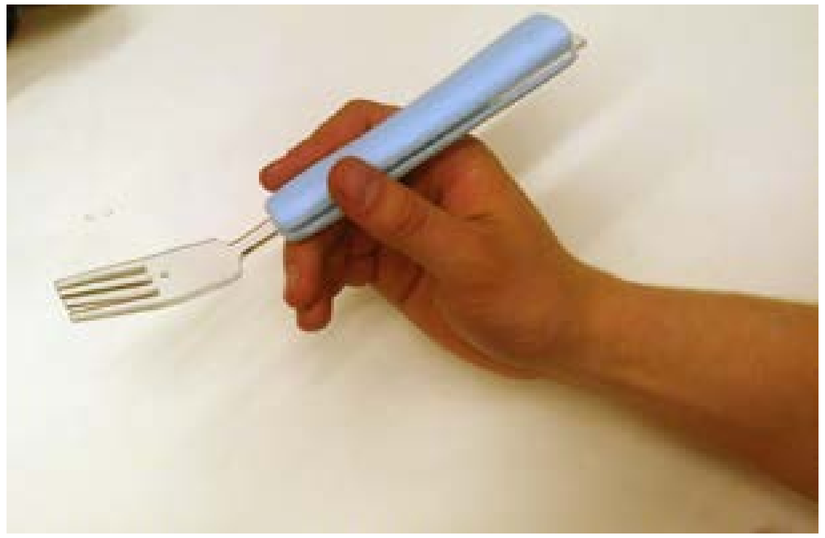
Testing a rough size for the fork
handle, as it has to house all of
the components whilst being
comfortable and ergonomic.

It is accepted that the handle would
be slightly larger than usual.

User testing provided insight into
the better size., providing that they
know that it needs to be larger than
normal.

The five szes were narrowed down
to three, with handle ends ranging
between 17-23mm.

# TEST

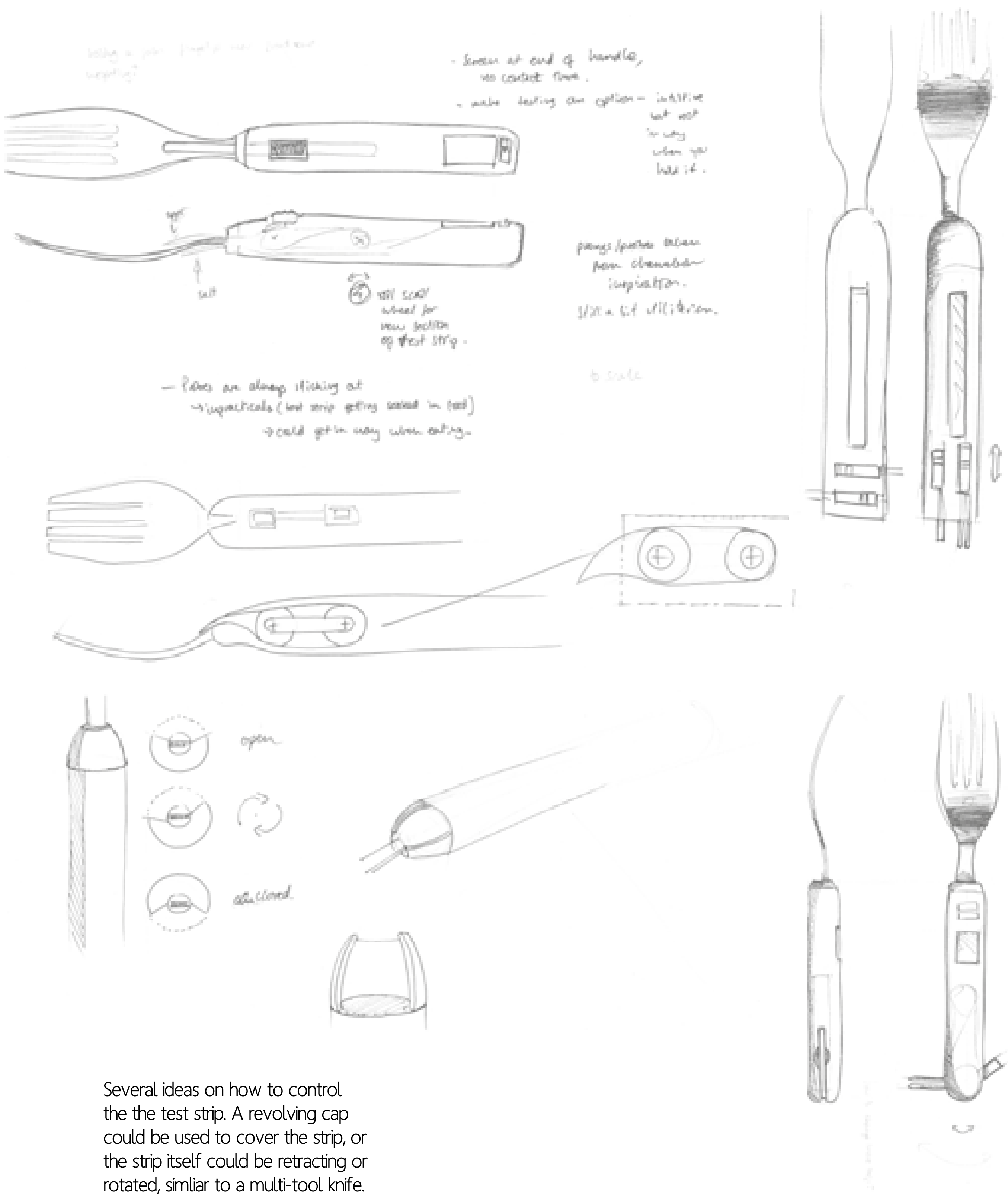


Consolidating the size of the handle (the prongs here are larger than necessary).

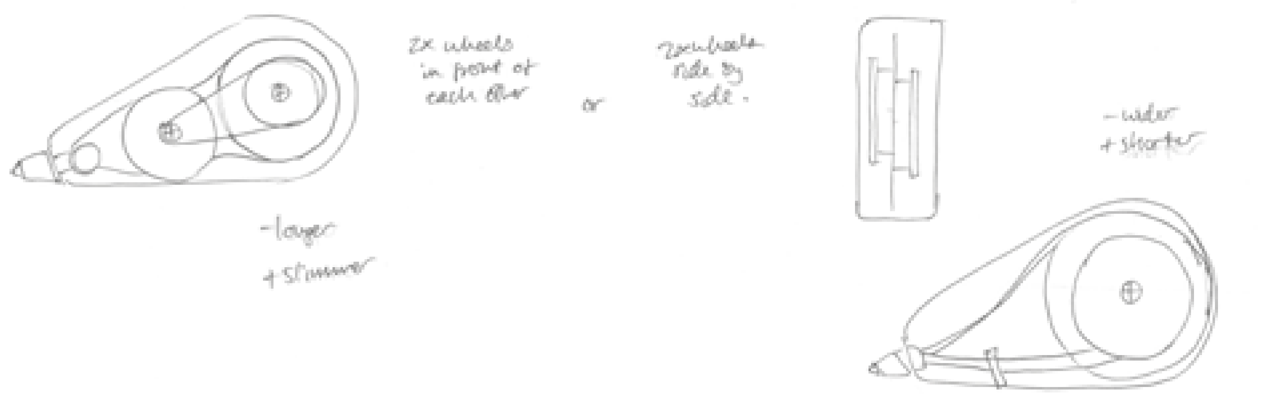
It also showed where the best points for curvature would be, once the dimensions are corrected. Here, it was found that it was actually better to have a slightly larger handle of curvature was was going to be formed into it.

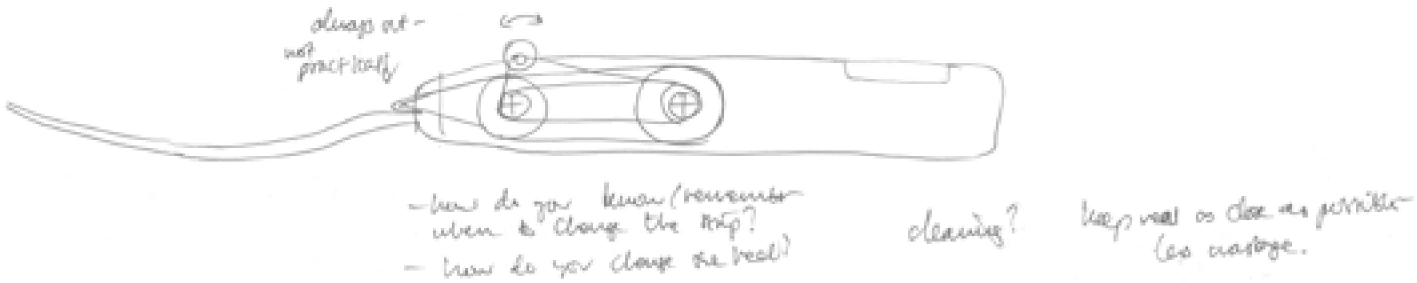


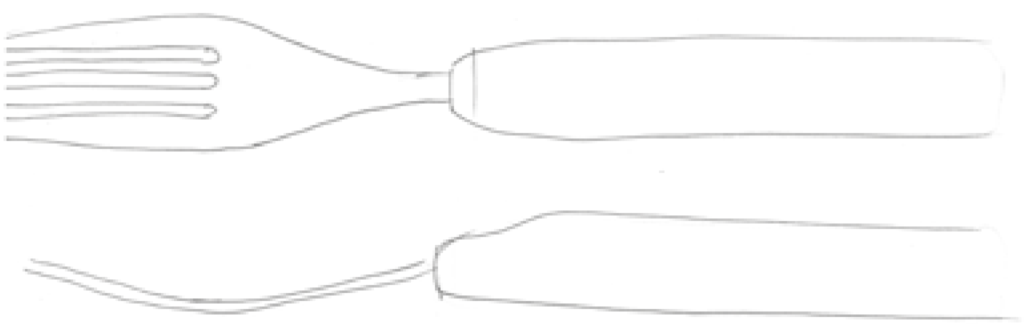
# ORGANISING COMPONENTS



Several ideas on how to control the the test strip. A revolving cap could be used to cover the strip, or the strip itself could be retracting or rotated, simliar to a multi-tool knife.



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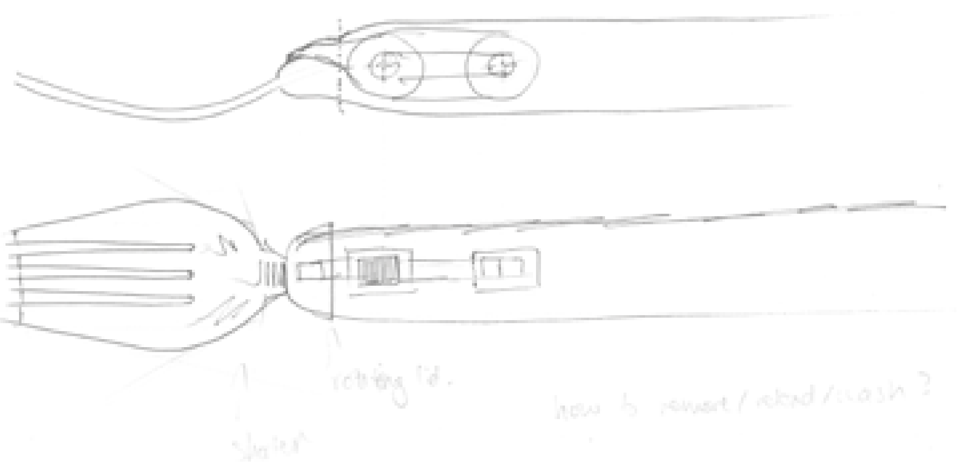


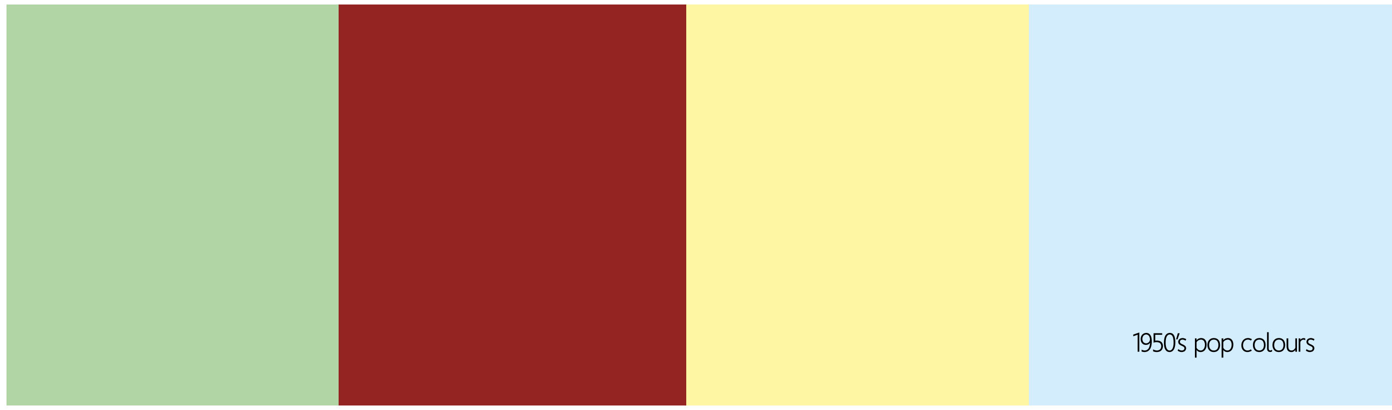


# TRENDS/INSPIRATION

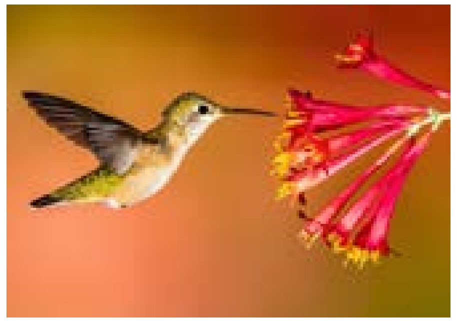
2015-2016 kitchenware and colour trends, according to Home Fashion Forecast (2015):

matte finishes in tabletop accessories

cast iron cookware



1950's pop colours



Probing in nature?

# RESPONSE 4 - FORK



The result of simultaneously designing around the components and around the user. A balance was required between it functioning realistically and being comfortable for the user to hold.

This response is relatively larger than the average fork - the handle specifically is 20mm wide at the widest point. The length has been taken from existing fork handles, approximately 120mm. An effort was made to keep the length similar to existing forks, so as not to make the user feel as uncomfortable when holding it. Furthermore, the radii of the cassette reel limited the form to being chunkier than longer.

The development towards this response lead to the realisation that a screen would not be required, as it makes the device bulkier, less intuitive and more scientific as it means more accurate results would be given. Instead, a soft glowing LED at the end could be used to indicate whether there is too much salt or sugar - this could be shown by how bright the LED glows, or simply on or off. Placing the light at the end of the fork could be quiteditracting when in use, however.

The light sits in an inner polypropylene tube. This tube sits in an outer tube. It is removable for the user to be able to wash the fork normally, due to the electronics. As well as holding the LED, the inner tube could also house the PCB, any wiring, button cells, and the cassette. This also allows for the cassette to be easily replaced.

The cassette, as before, would be replaceable. Its size has been altered to fit the fork better. It would be wound over a flat nozzle, similar to that found in tape correctors. The housing of the inner tube would stop the cassette from moving out of place when refilling, allowing for easy and understandable functionality.

At the end of the outer tube is a rotating cap. This has been implemented to reveal and cover the sugar testing strip as and when required - it would not be ideal for the strip to be exposed at all times - it is unattractive and impractical; continuous contact with food would damage and waste the strip.

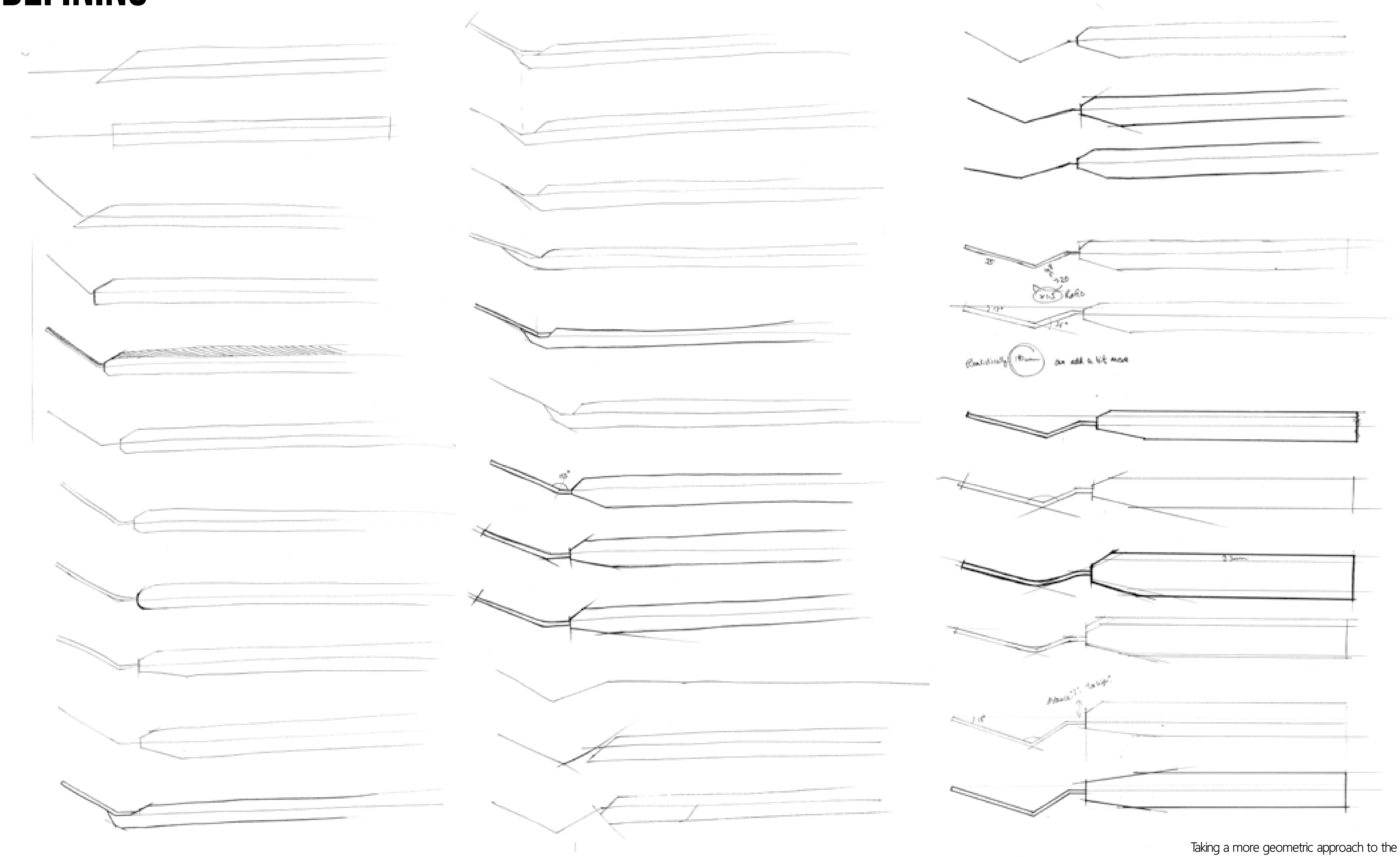
The form of the handle has a gentle draft, transitioning from circular to square, so that the inner tube can be easily removed. The fork prongs are more rounded than usual, so it is easier to scoop food towards the paper strips.

Due to the main functions being in the inner tube, an allowance can be made for the outer materials. This could mean using different, more æsthetically pleasing materials such as aluminium, although there is still nothing wrong with polypropylene.

Overall, the design still needs refining, as it is quite large. The rounded prongs make it look quite childish, or intended for user with limited dexterity. It contains some of the required functions, but not all - a power switch, a way of switching between salt and sugar checking and a clearer way of understanding 'how much is too much' is required.

# REDEFINING

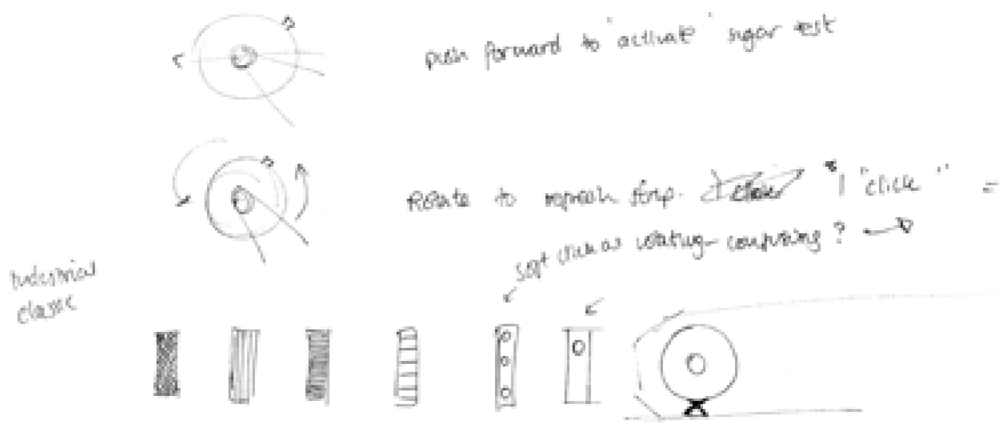


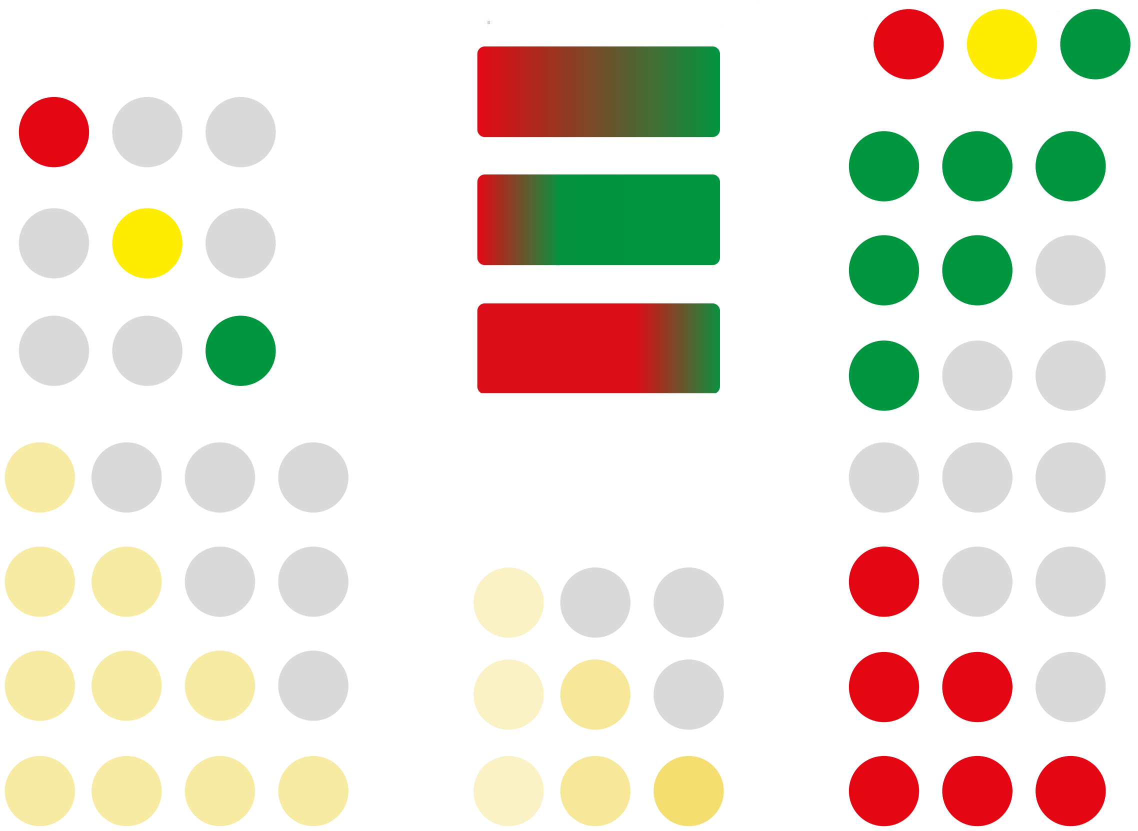




Taking a more geometric approach to the form of the fork, inspired by technical drawings, prior to adding curvature for comfort and style. This was done to really focus on the function of the fork, especially the angle of the prongs and the direction at which the test strip enters and exits the fork.

# DETAILING



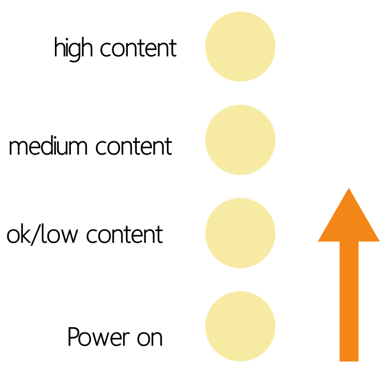



To make the design as intuitive as possible, it was decided for certain that a system of LEDs would be used instead. of a screen, It was realised that during a meal time, a user may not that interested in the exact percentage of sugar or salt in their food.

A scroll wheel would be used to refresh the strip - this makes sense as the test strips are on a reel, and so turning the reel would be the result of a turning/scrolling action - a strong sense of user semantics.

In order to 'switch' between power, sugar testing and salt testing, a small three-way 'switch' on the underside of the fork (depending on which way it is held) will be used: sugar - off - salt.

Pushing the switch toward sugar would reveal the test strip, in the same direction. Pushing the opposite way would activate salt checking.



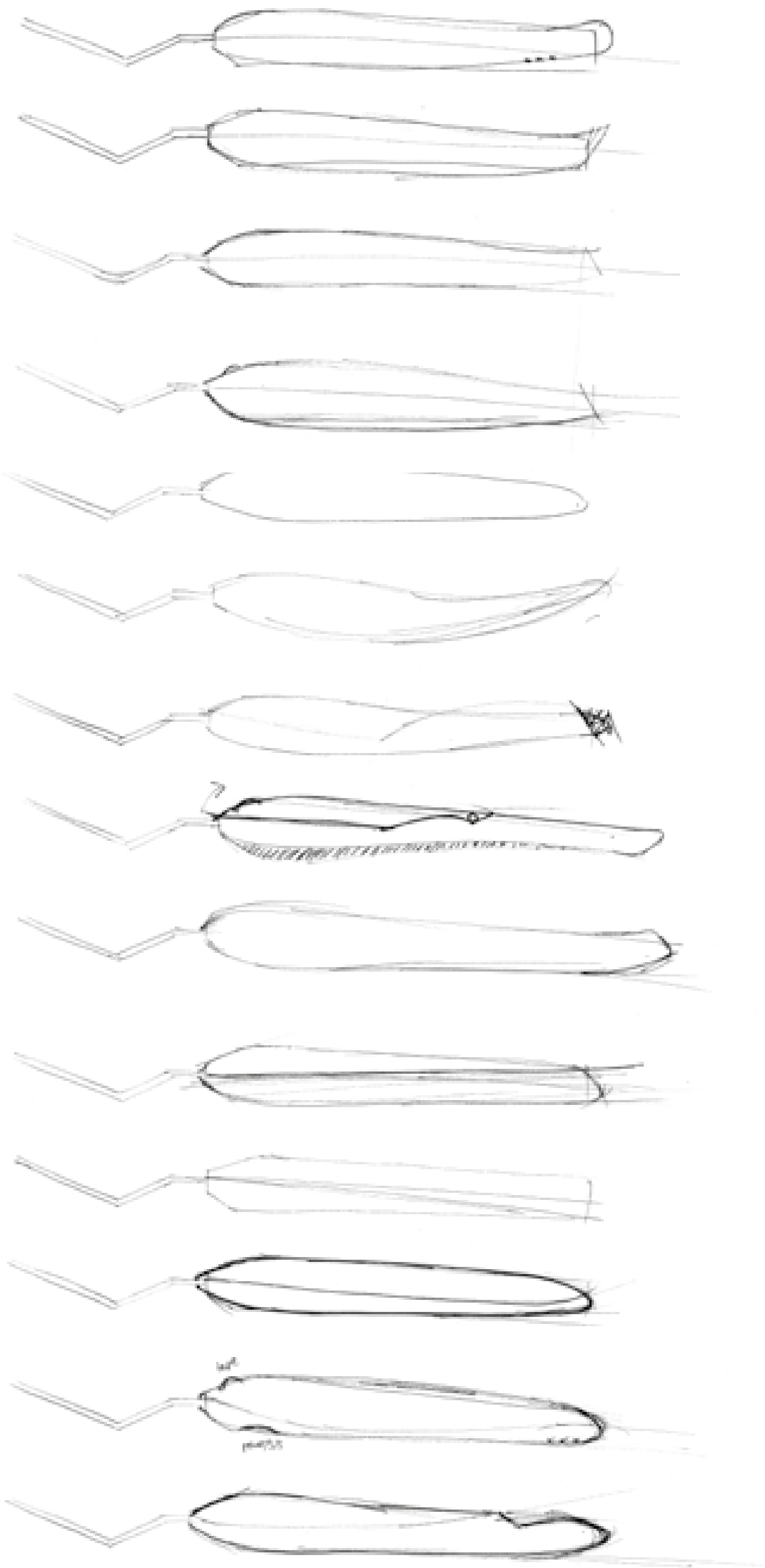
# FURTHER REFINEMENT

Further exploring the form of the handle.

Here it was realised that another way to clean and dismantle the fork for cassette replacement was to split the hadle sideways. This allowed for more freedom in the form, including different split lines and curvature.

It was also thought that the prongs at could be pulled out from the front for easy cleaning; this would also mean that the whole handle would not have to be dismanted for access to the prongs everytime.

The prongs themselves would fit into a socket, joining it to the PCB internally. The socket and other joints would be sealed to avoid food/drink getting inside.



# DESIGN OUTCOME

# RESPONSE 5 - FINAL DESIGN

The outcome. It is a response to the intial brief of designing a device that tells the user about everything in their food, refined down to a more realistic device that tells the user if there is too much salt or sugar in their food. This was due to the required technology being too expensive, or unavailable in the near future, for the time being. Research into what users looked for when making healthy choices showed that after calories and fat (for whcih the techonolgy does not yet work), sugar and salt were the next nost important values (Mintel, 2015).

This design is a much more user-friendly response. It is an intuitive design that has overcome the problem of the social stigma that is associated with checking food for health and personal interest.

Research into current methods and technologies that are ever-changing further lead to strengthen the idea that the device should measure salt and sugar content. These included conductivity (measuring chloride content in salt to find out the value of sodium) and the reaction found in blood sugar meters to find the levels of glucose (the main component of sugar).

In the future, ways of finding out about fat content and even energy content could be applied to the concept.

Inspired first by technical drawings, then by curved forms in nature, this design has minimal features for ease of use.

It answers the needs of the health conscious novice, whilst being inclusive to other users; this is because of the simple, approachable form and functionality, as will be discussed later. Kitchenware trends have also helped to define the design.

The technology has been miniaturised slightly and built into the main structure of a fork, so the user can 'blend in' with their surroundings - it also means that others around them do not feel awkward or different.

It is made of straightforward, easily sourced materials, allowing for ease of manufacture, if this concept was ever pushed to production.



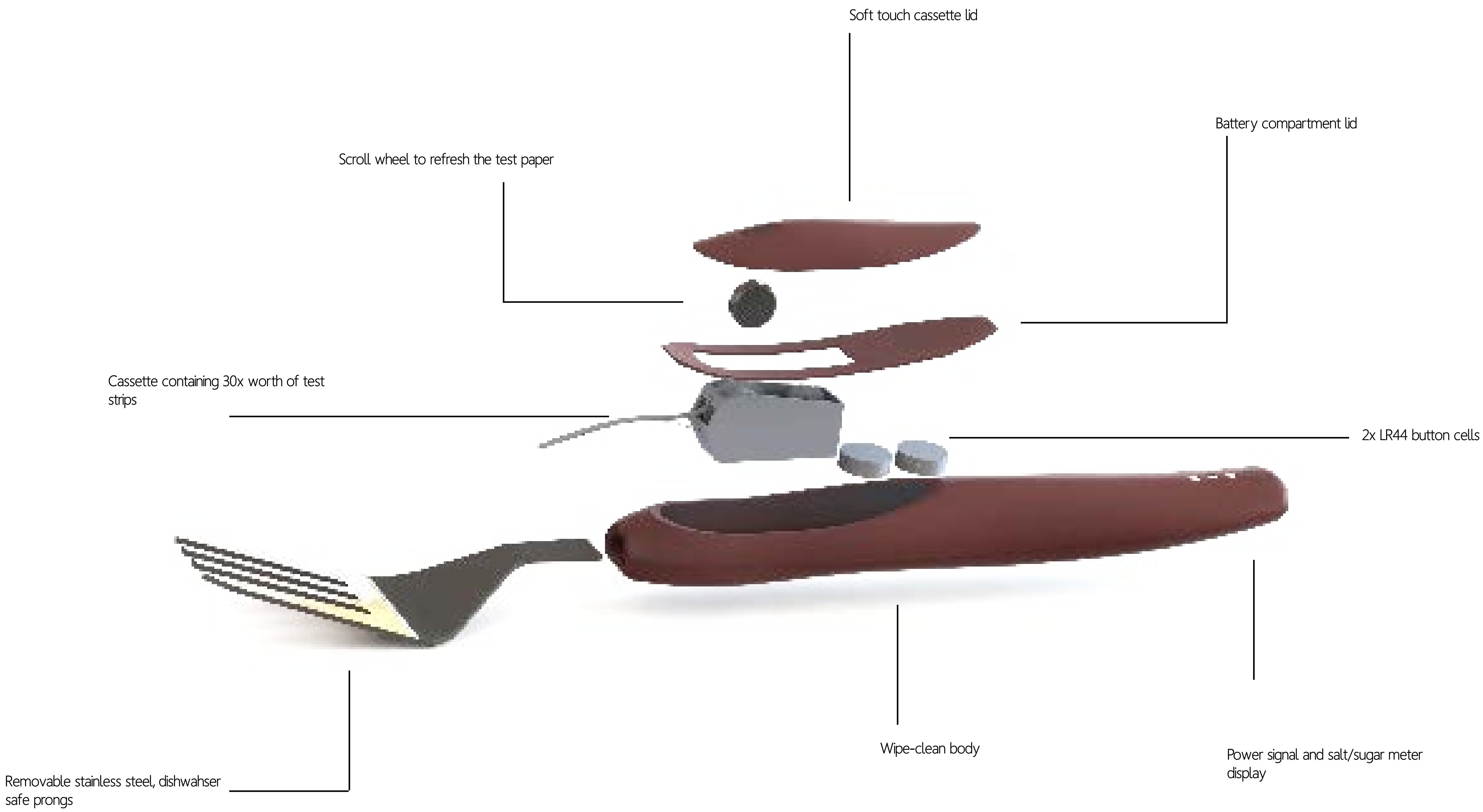
# COLOURS + TEXTURES

As it has been decided from the outset that inevitably the fork prongs will be made of stainless steel (for it's non rusting properties making it suitable for washing, high temperature tolerances and most importantly it's conductivity) and the handle will be made of polypropylene (for it's durability, availability, mouldable properties required for injection moulding and that it is an electrical and heat insulator), what is really left is to explore colour combinations and and some textures. Making it an inuitive design may mean using regular materials, but appropriate, interesting colours would make it even more approachable. Here, trending colours and other common kitchenware colours are tested.



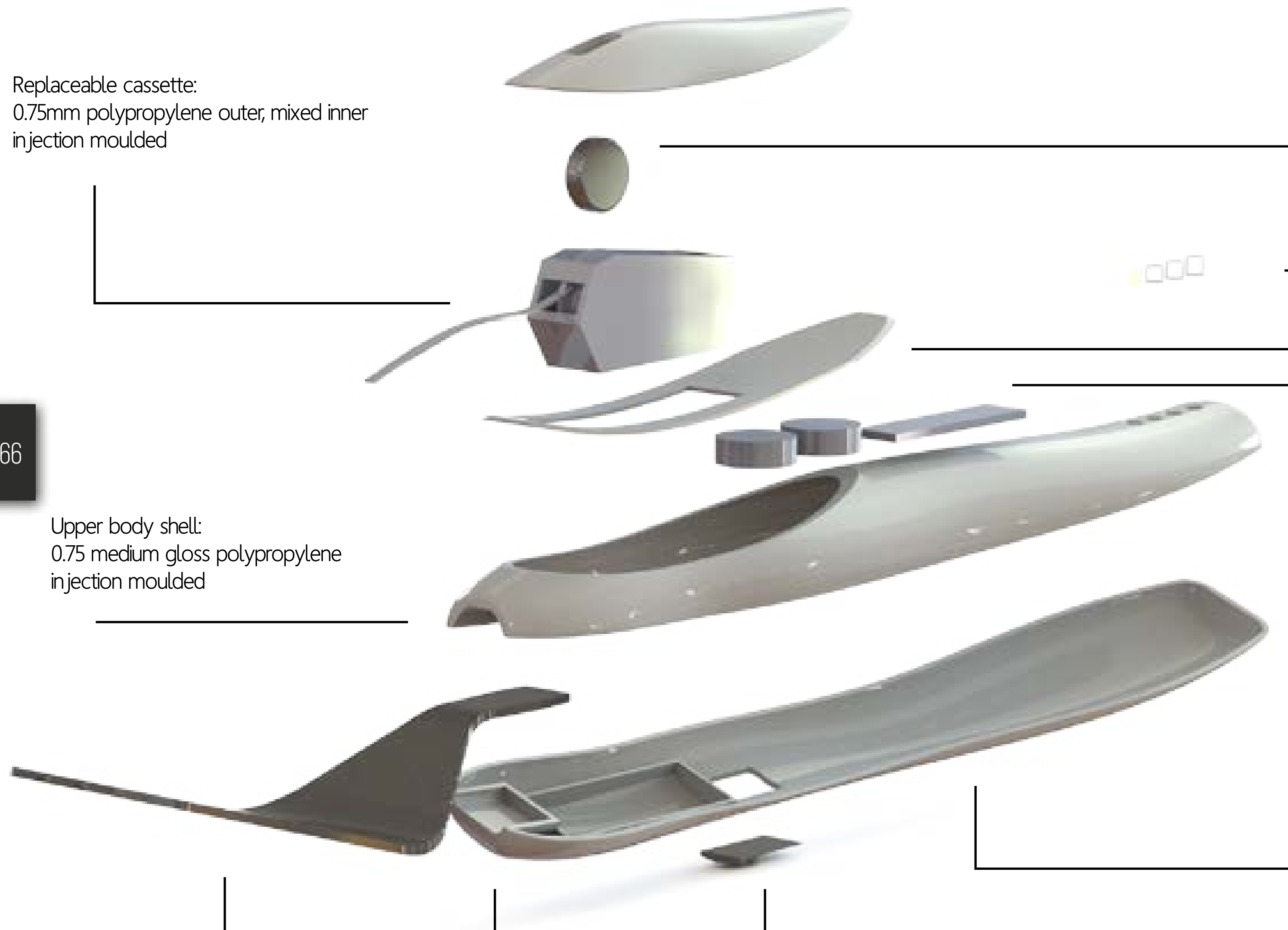
Sage green could be an ideal colour choice, in a matte finish. It answers to colour and material trends, whilst also being an appealing colour to use at the dining table. Dark red, dark grey and cream could work too, but maybe in medium gloss finishes.

# USER COMPONENTS




Approximate price: £30
Head cap sold separately.
Available in a range of colours: sage green, cream, dark grey, dark red.

# MATERIALS/MANUFACTURING




The main shells would be approproately ribbed and bossed. Snap fittings would hold them together.

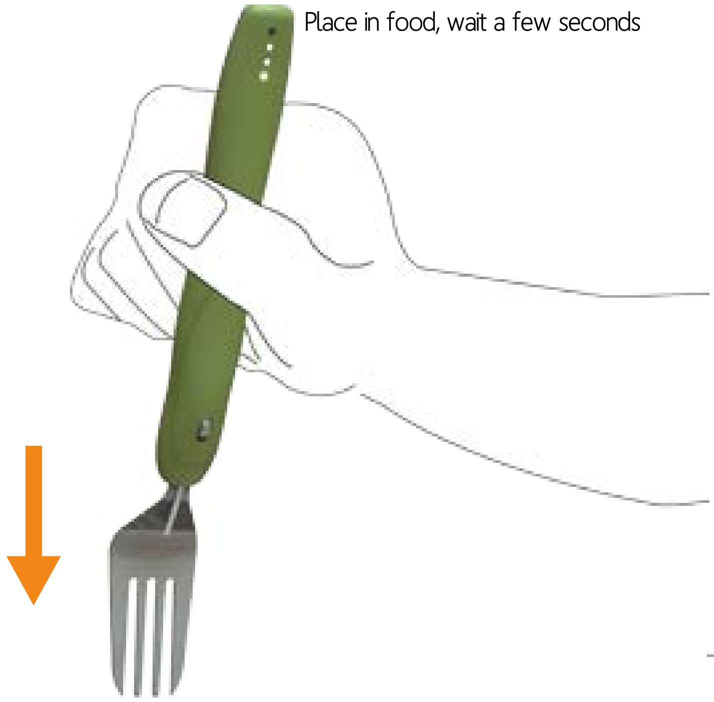
A snap-fitting would also be used for the cassette and battery covers, as it would not be opened very often. It would injection moulded to a slightly thicker measurement, for ease of removal (i.e. it is made to be moved, as opposed to the main body.

# HOW TO USE THE CHECKER

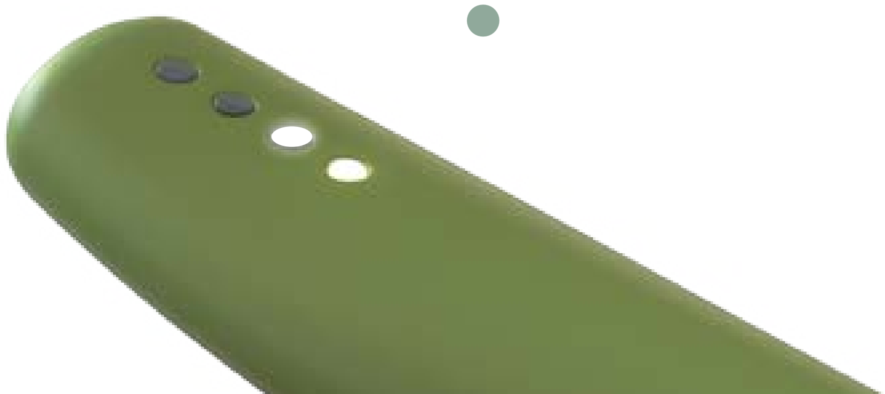
For Salt:

Switch to salt


Place in food, wait a few seconds



Read the result



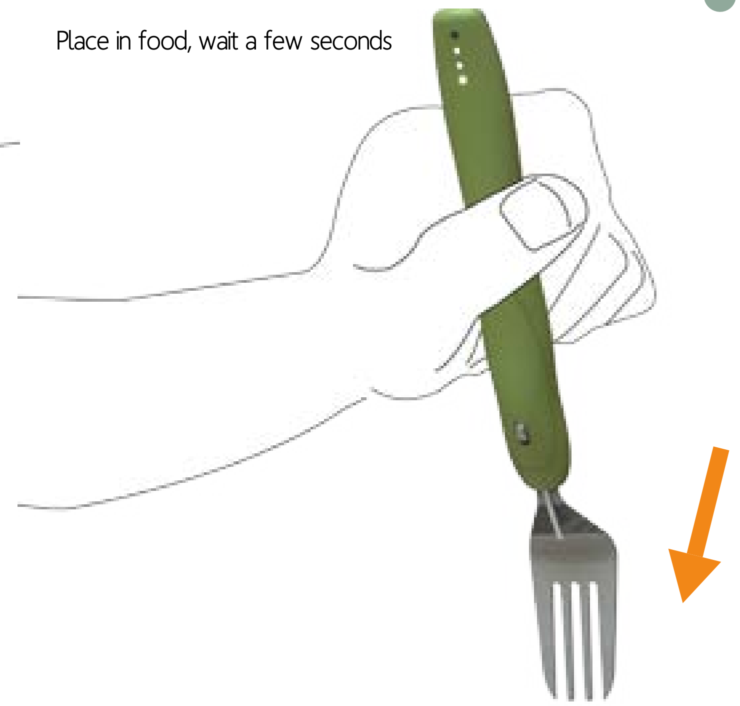


For sugar

Switch to sugar


The test strip will be pushed out.
Rotate the scroll wheel for a new piece of strip.

Place in food, wait a few seconds



Read the result

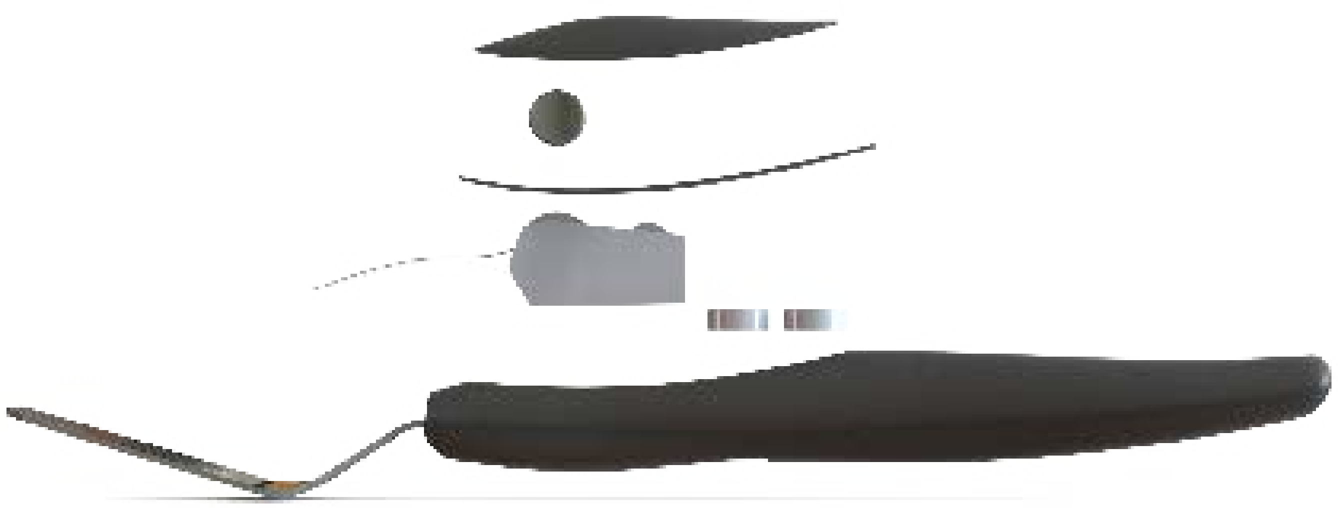
# HOW TO USE THE CHECKER

Washing the fork

Simply pull the prongs out of the handle
when it is powered off



Replacing the cassette or cells



# FAQs

Why should I monitor my salt and sugar intake?

You may be eating foods that you thought were fine, but in fact contain high levels of salt and sugar, which when consumed are widely known to cause common but serious health problems, including diabetes, high blood pressure, obesity and so on. You don't even have to monitor it - it can be somethign to use out of interest, whenever you want.

What about social stigma?

It has been designed to look as regular a fork as possible. Matching spoons and knives will be available in the near future.

How do I know when the strips have run out?

The tape will be marked with darkening shades of red to warn the user in time.

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