

User experience design

(M5X01239)

Nicholas Richards, p149016

1/7/2019

This report will show the user experience/usability testing and evaluation of 2 existing products against 2 working prototypes (4 peelers) by using 10 percipients or more to determine how effective each peeler is and if the working prototypes performed better in a controlled test against the existing products. This will be proven by statistical analysis obtained from data collected from each percipient in a table/spreadsheet format.

Contents

Design Issues	2
Design Interventions	4
Peeler C design process	5
Peeler D design process	8
Two working prototypes	10
Test method	12
Results	12
Evaluation and conclusion	13
Appendices	14
Appendix A	14
Likert scale used in testing	14
Examples of Likert scale obtained from percipients	15
Appendix B	21
Additional comments	21
Appendix C	24
Usability metric tables and graphs	24
Experience metric tables	26
Bibliography	27

Design Issues

The 2 working prototypes designs were developed from key issues the percipients identified during the empathy testing. The empathy testing was needed so that there was actual reason for changing the design of the existing products to improve an aspect than just changing the overall appearance to make it more visually appealing. Empathy testing involves finding a case study that would benefit from having a product they use daily, redesigned to make the operational use of the product easier.

The case study used was arthritis due to how the impairment of the disease causes the individual to suffer from many difficulties with their hands. Although the aim is to improve kitchen peelers for individuals who suffer from arthritis this doesn't mean that the peelers are to be used just for arthritis suffers, ideally the redesigned peelers need to be suited and accessible for the majority of the population. This implies that the peelers need to be of an inclusive design as well as a design that has a beneficial improvement.

Therefore the participants were made to peel veg with peeler A and peeler B firstly without any impairments and secondly with impairments. These impairments involved limiting movement and grip strength by using tape to demonstrate how arthritis effects people joints and bones using tape.



(Richards 2018)

After the empathy testing was completed each participant was asked to comment on what they thought needed to be improved with peeler A and peeler b. Issues identified with each peeler are as follows:

Peeler A

- Had to keep adjusting the grip position since the peeler kept slipping out of the hand
- Handle was too small as well as blade length
- Wasn't able to peel much off with each stroke, meaning that it took a lot of time
- Peelings kept getting stuck in either gaps on each side of the blade



(Richards 2018)

Peeler B

- The handle didn't fit the hand well making it uncomfortable
- Wasn't able to peel much off with each stroke due to grip strength
- Took a while to peel each veg because the peels kept getting stuck in the blades gap, which you had to remove by hand



(Richards 2018)

Design Interventions

Although the 2 working prototypes are improvements of the 2 existing products some features need to be the same so that when comparing each peeler in the testing stage it can be clear what peeler is the improvement of the other peeler. Therefore peeler C would need to have its blade parallel to the handle (Type A is parallel as well) and peeler D blade needs to be perpendicular to the handle (Type B is perpendicular as well).

Peeler C design process

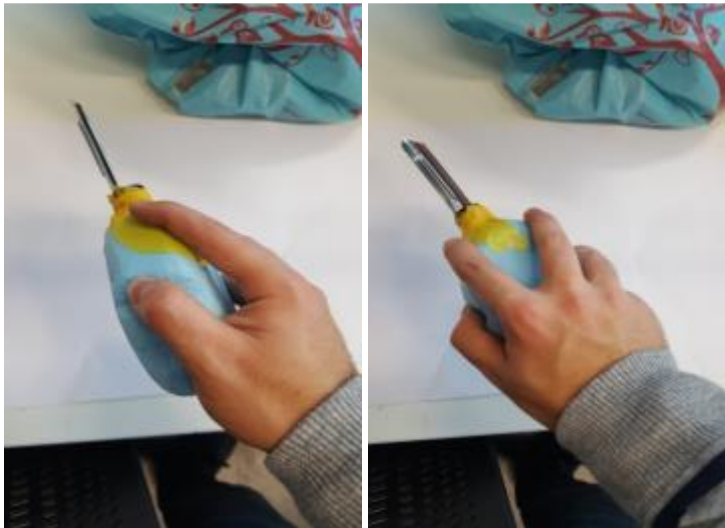


(Richards 2018)

The idea behind the design is that the user would strap the peeler to their hand and wrist/forearm, to obtain a better grip strength. The blade is parallel to the hand and the peeler shape is designed so it's gripped around the edges since with arthritis it's difficult to bend your fingers and joints.



While making the first prototype the design changed dramatically. As you can see I made the blade parallel to the handle due the fact I need to keep the testing fair when it comes round to it. Also the idea of having a strap was removed since it would be more of an inconvenience getting it on and off than a positive feature. The images also shows how the handle is gripped around the edges.



(Richards 2018)

Obviously the model above is not suitable to be used in the final testing therefore I took the opportunity to have the model tested by a couple of previous participants to find out their thoughts on the design of peeler C before an actual model is made for testing. The participants found the handle to be comfortable since it fitted in their palms easily but if a person with arthritis were to use it would they find it to straining to use since their grip strength isn't very strong. Meaning that the grip edges should be altered to offer more areas of grip.



The next stage of development shows how I've acted on the comments above and made the handle more oval and instead of having the grips location on the edges, they are now located all around.



(Richards 2018)

Peeler D design process



The image to the left is rather simple diagram but it represents the idea of how the overall peeler would be in a shape of a flask (that acts as a small bin/container.) On top of the flask there would be a lid that twists off but is has a blade located in the center with space either side for the peels to fall downwards.

(Richards 2018)

While observing the participants during the empathy testing I realised that when it came to cleaning up the peels (while their hands were impaired), it was quite a frustrating task since the peels were hard to grab hold. Therefore this made me consider adding a feature that would allow a person with or without arthritis to get rid of the peels easily.

The text to the right of the image explains what it is but the main reason is that it would save time in meal preparation by being able to get rid of the peels in one go and to obtain more grip strength by having the peeler rest upon a counter top instead of handling it in the air. This would also help sustain more balance by having the peeler fixed to the same spot.

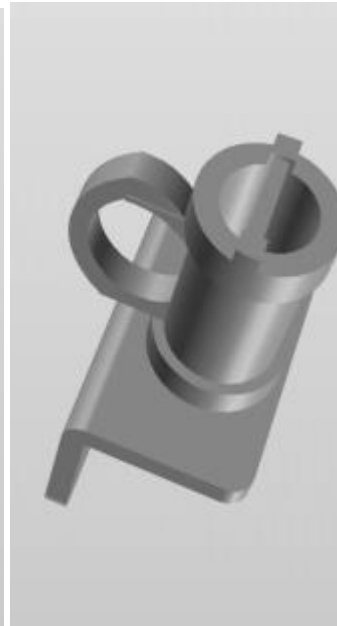


(richards 2018)

As with peeler C this is a simple model only used to help me create a more suitable model that will be used in the testing later on. As you can see in the images I've added a slot to the bottom of the

container because if the container is meant to stay in the same spot it would need to be secured therefore the slot would act as a locking system on the edge of the counter top which will prevent the container from moving or falling over.

When peeler D was tested by couple of participants they made the conclusion that the blade should have a swivel function to allow it to peel more round shaped veg quicker. Also maybe change the slot since if it got jammed on the edge of the counter it would be a nuisance to get off.



To be able to have a swivel function I've raised the blade location slightly above the lid. I've also changed the slot part having it slot over the counter top edge than it slotting on the counter top edge.

(Richards 2018)

Two working prototypes



(Richards 2018)



(Richards 2018)

The images above represent the final working prototypes that will be used for testing. Both have been covered with the same water resistant sealer and the blades used are the same as peeler A and B.

Test method

The test structure starts with the participant jotting down their age, gender and their dominant hand (left or right). Then selecting a peeler (doesn't have to be in alphabetic order), weighing the carrot (g) and then the test conductor starting the stopwatch (seconds) as the participant begins to peel. Once the carrot is peeled it is immediately weighed again to determine weight lost. This part of the test comes under usability metrics which identifies how each peeler performed against each other e.g. effectiveness and efficiency. The next part of the test is the experience metrics which is about how each participant felt about each peeler meaning user satisfaction. This is measured by using a Likert scale of 4 questions that come under the terms comfort rating, aesthetic rating, functionality rating and experience rating. The peelers will be identified by colour on the Likert scales and the data collected is measured by percentage. A copy of the Likert scale can be found in the appendix page 12. Also the participants were given the choice to add any additional comments on the back of the Likert sheet.

To make sure that the testing was kept fair certain variables were kept the same for each participant which included using the same stop watch, weighing scale and cutting the carrots to the same length (10.5 cm). This was done so the test results could be more accurate and not bias due to the size of the carrot. The carrots were made the same length by simply emptying two bags of carrots and lining them up smallest to biggest and cutting them all to the same length as the smallest.

Results

After analysing the data recorded in the usability metric tables which are located in the appendices, it showed that peeler B was the most effective since it is able to peel 0.31 grams per second. This result was achieved by dividing the mean weight lost by each peeler by the mean time by each peeler. The results also showed that the two working prototypes (type C and type D) did not perform better than the existing products. It showed that peeler A and C had no significant difference between them making them equal in comparison. Another factor that also shows that peeler b was the most effective is the percentage of weight lost which was 19.5%.Peeler D performed the worst out of the four. Data for this information can be located on page 24 in the appendices

The age/time comparison chart also showed that higher the age the longer it took to peel the all the veg with each peeler. This result was found by adding each peeler data together for each peeler and creating a separate table. Although the trend line does justify this point it is also important to be made aware that the majority of the age group was under the age of 23, meaning the result could be bias and that the majority age group was male whereas the female age was 54 and also the oldest age participating. Data for this information can be located on page 25 in the appendices

By working out the means from the percentages gained from each of the Likert questions (page 15-20 in the appendices), it gave evidence that peeler D was the most comfortable to use which was surprising since it was the least effective as proven in the usability metrics results. It also showed that peeler B had the highest aesthetics and user experience rating which could suggest that the

visual appearance of the product plays an important factor on user satisfaction as well. Meaning that if the peeler doesn't have a pleasing appearance then it could help cause the participant to determine that the peeler is not suitable and therefore defunct. This can also be supported by how peeler A has the lowest percentage rating for both aesthetics and user experience.

Peeler C according to the results was the peeler that performed best without giving any of the participants any strain of use. Even though this result was the lowest percentage this can't be mistaken as the worst, the reason why is explained on the Likert scale the third question down on page (page 14 in the appendices).

The participants provided additional comments about each peeler on the back of the Likert sheet, examples of these are located in the appendices and they help explain the scores they gave to each peeler in the tables (page 21-23 in the appendices).

Evaluation and conclusion

Ideally more than one aspect of the testing needs to be changed to gain a better and more valued result for each peeler. This would include adding more participants of different ages and more that are female, participants that are left handed as well since every participant was right handed and using more than just one piece of veg. This would enable comparisons between left and right hand users for each peeler and by using more veg could allow the participant to gain more confidence in using the peelers and therefore more honest results.

As stated in previous content in the report the two working prototypes did not perform better than the existing products. In fact peeler B was the most effective and the peeler that gave the best impression. Peeler A and C had equal results in the usability metric results but peeler A and the overall lowest experience metric results meaning that peeler C out performed A in User satisfaction, so there was some slight improvement.

Appendices

Appendix A

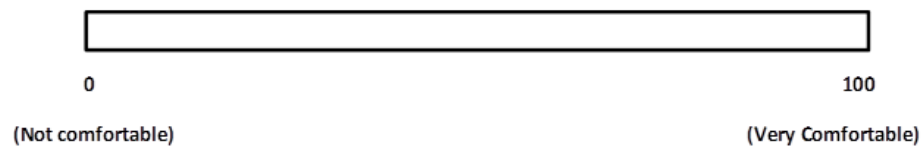
Likert scale used in testing

Percipient:

Type A Type B Type C Type D

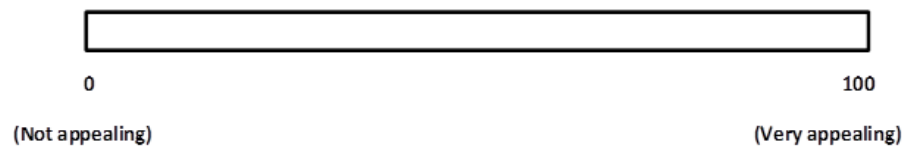
Comfort testing

How comfortable was the peeler to hold?



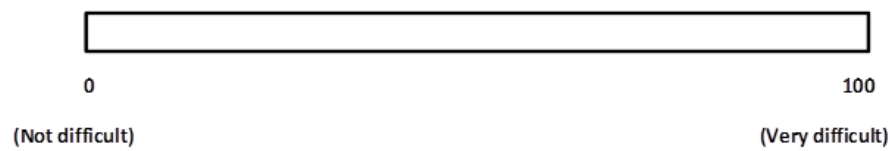
Ascetics testing

Is the appearance of the peeler visually appealing?



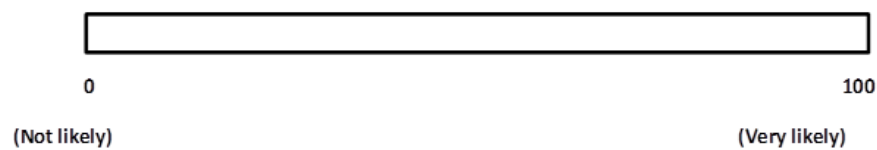
Functionality testing

How difficult was it to use?



User experience testing

Would you use this peeler again?

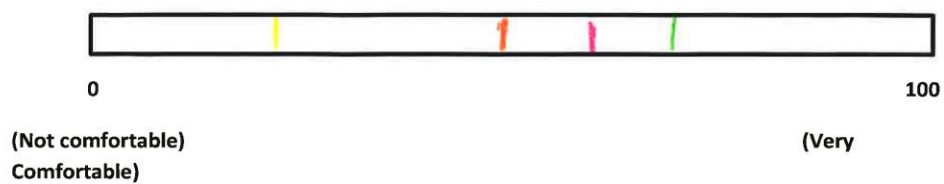


Examples of Likert scale obtained from percipients

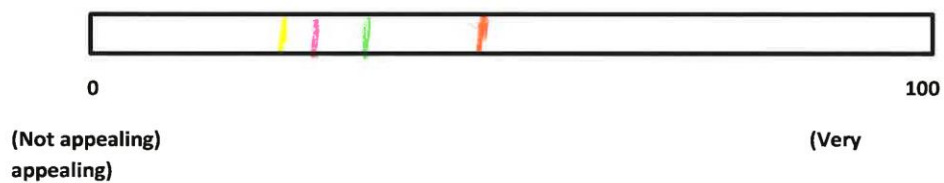
Percipient: B2

Type A Type B Type C Type D

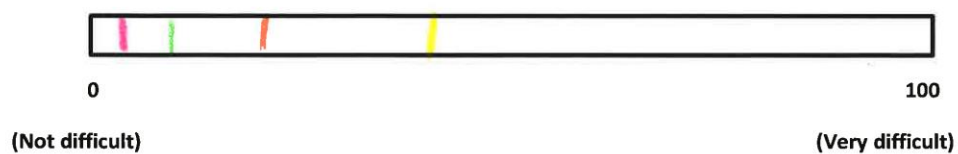
How comfortable was the peeler to hold?



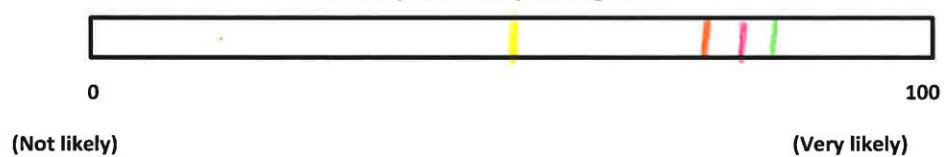
Is the appearance of the peeler visually appealing?



How difficult was it to use?



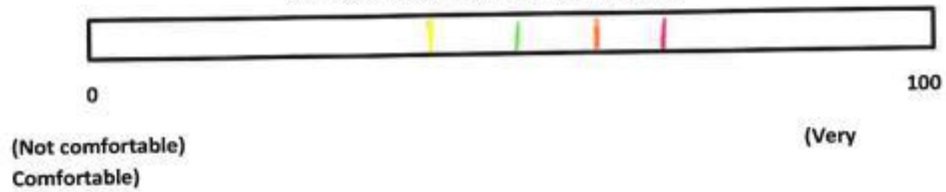
Would you use this peeler again?



Percipient: 3

Type A Type B Type C Type D

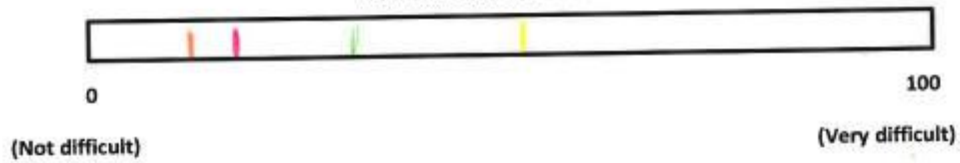
How comfortable was the peeler to hold?



Is the appearance of the peeler visually appealing?



How difficult was it to use?



Would you use this peeler again?



Percipient: 4

Type A Type B Type C Type D

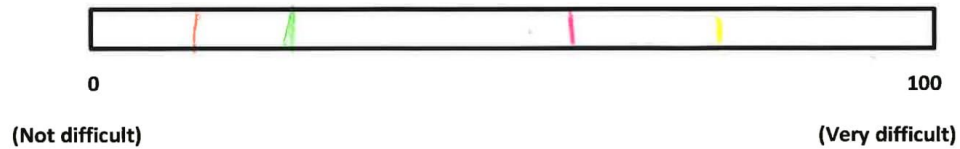
How comfortable was the peeler to hold?



Is the appearance of the peeler visually appealing?



How difficult was it to use?



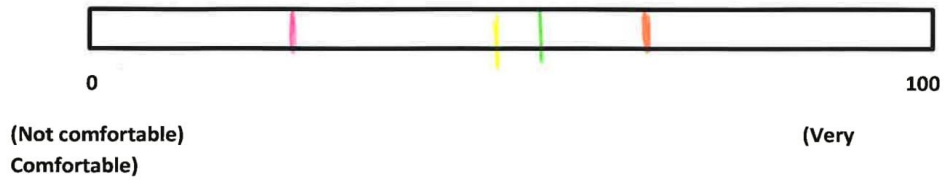
Would you use this peeler again?



Percipient: 5

Type A Type B Type C Type D

How comfortable was the peeler to hold?



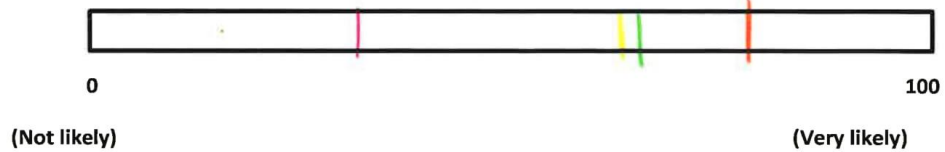
Is the appearance of the peeler visually appealing?



How difficult was it to use?



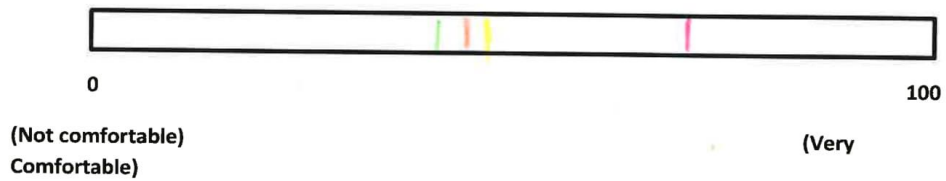
Would you use this peeler again?



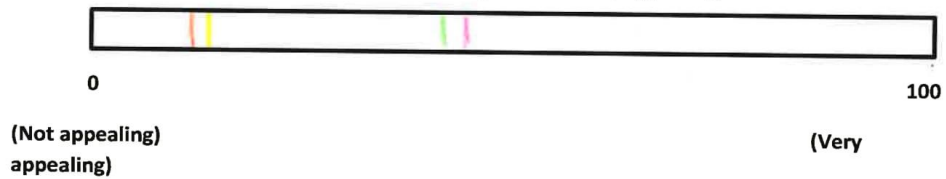
Percipient: 7

Type A Type B Type C Type D

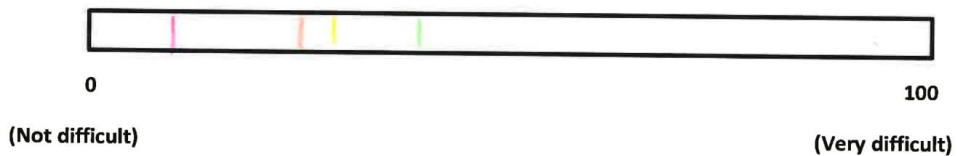
How comfortable was the peeler to hold?



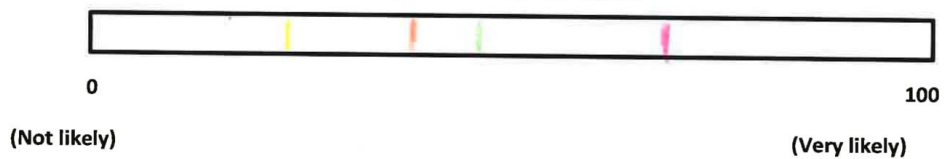
Is the appearance of the peeler visually appealing?



How difficult was it to use?



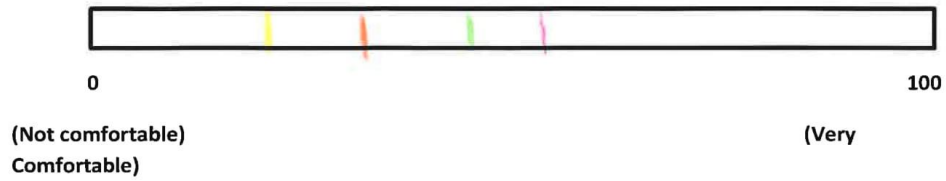
Would you use this peeler again?



Percipient: 10

Type A Type B Type C Type D

How comfortable was the peeler to hold?



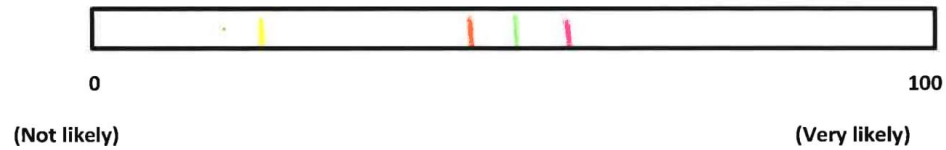
Is the appearance of the peeler visually appealing?



How difficult was it to use?



Would you use this peeler again?



Appendix B

Additional comments

Big cup Peeler is hard to
see what part you're peeling
maybe adapt it to be able
to see what you are peeling

TYPE D - BECAUSE THE BLADE IS INVERTED COMPARED TO NORMAL METHODS, I STRUGGLED TO SEE WHAT I WAS CUTTING. I WAS CUTTING 'BLIND'

- A - DIDNT LIKE HANDLE
- B - FELT WEAK AND FINELY
- C - TOO WIDE ? BUT INTERESTING
- D - SATISFYING TO USE TO USE

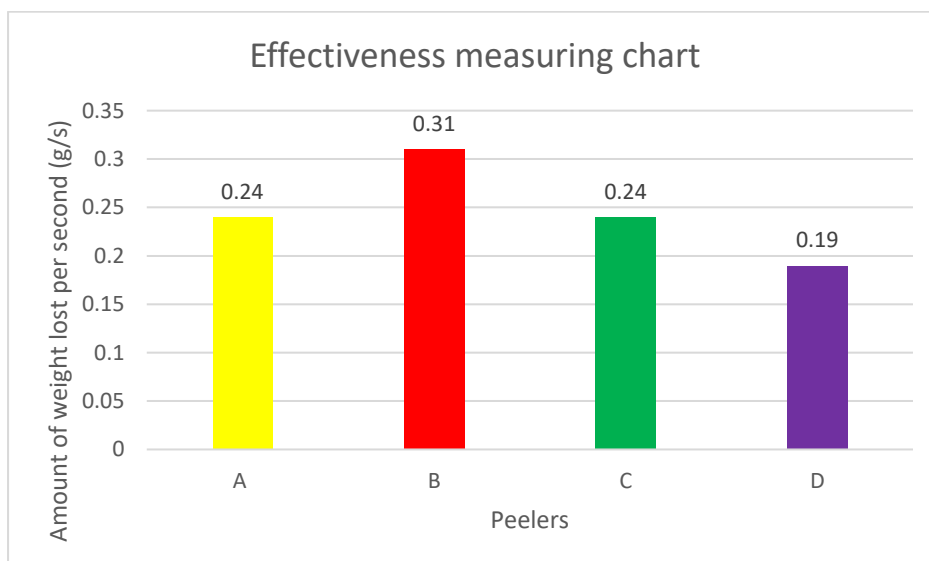
Appendix C

Usability metric tables and graphs

Participants	Gender	Age	R or L handed	Weight of carrot to be used by peeler (g)				Time taken to peel carrot (s)				Weight of peeled carrot (g)			
				A	B	C	D	A	B	C	D	A	B	C	D
p1	M	19	Right	60.2	51.3	47.7	68.4	31.2	27.4	26.3	44.5	52.3	36.3	45.5	62.1
p2	M	19	Right	53.5	44.6	35.4	52.1	52.4	39.3	31.8	47.9	50.7	39.7	31.1	49.6
p3	M	20	Right	56.7	57.4	43.3	39.3	38.4	30.6	27.3	30.1	44.3	44.1	36.5	29.5
p4	M	20	Right	46.1	63.2	38.9	66.6	26.9	25.1	18.9	34.2	37.9	50.5	29.7	56.9
p5	M	30	Right	46.6	27.4	56.3	28.2	31.1	28.5	30.2	34.4	43.1	21.3	47.9	22.1
p6	M	22	Right	29.1	34.8	37.1	32.3	30.5	19.3	28.1	38.6	23.5	28.6	29.4	24.3
p7	M	19	Right	38.5	41.2	37.3	29.7	21.9	18.4	22.5	25.1	27.8	35.5	28.1	25.7
p8	F	54	Right	49.3	55.7	33.6	51.1	32.4	38.5	35.8	43.3	41.3	48.7	27.7	43.3
p9	F	54	Right	33.4	29.4	47.7	43.8	28.5	25.7	43.4	36.3	24.7	21.2	38.6	32.6
p10	M	23	Right	58.9	39.1	28.8	51.2	30.6	26.6	23.3	42.2	49.8	32.3	21.4	42.7
Mean				47.2	44.8	40.6	46.3	32.4	27.9	28.8	37.7	39.5	35.8	33.6	38.9

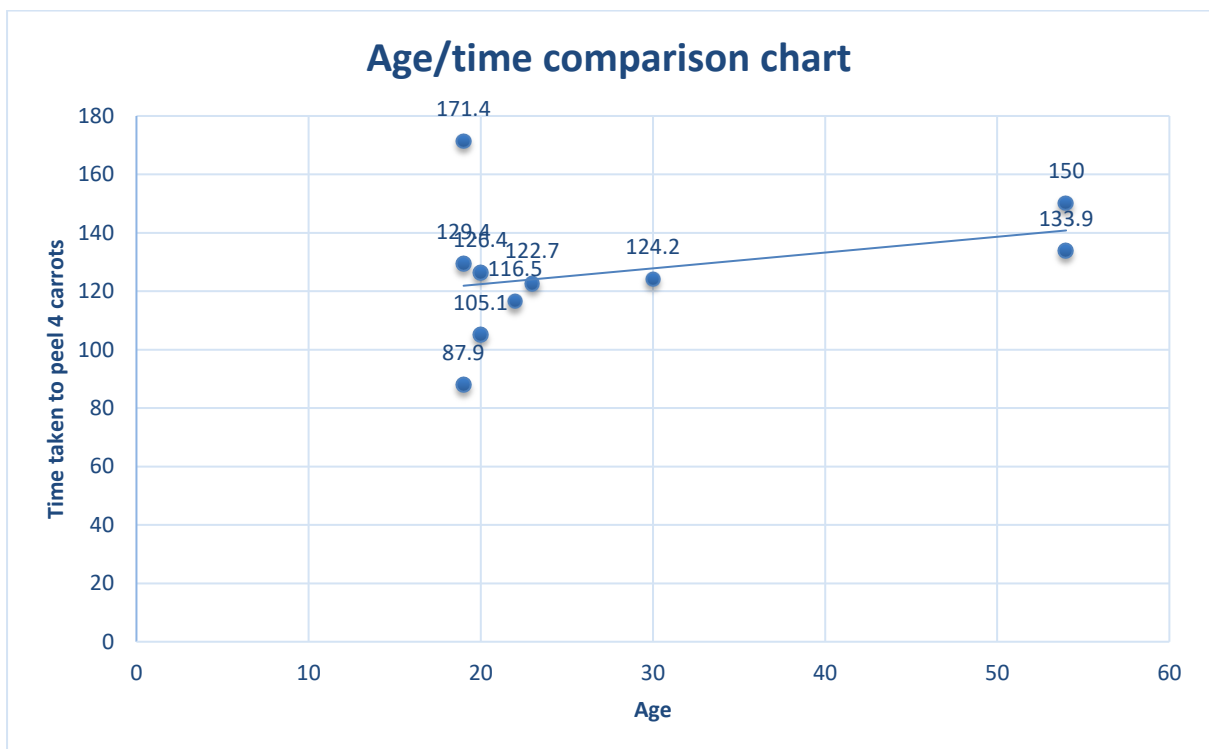
Participants	Gender	Age	R or L handed	Amount of weight lost (g)				% of weight lost			
				A	B	C	D	A	B	C	D
p1	M	19	Right	7.9	15	2.2	6.3	13.1	29.2	4.6	9.2
p2	M	19	Right	2.8	4.9	3.6	2.5	5.2	11	12.1	4.8
p3	M	20	Right	12.4	13.3	6.8	9.8	21.9	23.2	15.7	24.9
p4	M	20	Right	8.2	12.7	9.2	9.7	20	20.1	23.7	14.6
p5	M	30	Right	3.5	6.1	8.4	6.1	7.5	22.3	14.9	21.6
p6	M	22	Right	5.6	6.2	7.7	8	19.2	17.8	20.8	24.8
p7	M	19	Right	10.7	5.7	9.2	4	27.8	13.8	24.7	13.5
p8	F	54	Right	8	7	5.9	7.8	16.2	12.6	17.6	15.3
p9	F	54	Right	8.7	8.2	9.1	11.2	26	27.9	19.1	25.6
p10	M	23	Right	9.1	6.8	7.4	8.5	15.4	17.4	25.7	16.6
Mean				7.7	8.6	7	7.4	17.2	19.5	17.9	17.1

Peeler	Amount of weight lost (g)				Time taken to peel carrot (s)				Amount of weight lost per second (g/s)			
	A	B	C	D	A	B	C	D	A	B	C	D
Mean	7.7	8.6	7	7.4	32.4	27.9	28.8	37.7	7.7/32.4	8.6/27.9	7/28.8	7.4/37.7
									0.24	0.31	0.24	0.19



Parcipients	Gender	Age	R or L handed	Combined weight of 4 carrots (g)	Time taken to peel 4 carrots (s)	Combined weight of 4 peeled carrots (g)
p1	M	19	Right	227.6	129.4	196.2
p2	M	19	Right	185.6	171.4	171.1
p3	M	20	Right	196.7	126.4	154.4
p4	M	20	Right	214.8	105.1	175
p5	M	30	Right	158.5	124.2	134.4
p6	M	22	Right	133.3	116.5	105.8
p7	M	19	Right	146.7	87.9	117.1
p8	F	54	Right	189.7	150	161
p9	F	54	Right	154.3	133.9	117.1
p10	M	23	Right	178	122.7	146.2

Parcipients	Gender	Age	R or L handed	Combined weight lost (g)	% of combined weight lost
p1	M	19	Right	31.4	13.8
p2	M	19	Right	14.5	7.8
p3	M	20	Right	42.3	21.5
p4	M	20	Right	39.8	18.5
p5	M	30	Right	24.1	15.2
p6	M	22	Right	27.5	20.6
p7	M	19	Right	29.6	20.2
p8	F	54	Right	28.7	15.1
p9	F	54	Right	37.2	24.1
p10	M	23	Right	31.8	17.9



Experience metric tables

				Comfort rating (0-100%, High percent is positive)				Aesthics Rating (0-100%, High percent is positive)			
Parcipients	Gender	Age	R or L handed	A	B	C	D	A	B	C	D
p1	M	19	Right	27.2	34.7	47.6	51.7	18.4	12.9	29.3	62.6
p2	M	19	Right	21.8	49	69	59.9	22.4	46.3	32.7	26.5
p3	M	20	Right	40.1	59.9	51	68	38.1	40.8	45.6	44.2
p4	M	20	Right	29.3	53.1	56.5	61.2	37.4	42.9	39.5	47.6
p5	M	30	Right	48.3	66.6	53.7	21.1	40.8	54.4	31.3	42.2
p6	M	22	Right	46.9	72.8	53.1	25.8	26.5	80.3	47.6	17.7
p7	M	19	Right	46.9	44.2	40.8	70.7	14.3	12.2	42.2	44.9
p8	F	54	Right	45.6	36.7	53.1	72.1	27.2	36.7	32.7	35.4
p9	F	54	Right	30.6	47.6	55.1	51.7	34	47.6	37.4	42.9
p10	M	23	Right	21.1	32.7	45.6	53.7	42.2	53.7	46.3	51
Mean				35.8	49.7	52.6	53.6	30.1	42.8	38.46	41.5

				Functionality Rating (0-100% low				User Experience(0-100%, High			
Parcipients	Gender	Age	R or L handed	A	B	C	D	A	B	C	D
p1	M	19	Right	12.9	6.1	17	2.7	5.4	3.4	24.5	31.3
p2	M	19	Right	40.8	20.4	9.5	4.1	50.3	72.8	81.6	77.6
p3	M	20	Right	51	12.4	31.3	17.7	34.7	54.4	51.7	55.8
p4	M	20	Right	74.8	12.4	23.8	57.1	37.4	59.2	53.7	49.7
p5	M	30	Right	21.1	9.5	18.4	45.6	62.6	78.2	65.3	32
p6	M	22	Right	31.3	12.2	33.3	76.9	12.2	81.6	17.7	4.8
p7	M	19	Right	29.3	25.2	39.5	10.2	23.8	38.1	46.2	68
p8	F	54	Right	45.6	36.1	13.6	42.9	44.2	35.4	45.6	41.5
p9	F	54	Right	72.1	60.5	20.4	11.6	33.3	43.5	53.1	47.6
p10	M	23	Right	76.9	54.4	12.2	28.6	19.7	44.9	50.3	56.4
Mean				45.58	24.92	21.9	29.7	32.4	51.2	49	46.5

Bibliography

Richards, N 2018, *Empathy testing*, photograph viewed 9th October 2018

Richards, N 2018, *Peeler A*, photograph viewed 2nd October 2018

Richards, N 2018 *Peeler B*, photograph viewed 2nd October 2018

Richards, N 2018 *Peeler C idea*, photograph viewed 23rd October 2018

Richards, N 2018 *Peeler C model*, photograph viewed 26th October 2018

Richards, N 2018 *Peeler C final design*, photograph viewed 4th November 2018

Richards, N 2018 *Peeler D idea*, photograph viewed 23rd October 2018

Richards, N 2018 *Peeler D model*, photograph viewed 26th October 2018

Richards, N 2018 *Peeler D final design*, photograph viewed 4th November 2018

Richards, N 2018 *Peeler C working prototype*, photograph viewed 20th November

Richards, N 2018 *Peeler D working prototype*, Photograph viewed 20th November