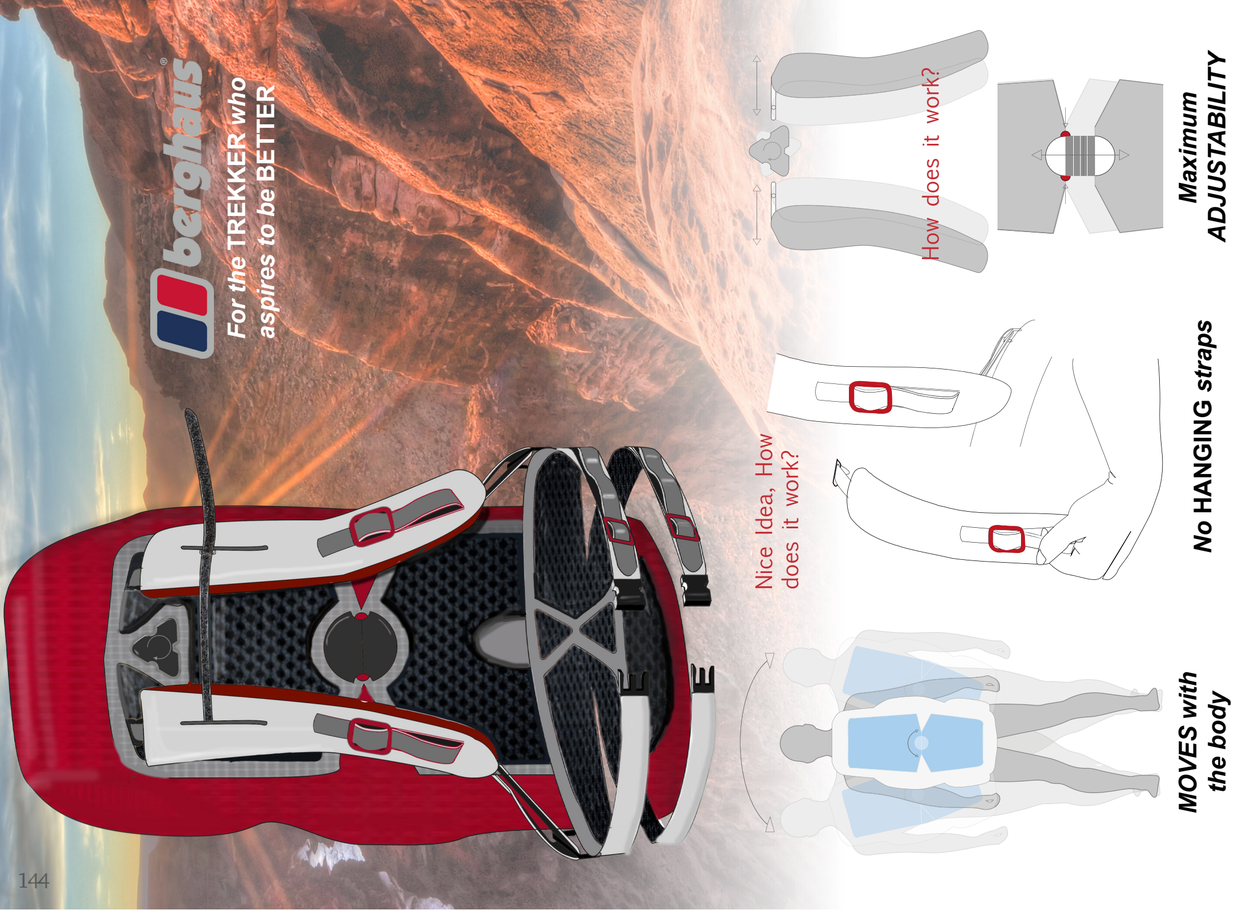
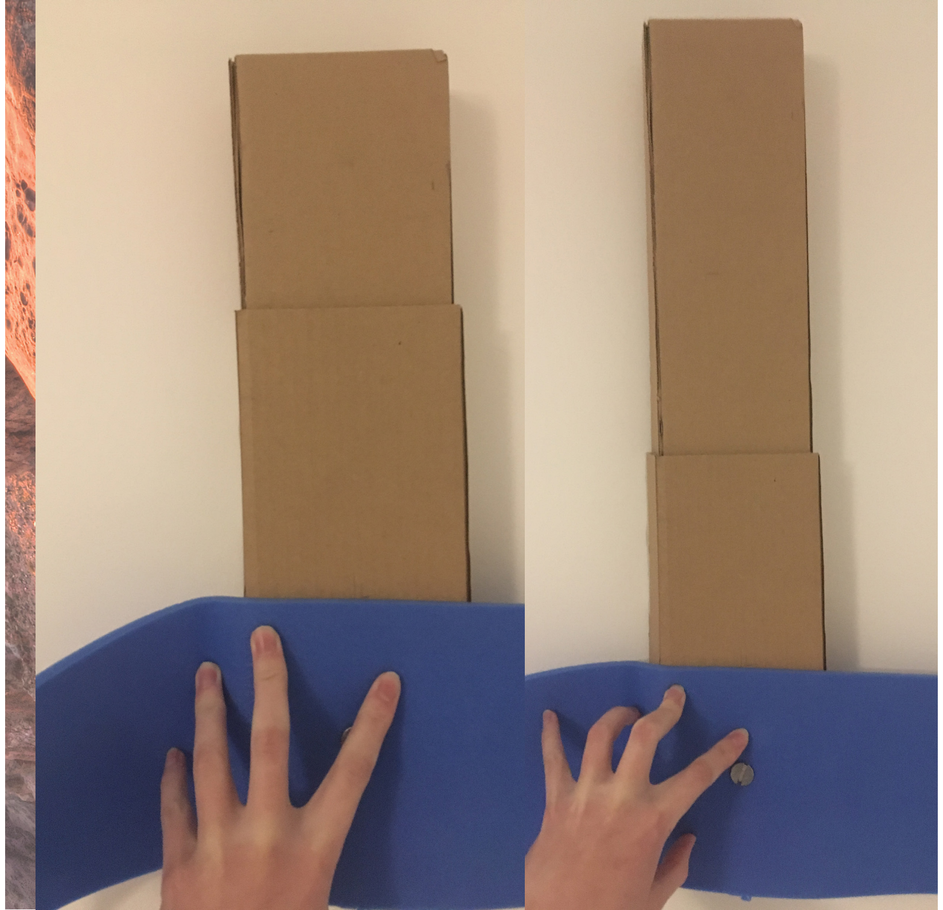
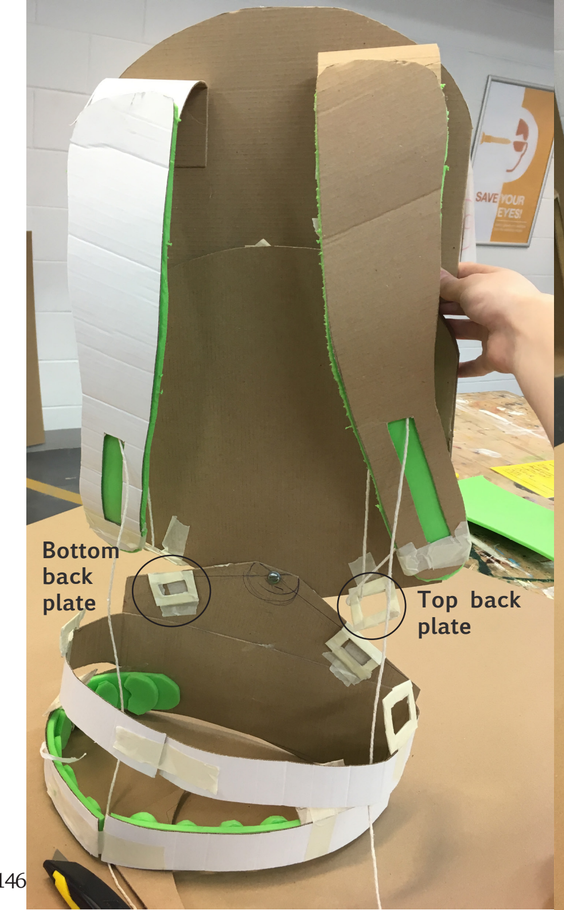


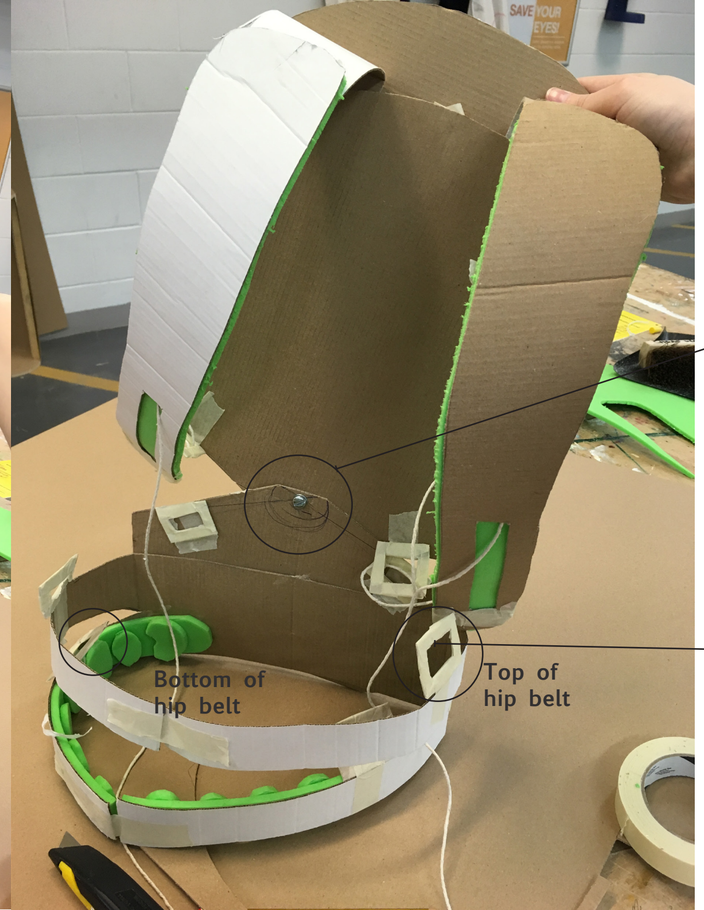


INITIAL PROTOTYPE

Initially a telescopic mechanism was concieved for torso length adjustment, however after prototyping, it became clear that this was too bulky and would therefore be uncomfortable in a rucksack.

Therefore other systems were trialled.





INITIAL PROTOTYPE

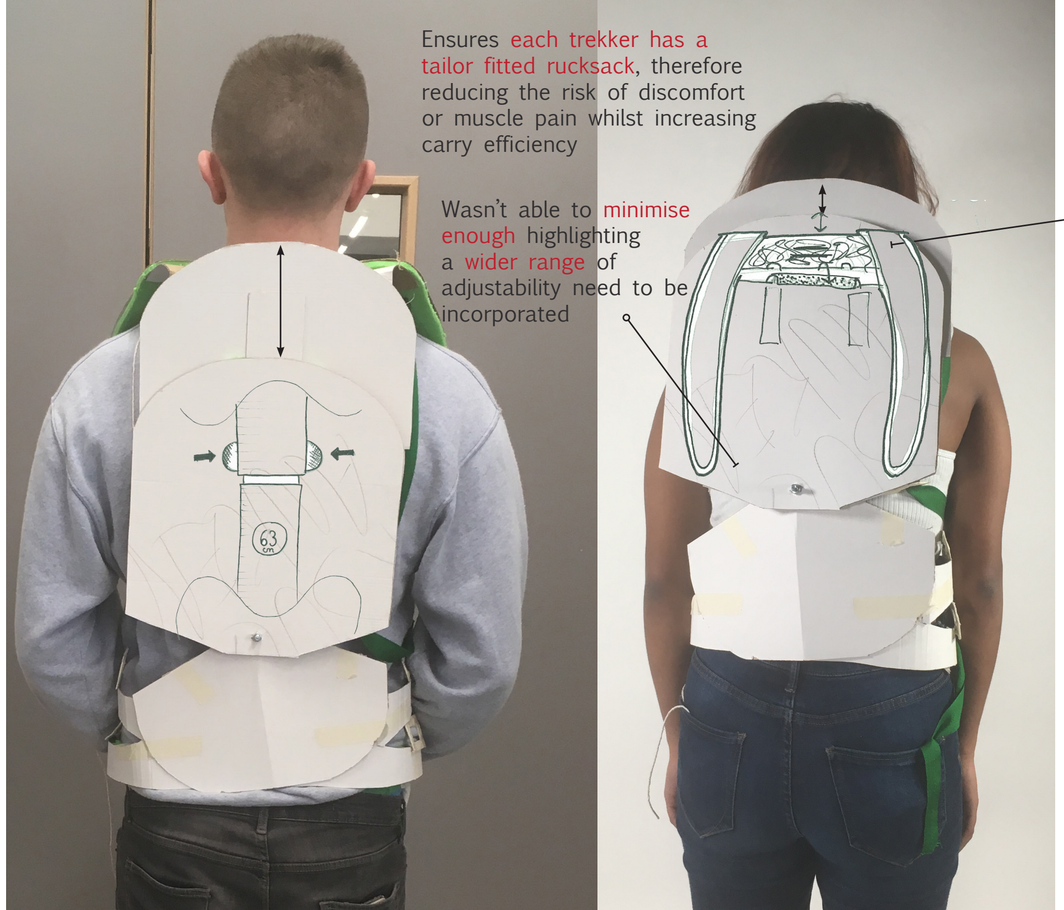
Althought it pivoted from side to side with the motion of the shoulder and pelvic girdle, a 3D element was considered:

- It would allow for the shoulder to move backwards and forwards without excess rubbing
- It would further help to support the body in its natural movement improving carry efficiency

Tested shoulder strap connection point in various places:

- Top of hip belt: pulled up hip belt
- Split in hip belt: felt uncomfortable and didnt allow hip belt to move freely
- **Top back plate**: really comfortable and allowed body to move naturally
- Bottom back plate: didn't allow back plate to effectively work as shoulder and pelvis couldnt move in opposition

TESTING TORSO **LENGTH**



Ensures each trekker has a tailor fitted rucksack, therefore reducing the risk of discomfort or muscle pain whilst increasing carry efficiency

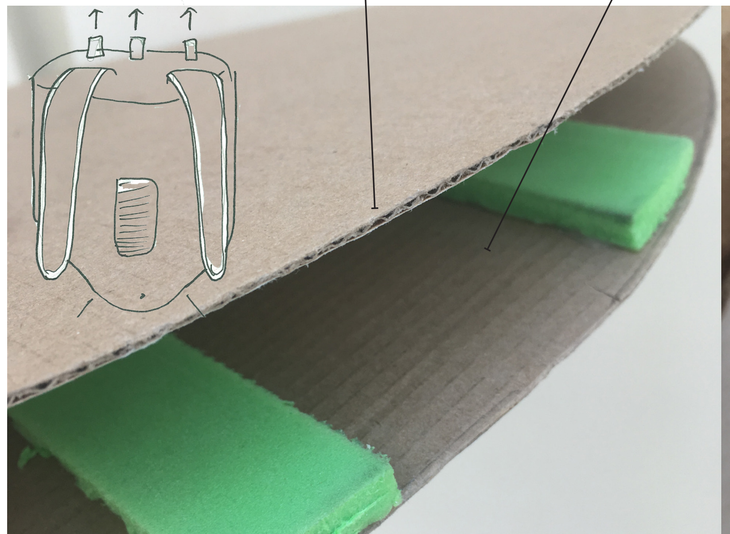
Wasn't able to minimise enough highlighting a wider range of adjustability need to be incorporated

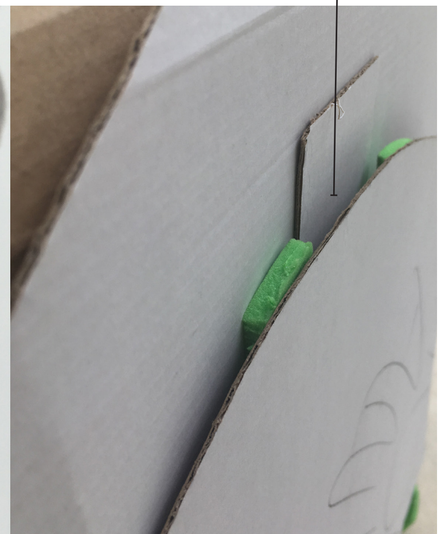
Industrial strength velcro would be used to secure the extension in place as this is easy to interact with whilst remaining strong enough

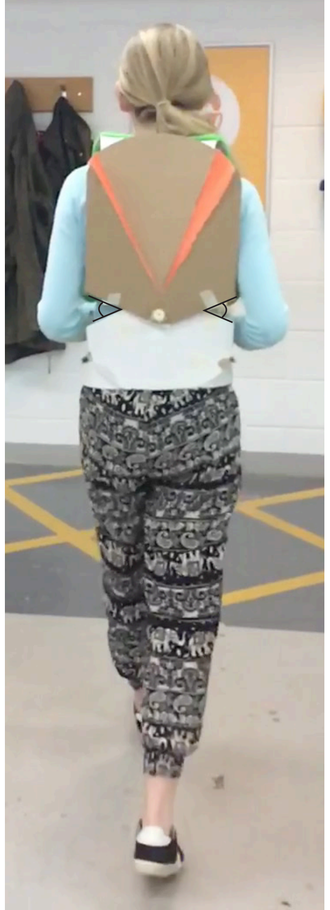
Markings to show smal, medium, large that the user then aligns the back plate against

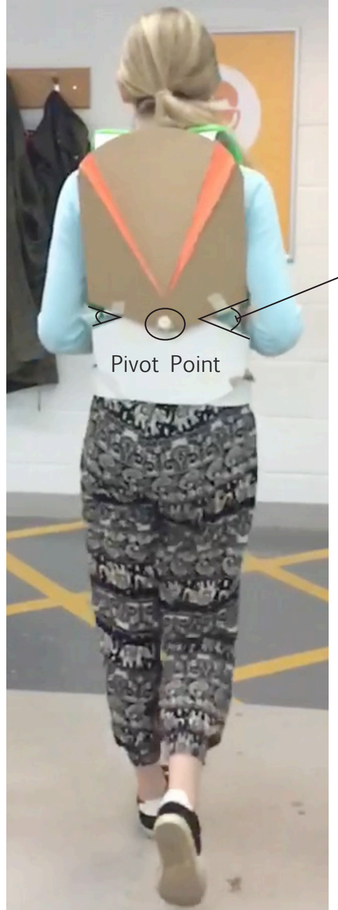
Visual communication of the size through markings or a dial to show the exact number would be useful to teach a novice

Operates on a runner to allow for the tors to be extended at will.





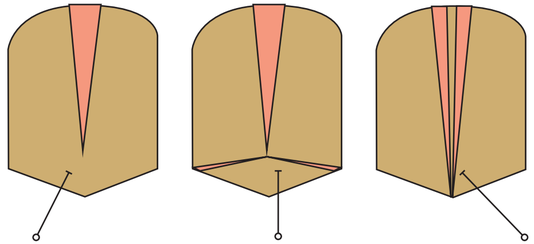




TESTING THE **BACKPLATE**

By making the pivot point lower, it allowed the body to move more nautrally, extending and compressing depending on the pelvic movement.

The orange sections are made from flexible foam, to allow for the shoulder to move forwards and backwards. However, it didnt work as effectively as intended, therefore different layouts were trialled.



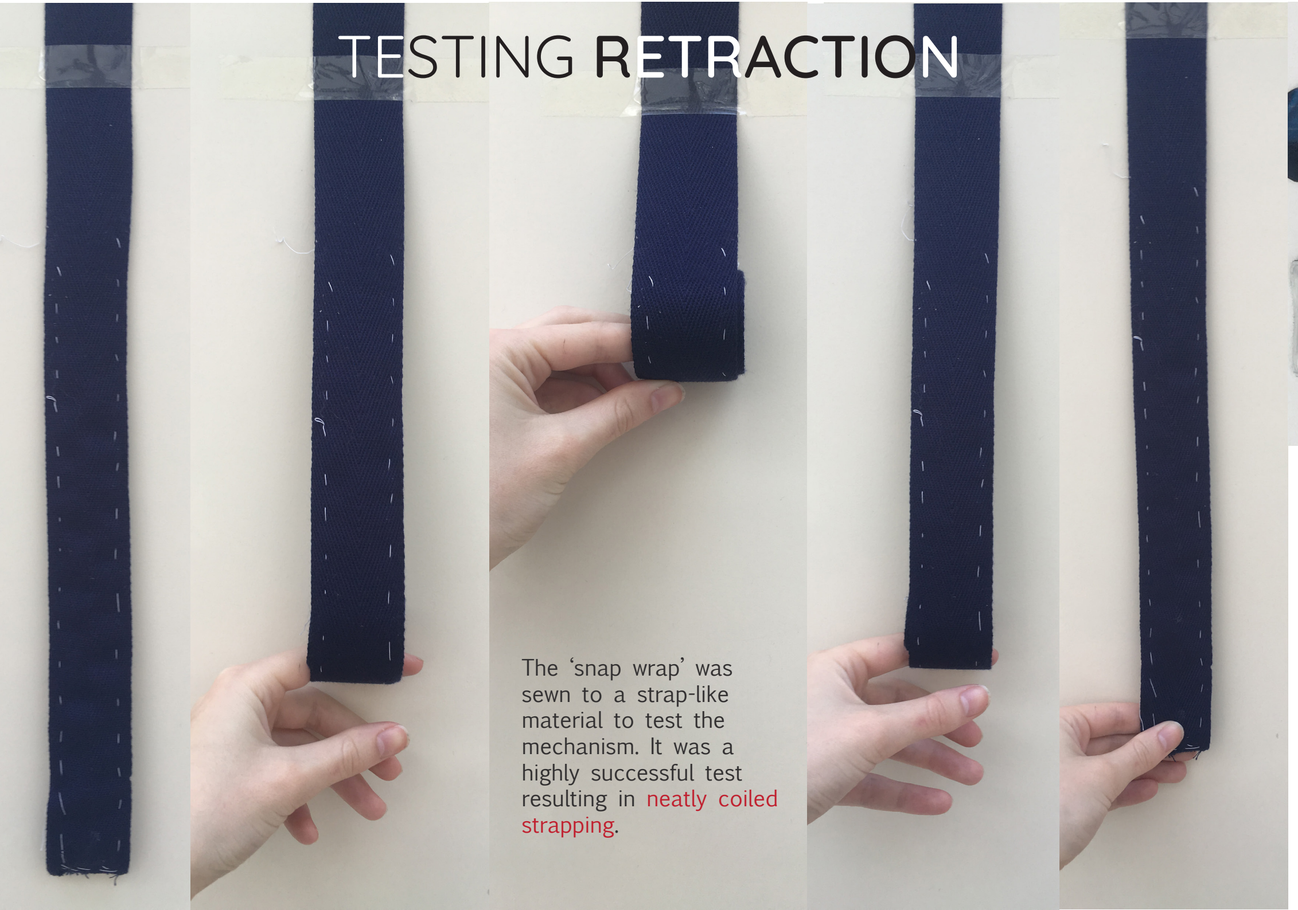
Movement is more restricted, foam part would compress and extend in response

Movement is allowed in too many directions, could become uncomfortable

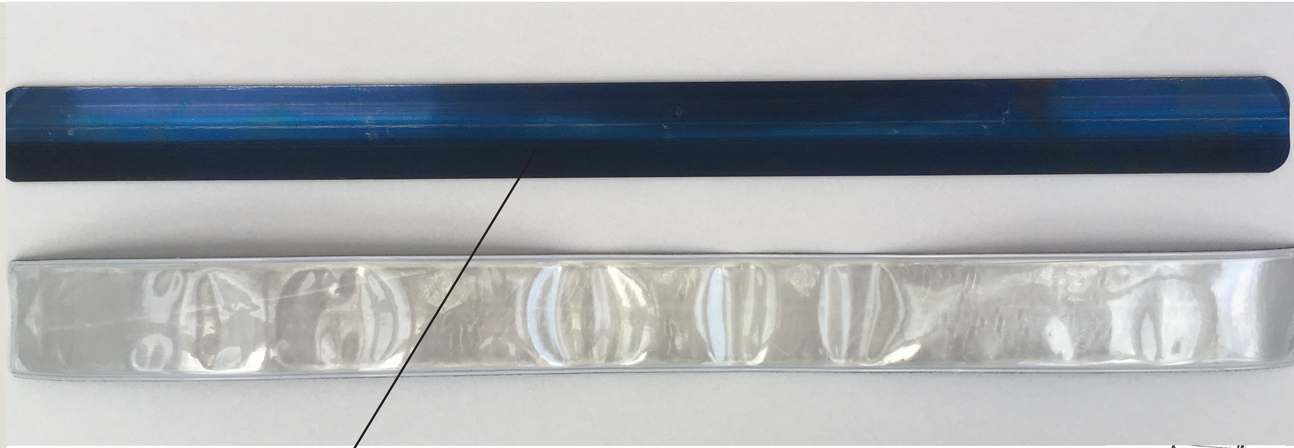
Allows each part to move independently with the shoulder straps

Despite different layouts, it became clear that the shoulder does not move enough to require flexibility. By using a thin plastic for the backplate, it would allow enough flex to support the small movement

TESTING **RETRACTION**



The ‘snap wrap’ was sewn to a strap-like material to test the mechanism. It was a highly successful test resulting in neatly coiled strapping.



Used in ‘snap wraps’, sprung stainless steel is encased in a fabric.

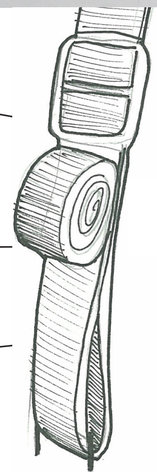
It then rolls up upon impact (when it is ‘slapped’ against the wrist)

The idea was to use this to eradicate the problem of hanging straps

Would be an addition to the current method of adjustment

Highly interative as a feature, sparking interest among potential consumers (draws them in)

Could have potential issues of it bouncing against the chest- would require an extra clip



AN ALTERNATIVE

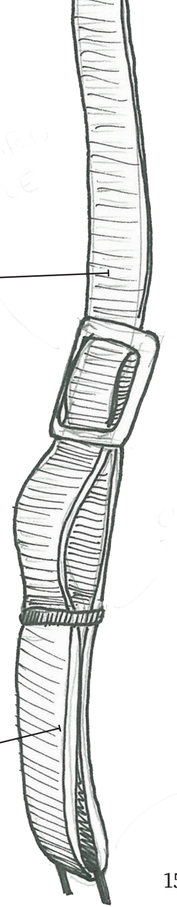
Similar to a handbag mechanism, the problem of the hanging strap is removed as it oprates on a continuous loop

This is a total redesign of the existing mechanism making it more intriguing to potential consumers

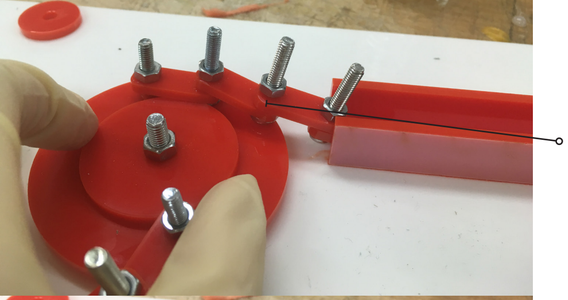
Has a wide range of adjustability for varying consumer sizes

As this mechanism is already used in products such as handbags and bra straps, it is percieved to be more trusted than the previous solution

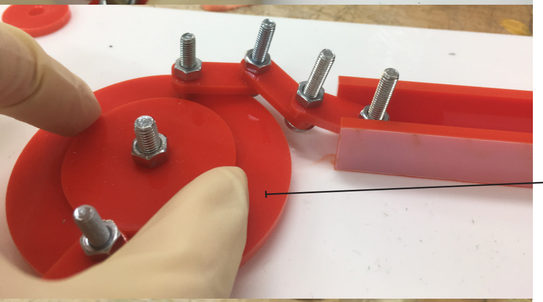
Difficulties were experienced when moving the buckle up and down, a handle/ area to grip would make it easier to operate



TESTING SHOULDER **ADJUSTMENT**

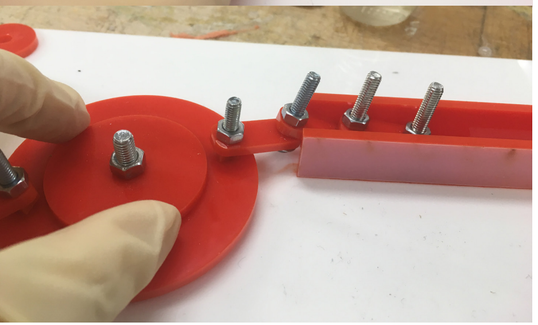


Segmented strip was trialled but difficulties were experienced when rotating inwards

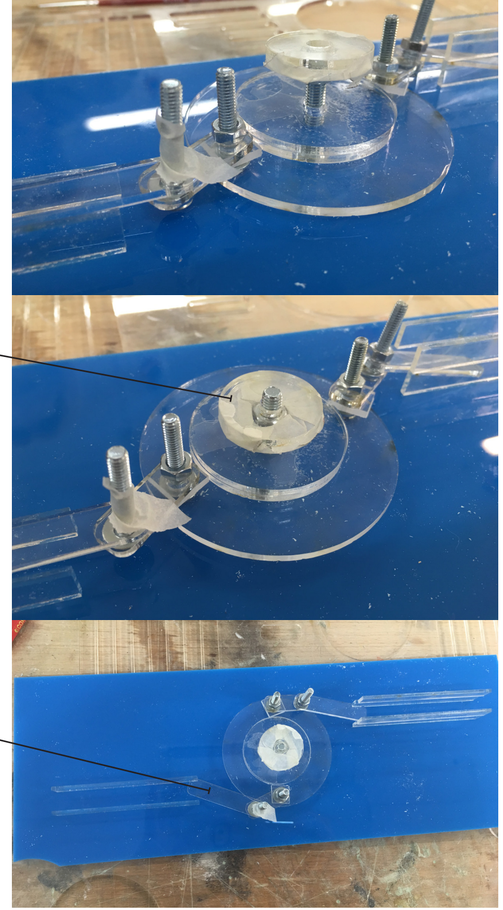


Once at desired width a locking mechanism is screwed down

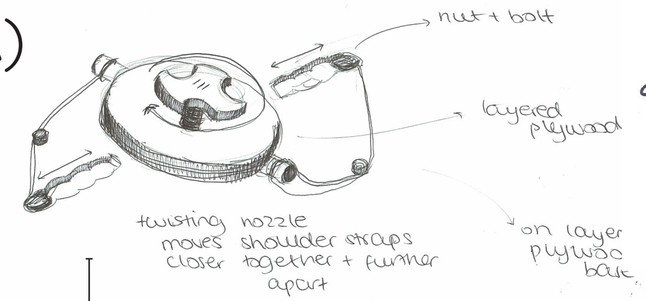
Easy to interact with, could be done with a gloved hand and one-handed

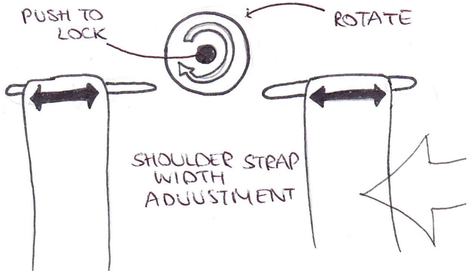


2 interconnecting strips was easier to interact with- however, second strip needs to be longer



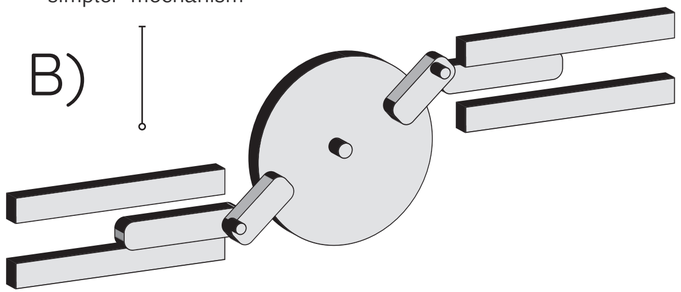
A)





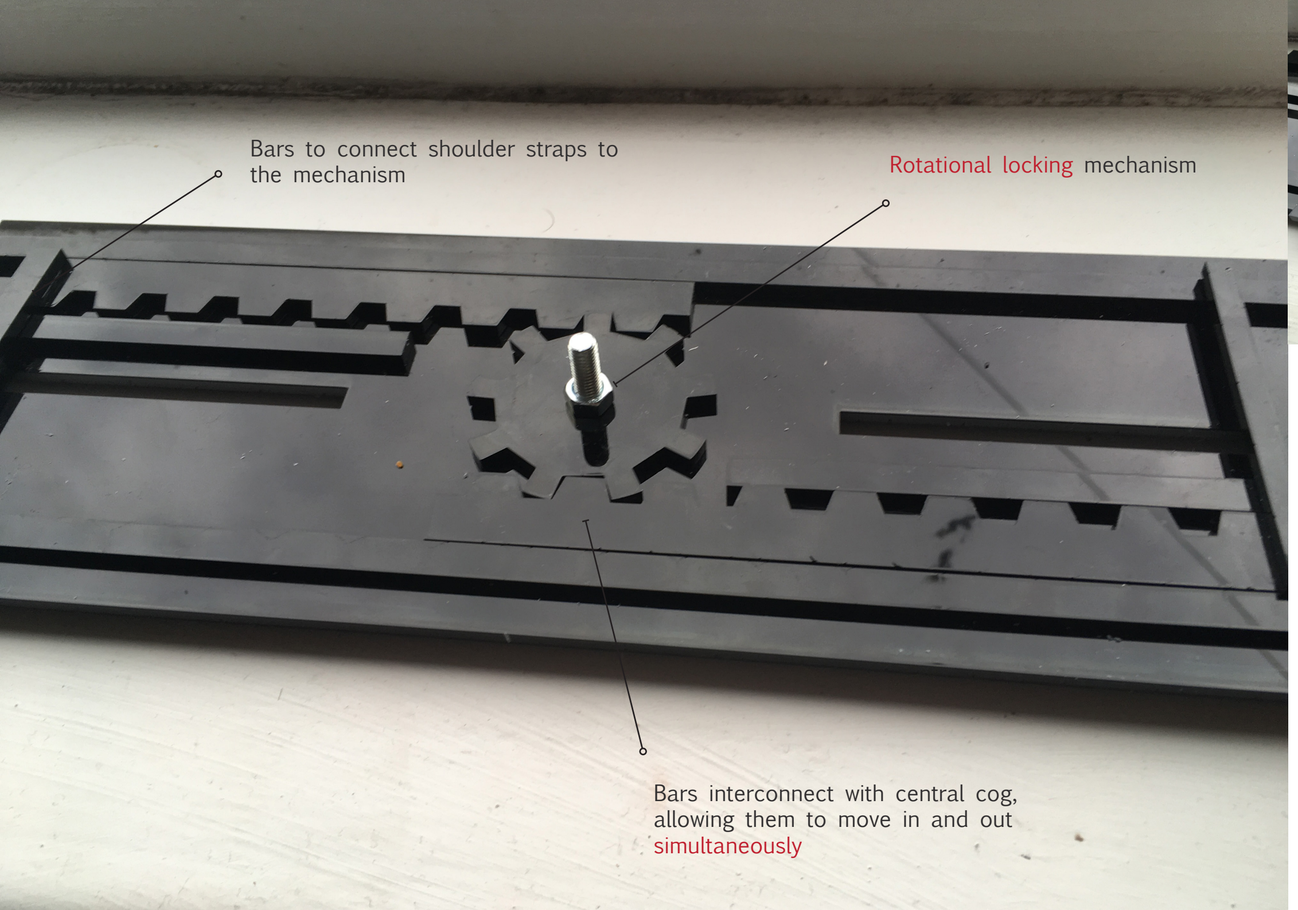
Required a spring so evolved into a simpler mechanism

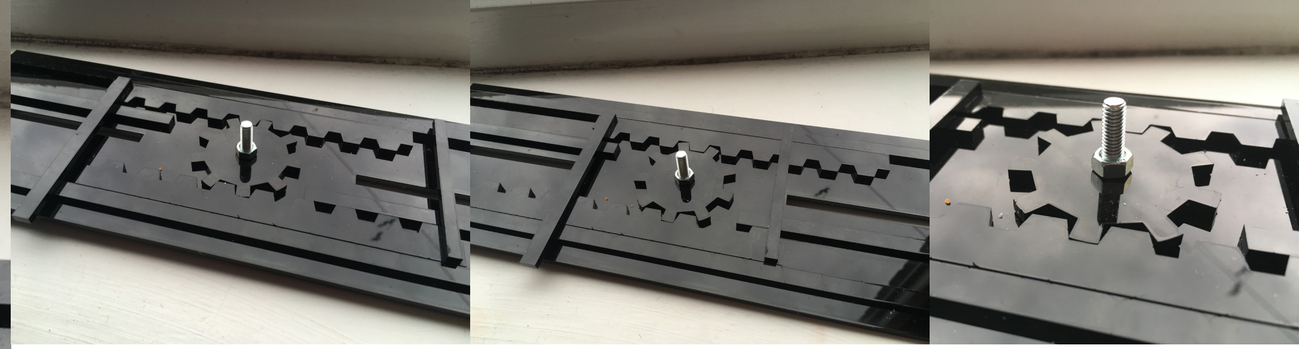
B)



Initially it was thought option A would work, however, without the inclusion of a coiled spring it was difficult to rotate the pins out again.

Therefore option B was decided upon. The simple mechanics involved make it highly unlikely to fail. However, during testing, it encountered obstruction difficulties and wasnt consistently working, therefore another mechanism was required.



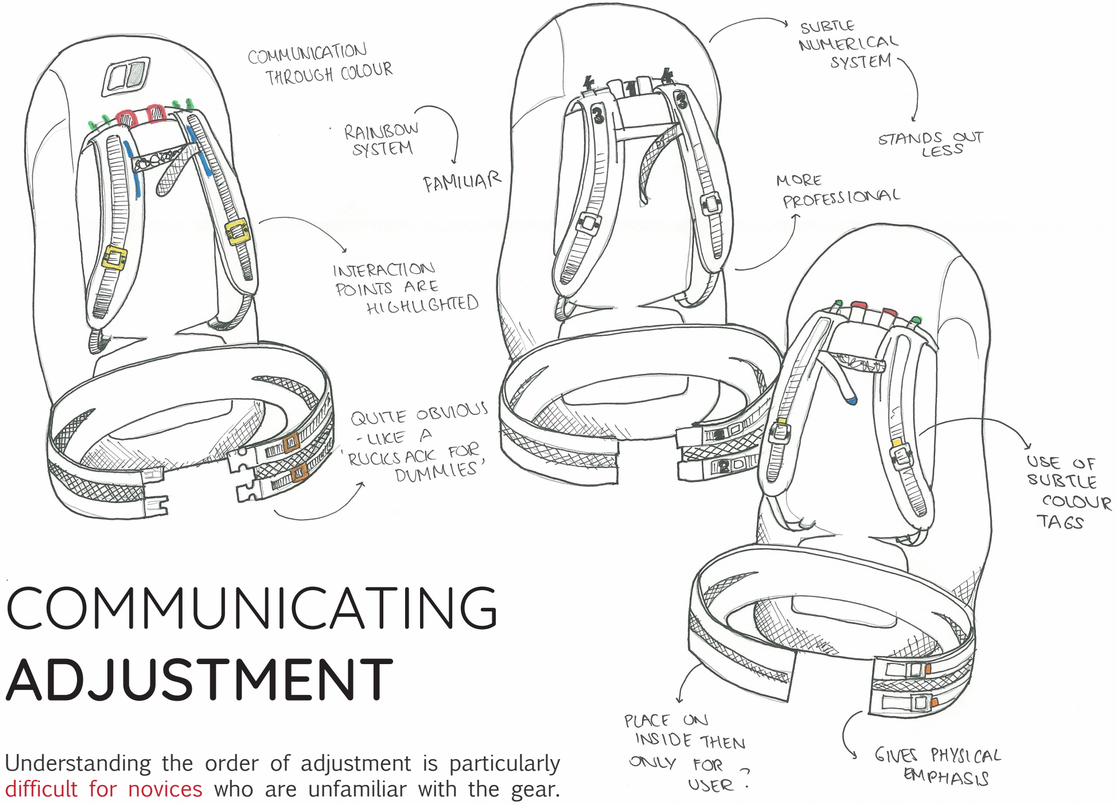


TESTING SHOULDER **ADJUSTMENT**

Inspired by the idea of using gears, a new mechanism was devised. Each strap would be connected to a bar with notches which would then rotate along the central cog.

In order to make the straps in line, additional bars were used which would connect the straps to the mechanism.

This mechanism consistently worked without risk of failiure, therefore it was this option that was taken forward.



COMMUNICATING **ADJUSTMENT**

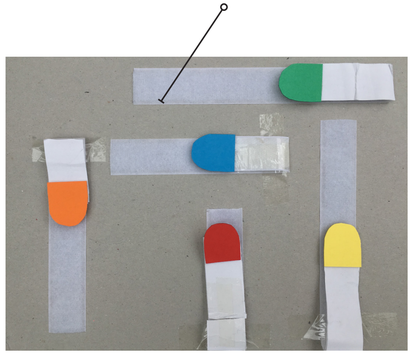
Understanding the order of adjustment is particularly difficult for novices who are unfamiliar with the gear. Therefore different systems to communicate this were trialled:

Stitching was discarded as an idea due to the fact that it was harder to highlight the key interaction points in comparison to the use of tabs.

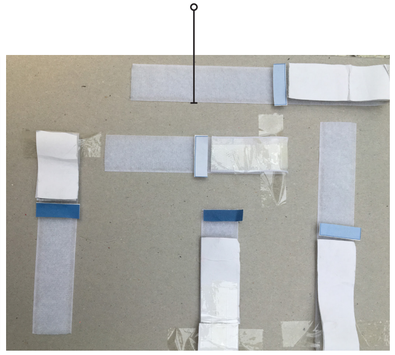
A test was created using velcro straps on a board. Candidates were then asked to strap up the velcro according to the sequence the tabs/numbers dictated.

*"The straps are done up in a **particular order.** This order has been created so **everyone** would understand it. Ignoring the placement of the straps and solely using the **tabs** as a reference point, velcro the straps in the order you think it would be."*

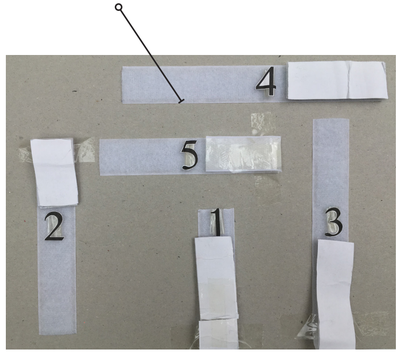
Using different coloured tabs
Rainbow order is correct

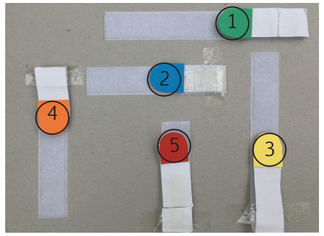


Using graduated colour tabs
Dark to light blue is correct

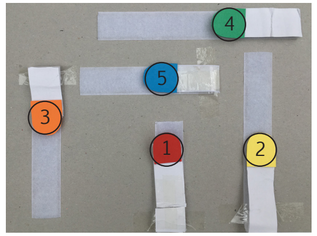


Using numbered tabs
1 to 5 is correct

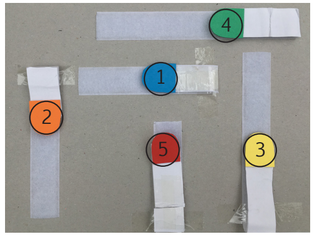




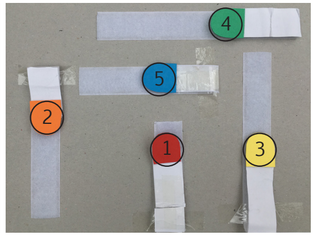
"Green is go and red and orange are last like a traffic light"



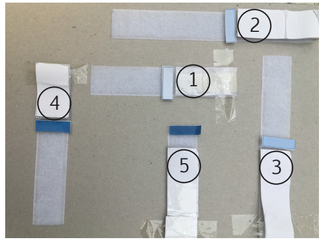
"Traffic lights were the starting point, then fit in the other colours"



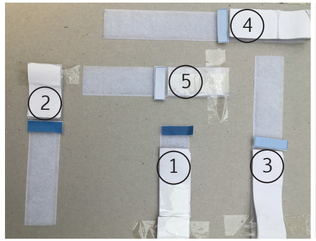
"The colours were fun and engaging but I was clueless"



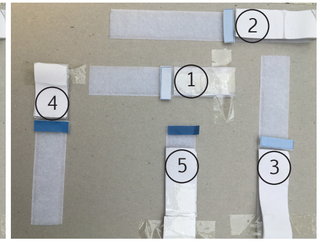
"More like a puzzle, used the colour spectrum but took me a while"



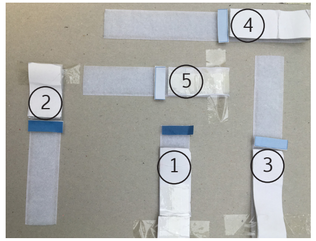
"Darker colour is stronger so end with and more important"



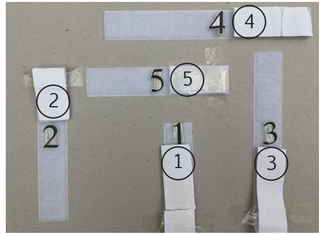
"It was a toss up between the light to dark and dark to light"



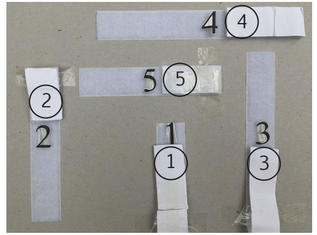
"Understood it was gradient but wasnt sure which end to start"



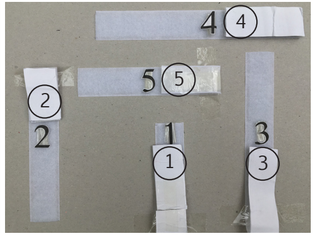
"Light is weakest so makes sense to finish with it"



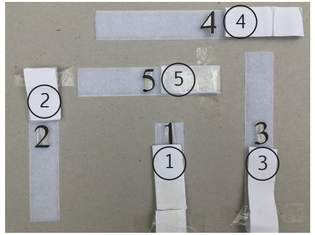
"Obvious, didn't have to think"



"Easy and very obvious"

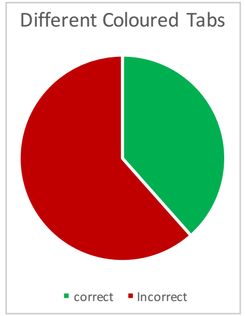


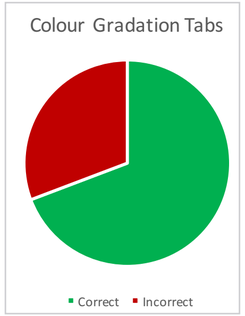
"Didn't hesitate as really clear"

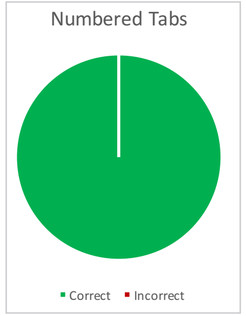


"Numbers was most straightforward"

THE **RESULTS**







"Numbers were easiest but it feels a bit like school"

"It's not second nature to know the colours of the rainbow, you really have to think about it"

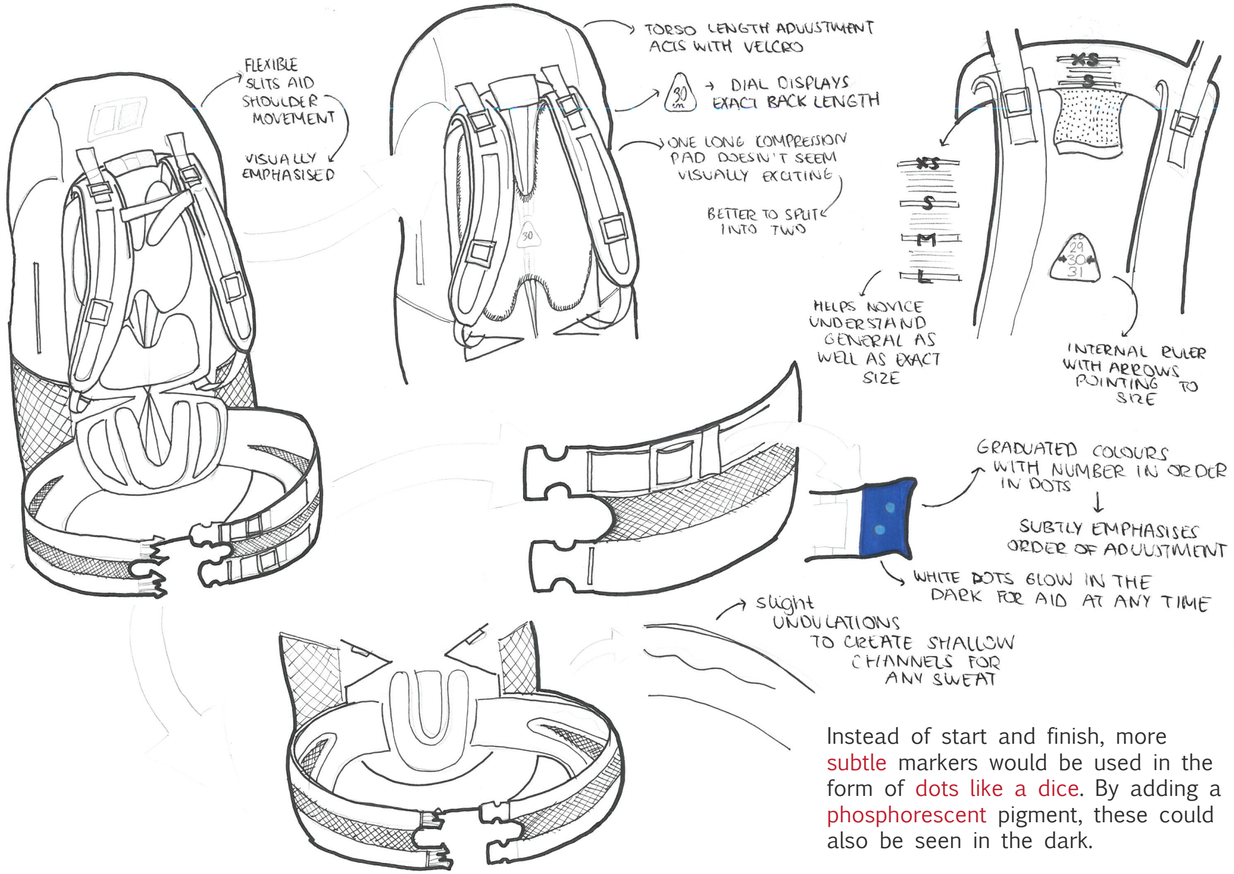
"People who are colour blind could struggle with the coloured tabs and also the coloured options would be harder to see in the dark"

"People don't like to have to think over something, it should be more intuitive"

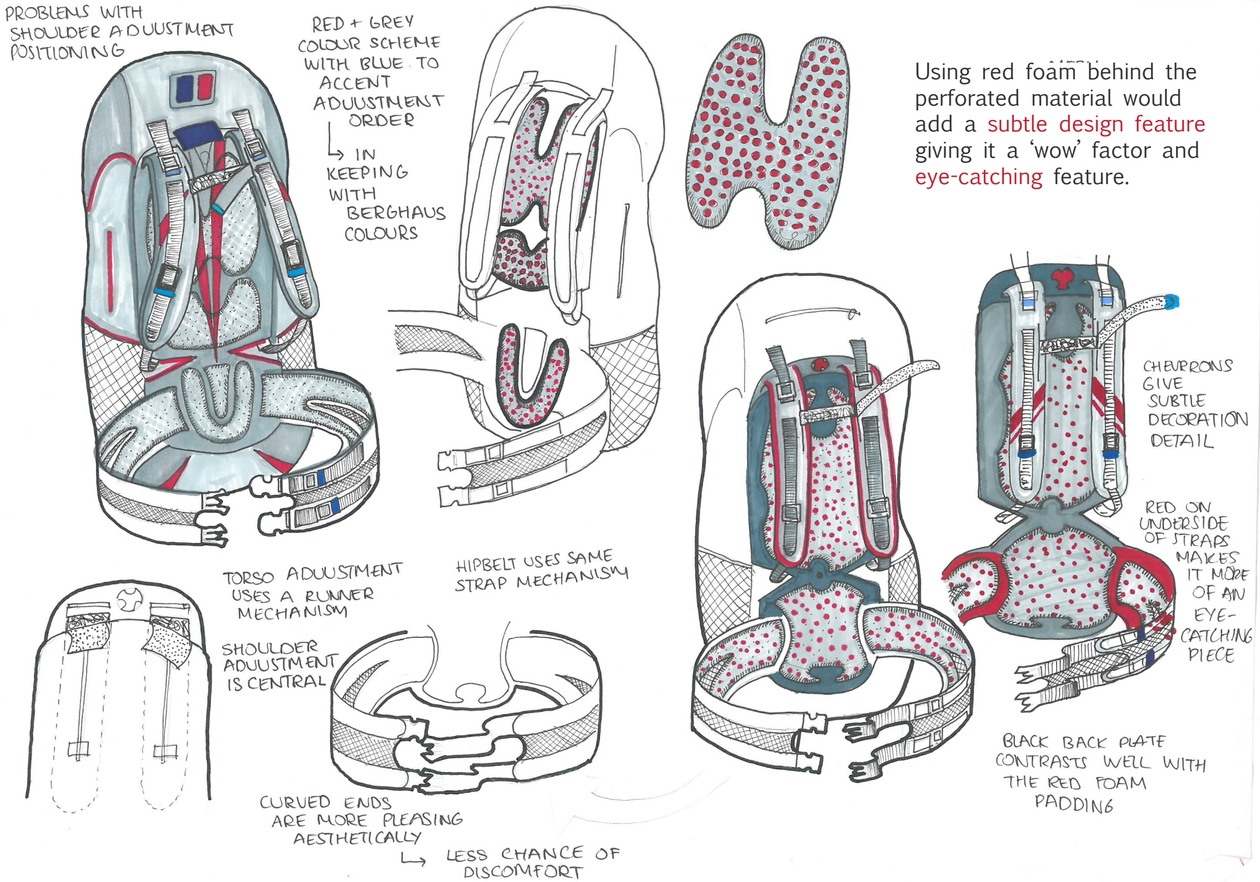
"Numbers was easier to understand but I preferred the subtlty of the gradient"

"Markers such as 'start' and 'finish' would ensure the graduated tabs were always done in the correct order"

By doing the test in an abstract fashion with no reference to the rucksack, it ensured peoples answers were not swayed by prior knowledge of rucksacks. The results concluded that, although the numbered method was the clearest, some may feel a bit like its a 'rucksack for dummies.' As a result, the colour graduation system will be used but with clear markers for 'start' and finish' to direct the user better.



Instead of start and finish, more subtle markers would be used in the form of dots like a dice. By adding a phosphorescent pigment, these could also be seen in the dark.

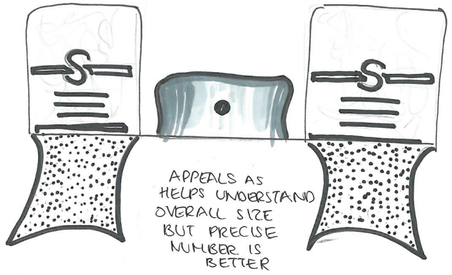


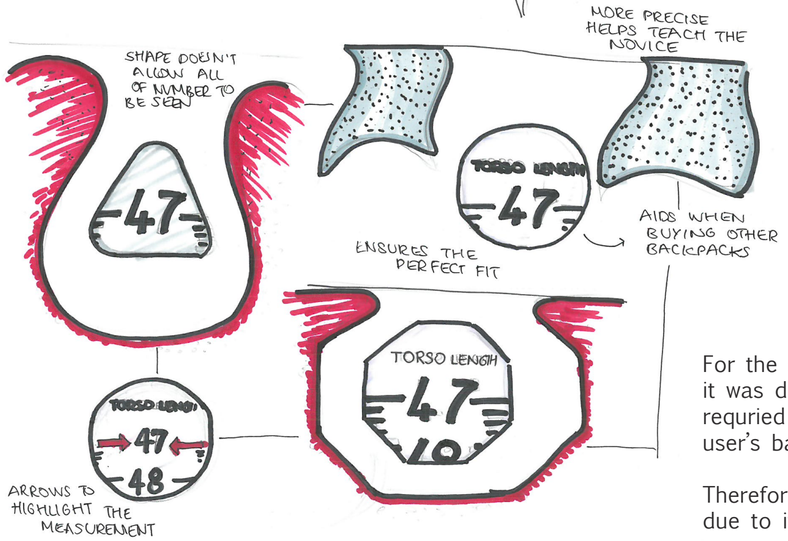
Using red foam behind the perforated material would add a subtle design feature giving it a 'wow' factor and eye-catching feature.

THE **DETAILS**

Focusing on the key interaction areas, different forms and designs were considered.

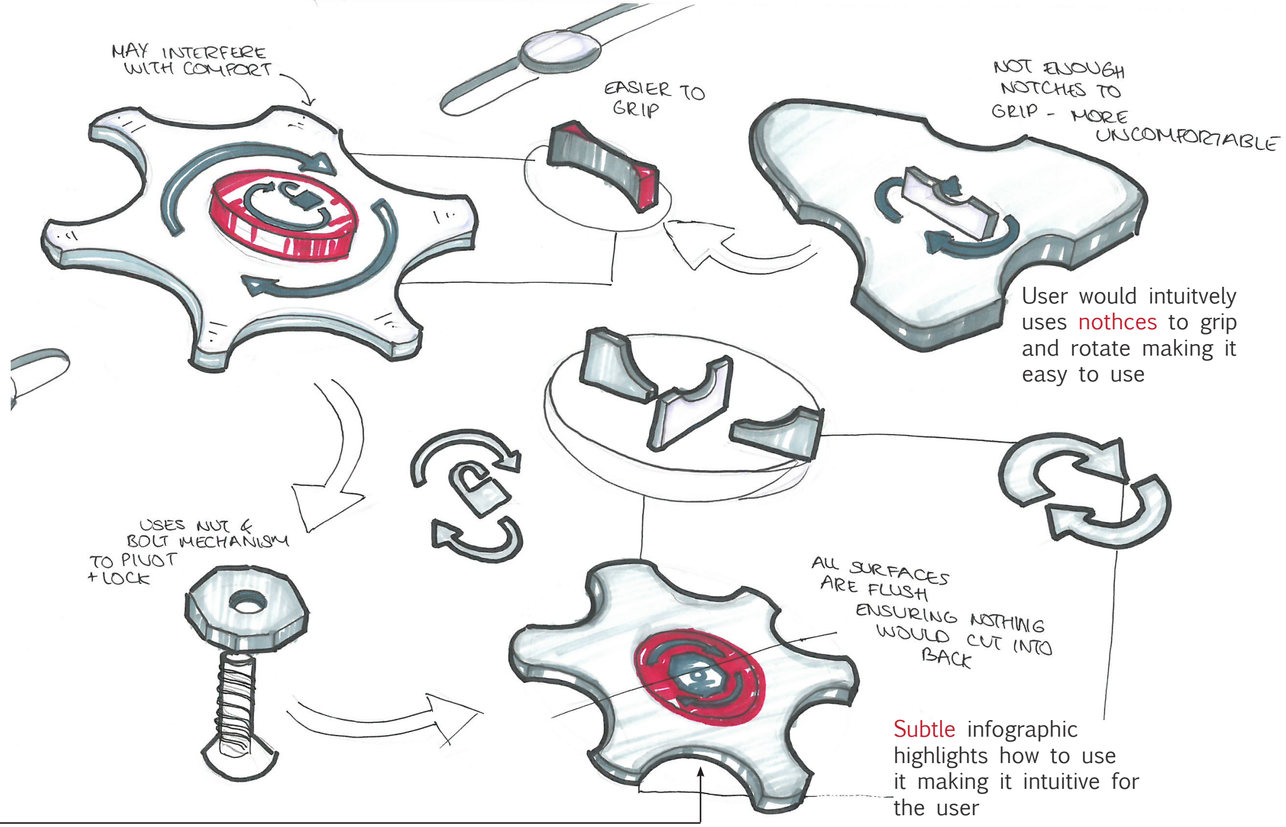
For the **torso length** adjustment, it was decided a window to show the exact size would be included as this would ensure the perfect fit whilst teaching novices key information





For the **shoulder adjustment,** when testing, it was discovered that a flush surface was requried otherwise it would dig into the user's back.

Therefore the arrowed option was chosen due to its notched shape and flush surface.



User would intuitvely uses nothces to grip and rotate making it easy to use

Subtle infographic highlights how to use it making it intuitive for the user