PROJECT FOUR: MILESTONE 2 – COVER PAGE

Team Number: TUES-22

Please list full names and MacID's of all *present* Team Members.

Full Name:	MacID:
Yasmine Elkhouly	Elkhouy
Sana Khan	khans288
Alexander Hucik	hucika
Sameer Shakeel	shakes4

MILESTONE 2.1 – CLIENT NOTES

Team Number: TUES-22

You should have already completed this task individually prior to Design Studio/Lab B for Week 8.

1. Compile your team's notes from the client Q&A visit.

- Dimensions of a mechanism being placed on the floor for your art-space?
  - Space between desk and easel 4 ft
  - Sink to chalkboard is 7 ft
- Height of Client
  - 5'1.5"
- Size of Wrists
  - 5' ¾"
- Length of hand (From middle finger to base of wrist)
  - 6.5'
- Width of hand
  - 3' 1/4" (straight across)
  - 4' (straight across to her thumb but hand it a little bent)

Client Notes mainly focus on issues associated with painting process since our problem statement is addressing this

- When drawing with crayons and charcoal pencils cannot allow hand to rest on surface, she experiences pain on the entire side of her dominant arm (right arm) and hand.
- Angled brushes to allow for maneuverability with brush and paint
  - Only possible with smaller brushes
  - Smaller the brush bigger the cramp as she holds them
  - Pain in armpit or axial area after a few minutes no matter what the side of the brush
- Grip of her paintbrushes is ideally loose and holding wider grips instead of smaller ones
- One hand dominant so cannot paint with left hand
  - Often uses left hand to hold right hand to balance the weight of both arms centrally, which allows her to paint for longer periods of time
- Must wear vest, sleeve, and gauntlet during painting and any weightbearing activities
  - **Solution must consideration compression gear**
  - Sleeve: has 20-30mm compression level
  - Texture of her compression gear are thick-tight material
  - Vest is nylon and spandex material
- Would like to keep painting in bed for instances when she must be in bed and rest
  - **Solution must be functional for use in bed**

- Fine with Velcro material as long as it does not touch her skin
    - Prefers things that are adjustable (likes the idea of Velcro usage)
- Largest size for a canvas that she typically uses 39.5" by 39.5"
- Does not prefer extreme temperatures since they aggravate lymphedema
    - Prefers heat rather than cold
    - Warm temperature is fine
    - She has temperature instability in her body
- Struggles with running errands
    - Cannot drive, limited walking ability, limited ability with carry things
- Favourite color is turquoise/red
    - **Make it her favourite color!**
- Materials containing gluten and rough edges are not preferable
    - Prefers cotton and silk as materials
    - **Use padding between undesirable materials if needed for solution**
- Standing, seated, to the side or turning the painting canvas itself (to allow for her to work on every portion with a seated position) during painting process
    - **Solution must allow for this range of motion**
- When outstretching her arm to pain the position that provides her with least amount of discomfort is when her wrist is in line with arm
    - No bending
- Outstretching her fingers is easier and less painful than bringing her finger in (ie. Like holding a pen)
- Small and detailed work is challenging for her joins and muscles
- Does not want to paint on floor if it was not needed however there are benefits
    - Increases her feeling of stabilization since she does not feel nauseous and allows her to focus on the task at hand
    - Floor can hold her weight and does not force her to weight bear her whole body
    - Makes her feel less nauseous and dizzy-being on the floor mitigates these feelings
    - **Solution should allow her to paint on floor since this is the ideal position**
- When she is standing up and painting her arm fatigues her first instead of weight bearing her whole body
- To relieve pain after painting or when hands hurt, shaking her whole hand brings relief to the nerve shock
- Has difficulties with pushing and pulling motion
    - Pushing is easier as she uses torso to bear the weight of pushing
    - Pulling is difficult for lymphopenia affected areas
- Wearing something such as a belt on the shoulder must consider posture, must be symmetrical, straps must not be constructive as she has lymphedema at the lower posterior edge of her shoulder
- More use of her palm easier it is to grip something
- Open and likes the idea using of a painter's mahl stick

MILESTONE 2.2 – RESEARCH ASSIGNMENT

Team Number: TUES-22

You should have already completed this task individually prior to Design Studio/Lab B for week 8.

1. Copy-and-paste each team member's research assignment on the following pages (1 assignment per page)
   → Be sure to indicate each team member's Name and MacID

See individual worksheet for assignment specification.

We are asking that you submit your work on both the team and individual worksheets. It does seem redundant, but there are valid reasons for this:

1. Each team member needs to submit their research assignment with the **Milestone Two Individual Worksheets** document so that it can be ***graded***
2. Compiling your individual work into this **Milestone Two Team Worksheets** document allows you to readily access your team member's work
   a. This will be especially helpful when completing the rest of the milestone

Team Number: TUES-22

Name: Sana Khan	MacID: khans288

Include your research assignment below.

What is your question?

What triggers lymphedema flare ups and what devices are most suited to cope with these flare ups?

What is your answer?

Lymphedema is a disease that is mainly caused by removal of the lymph nodes during cancer treatment. It causes swelling in the arms and legs, specifically fingers and toes. When swelling occurs, it can cause heaviness, pain, and limited range of motion [8]. If too much fluid is built up in the soft tissues under your skin or if lymph fluid cannot drain well which causes a blockage in the lymphatic system, flare ups will occur [8]. This is triggered by air travel due to the changes in air pressure, injury or infections to the specific limb or area, exposure to excessive heat, lifting heavy weights, and applying too much pressure to the area [6].

Constriction or squeezing of the arms or legs will increase blood pressure and fluid flow near those lymph vessels. This will cause swelling since those vessels may not exist or are damaged [9]. This is why it is important to wear loose clothing that does not apply pressure to the given area [7]. Compression sleeves have known to help reduce swelling and pain; however, they need to be fitted well [5].

Flare ups can occur if arms or legs are left hanging for too long. They need to be kept elevated so that any fluid build-up flows back into the body to prevent swelling and increase circulation [7]. A lymphedema compression pump has been found to be very helpful with allowing the fluid to properly flow throughout the body [5]. A comfortable sleeve easily connects to your arms, legs, or torso as needed. It inflates and deflates, applying appropriate pressure to the area and pumping the fluid back into your body to exercise proper circulation [4].

Figure 1: Compression pump for the arm [4].

Flare ups can also occur if the skin has been damaged, cut, or cracked. This is because white blood cells move to the limb that is injured to try and heal it, but this will cause fluid buildup since those vessels are missing or damaged which again causes swelling and pain [9]. So, it is important to keep those limbs protected. It is encouraged to bandage the area appropriately when doing certain activities to prevent any cuts or scrapes [3]. Bandaging with gauze, stockinette, or tubular bandages are the most recommended materials since they are gentle on the skin but still provide protection and relief [1].

Figure 2: Bandaging using gauze [1]

Repetitive movements and over exertion of the affected limb will cause flare ups as well, however, small exercise like movements is important in keeping fluid flow throughout the body and most importantly for the affected limb [2]. Soft stress balls, finger stretchers, and 1-to-3-pound weights are good tools to help regain strength in hand muscles and fine joints [1].

To conclude, there are several factors that trigger flare ups for individuals with lymphedema, however, devices such as compression sleeves, bandages, and lymphedema compression pumps for the arms, legs, and torso are important devices used to reduce pain, swelling, and fluid build-up.

List of Sources:

[1] "Products for Lymphedema." https://jeanlamantia.com/cancer-bites-diet-blog/products-for-lymphedema/ (accessed Mar. 11, 2021).

[2] "Arms in Motion." https://www.curetoday.com/view/arms-in-motion (accessed Mar. 11, 2021).

[3] "Treating Lymphedema | Johns Hopkins Medicine." https://www.hopkinsmedicine.org/health/treatment-tests-and-therapies/treating-lymphedema (accessed Mar. 11, 2021).

[4] "Lymphedema Compression Pump | Care-Med LTD." https://care-med.ca/lymphedema-compression-pump/# (accessed Mar. 11, 2021).

[5] "Lymphedema - Diagnosis and treatment - Mayo Clinic." https://www.mayoclinic.org/diseases-conditions/lymphedema/diagnosis-treatment/drc-20374687 (accessed Mar. 11, 2021).

[6] "Risk factors and triggers." http://www.lymphoedemanz.org.nz/About+Lymphoedema/Risk+Factors+and+Triggers.html (accessed Mar. 11, 2021).

[7] "Lymphedema - Symptoms and causes - Mayo Clinic." https://www.mayoclinic.org/diseases-conditions/lymphedema/symptoms-causes/syc-20374682 (accessed Mar. 11, 2021).

[8] "Lymphedema in Legs & Arms: Symptoms, Causes, & Treatment." https://www.webmd.com/a-to-z-guides/what-is-lymphedema (accessed Mar. 11, 2021).

[9]. "For People At Risk for Lymphedema." American Cancer Society. https://www.cancer.org/treatment/treatments-and-side-effects/physical-side-effects/lymphedema/for-people-at-risk-of-lymphedema.html (accessed Mar. 11, 2021)

Team Number: TUES-22

Name: Sameer Shakeel	MacID: shakes4

What is your question?

What are the materials, material properties and geometric properties found in art supplies for artists with disabilities?

What is your answer?

Supplies made for artists with disabilities often use materials and geometry that would have properties which would help the condition. For example, artists with uncontrolled hand movement would prefer a device that would be lightweight and easy to hold/balance with whatever body part they would hold it with. Or artists with weight bearings may prefer a device that would use allow the use of other body parts, thus having durable or biocompatible materials [5]. These materials and geometric properties will be discussed in this summary by looking at previously designed art supplies.

A common art supply used by people who have neurological disorders, cerebral palsy, spinal cord injuries or upper extremity disabilities is a mouth stick [1]. This stick is commonly made from lightweight materials, such as aluminum or stainless steel [2]. Aluminum is a material that is lightweight, soft, ductile corrosion resistant and has a high electrical conductivity [3], and since the mouth stick is held by the mouth, the lightweight and soft properties of aluminum are very useful in allowing the user to hold this art supply for extended periods of time. Stainless steel is a material that is durable, has a long-life span, high tensile strength, corrosion resistance, and is environmentally friendly [4], and since the stick is something used daily, the long-life span and durability of it is very beneficial. The other component is the mouthpiece that attaches to the aluminum stick [5]. These mouthpieces are made from thermoplastic materials with low melting points to mold to the mouth easier. They are biocompatible to not leave a taste in the mouth and are thin to comfort the user of the device [5].

Another common art supply used are the egg-handled paint brushes. This is often used by people who have trouble gripping onto things, fine motor, or arthritis [6]. These brushes have more focus on the geometric/ergonomic design rather than materials, having handles shaped in an urn-shape [6]. This is what helps the artist grip onto the paintbrush easily and allows them to have a steadier hand when completing their artwork.

Figure 1: Egg handled paint brushes [7].

Overall, lightweight, durable, high tensile strength materials and ergonomic designs are the main properties that were seen to help people with disabilities in creating art as these properties did a good job in assisting the user with their disability. In our initial problem statement, we specified in creating an everyday system that reduces the weight bearing on the client's upper

body to help with her condition, meaning lightweight, and durable materials should be considered when designing a solution. So, in theory, aluminum, and stainless steel would great options for materials in devices to be designed if they fit the criteria. Also mentioned was the feasibility of the system, as it should be easy for the client to use. Thus, modifying ergonomics in a way that would help the client's upper body is crucial in assisting her with creating the best art she can in a comfortable position.

List of sources:

[1] "Head Pointers and Mouth Sticks | Writing And Reading Aids." https://www.healthproductsforyou.com/c-head-pointers-and-mouth-sticks.html (accessed Mar. 10, 2021).

[2] "Pediatric Mouth Sticks | Head Pointers | Communication Aids." https://www.rehabmart.com/category/pediatric_mouth_sticks_and_head_pointers.htm (accessed Mar. 10, 2021).

[3] "Aluminium: Specifications, Properties, Classifications and Classes." https://www.azom.com/article.aspx?ArticleID=2863 (accessed Mar. 10, 2021).

[4] "Stainless Steel Characteristics: Grades, Properties & Applications." https://eagletube.com/about-us/news/stainless-steel-characteristics/ (accessed Mar. 10, 2021).

[5] "(PDF) A new Approach to Mouth Sticks Material selection for Additive Manufacturing of personalizable Mouth Pieces." https://www.researchgate.net/publication/342353959_A_new_Approach_to_Mouth_Sticks_Material_selection_for_Additive_Manufacturing_of_personalizable_Mouth_Pieces (accessed Mar. 10, 2021).

[6] "Find specific products for children or parents with disabilities. Larimer County, Colorado." https://larimer.co.networkofcare.org/aging/assistive/list.aspx?indexingterms=painting-tools (accessed Mar. 10, 2021).

[7] "Blick Egg Handled Brushes, Special Needs - Adaptive Grip And Easy-To-Grip Brushes, Dick Blick - Art Materials." https://www.artquid.com/art-materials/blick-egg-handled-brushes-m5194.html (accessed Mar. 10, 2021).

Team Number: TUES-22

Name: Alexander Hucik	MacID: hucika

What is your question?

In detail, how do Alanna's autoimmune diseases, specifically Ankylosing spondylitis, Lymphedema and Fibromyalgia affect her ergonomics in everyday life?

What is your answer?

Autoimmune diseases are very painful and stressful. There are over 80 types and they affect parts all over the body and cause a wide variety of symptoms [1]. That is why I want to know how these diseases affect our client Alanna's physical capabilities, very specifically ergonomics. As our team has been tasked with designing a device to improve Alanna's daily life [2], it is very important to know which body and limb positions can cause pain and discomfort, so we avoid the need for these positions to interact with our device.

First, I will discuss Ankylosing spondylitis (AS), a rare type of arthritis that causes pain and stiffness in the spine [3]. AS can also cause pain and stiffness in the hands, ribcage, hips, thighs, feet, and shoulders; it could even cause fusion of the vertebrae [3]. So, how does AS affect your everyday ergonomics? Let us look at the example of working an office job, what are the dos and don'ts of managing AS. Since AS can make your back stiff and painful, you want to make sure you are sitting with your thighs at a 90-degree angle while planting your feet flat, and the chair ought to support your spine [4]. If you are typing on a keyboard, or maybe in Alanna's case holding a paintbrush, you should hold your wrists and arms level and maybe consider a wrist cushion or mat (perhaps this is something our device could include) [4]. Some other things to consider are having the correct eye level with your work (monitor or easel is at eyelevel) and keeping items close so you do not repeatedly overstretch (as AS affects tendons and ligaments too).

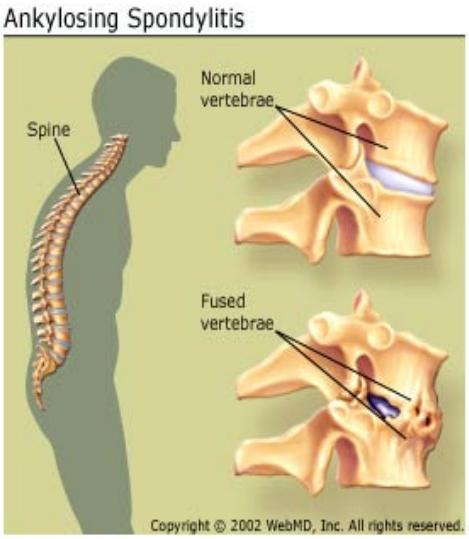


Figure 2: Effects of Anylosing Spondylitis on the Vertebrea [3].

Furthermore, Lymphedema is another autoimmune disease defined as swelling most frequently in the arm(s) and/or leg(s) [5]. Common symptoms are partial or full swelling in your arms, legs, fingers, toes, heaviness, restricted motion and thickening of skin [5]. To accommodate the discomfort caused by Lymphedema, it is very important to avoid injury to the skin from sharp objects and tools [6]. Positional supports like pillows, armrests and braces are crucial to elevate swollen limbs [6]. Additionally, small parts may be tough to work with because of finger swelling, so using speech recognition instead of a keyboard and having large diameter handles are something our client would appreciate [6].

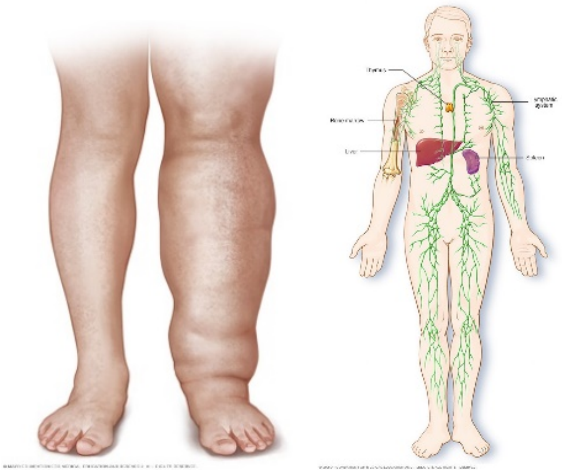


Figure 3: Leg lymphedema (on the left) and the Lymphatic system (on the right) [5].

Lastly, let us look at Fibromyalgia, where lightweight and rest is the 'name of the game'. Fibromyalgia is a disorder where broad musculoskeletal pain, fatigue, sleep, memory, and mood problems occur [7]. Fibromyalgia causes these symptoms because the disorder amplifies pain processing in the Nervous System [7]. If our device is to be wearable, it is important for Fibromyalgia patients to wear lightweight, warm, and layered fabrics [8]. Resting and not overworking yourself it important as this could cause flares. Therefore, it is important to not lift very heavy objects (our device must be lightweight!). Like the other auto-immune disorders, positional rests, mats and even feet cushions (could be insoles, a mat, or slippers) relieve a great deal of pain [8].

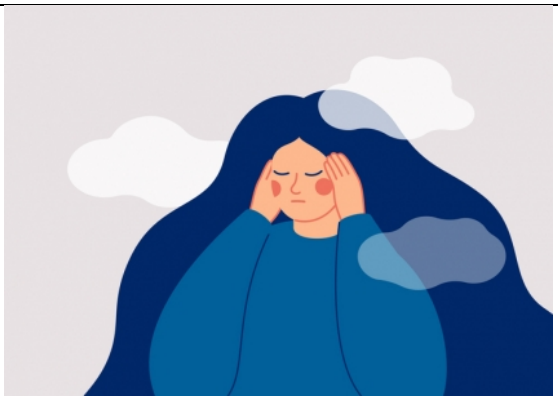


Figure 4: Fibromyalgia mimics symptoms of many other diseases [9].

List of sources:

[1] "What Are Common Symptoms of Autoimmune Disease? | Johns Hopkins Medicine." https://www.hopkinsmedicine.org/health/wellness-and-prevention/what-are-common-symptoms-of-autoimmune-disease (accessed Mar. 09, 2021).

[2] "P4 Project Module" class notes for ENG 1P13, Faculty of Engineering, McMaster University, Term 2, 2021.

[3] "Ankylosing Spondylitis (AS): Symptoms, Causes, Diagnosis, Treatment, and Prognosis." https://www.webmd.com/arthritis/ankylosing-spondylitis-17/basics/what-is-as (accessed Mar. 09, 2021).

[4] "Manage Ankylosing Spondylitis at Work." https://www.webmd.com/arthritis/ankylosing-spondylitis-17/daily-life/slideshow-ankylosing-spondylitis-work (accessed Mar. 09, 2021).

[5] "Lymphedema - Symptoms and causes - Mayo Clinic." https://www.mayoclinic.org/diseases-conditions/lymphedema/symptoms-causes/syc-20374682 (accessed Mar. 09, 2021).

[6] C. Maheu, R. Cashman, K. Johnson, and M. Parkinson, "Lymphedema | Cancer and Work." https://www.cancerandwork.ca/healthcare-providers/cancers-impact-on-work/effects-lymphedema/ (accessed Mar. 09, 2021).

[7] "Fibromyalgia - Symptoms and causes - Mayo Clinic." https://www.mayoclinic.org/diseases-conditions/fibromyalgia/symptoms-causes/syc-20354780 (accessed Mar. 09, 2021).

[8] "10 Ways to Manage Fibromyalgia at Work | Everyday Health." https://www.everydayhealth.com/fibromyalgia/10-ways-to-manage-fibromyalgia-at-work/ (accessed Mar. 09, 2021).

[9] "Learn More About Fibromyalgia Symptoms." https://www.practicalpainmanagement.com/patient/conditions/fibromyalgia/fibromyalgia-symptoms-diagnosis (accessed Mar. 09, 2021).

Team Number: TUES-22

Name: Yasmine Elkhouly	MacID: elkhouy

What is your question?

- What are the generic dimensions of art and sculpting supplies and what art supplies exist to support disabled artists?

What is your answer?

Using art as a form of therapy can often provide disabled individuals a sense of personal accomplishment. Art can help to improve one's outlook on life, voice unexpressed emotions, and allows for communication with the world, especially in the case of those with physical disabilities. Artists that deal with disabilities in their everyday lives have found various methods to produce beautiful and intricate art pieces regardless of the adversity that they face. Art and sculpting supplies often need to be tailored specifically for persons with disabilities for support and to ensure their success. However, it can be difficult and highly expensive to find or purchase such tools, therefore; "big box" retailers, which offer bargain prices, are the only option. Thus, it is crucial to consider the generic dimensions of art supplies during the design process of our solution.

Floor easels are an essential tool for large-scale painters. They are commonly designed with upper and lower canvas support so they can hold large canvases, up to 100" and 25lbs, while adjusting up to 15 to 30 degrees [1], [2]. The height of floor easels is typically adjustable and ranges from a maximum of 122" to a minimum of 74", with a base width and depth of 30". Shelf width and depth are commonly 27.5" and 3" respectively [1], [2]. This tool additionally often features non-skid rubber feet for stability [1], [2].

Popular painting surfaces include canvas panels and canvas boards since they are more stable and portable and can be set up easily within a studio [3]. Canvas boards and panels are usually covered with cotton or linen canvas that is secured to a wood, wood fiber, or MDF backing [3]. Canvas panels and canvas boards are available in a multitude of sizes varying from 40" by 12" to 72" by 48" with a depth ranging from 18mm to 38mm [3].

Artists' paintbrushes come in an array of sizes, shapes, and hairs. Brushes with longer handles are up to 12" are helpful for easel work, while the short ones are around 6" and are used detailed work [4]. Round brush diameters range from 1/64" to 11/16", while flat, bright, and filbert brush widths range from 1/32" to 31/32" [4]. Foam brushes are also used for a wide variety of art applications. Common dimensions include 3" for foam rollers and 1" to 3" for foam brushes [5]. In addition, paint wedges are ergonomically designed painting tools utilized by many artists. They are offered in various shapes with an approximate width of 102 mm and length of 76mm [6].

A commonly used sculpting tool such as sculpting and armature wire has dimensions of 0.13" by 20ft [7]. Another tool is palm carvers, which are 4 to 3/4" with wooden handles[8].

Although accessible and affordable adaptive art supplies exist, there is not a wide variety. Egg handled brushes are ergonomically designed paintbrushes with a rounded handle to allow for gripping and a flat side on the handle to prevent rolling when not in use [9]. Mop

brushes, which are shaped like a shaving brush, and grip brushes, which have a knob-shaped end, are also other easy-to-hold designs for those with physical limitations[10], [11].

List of sources:

[1] "Products for Lymphedema." https://jeanlamantia.com/cancer-bites-diet-blog/products-for-lymphedema/ (accessed Mar. 11, 2021).

[2] "Arms in Motion." https://www.curetoday.com/view/arms-in-motion (accessed Mar. 11, 2021).

[3] "Treating Lymphedema | Johns Hopkins Medicine." https://www.hopkinsmedicine.org/health/treatment-tests-and-therapies/treating-lymphedema (accessed Mar. 11, 2021).

[4] "Lymphedema Compression Pump | Care-Med LTD." https://care-med.ca/lymphedema-compression-pump/# (accessed Mar. 11, 2021).

[5] "Lymphedema - Diagnosis and treatment - Mayo Clinic." https://www.mayoclinic.org/diseases-conditions/lymphedema/diagnosis-treatment/drc-20374687 (accessed Mar. 11, 2021).

[6] "Risk factors and triggers." http://www.lymphoedemanz.org.nz/About+Lymphoedema/Risk+Factors+and+Triggers.html (accessed Mar. 11, 2021).

[7] "Lymphedema - Symptoms and causes - Mayo Clinic." https://www.mayoclinic.org/diseases-conditions/lymphedema/symptoms-causes/syc-20374682 (accessed Mar. 11, 2021).

[8] "Lymphedema in Legs & Arms: Symptoms, Causes, & Treatment." https://www.webmd.com/a-to-z-guides/what-is-lymphedema (accessed Mar. 11, 2021).

MILESTONE 2.3 – REFINED PROBLEM STATEMENT

Team Number: TUES-22

1. Write your initial problem statement below. This is what you have submitted for Milestone 1.2.

Design a system which reduces weight bearing on the client's biceps, triceps, arms, and peck muscles to minimize the weight applied on their upper body and increase its functionality to carry out daily tasks with ease.

2. Outline the Who, Where, Why, and What elements of your problem statement. Then write the refined problem statement below. Refer to the provided Refined Problem Statement rubric provided.

- Who? – Client
- Where? – Client's biceps, triceps, arms, and peck muscles
- Why? – To allow for painting and sculpting with ease
- What? – A system that reduces weight bearing

Refined Problem Statement:

Design a system that reduces weight bearing on the client's biceps, triceps, arms, and peck muscles to minimize the weight applied on their upper body and increase its functionality to allow for painting and sculpting with ease.

MILESTONE 2.4 – FUNCTIONAL ANALYSIS

Team Number: TUES-22

1. Identify your team's choice of design tool to perform Functional Analysis and the rationale behind choosing it. For examples of design tools, see lecture on Monday March 8th.

Choice: Morphological chart

Rational: We chose the morph chart because it allows us to write out and identify all the main functions the design should perform. It also allows us to come up with several different ways of carrying out each function which displays what our optimal design should have as well as ideas that may or may not work.

2. Include a copy of your team's functional analysis below.

Function	Mean 1	Mean 2	Mean 3	Mean 4
Height Adjustment	Lever	Clamp tightening knob	Motors	Hinge/ Flexible joints
Stabilize her arm	Arm rest	Strap	Arm cuffs	Wrist mat (memory foam)
Gripping paintbrush horizontally	A large ergonomic grip that can hold any paintbrush	Using a hook	Storage compartment that can hold any size paintbrush	Wearing a glove that holds the paintbrush
Hold the weight of her arm	Arm rest	Tripod	Strap that comes down from the ceiling	Arm brace (connected to her waist as a belt)
Doesn't restrict movement	Has wheels	It isn't attached to her so she can move away from it easily	Slidable arm rest	Rotatable

Provide Comfort	Comfortable materials (no sharp or objects)	Using memory foam	Can take the shape of her body	Can provide heating

MILESTONE 2.5 – CONCEPT EXPLORATION

Team Number: TUES-22

Complete this worksheet during Design Studio/Lab B for Week 8.

1. Include multiple photos of your concept exploration, if needed
   → Include necessary annotations to help in the communication of your ideas
   → Include your Team Number, Name and MacID on *each* concept
2. Insert your photo(s) as a Picture (Insert > Picture > This Device)
3. **Do not include more than *two* concept photos per page**

Make sure to include photos of each team member's concept exploration

We are asking that you submit your work on both the team and individual worksheets. It does seem redundant, but there are valid reasons for this:

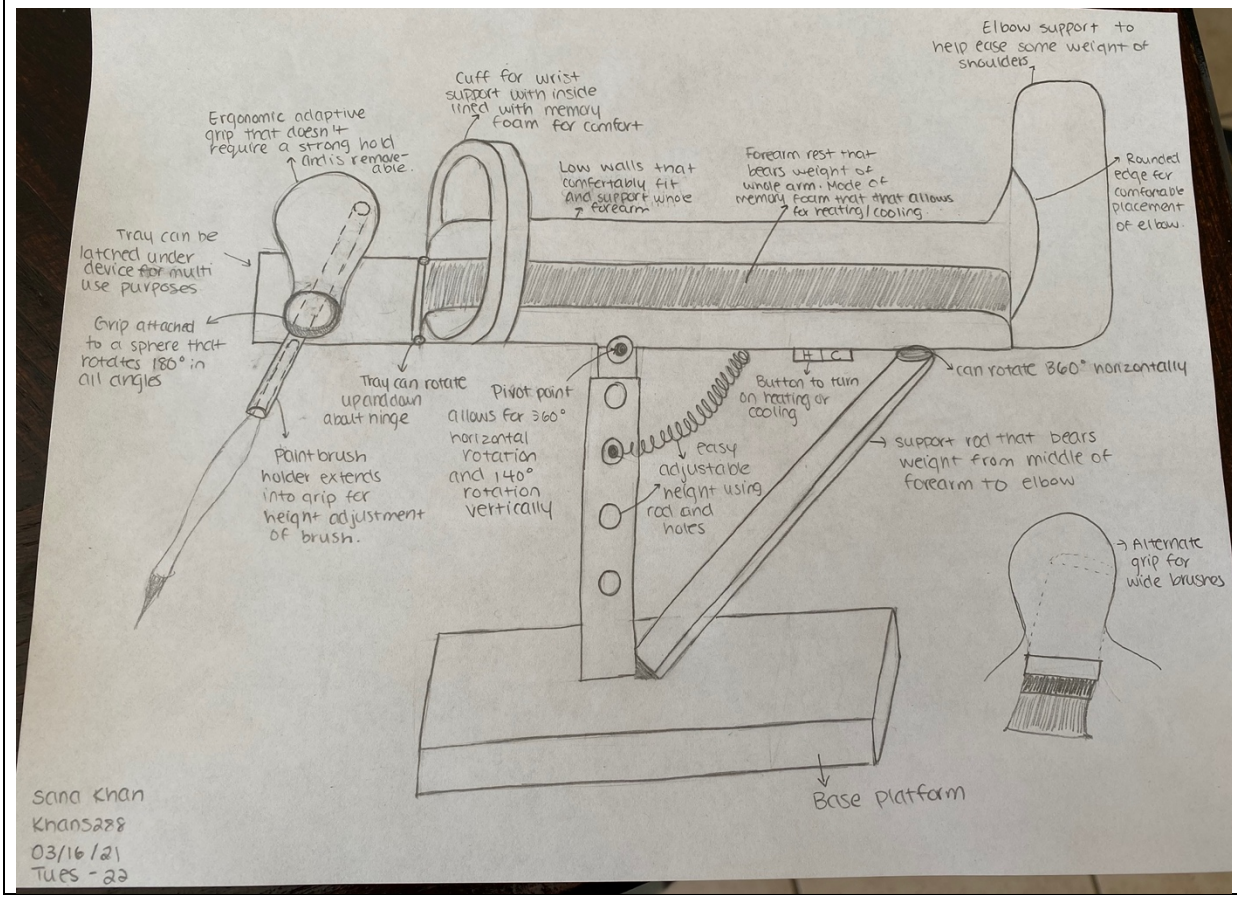
- Each team member needs to submit pictures of their concept with the **Milestone Two Individual Worksheets** document so that it can be ***graded***
- Compiling your individual work into this **Milestone Two Team Worksheets** document allows you to readily access your team member's work
  - This will be especially helpful when completing the next milestone

Team Number: TUES-22

Concept 1

Name: Sana Khan	MacID: khans288

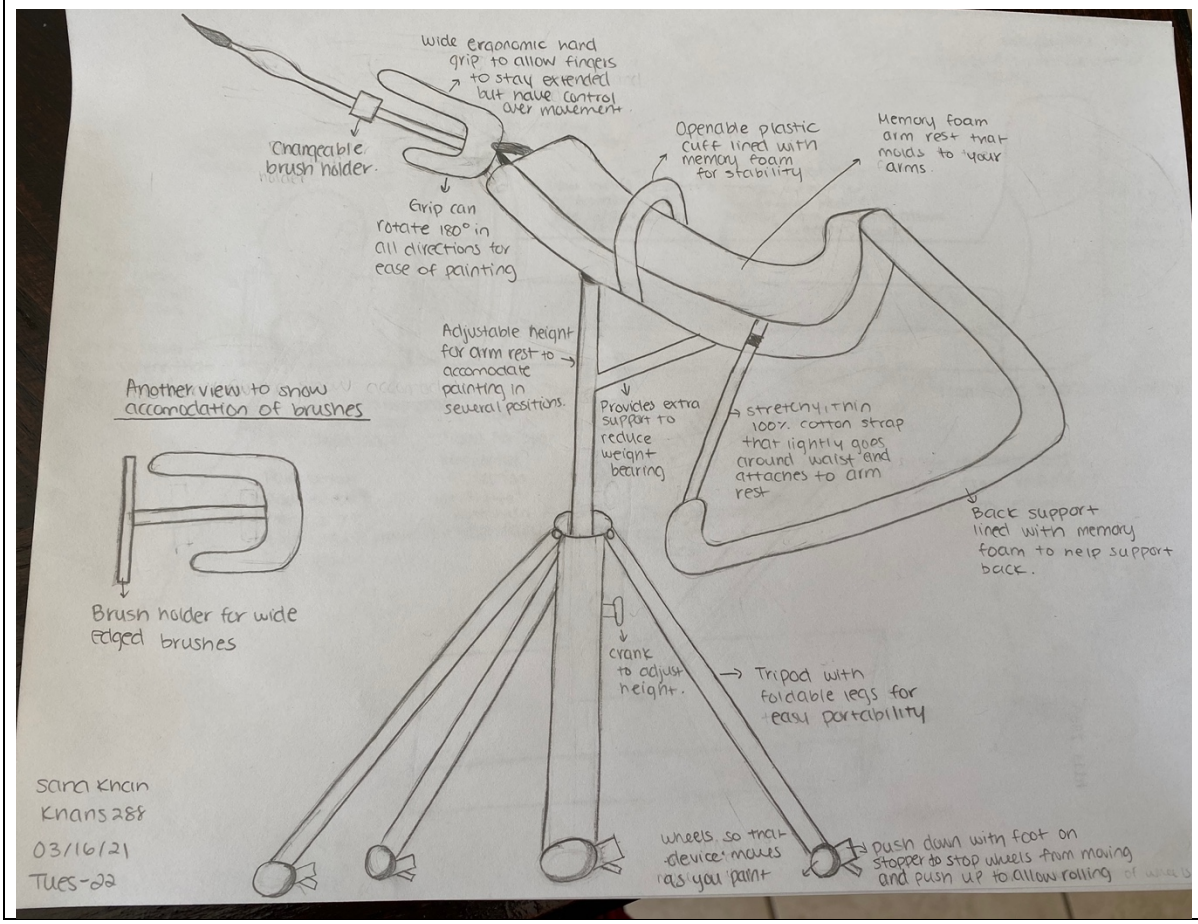
Insert screenshot(s) of your concept below.



Concept 2

Name: Sana Khan	MacID: khans288

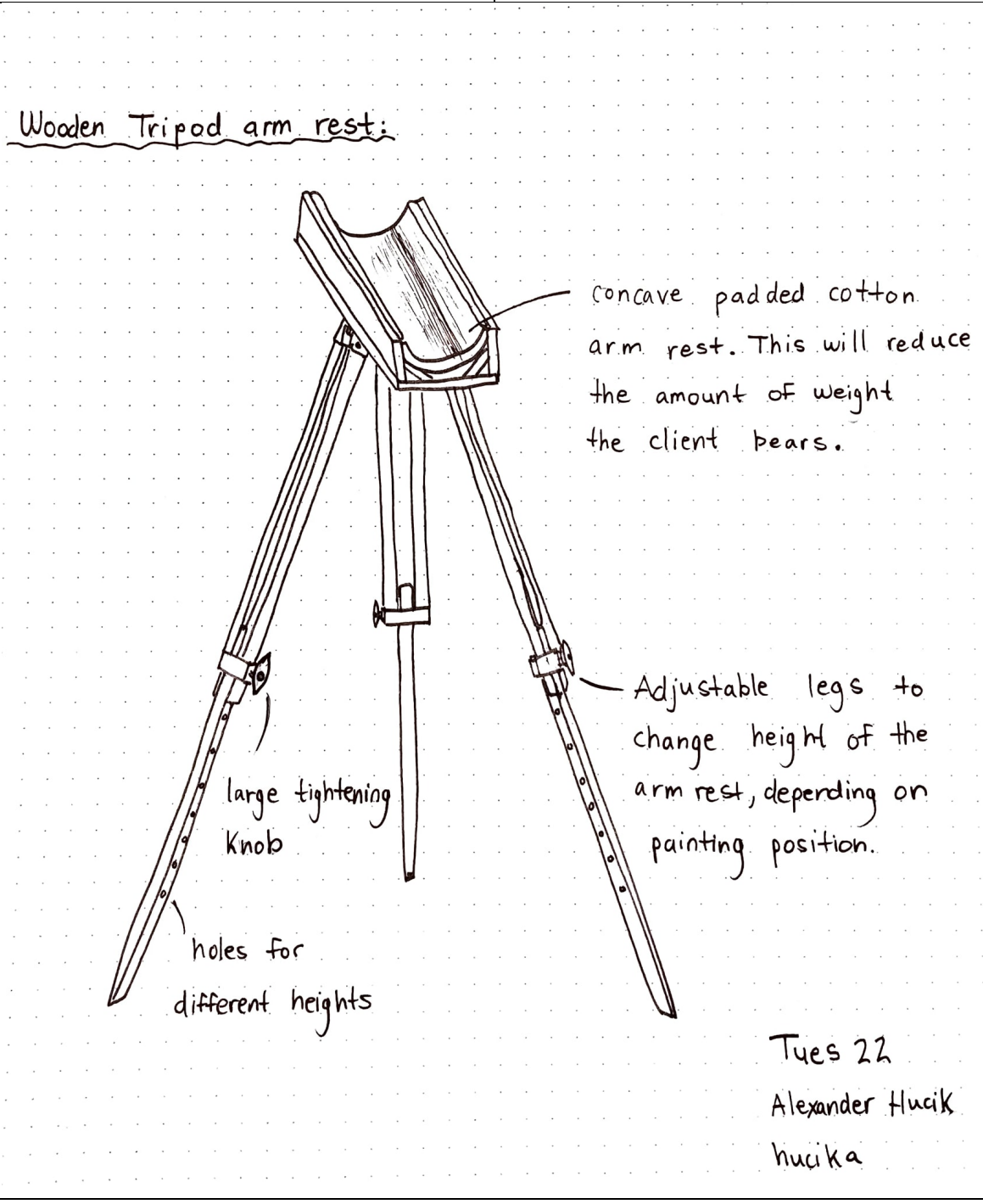
Insert screenshot(s) of your concept below.



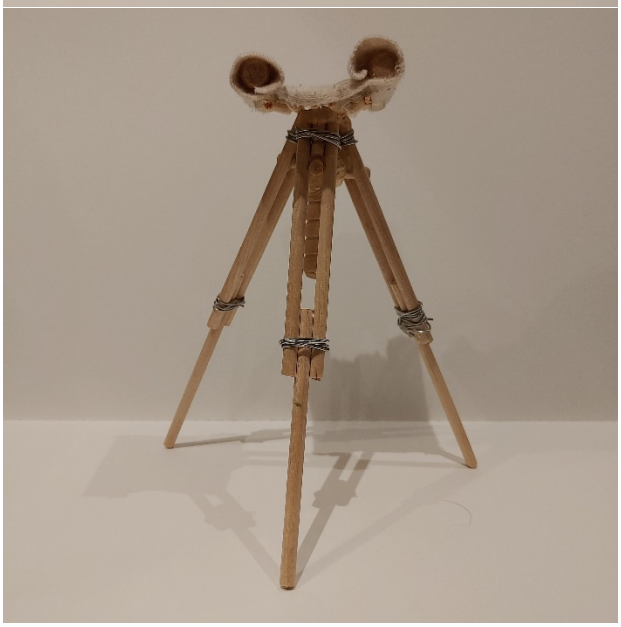
Team Number: TUES-22

Concept 1

Name: Alexander Hucik	MacID: hucika

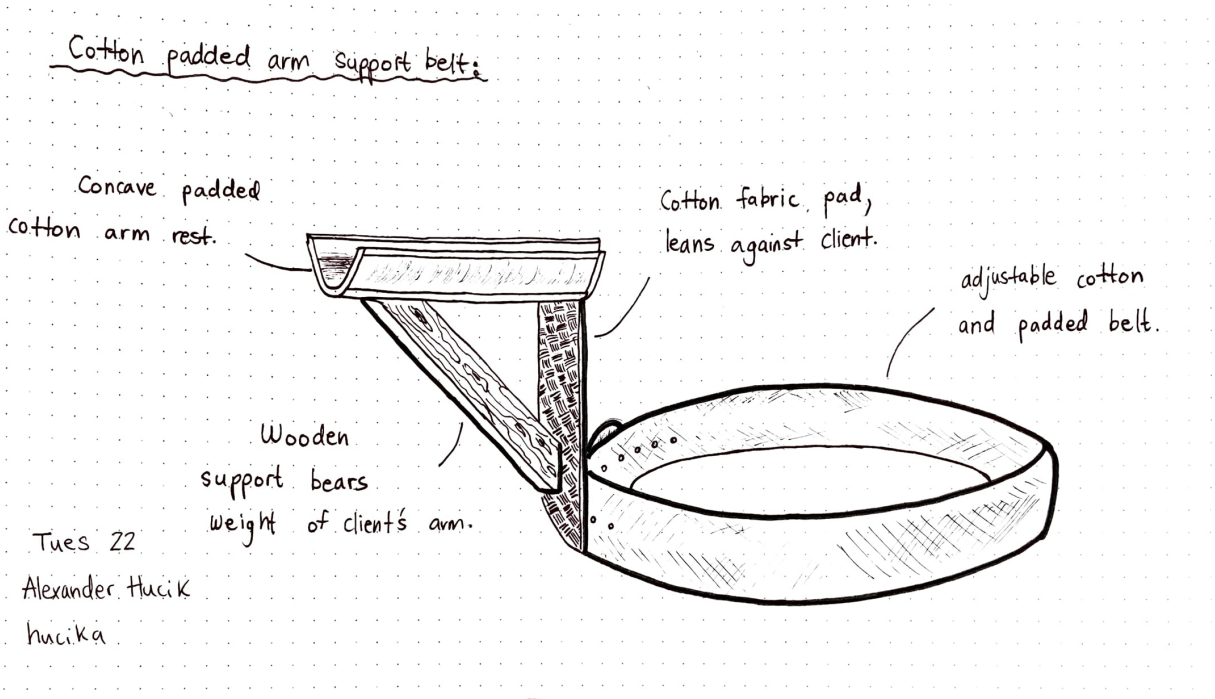


Basic Prototype:



Concept 2

Name: Alexander Hucik	MacID: hucika

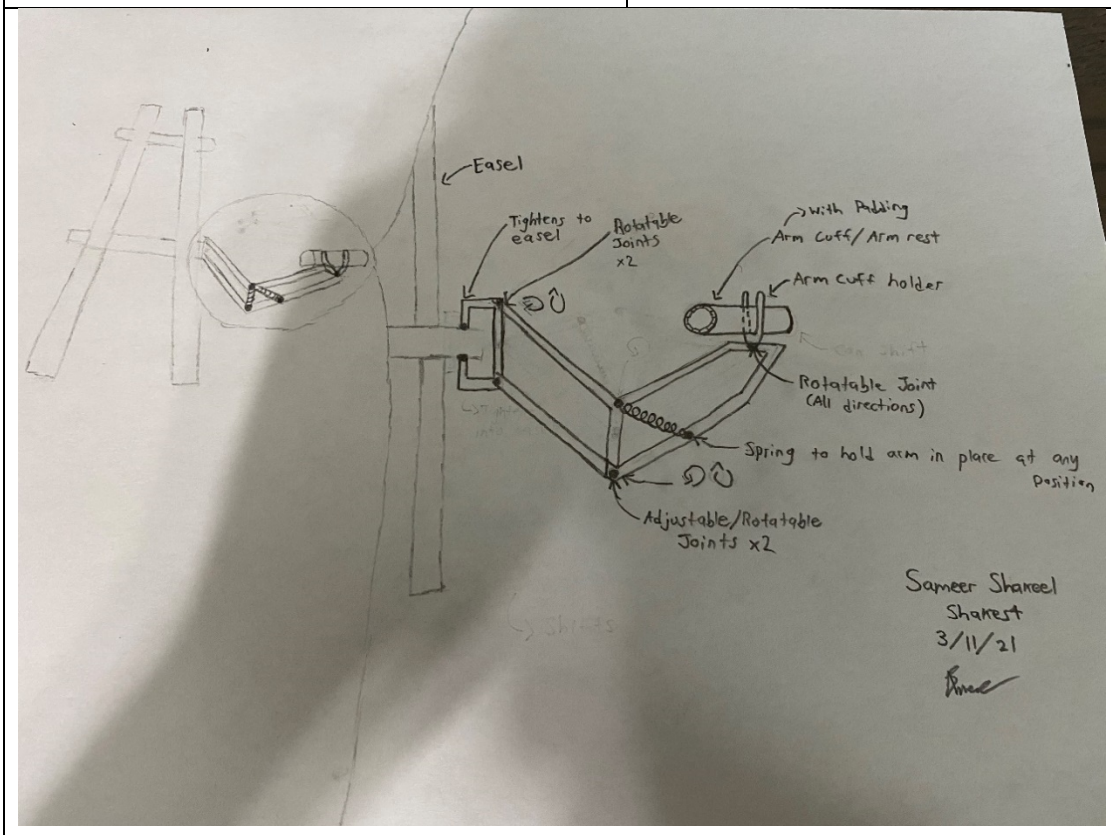


Basic Prototype:

Team Number: TUES-22

Concept 1

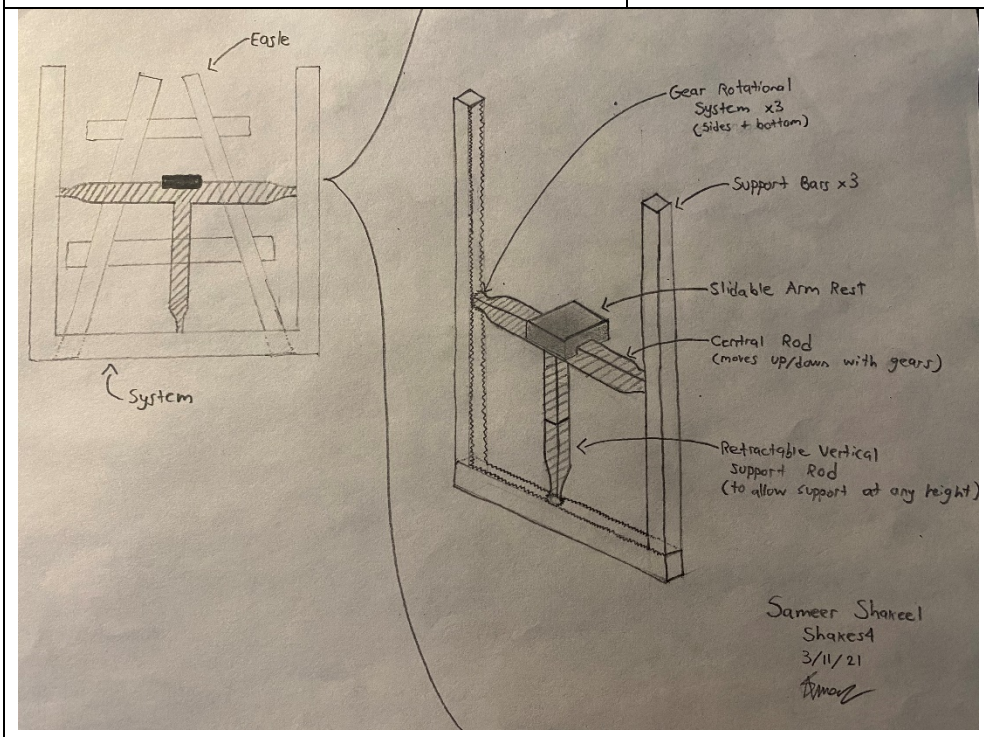
Name: Sameer Shakeel	MacID: shakes4



The goal of this concept design is to constantly reduce the weight bearing on Alanna's arm while she is painting. Ideally, as Alanna's arm moves, so will the mechanism and when she stops, the mechanism will stop as well, allowing her to rest her dominant arm while painting. Changes may have to be made to allow the full stationary support of her arm while still being a lightweight mechanism.

Concept 2

Name: Sameer Shakeel	MacID: shakes4

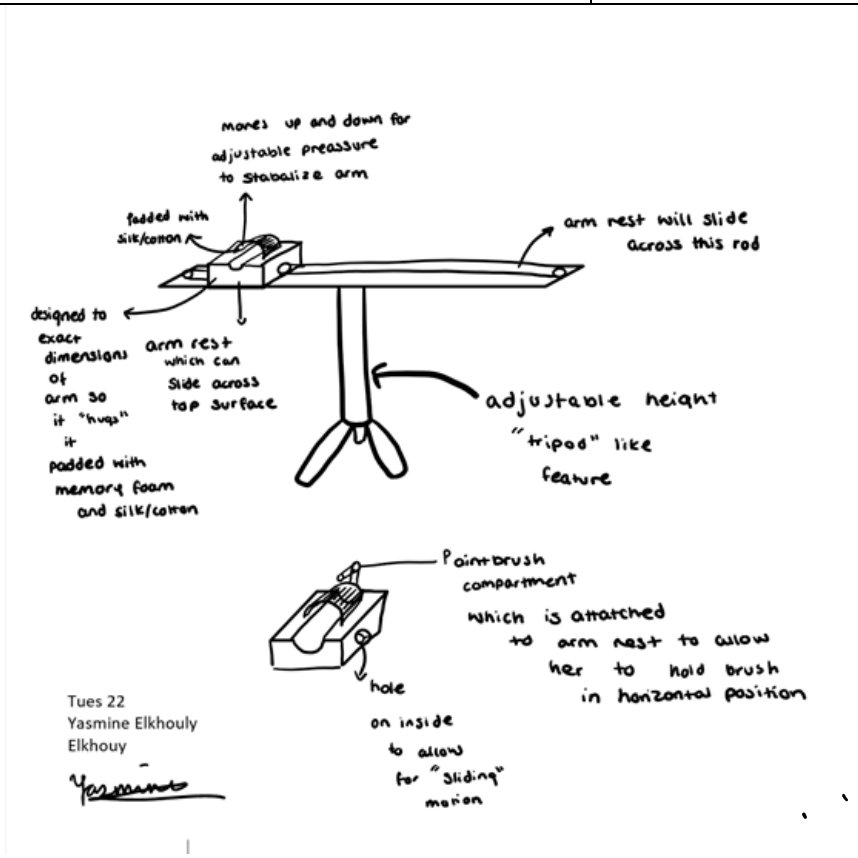


The goal of this concept is to provide Alanna with arm support anywhere throughout her canvas through the adjustment of an arm rest. The arm rest is attached to two rods on the x and y axis which can linearly rotate by means of a gear rotational system. This allows the arm rest to be positioned at any point on the canvas.

Team Number: TUES-22

Concept 1

Name: Yasmine Elkhouly	MacID: elkhouy



Concept 2

Name: Yasmine Elkhouly	MacID: elkhouy