

MILESTONE 2.1 – CLIENT NOTES

Please complete this worksheet in your corresponding team document.

MILESTONE 2.2 – RESEARCH ASSIGNMENT

Team Number:

TUES-22

Complete this worksheet individually before coming to Design Studio/Lab B for Week 8.

1. Include your research assignment in the space provided

One of the key challenges of client-based design work is understanding the client and the context in which they will be using your potential solution. In any design project, designers rarely have unlimited access to the client and the information we obtain is limited by the questions that we think to ask. To address this challenge, designers often do additional external research so they can better understand the client's activities and environment, appropriate vs inappropriate materials, existing devices on the market etc.

Based on your notes from the client visit, identify and answer one question that:

- Can be answered by external research (external = not class materials)
- Is distinct from the questions being researched by your teammates
- Will help you in your design work

Good questions would be:

- What are the physical properties of art supplies used by our client (e.g., diameter, magnetism, friction)
- How do other artists with physical limitations work?

A bad question would be:

- What TV shows does my client like to watch? [Why is this bad? It cannot be answered by external research and it is irrelevant to the design process]

Your research assignment:

- State the question you plan to answer through your research
- Summarize your research findings (answer). Your answer should be a coherent, well-written summary of your research, not a “brain dump”.
- You may include images, but don't forget to cite them properly.
- Aim for a length of about 500 words
- Properly cite your sources using IEEE formatted references and in-text citations. For information on referencing formats and choosing sources, see Design and Communication Workshop 1.

At the beginning of Design Studio/Lab B, we will be asking that you copy-and-paste the same research assignment into **Milestone Two Team Worksheets**. It does seem redundant, but there are valid reasons for this:

- Each team member needs to submit their research assignment 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 rest of the milestone

Team Number: **TUES-22**

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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)

MILESTONE 2.3 – REFINED PROBLEM STATEMENT

Please complete this worksheet in your corresponding team document.

MILESTONE 2.4 – FUNCTIONAL ANALYSIS

Please complete this worksheet in your corresponding team document.

MILESTONE 2 .5 – CONCEPT EXPLORATION

Team Number: **TUES-22**

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

1. Include multiple images of your concept exploration, if needed
 - Include 2 distinct concepts
 - Include necessary annotations to help in the communication of your ideas
 - These can be photos of hand sketches, photos of initial prototypes, screen grabs of basic CAD models
 - 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 images per page**

During this Design Studio, we will be asking that you copy-and-paste the same photos into **Milestone Two Team Worksheets**. It does seem redundant, but there are valid reasons for this:

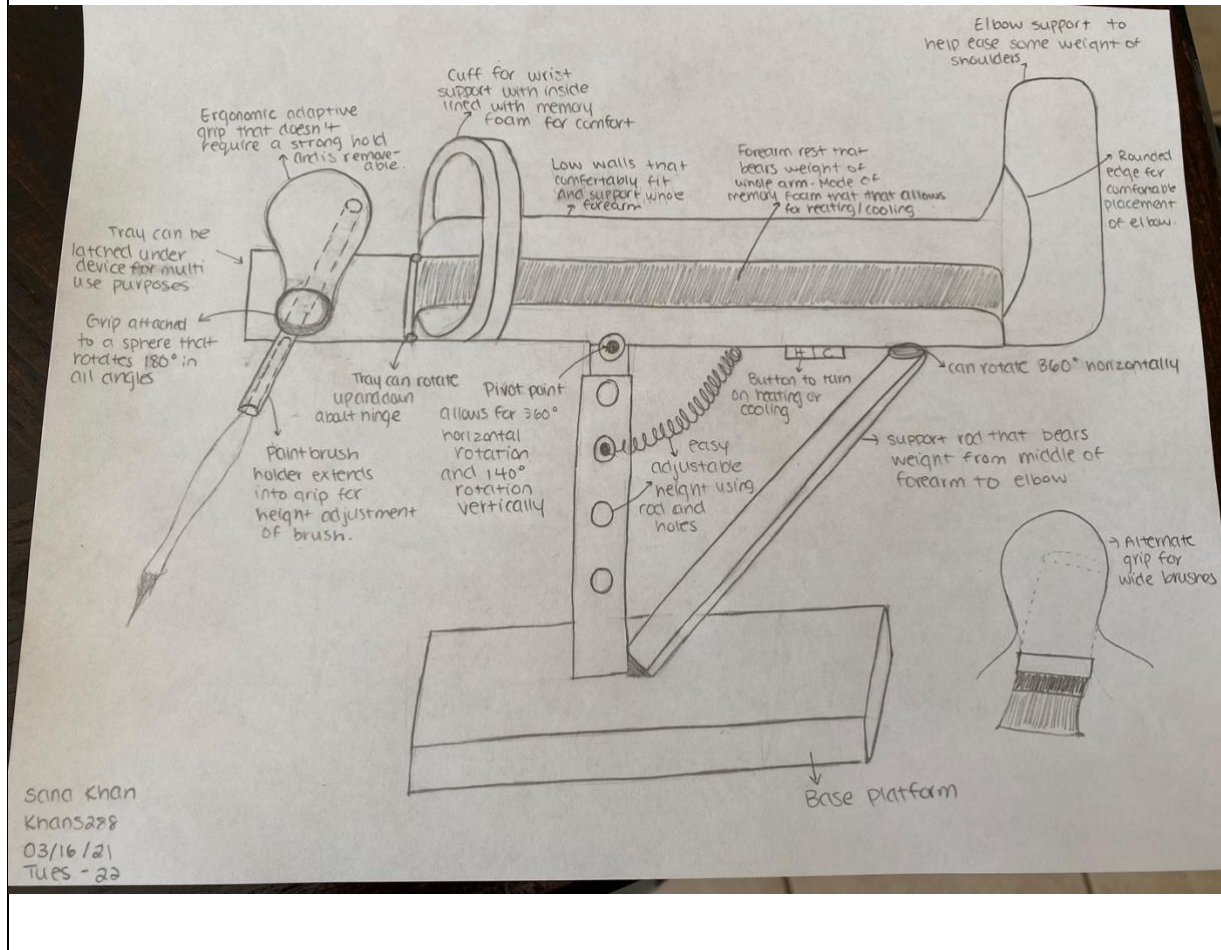
- Each team member needs to submit pictures of their concept with the **Milestone Two Individual Worksheets** document so that it can be *graded*
- Compiling your individual work into this **Milestone Two Team Worksheets** document allows you to readily access your team member's work
 - This will be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

Team Number: **TUES-22****Concept 1**

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Insert screenshot(s) of your concept below.

**Concept 2**

ENGINEER 1P13 – Project Four: *Power in Community*

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Insert screenshot(s) of your concept below.

