Team Stress

Advanced Media Semester 6

HANDOVER DOCUMENT

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First Draft
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Introduction

This semester, we have been tasked with creating a solution that works together with the Moodmetric Ring to address the needs of individuals experiencing Persistent Physical Symptoms (PPS). Our goal is to create prototypes of graphs that effectively conveys stress-related data, enabling those with PPS to gain valuable insights into their stress levels and track their progression over time.

Problem Statement

Previous project participants, including students and researchers, worked on developing a variety of applications to display the stress data collected by the Moodmetric ring. However, one significant issue with previous and current apps, such as Moodlet, is that the data displayed lacks research validation. Furthermore, important information such as stressors and time stamps are not included in the stress visualization, which makes it harder for the users to gain more detailed insights to their stress moments and potential stressors.

Assignment & Goal

Design a solution that effectively communicates stress data to users with PPS. The goal is to present the stress information in a meaningful, easily understandable manner.

Research Questions

For our group, the main research questions are:

" How might we design a solution for individuals with physical complaints, that provides meaningful data collected from stress wearables in a non-judgemental way?"

To answer our main research question, we have created multiple sub-questions. Combined with the methodology we used; we answered each sub-question:

1. What are the needs of individuals with PPS?
2. How can we design an interface that displays stress data in a non-judgmental way?
3. How are we going to measure the user-friendliness in data visualizations?

Methodology

During this project we used design thinking method in combination with CMD (Communication and Multimedia Design) research methods. This approach allowed us to tackle our project with a user-centred mindset.

Design thinking served as the foundation of our project methodology. It consists of five phases: Empathize, Define, Ideate, Prototype and Test. It encouraged us to empathize with our target users, understand their needs, and gain insights into their experiences, challenges, and preferences. We then employed ideation techniques to generate concepts.

CMD methods provided us with a structured approach to collecting and analysing data. We used a variety of research techniques, such as interviews, literature studies, showroom, and lab methods, to gather valuable insights from our target users.

1. Phase 1 – Empathize and Define

User-centric research is the main emphasis of the first stage of the design thinking process.

“Without a deeper comprehension of the target audience, design thinking cannot begin.”
(Mortensen, 2023)

1.1 Literature Research on PPS

Understanding PPS, Stress and its impact on individuals

The first step we took was to gain a deeper understanding of PPS through a literature study. We learned the following:

Persistent Physical Symptoms (PPS), also known as Medically Unexplained Symptoms (MUS), is a condition characterized by long-term physical symptoms without identifiable medical causes. This literature review explores PPS across various medical fields and highlights the impact it has on individuals' physical and psychological well-being.

The study identifies common physical symptoms associated with PPS, including chronic pain, fatigue, digestive issues, sleep disturbances, dizziness, numbness, sensitivity to light, and breathing difficulties. It also discusses the physiological, social, cognitive, and behavioural aspects of PPS, such as autonomic dysregulation, medical uncertainty, catastrophic misappraisal of symptoms, and avoidance behaviours.

PPS significantly affects individuals' sense of self, relationships, and daily functioning. Managing symptoms through medication, physical therapy, and lifestyle changes proves challenging, leading to higher healthcare costs and unemployment rates among PPS patients. Additionally, individuals with PPS face psychological burdens due to a lack of social support and the invisibility of their symptoms.

Stress plays a significant role in worsening physical symptoms and potentially leading to depression. Stress management techniques, including the use of stress wearables and stress-management apps, can be helpful for PPS patients.

Current available treatments for PPS include antidepressant medication, psychological interventions like cognitive-behavioural therapy (CBT), relaxation techniques, group therapy, and brief dynamic psychotherapy. In addition, it also emphasizes the importance of family involvement and considering cultural factors in PPS treatments.

Link to the document

1.2 Target User Research

Appendix qualitative research document

Introduction

Now that we had an understanding of what PPS is, what the common complaints are and how stress affects people with PPS, our group started thorough field research on our Target Users. This qualitative research is the continuation of the empathizing phase of the design thinking process, providing a deeper knowledge of our target users' experiences, pain points, and needs. By combining the insights from our field study and literature study, we hope to provide our stakeholders with the information they need to make decisions both for this and future projects. This research and future research will hopefully result in a stress wearable application that resonates with the target users. The findings are from 7 interviews, along with 11 transcriptions from other researchers. You will find the detailed version of this research in the Appendix.

Note

In this section, we're sharing insights from our target user research. Please note that, while our target user research provided us with many valuable insights and feature ideas, they won't be implemented during this project as they fall outside of our scope. The reason for this is because we intentionally designed the interview questions to gather a comprehensive understanding of our users. We wanted to avoid limiting our users within the boundaries of our predefined scope. By exploring their pain points, favourite apps, and preferred solutions, we aimed to gain a deeper perspective on their needs and expectations.

Our primary focus will be on stress data visualization. However, we will still share the additional insights for future reference, as it may be a valuable resource for potential future enhancements or expansions.

Method

During this research, we used the Field strategy's Interview method. We specifically used a semi-structured interview approach, which gave our target users more space and allowed them to share their stories, concerns, and experiences with stress and its impact on their physical well-being. To recruit our participants, we created a **survey** with a few questions about PPS conditions, complaints, and whether they wanted to participate in our interviews. We also used and carefully analysed prior interview transcriptions to gain a better understanding of the target audience.

Kommentar [PK1]: Survey link

Secondary Field Research

Before conducting our interviews, we translated and analysed the 11 transcriptions we have received from the external research team members: Jesse and Fenne (Fontys Paramedical students).

Why did we use their research? We decided to use other research materials into our target user research because the clinic that initially planned to connect us with our target uses was at full capacity, due to other student researchers. As a result, the process of accessing and engaging with our target users was taking longer than expected, and we had limited time for our research activities. At that point any qualitative research that would provide insights about our target group, was valuable, which is why we asked for them and we received those from Jesse and Fenne.

Considering the fact that our scopes are a bit different we did our own analysis to find information that we were looking for, which would create a foundation for our own interviews. While Jesse focused more on physiotherapists, Fenne focused more on gathering experiences from Moodmetric, Empatica and Smart Sock.

Fenne's method: She let the target users use Moodmetric, Empatica and Smart Sock for a couple of days (for how many days is unknown), but they all had positive and negative remarks about the app in terms of design and functionalities.

Jesse's method: He used the same method but with physiotherapists instead of patients. Even though his target users are physiotherapists, his interviews did give some insights on PPS patients and their needs.

The goal with this process was to analyse the interviews from Jesse and Fenne and find information that would in some extend answer the following question:

1. How does daily life of people with PPS look like?
2. What are their needs and pain points?
3. What data are they interested in?
4. What health related wearables are they using? What are Likes and dislikes about these wearables?
5. Do they prefer any device type (smartphone, PC)?
6. Is there anything about the personalized solution?
7. What are their common stressors?

Secondary Research Results Summary

After analysing the transcription from Jesse and Fenne, we started Affinity Mapping, as shown in Figure 1 and Figure 2. We were able to identify participants' **needs**, **pain points**, **data** that the participants are interested in, participants' **preferences** and **common stressors**.

The first affinity map is based on the interviews conducted by Jesse and Fenne. We were able to identify pain points and common themes in the daily life among the target audience from the analysis of their transcripts.

Participants' Pain Points:

- Chronic muscle tension and pain (in hands, feet etc.)
- The participants have more physical pains after experiencing stress.
- The participants want to know why they have pain (refers to stress application showing possible stressors that could cause pain)

Data of Interest:

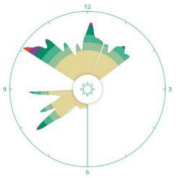
- Participants are interested in heart rate and stress level measurements.
- They want an overview of their stress levels throughout the day.
- They seek insights into how different activities affect their stress levels.
- They want a solution that warns them when they are stressed so they can prevent it.

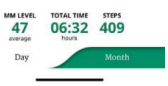
Our insights: We noticed from the transcriptions that the majority of the participants connected the heart rate levels to their stress, they thought higher heart rate equals to more stress, which is why they want to see that relation visualized. They also wanted to see how certain activities affect their stress levels.

The wearables and their preferences:

Reminder: during this research users used Empatica wristband, Moodmetric ring and Smart Sock

- Dislikes confusing visualization and colors (refers to Empatica's visualization and Moodmetric's 12 hours clock visualization and colors)





- The majority of them preferred Moodmetric's data visualization compared to Empatica because it much more clear and easier to understand.

Our insights: Even though Moodmetric app has 24 hours visualization, users did not know about it even after using it.

Personalized Solution:

- Participants value personalized feedback, data, and insights relevant to their treatment and stress management.
- Participants would like to have the ability to customize data sharing.

Common Stressors:

- Common stressors mentioned include driving cars, daily activities, certain situations, migraines, muscle tension, chronic back pain, and other physical discomforts.

Feature preferences:

- The "Notes" feature. (This is an idea that Fenne mentioned. The note would allow users to log what caused stress peaks)
- Prefers video or image-based tutorials about app usage over text-based ones.
- Wants a simple design.
- Wants to be able to log what caused stress peaks.

Link to see full document

Affinity Maps derived from the research from Jesse and Fenne

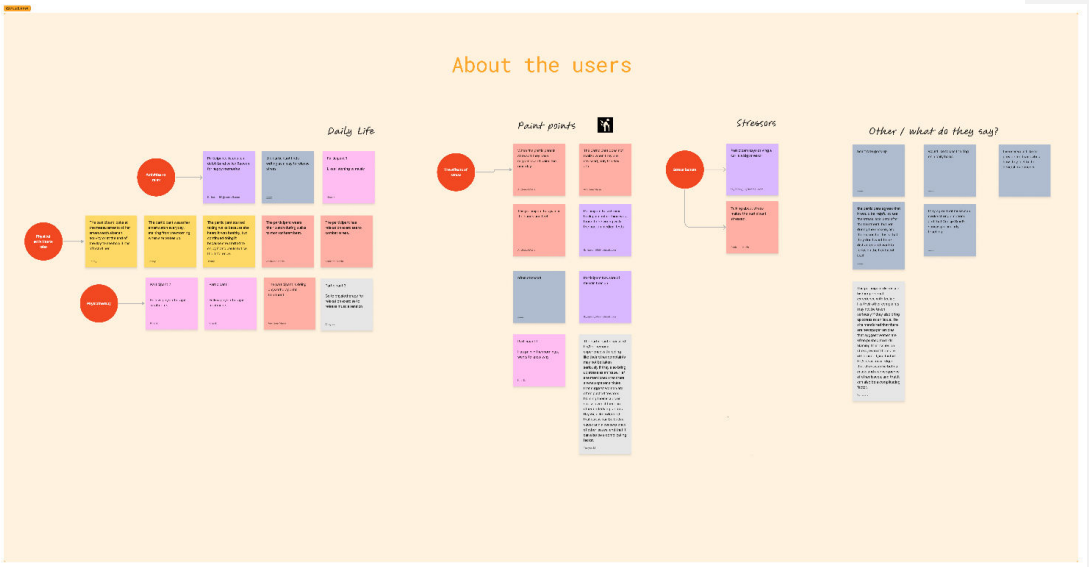


Fig. 1 – Affinity Map (About the users)

See the full image

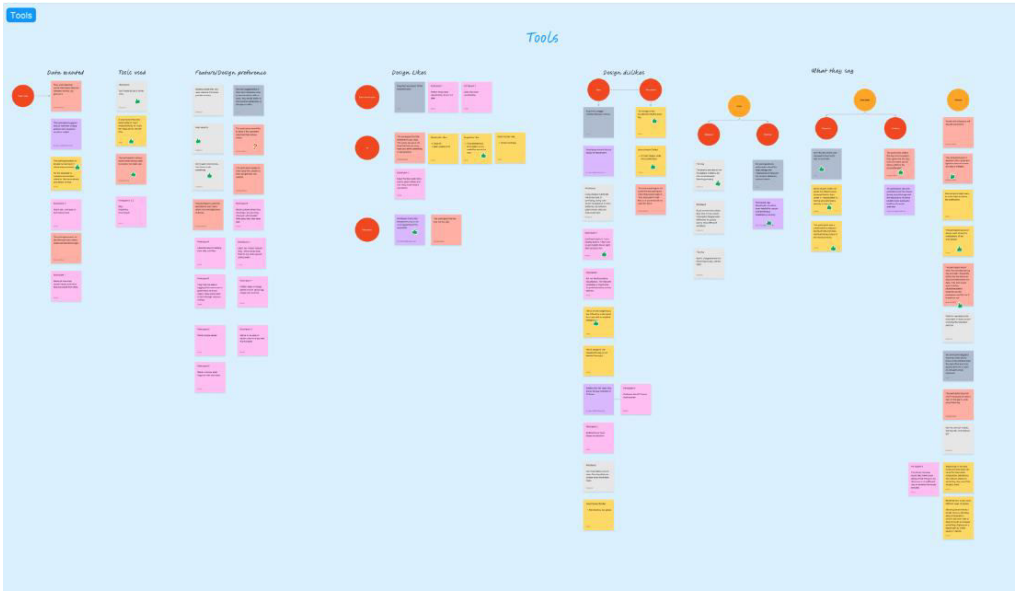


Fig. 2 – Affinity Map (Tools)

See the full image

These affinity maps can be seen through this link :
https://www.figma.com/file/Gg8xt0nWCL5mUjadOo3S1i/Interview-Analysis?type=whiteboard&node-id=0%3A1&t=sJiD4unOUyOOe7Xx-1

Our interviews

The structure of the interviews we conducted

As we mentioned in the previous section, Jesse's and Fenne's interviews served as a foundation for our interviews. Considering the fact that we had different scopes, our interviews were still very much needed, as we wanted to gain a deeper understanding of the target users' experiences with PPS, stress and stress management practices. The interviews were divided into three sections.

Section 1:

- Participants were asked about their knowledge of PPS,
    - their common symptoms,
    - and how these symptoms affect their daily lives.

Section 2:

- Focused on participants' use of stress management applications and wearables,
    - including their desired features,
    - favourite apps,
    - and preferred device types.

Section 3:

- Participants were invited to express their ideal stress management solution,
    - including colours,
    - desired features,
    - data visualization,
    - and methods of notification.

The interviews were conducted with the participant's consent to record, ensuring accurate capturing of their insights. We interviewed 7 people in total.

Our participants are suffering from the following conditions: MS (Multiple sclerosis), Anxiety disorder, ME (Myalgic encephalomyelitis), ADHD and CPTSD (Complex Post Traumatic Stress Disorder).

Link to interview Script

Interview Results Summary

For summary purposes, in this document we divided the results into 2 categories: Needs and Pain points.

After our interviews, we started Affinity Mapping to map the data, as shown in Figure 3 and Figure 4. To summarize, we divided the results into 2 categories: Needs and Pain points.

Needs

Section 2 and 3 were used to gather insights on what the target audience wants to see in stress management apps.

- Personalized stress management solutions to dealing with anxiety independently.
- Personalized relaxation sounds and/or music playlist (User mentioned Spotify integration as an example)
- Integration with user's calendar to connect their stress overview with their activities (display timeframes as well)
- A feature that would allow them to reach out to someone when feeling stressed.
- Easy to understand data visualization that shows timestamps, possible triggers (as a visualization example they mentioned line graphs the most)
- Stress journal with voice recording option, theme customization options, and
- Visualizations of a sleep cycle and heartbeat
- Visualisation of the heartbeat during stress, and clear explanations of data
- Notifications for stress levels
- Identification of stress patterns, the establishment of personal stress baseline
- Integration with calendars

Pain points

To gather insights, the application: Moodmetric was used to determine pain points that the target audience determined based on functionalities and design aesthetics. Other apps were also used for the same goals such as: Oura, Garment and Empatica.

Moodmetric:

- Confusing application interface (refers to Moodmetric and Empatica)
- Generalized and non-relaxing atmospheric sounds
- Unclear meaning of "MM level"
- Explanation of the meaning of colours is lacking for graphs. (For example, Oura provides explanations for the colours)
- Confusing features such as: the analytics.
- Lack of clarity in calendar integration, daytime and nighttime visualization, confusion about some icons and terms (such as the visualization that separates daytime and night-time with a single icon in the middle), and the need for a secure login page.
- Dissatisfaction with current therapy; there is a limited usefulness of meditation and the need for clearer explanations and tutorial.
- Limited availability of stress management solutions that are specific to their health and situations, confusion about the meaning of elevated heart rate, and stress caused by notifications.

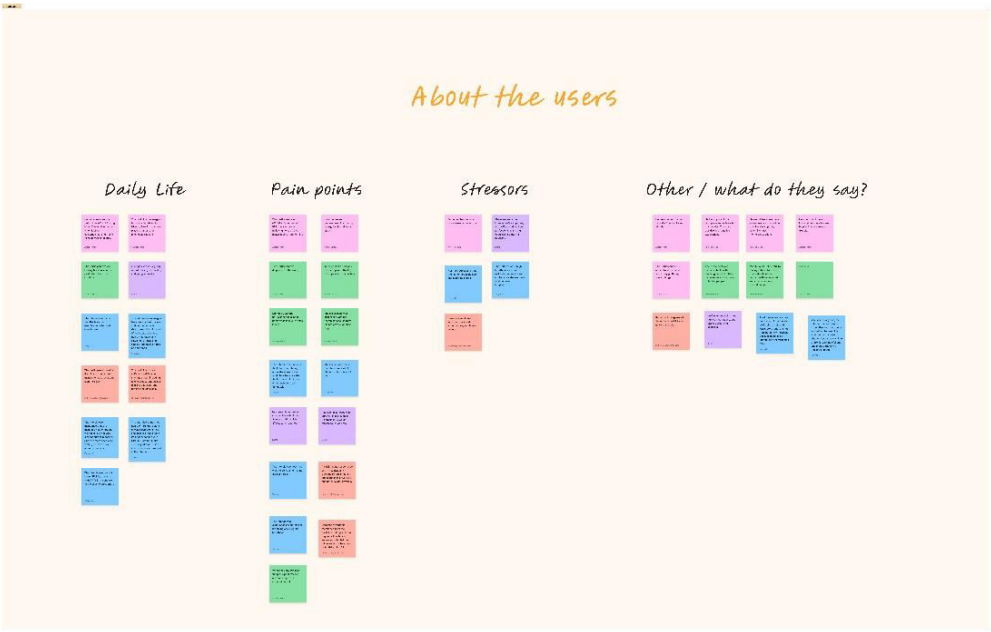
Empatica:

- Lacks notifications about stress levels and does not establish a personal baseline for stress.
- The current data visualization on the app and computer overwhelming and difficult to understand without an explanation.

Features Suggestions Summary

- Calendar Integration and/or Activity logger: Linking the app to the user's agenda and activities to identify possible stress triggers
- Positivity, Motivation, and Tips: Providing positivity, motivation, and easy-to-read tips.
- Forum: Including a forum within the app for asking questions and interacting with others.
- Supportive Features: Providing support and understanding during times of stress without being intrusive.
- Customization: Allowing customization options for personal preferences.
- Music Playlist: Connect the apps such as Spotify to create a personalized relaxation playlist.
- Activity Overview: Offering a general activity overview and the ability to highlight good or stress-free days.

Affinity Maps derived from our Interviews



See the full image

Fig. 3 – Affinity Map (About the users)

Fig. 4 – Affinity Map (Tools)

See the full image

See link : https://www.figma.com/file/Gg8xt0nWCL5mUjadOo3S1i/Interview-Analysis?type=whiteboard&node-id=0%3A1&t=sJiD4unOUyOOe7Xx-1

Note

As a reminder we included all the feature suggestions in this document for future references. As for our project we will exclude all the feature preferences that were not within our “Data Visualization” scope. From this suggested-features-list we made a user requirement list (see User Requirements Section) that focused mainly on data visualizations with 2 additional feature concepts such as HRV and Activity/Calendar integration.

1.3 Creation of Persona's and User Requirements

1.3.1 Personas

Our target user research resulted in two personas: Cecile and Emma.

See link to view them in Figma : https://www.figma.com/file/Gg8xt0nWCL5mUjadOo3S1i/Interview-Analysis?type=whiteboard&node-id=0%3A1&t=sJiD4unOUyOOe7Xx-1

Cecile Janssen

Age	**48**
Job Title	**Administration**
Location	**Eindhoven**
Hobby	**Writing**

Bio

I am a sociable, happily married woman with one daughter. I often wake up with unexplained muscle pain in the morning, which I suspect is related to stress. When I experience high levels of stress, I tend to develop migraines and muscle pain the next day.

Interests

- Reading and writing as a way to release stress.
- Listening to music.
- Regularly exercising to release muscle tension.

Goals

- She wants data that warns her when she is stressed, so she can prevent it.

Technology

GARMIN.

Pain points

- When stressed, migraine and muscle pain appear the next day.
- Does not realize when she is stressed, only the day after.

Needs & expectations

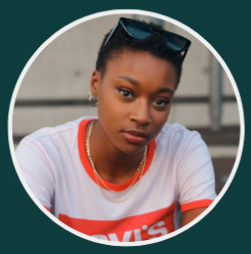
- Wants to know when she is stressed, why she is stressed, what caused her pain and/or why she has pain.
- Likes the idea of tracking her daily activities.

Personality

introvert — Extrovert

Busy — Time Rich

Safe — Risky



Emma Bakker

"Music: the gentle breeze that soothes the restless mind"

Age	**23**
Occupation	**Student**
Location	**Eindhoven**
Hobby	**Singing**

Bio

Emma is a student at Fontys ICT that was diagnosed with anxiety. She spends most of her free time at home due to her panic attacks. She loves to sing and listen to music to help her relax and manage her stress.

Interests

- Listening to music and singing
- Playing video games
- Walks in park
- Design websites and apps

Goals

- Try to seek more support from family.
- Bring more awareness of her condition at University
- Find out other ways to prevent her panic attacks
- Getting outside more and make friends

Technology

Calm WATCH

Pain points

- Stress triggers headaches
- Displeased with her therapist
- Feels misunderstood by people she just met
- Cannot process information when stressed and her mind blanks out
- Her main stressor is workload and thinking of the future

Needs & expectations

- A solution that warns Emma when her stress levels rise
- An app on her phone that has meditation and breathing exercises

Personality

Introvert — Extrovert

Busy — Time Rich

Safe — Risky

1.3.2 User Requirements

Following the insights from research, a user requirement list was made:

Note that we did not include Jesse's research in this because he focused on physiotherapists, which is not our target audience. The comments made by physiotherapists about the patients were insightful but not relevant in the context of data visualization, but more on which functionalities should be included outside of data visualization in the application.

- A baseline establishment: user's average stress level
- Real-time stress level visualization
- Display stress levels in relation to different activities
- Allow users to track their stress levels over an extended period and view trends
- Visualize stress data throughout the day in an easy-to-understand format
- Integrate HRV measurements for a more comprehensive stress analysis
- Incorporate additional data points such as sleep patterns and activities

After having made these requirements, user stories were made (see below):

- As a user, I want the system to establish a baseline stress level for me, allowing me to compare my current stress levels to my individual normal range and track my progress in managing stress.
- As a user, I want the system to visualize the measured stress level in real-time so that I can be aware of my stress levels and take appropriate actions
- As a user, I want the system to display how different activities affect my stress levels, so I can identify activities that contribute to stress
- As a user, I want to track my stress levels over an extended period of time and view trends, so that I can gain insights into my overall stress patterns and identify any long-term changes or trends that may be impacting my well-being
- As a user, I want the system to visualize my stress data in an easy-to-understand way
- As a user, I would like the system to integrate heart rate measurements, as it can provide additional insights into relation between my stress level and heart beat
- As a user, I would appreciate if the system could incorporate other data points, such as sleep patterns and activities to provide a view of my stress management journey

Summary

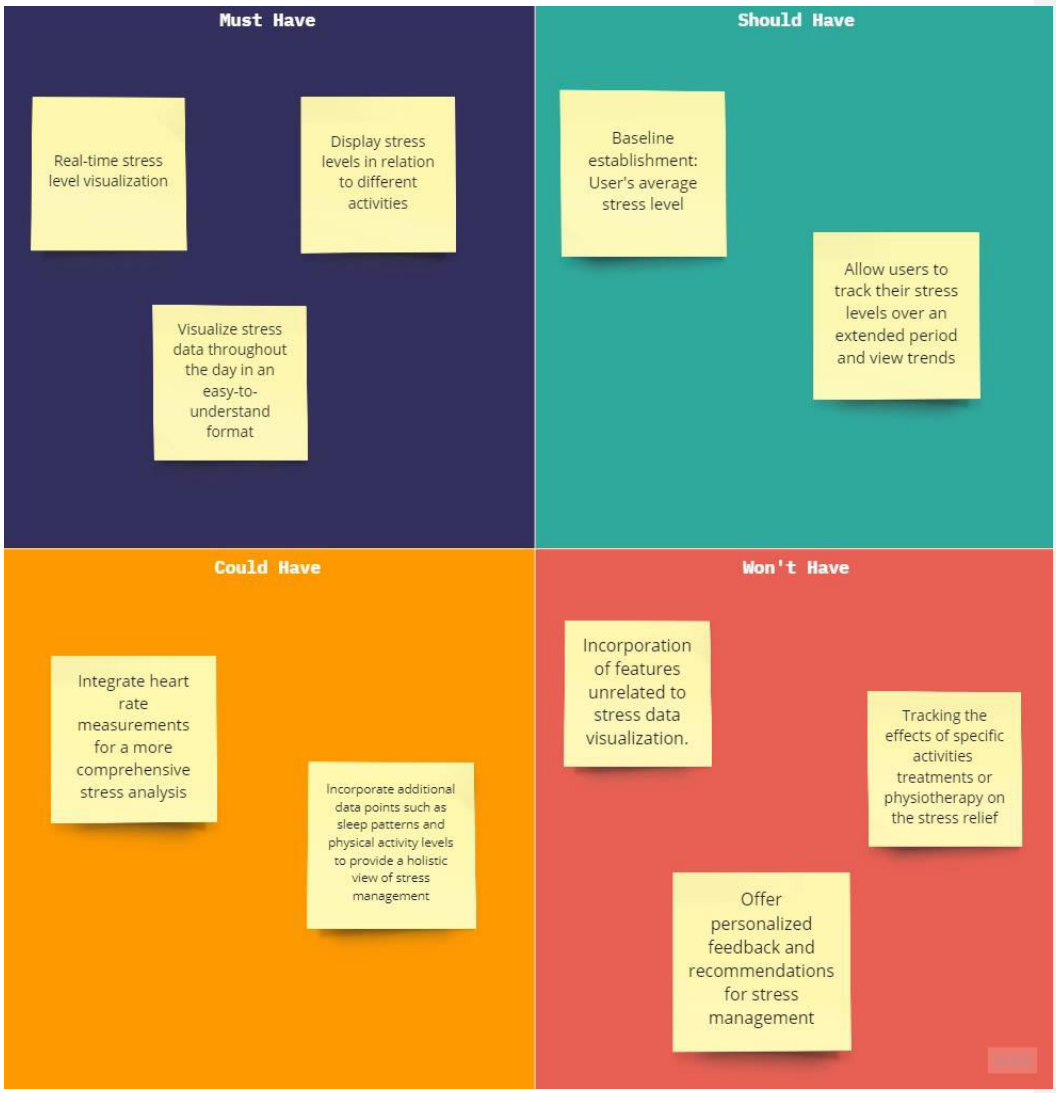
Personas, affinity mapping, and user requirements played key roles in guiding the design process for stress data visualization. The persona of Cecile Janssen based on interviews provided insights into the target audience's characteristics and pain points. Affinity mapping identified common themes and pain points. User requirements were derived from research findings and user insights, forming the foundation for the data visualization requirements. User stories captured desired functionalities. These techniques ensured a user-cantered approach and addressed user needs effectively.

1.4 MOSCOW Analysis

Introduction

The MOSCOW technique categorizes requirements into four distinct categories: Must-have, Should-have, Could-have, and Won't-have. This technique helps guide the prioritization process, ensuring that essential features are addressed first while allowing flexibility for additional functionalities. When applied to the development of a data visualization application for people with PPS, the MOSCOW analysis becomes an invaluable tool for understanding and prioritizing the needs of users. At first, we had an extensive set of requirements, but we eventually focused solely on stress data visualization.

Detailed breakdown



Must have:

- **Real-time stress level visualization**
- **Visualize stress data throughout the day in an easy-to-understand format**
- **Display stress levels in relation to different activities**

Real-time stress measurement provides immediate feedback, empowering users to manage stress effectively. Visualizing stress data in an easy-to-understand format helps users identify patterns and triggers. Displaying stress levels in relation to activities helps users make informed adjustments for better stress management. Based on our literature study and user research, this is one of the most required features. According to “Stress data Visualization” paper from TU/e, current stress data visualization fails to display relation between stress data and the user's life events.

"Existing visualizations present stress level data in isolation from information about life events, which makes it difficult for the user to understand his/her stress data and learn from it." - (Semikina, 2014)

Even though Moodmetric has it, users had a hard time finding it and understand it.

Should have:

- **Baseline establishment: User's average stress level**
- **Allow users to view their stress levels over an extended period and view trends**

Establishing a baseline for the user's average stress level is needed in a stress management app. It allows users to track their progress and understand their stress patterns. Tracking stress levels over time and viewing trends provides valuable insights for effective stress management. Users can identify triggers, understand fluctuations, and make informed decisions to manage their stress effectively.

Could have:

- **Integrate heart rate measurements for a more comprehensive stress analysis**
- **Incorporate additional data points such as sleep patterns**

One valuable could-have feature for a stress management app is the integration of heart rate measurements. By capturing physiological data related to stress levels, such as heart rate, users can gain a deeper understanding of their stress responses and overall well-being. Another beneficial could-have requirement is incorporating additional data points like sleep pattern. These factors are closely linked to stress and can provide a view of an individual's stress management journey.

Won't have:

- **Incorporation of features unrelated to stress data visualization**
- **Tracking the effects of specific activities treatments or physiotherapy on the stress relief**
- **Offer personalized feedback and recommendations for stress management**

Tracking the effects of specific activities, treatments, or physiotherapy on stress relief is as a won't-have requirement, as it falls outside the primary purpose of the app. Similarly, offering personalized feedback and recommendations for stress management is not included due to complexity and resource constraints. Instead, the focus is on providing users with accurate and meaningful stress data visualization, empowering them to interpret and apply the information based on their individual circumstances and preferences.

Summary

The mentioned must-have requirements are considered must-haves as they directly address essential aspects of stress data visualization and user needs, including real-time stress level measurement for immediate feedback, easy-to-understand stress data visualization for insights and peak stress identification, and displaying stress levels in relation to activities for understanding the impact of various factors on stress management. Also, the above two should-have requirements are crucial for effective stress management as they enable users to establish a baseline for their average stress level, view progress, and identify patterns over an extended period, providing valuable insights for informed stress management decisions. The mentioned requirements help guide the design solution by emphasizing the importance of real-time stress level measurement, easy-to-understand stress data visualization, displaying stress levels in relation to activities, establishing a baseline for average stress level, and tracking progress over time.

1.5 Research on New Ways to Visualize Data

We finalized the initial research phase with in-depth data visualization research, where we explored data visualization in different industries and good and bad practices. We tried to look into industries that gather big amount of data and visualize it to regular users, which very much aligns with our project goal, which visualize stress data in easily understandable way. The industries we look into were Energy, Finance, Aviation, Sports, Logistics and Healthcare.

1.5.1 Importance of effective visualization in conveying stress data to users with physical symptoms

From the previous research, we can derive that stress plays a vital role for individuals with PPS. Stress should therefore play the central role in conveying the data to users through effective visualizations.

- Visualizations simplify complex stress data, making it easier for users with PPS to comprehend and interpret the information. Clear visual representations help them quickly grasp their stress levels, patterns, and triggers, enabling informed actions.
- Visualizations also highlight correlations between stress levels and physical symptoms, allowing users to recognize the impact of stress on their well-being. Identifying patterns and trends over time helps users make informed decisions about managing stress and seeking appropriate interventions.
- Visualizations could also serve as a motivational tool, visually tracking stress levels and symptom patterns. Seeing improvements and the effectiveness of stress management techniques provides a sense of accomplishment, encouraging users to continue their efforts.
- Visualizations facilitate communication between users and healthcare professionals. Sharing visualized stress data enhances discussions about symptoms and interventions, leading to more targeted treatment plans.

1.5.2 Exploration of visualization techniques in different fields

We were requested to explore data visualization in other fields with the hope of finding new innovative ways to display stress data. We looked into industries that collect and visualize big data. In this section, we are discussing some of the findings.

Energy Consumption data visualizations

For this field, a research paper about interactive energy consumption visualization has been used to create a dashboard with different graphs that display energy consumption data. The focus of these

graphs was to show high consumption patterns, estimate costs and savings and recommend energy-saving strategies.

The visualizations used are:

1. A **bar graph** showing the energy usage for their building over the chosen period of time; a bar and line graph showing a comparison between current energy usage and the target energy usage over the same period of time; a dual line graph showing energy usage over the chosen period compared to average historical energy usage over a similar period time; and lastly a heat map showing a comparison between temperature and energy over the chosen period time. (Lunga, 2014)
2. A **heatmap** showing the energy usage within each building together with temperature data, a bar graph showing the energy usage for a specific building as selected in the drop-down menu, and a stacked bar graph showing the energy usage for all buildings concurrently. The concept of a low-up bar graph that would provide even more zooming limitations on each building was driven by the difference in scale for energy measures that made readings from neighboring buildings invisible. (Lunga, 2014)

The stacked bar graph (see image below for an example) is great for showing multiple data in one overview. In this case, the energy usage and the target energy usage over the same period are shown in one graph. In our case, it could be used to show the current tension-, sleep-, and heart level and their average over time.

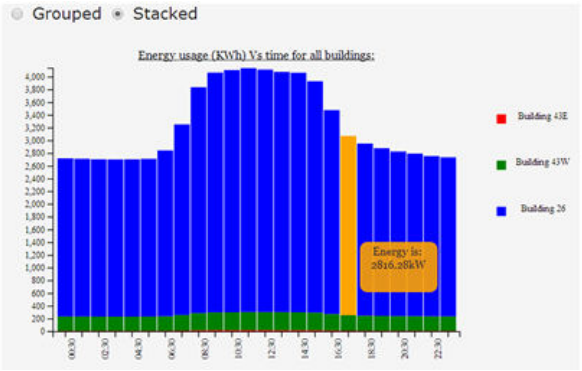


Fig. 1 Stacked bar graph with transition ability

Finance data visualizations

In finance, data visualization is the visual representation of data. Often thought of solely as a graphic presentation, data visualization encompasses visual summaries of information that span pictures, diagrams, charts, and maps. In data science, data visualization is recognized as displaying data to provide insights that will support better decisions, that is, telling the story behind the data.
The visualizations used are:

1. **A pivot table** is a handy tool aggregating large quantities of data into a single view. This visual summary organizes your data by different attributes, allowing finance teams to see the complete picture of your organization in one singular view.

2. **A stacked bar** chart lets you visualize different attributes within a single view. A stacked bar chart is especially useful in finance, where professionals constantly assess data dimensions.
3. **A heat map** is another vital data visualization tool for any finance professional, as it allows you to see how a data point is dispersed over a geographic area. This is especially useful if your organization operates in or sells to multiple locations.

Air pilots

Air pilots use a variety of data visualizations to aid in their decision-making process and ensure safe and efficient flights. Here are some common ways air pilots visualize data:

1. **Flight instruments:** The cockpit of an aircraft is equipped with various flight instruments that provide real-time data to the pilots. These instruments include an altimeter, airspeed indicator, attitude indicator (artificial horizon), heading indicator (compass), and vertical speed indicator. Each instrument presents essential flight parameters visually, allowing pilots to monitor and control the aircraft's altitude, speed, attitude, heading, and rate of climb or descent.
2. **Navigation displays:** Pilots rely on navigation displays, such as electronic flight displays (EFDs) or primary flight displays (PFDs), which present information about the aircraft's position, course, and navigation aids. These displays show navigational charts, waypoints, route information, and terrain awareness to help pilots navigate and maintain situational awareness during the flight (GPS.gov: Aviation Applications, n.d.).
3. **Weather radar:** To visualize weather conditions and avoid hazardous weather phenomena, pilots use weather radar systems. These systems display weather patterns, such as storms, precipitation, and turbulence, on a radar screen. The radar allows pilots to identify potential turbulence or severe weather areas and make appropriate navigational decisions to ensure passenger safety and comfort.

Sport analytics

Sports analytics is a field that uses statistical modeling and data analysis methods to acquire understanding and make wise judgments in the realm of sports (Pykes, 2022). It covers various athletic performance-related topics, such as player assessment, game strategy, injury prevention, and team administration. Because of recent technological breakthroughs, more data accessibility, and the desire to acquire a competitive edge, sports analytics has become increasingly popular.

1. **Data visualizations** are used to analyze and compare player performance metrics, such as shooting percentages, scoring efficiency, passing accuracy, and defensive impact (Sarlis & Tjortjis, 2020). Charts, graphs, and **heat maps** allow analysts to identify strengths and weaknesses, track progress over time, and make data-driven decisions regarding player selection, lineup configurations, and game strategies

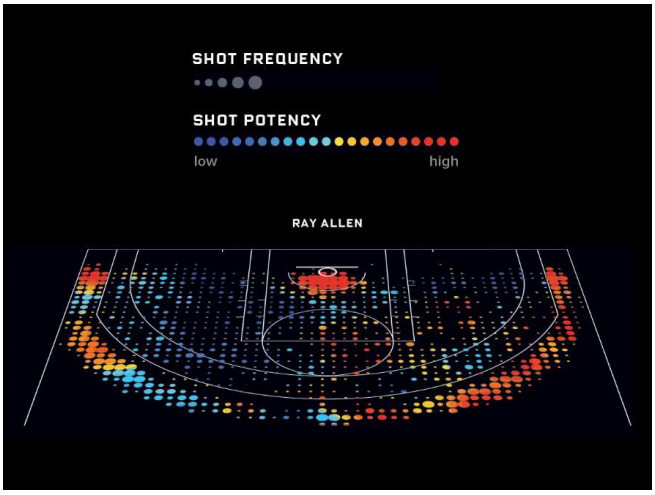


Fig. 3

Transport and logistics

Data visualizations play a crucial role in transport and logistics by providing insights, improving decision-making processes, and enhancing overall operational efficiency. Here are some ways data visualizations are used in this domain:

1. **Data visualizations** enable logistics professionals to analyze transportation data, including historical routes, traffic patterns, and delivery schedules (What Is Route Optimization in Logistics?, 2022). Interactive maps and **route visualizations** help identify the most efficient routes, considering distance, traffic congestion, and delivery time windows. This aids in optimizing logistics operations, reducing fuel consumption, and improving delivery timelines.

Stress data visualizations

A Master's Thesis titled "Stress data visualization" by Sofia Semikina from the Eindhoven University of Technology focuses on the visualization of stress data about everyday life events to better understand and manage stress (Semikina, 2014). The thesis identifies a problem with existing stress data visualizations, which present stress level data in isolation from information about life events. This makes it difficult for the user to understand and learn from their stress data.

The goal of the project is to develop new visualization techniques for stress data that can be related to everyday life events, enabling the recall function of the user. The thesis proposes combining stress level data with a personal calendar containing information about professional and personal life events. This approach aims to provide a more contextual understanding of stress levels, making it easier for users to associate specific stress data with particular life events.

As for analysis **of their potential benefits for communicating stress data effectively**, the results that are related to our design goals are as follows:

- Shape visualization gives a stronger impression of stress than color visualization, while colored shape visualization is perceived as the lowest.

- Users find color visualizations more intuitive and perform better with them.
- Different techniques make different tasks easier, such as color shape visualization for detecting steep stress level growth and color visualization for finding the highest or lowest values.

An example of using the results in a graph (see image below for an example) is in a way also a stacked graph. In our case it could be great for using for our calendar screen, where the time and the data visualization level are shown in one clear overview.

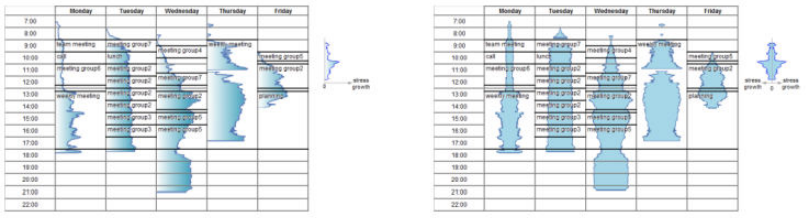
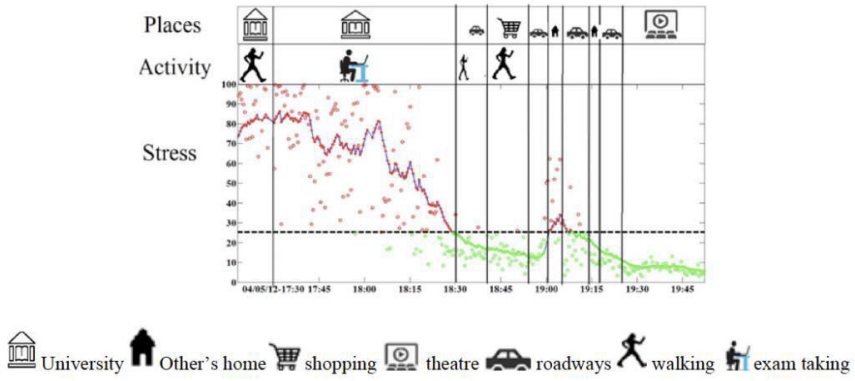


Fig. 3 Two ways of shape visualization (Semikina, 2014)

The paper titled "Visualization of Time-Series Sensor Data to Inform the Design of Just-In-Time Adaptive Stress Interventions" investigates the challenges and opportunities in visualizing time-series sensor data on stress to inform the design of just-in-time adaptive interventions (JITAIs). They propose four new visualizations based on one million minutes of sensor data from 70 participants.

The image below is one of the examples of proposed four new visualizations. It offers a representation technique for understanding complex combinations of stress factors. It displays stress as a function of location, activity, and time, with segmented and annotated areas. High-stress segments correspond to activities like exams and driving, while low-stress segments correspond to socializing, entertainment, and walking. These visualizations provide valuable insight into stress intensity, potential stressors, and associated contexts (Sharmin, Raij, Epstien, & Nahum-Shani, 2015).



Contextual stress profile of a participant. X-axis shows time, Y-axis shows stress level and context (activity and location). Black dashed line represents baseline stress. (Sharmin, Raij, Epstien, & Nahum-Shani, 2015

See link for all the documents

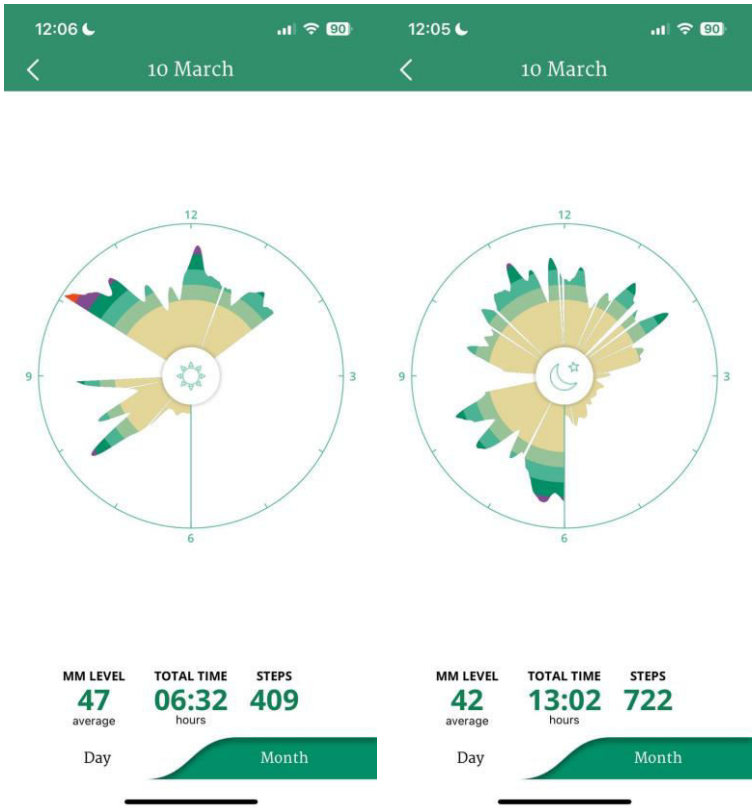
1.6 Moodmetric section:

Before conducting Competitor Analysis, we summarized all the problems related to Moodmetric application. The summary is based on our user research, our own feedback and heuristics principles.

Concerning Moodmetric, the research conducted by Jesse, Fenne and us, it could be summarized with the following problems that Moodmetric currently has along with other apps / wearables.

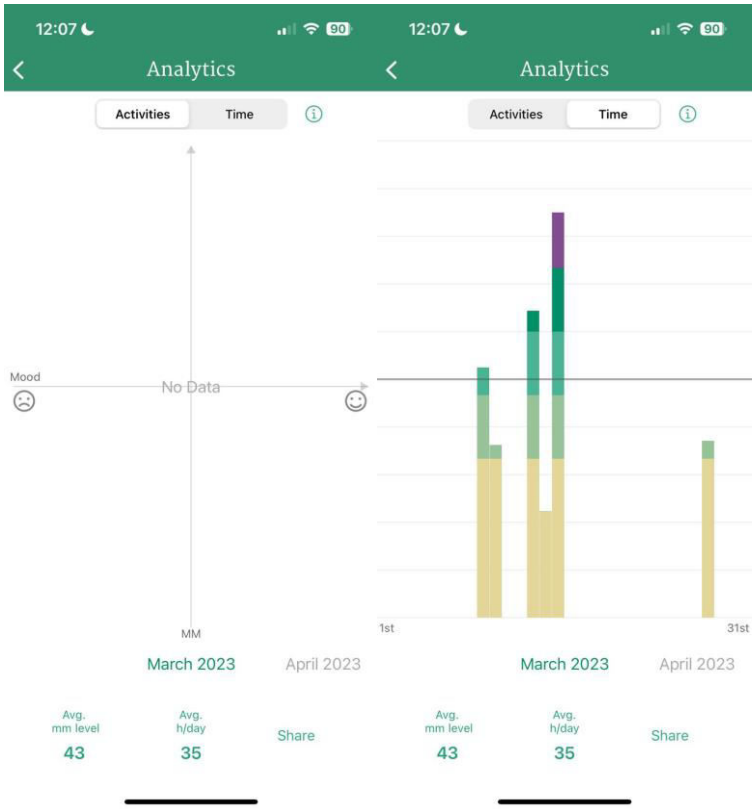
Confusing application interface:

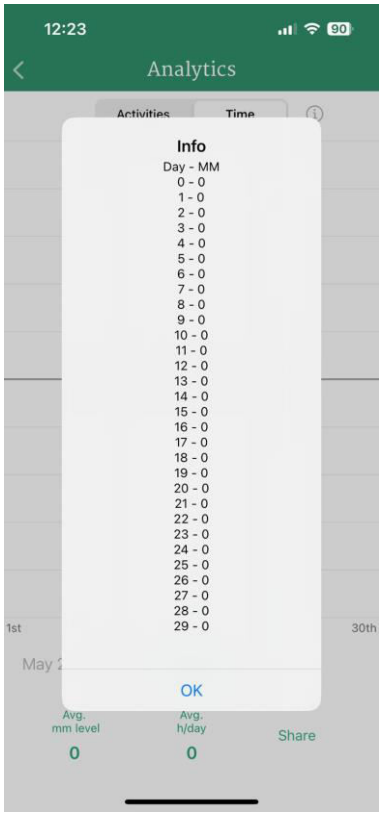
The participants mentioned confusion and difficulty in understanding the interface of Moodmetric, along with Empatica. With Moodmetric a lot of users didn't know that if you swipe, you can see the night data visualization. This suggests that Moodmetric may have usability issues or a complex design that users find challenging to navigate.



Lack of clarity in data visualization:

Participants expressed a need for easy-to-understand data visualization that includes timestamps, possible triggers, and clear explanations of the data. Moodmetric fails to provide clear and intuitive visualizations, it may hinder users' ability to interpret and make sense of their stress data effectively.

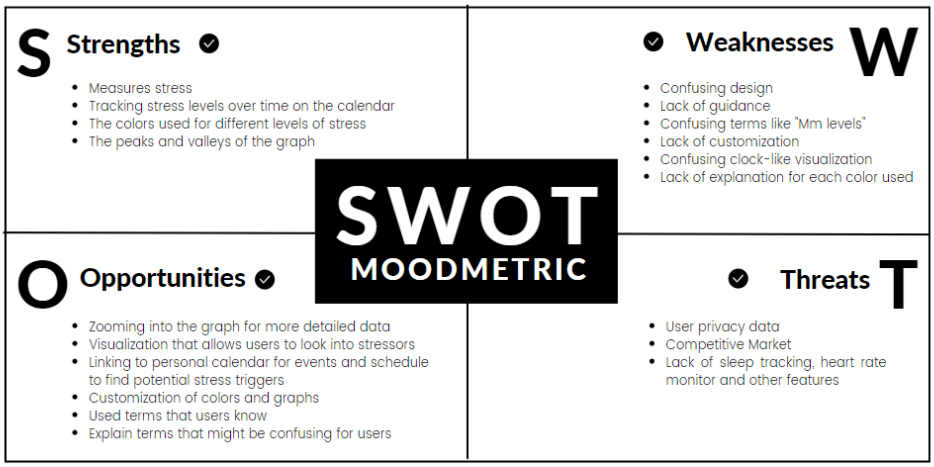

12:07
Analytics
Activities
Time
Mood
No Data
MM
March 2023
April 2023
Avg. mm level
43
Avg. h/day
35
Share
12:07
Analytics
Activities
Time
1st
31st
March 2023
April 2023
Avg. mm level
43
Avg. h/day
35
Share



Lack of personal stress baseline:

Participants mentioned a desire for notifications about stress levels and the establishment of a personal stress baseline. Moodmetric lacks these features, and users may not receive timely alerts or have a reference point to understand their stress levels in relation to their individual baselines.

SWOT Analysis



1.7 Competitor Analysis

Introduction

When conducting the competitor analysis our main focus was the data visualization of the apps and see if the wearables track stress levels or not. We also looked into reviews and picked valuable information from their users.

Competitor Analysis was a must in this project to assess strengths and weaknesses of different wearables that track stress, heart rate, sleep cycle and so on. The competitor analysis was based on the amount of star reviews and reviews from users. The data was collected from Google Play Store and Apple Store.

By evaluating their application, we were able to identify features that are missing, improvements and understand the needs of our target users.

We chose globally popular solutions that have wearables and applications to track health data.

Overview of the competitors

COMPETITOR ANALYSIS

OVERVIEW

COMPETITOR	SOLUTION	PLATFORM	PRICE RANGE
Oura Ring	Ring that tracks sleep, HRV, body temperature	iOS/Android	$299 - $399
Fitbit	Smartwatches that track physical activities, sleep, HRV, calories burned	iOS/Android	$79–$299
Empatica	Wearables that track sleep, HRV.	Web version	$299 - $399
Apollo Neuro	Wearables that offers touch therapy through silent vibrations	iOS/Android	$199 - $249
Garmin	Smartwatches that track sleep, stress level, heart rate, activities.	iOS/Android	$199 - $899
Bellabeat Ivy	Jewerly wearables that track respiratory rate, cardiac coherence, activities	iOS/Android	$149 - $199

Strengths and weaknesses

COMPETITOR ANALYSIS — OVERVIEW

COMPETITOR	STRENGHS	WEAKNESSES	TYPES OF GRAPHS	STRESS TRACKER
Oura Ring	• Different types of visualization for sleep, body temperature, HRV.	• Overwhelming data • Customization • Integration with more apps	• Bar Chart • Linear Chart	No
Fitbit	• Tracks Food Intake • Tracks physical activities and calories burned	• Zooming in the graphs for in depth data • Customization of graphs • Custom baseline for heartrate	• Bar Chart • Linear Chart • Donut chart	No
Empathica	• Used by thousands of researchers and clinics • Tracks sleep and HRV	• Mobile Version • Confusing graphs	• Bar Chart • Linear Chart	Yes
Apollo Neuro	• Helped users with sleep and anxiety • Helps the users to relax	• Lack of data visualization • Data Tracking • Lack of cusomization	• Donut Chart • Circular Chart	No
Garmin	• Good tracking of data • Different types of health data	• User Interface • Customization • Onboarding	• Circular Chart • Bar Charts	Yes
Bellabeat Ivy	• The jewerly is beautiful • Tracks sleep and steps	• No control over the app • Design is not functional • Not in depth data for sleep	• Circular Chart	No

Conclusion & Next Step

We investigated the most popular companies that provide insights into users' daily lives such as sleep, heart rate, stress, and physical activities.

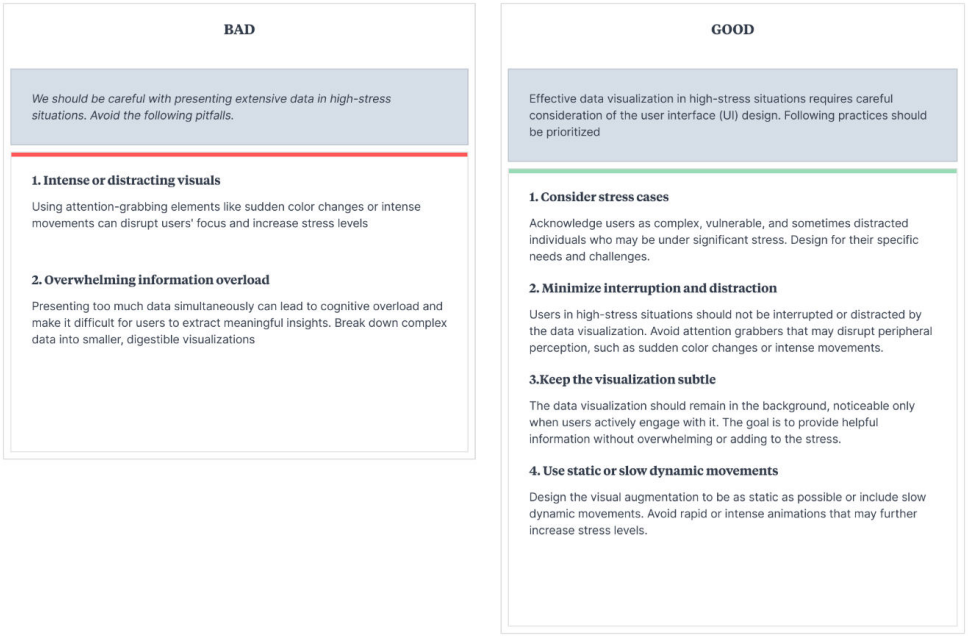
What we noticed about these products is that they do not provide detailed information about stress levels. Going through reviews revealed that users lack the option of customizing and zooming into the graph for a more detailed look at the data. Another feature they lack is the ability for the user to log in daily events and activities (or connect their personal calendar) that can be linked to stress peaks.

As you can see from this analysis current solutions have visualization issues as well and going from here, we can list down the user requirements and research findings and create different type of visualization concepts.

Link to document

1.8 Research on Good and Bad Practices of Analyzing Data

After all the research regarding different visualization and good and bad visualization practices, we narrowed the scope down into the following practices. (The complete research will be found in the Appendix in the final version)



2. Phase 2 – Ideate and Prototype

2.1 Design Solution

Visualizing Stress Data for People with Physical Symptoms

After all of the interviews, competitor analysis, best, good & worst practices and the user requirements and stories, we started prototyping to quickly gather insights from all the group members.

For the first version of prototype, we have created a medium fidelity mobile interface as a clickable Figma Design. This is the first version as compiled from the results of the research conducted, which are then later used as base prototype for user testing.

Problem Statement

Individuals with Persistent Physical Symptoms (PPS) experience long-term physical symptoms without identifiable medical causes, leading to significant impact on their physical and psychological well-being. Stress exacerbates these symptoms and affects daily functioning. However, there is a need for effective stress management techniques and visualizations that empower individuals with PPS to understand, manage, and communicate their stress levels and activities patterns.

Key Features

These key features were based on the must haves of the MOSCOW analysis.

- Real-Time Stress Level visualization: Instantly measure and track your stress levels throughout the day.
- Easy-to-Understand Stress Data Visualization: Present stress data in a user-friendly format, making it easy to interpret and analyze.
- Stress Levels Displayed in Relation to Activities: Visualize how your stress levels correlate with different activities or events, providing valuable insights into the triggers of stress.

Benefits

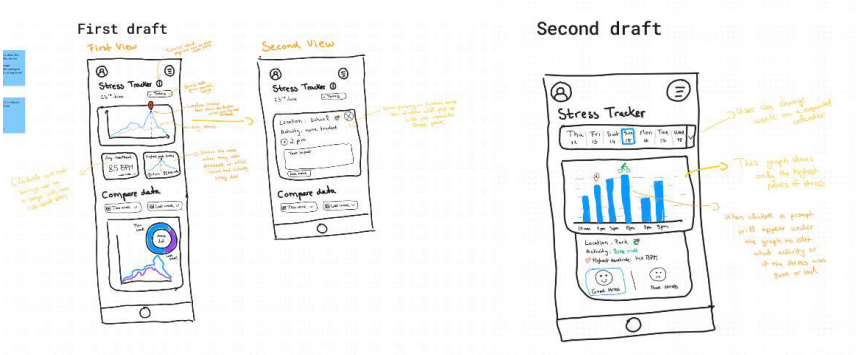
- Improved understanding and management of stress levels and their impact on physical symptoms.
- Improved understanding on what triggered the stress that is related to an activity.

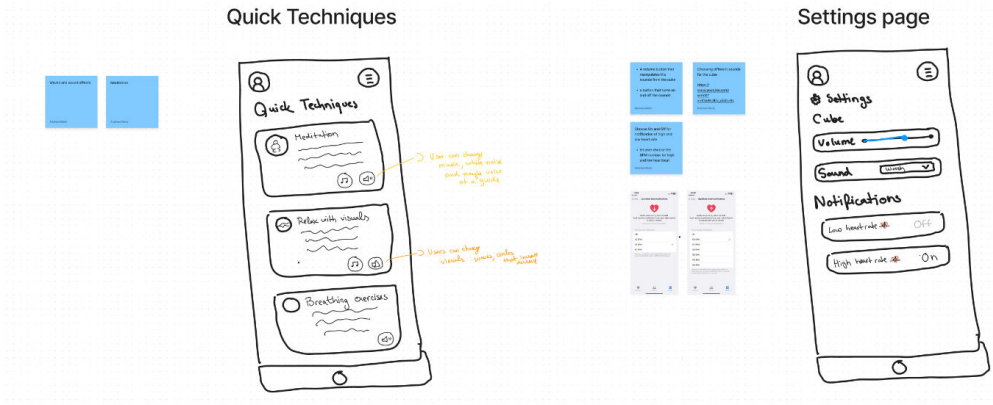
The design solution aims to empower individuals with Persistent Physical Symptoms (PPS) to visualize their stress data. The solution informs individuals in their journey towards improved quality of life.

2.2 Sketches

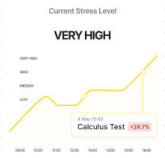
When we started working on our project, each group member contributed their own sketches based on the initial ideas, requirements and the research conducted in the previous phases. These sketches were individual interpretations of how the final product could look and function. We shared our sketches with each other to get feedback and gather more ideas. This collaborative brainstorming allowed us to explore various possibilities and perspectives. Below is an overlook of all of the sketches contributed.

These sketches can be seen through the following link :
https://www.figma.com/file/OLZwVqmD4V4G3xuk30pwu1/Sketches?type=whiteboard&node-id=0%3A1&t=0PJ2dE93pMbDxtOk-1

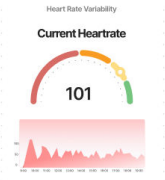


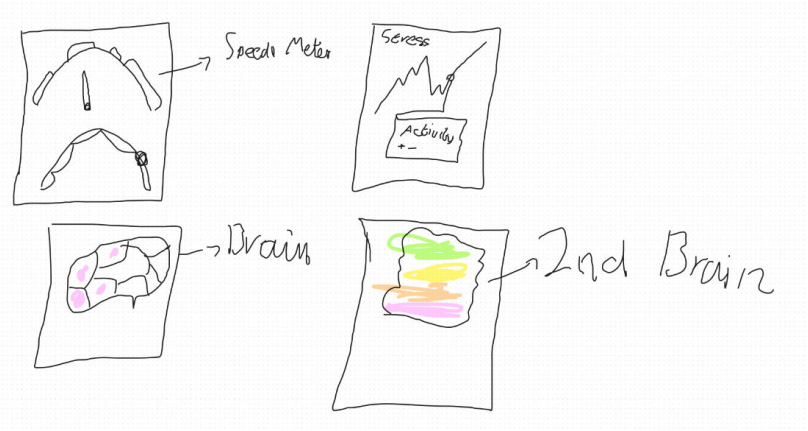


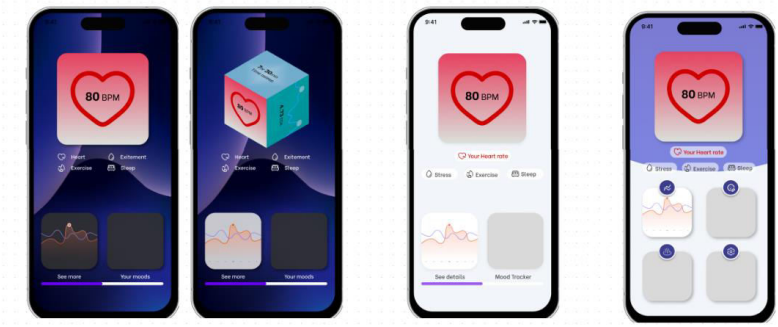

MAY 2023

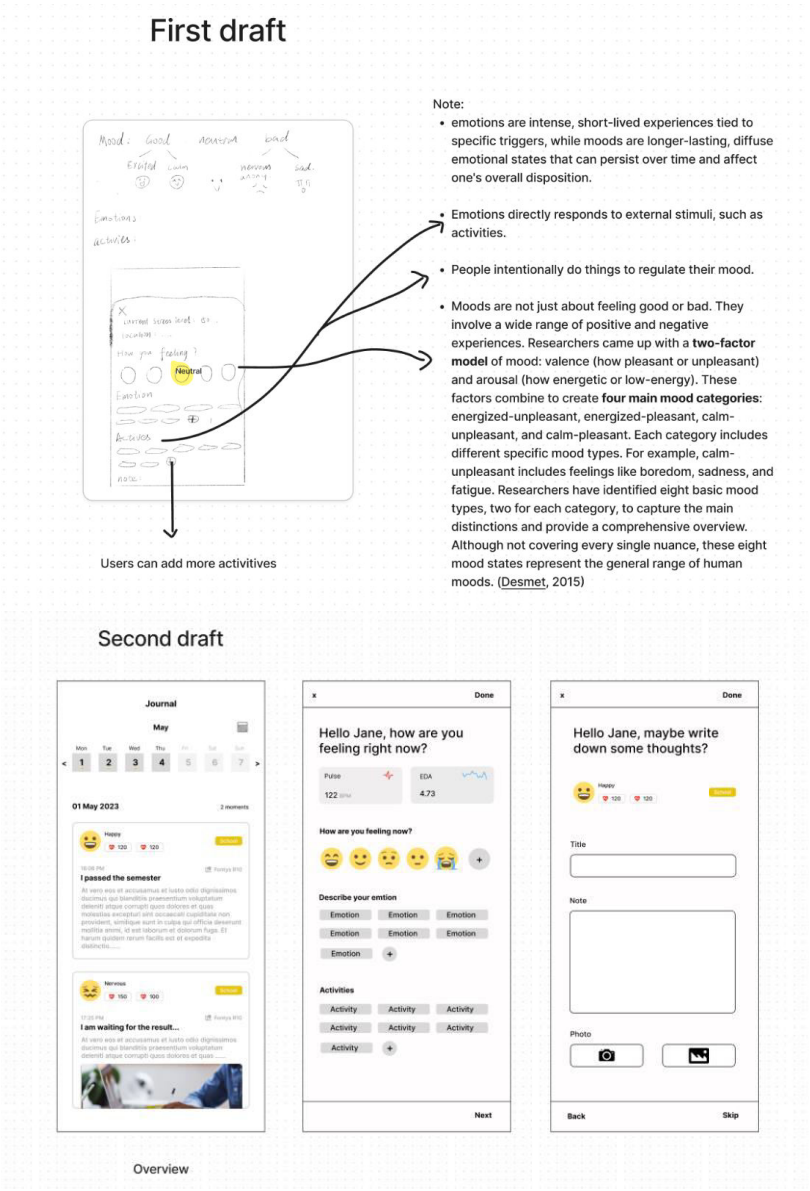

Current Stress Level
VERY HIGH
Calculus Test


Sleep Cycle
SLEPT 12.3 HOURS
12.3%
48.8%
14.6%
24.3%


Heart Rate Variability
Current Heartrate
101


Speedo Meter
Seress
Activity
Brain
2nd Brain

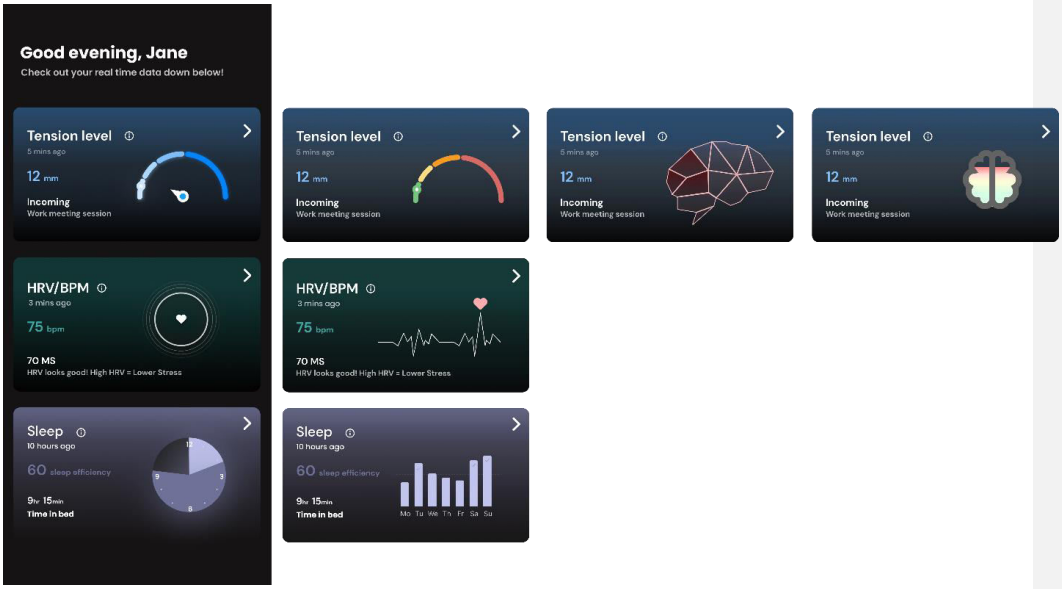

80 BPM
80 BPM
80 BPM

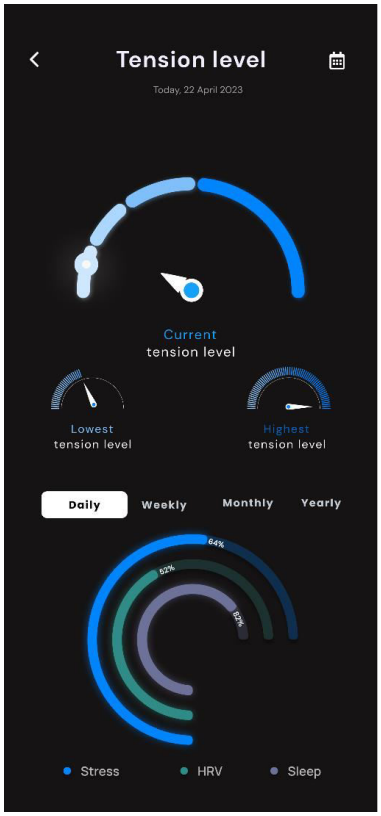


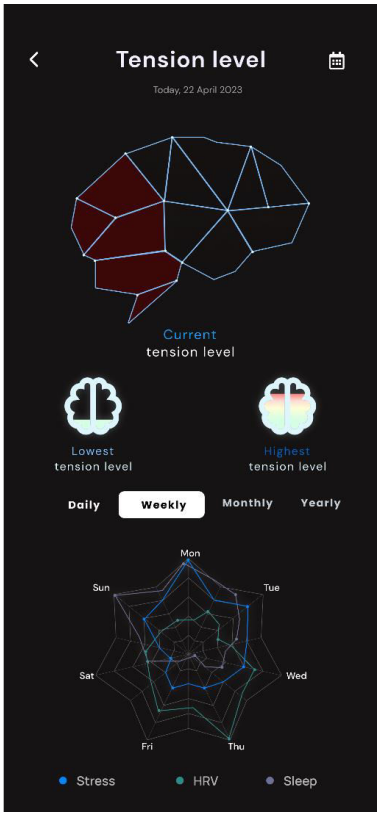
2.3 First Prototype

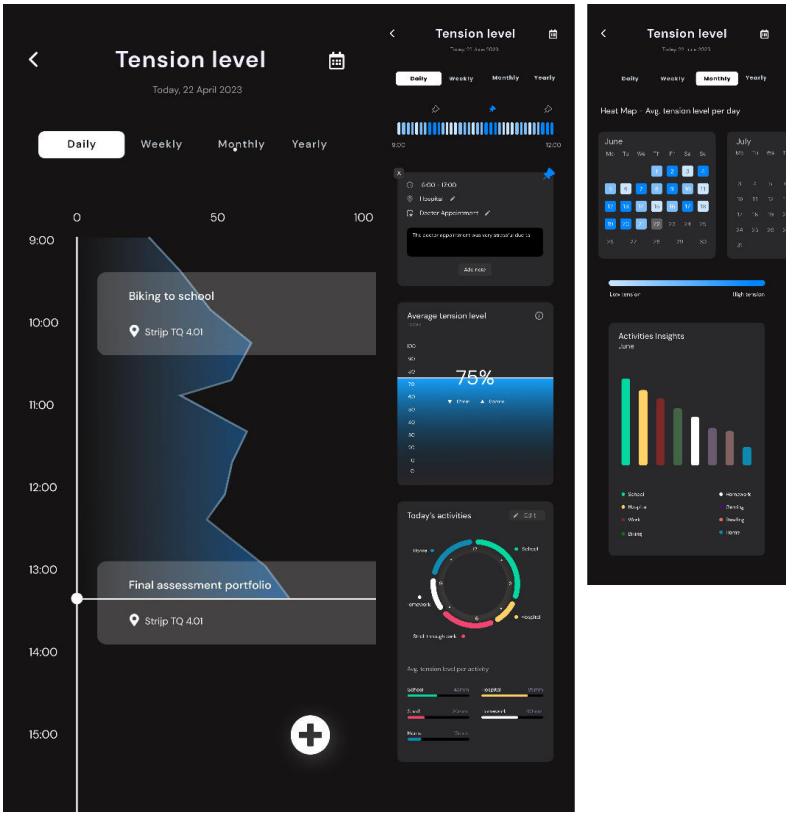
After reviewing the sketches, we decided to combine the best elements from each design into a single concept. Using the selected components, we created a basic prototype. This first prototype aimed to represent the overall structure and flow of the final product. We focused on key functionalities and user interactions to bring the core ideas to life. During this stage, we faced challenges and had to make adjustments based on the initial testing and feedback we received. Below is an overview of the first prototype created.

See following link :
https://www.figma.com/file/GxCASyBEFopEA4linWRWgN/Prototype?type=design&node-id=282%3A4194&t=rn65cIkdSOzF5DmU-1




Tension level
Today, 22 April 2023
Current
tension level
Lowest
tension level
Highest
tension level
Daily
Weekly
Monthly
Yearly
64%
52%
82%
Stress
HRV
Sleep


Tension level
Today, 22 April 2023
Current
tension level
Lowest
tension level
Highest
tension level
Daily
Weekly
Monthly
Yearly
Mon
Tue
Wed
Thu
Fri
Sat
Sun
Stress
HRV
Sleep


Tension level
Today, 22 April 2023
Daily
Weekly
Monthly
Yearly
0
50
100
9:00
10:00
11:00
12:00
13:00
14:00
15:00
Biking to school
Strijp TQ 4.01
Final assessment portfolio
Strijp TQ 4.01
Tension level
Average tension level
75%
Today's activities
Tension level
Heat Map - Avg. tension level per day
June
July
Activities Insights
June

3. Phase 3 – Testing and Prototype

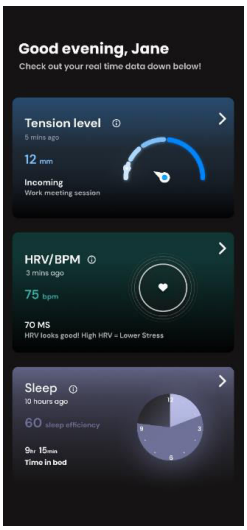
3.1 A/B Testing

To refine our design further, we conducted AB testing with the first prototype. AB testing involves presenting two or more versions of a design to different groups of users to compare their performance and gather feedback.

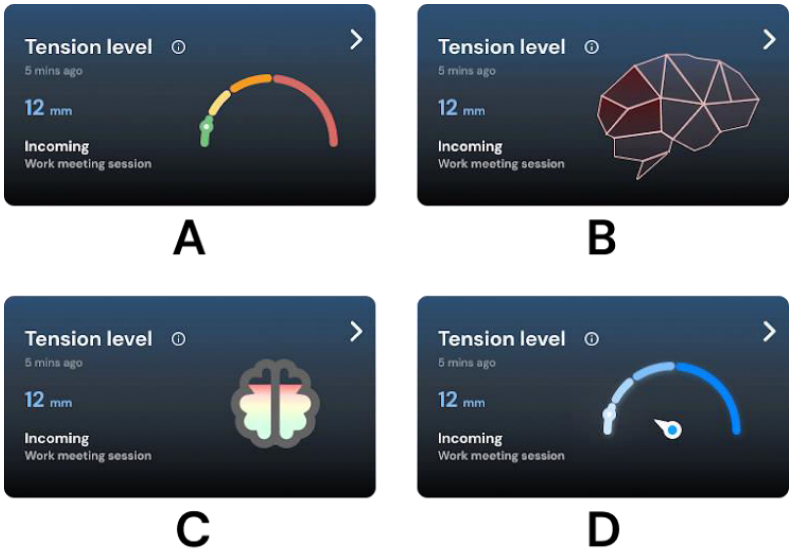
The participants had diverse opinions and feedback regarding the different screens and visualizations related to the overview page, tension level, HRV/BPM, and sleep. Overall, there were common themes and suggestions that emerged from their responses.

Regarding the overview page, Participant 1 found it confusing and lacking meaningful information, while Participant 2 appreciated the design but had questions and suggestions for further clarity. Participant 3 understood some aspects but expressed confusion about specific terms and measurements. Participant 4 found the visualization understandable but had some uncertainty about the tension data. Participant 5 perceived the overview as a quick way to access information on tension level, HRV/BPM, and sleep, assuming that further details could be accessed by clicking on the respective boxes.

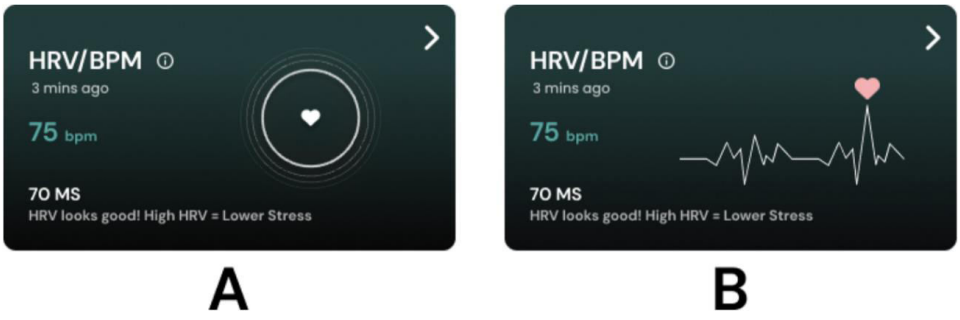
Link to document



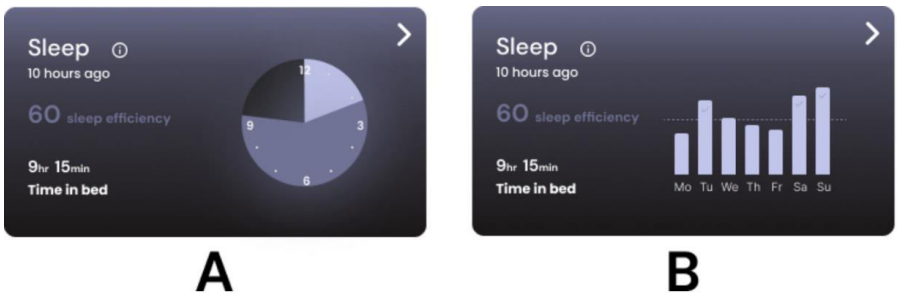
For the tension level screens, participants had different preferences. Most participants preferred screen D. Feedback included the need for clearer explanations, more intuitive visual cues, and indicators to understand tension levels and associated data.



Regarding the HRV/BPM screens, participants had mixed opinions. Some participants had questions and expressed confusion about specific elements like the heart icon, measurements, and the meaning of certain terms. Preferences varied, with some participants favoring Screen A due to its simplicity and calming design and representation of heartbeat, while others preferred Screen B for its indicator and representation of heart rate.

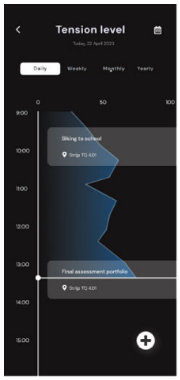


For the sleep screens, participants had differing views. Some participants found the visualizations confusing and questioned the meaning behind certain elements, such as the sleep efficiency and different colors of clock, while others appreciated the simplicity and calming design. Preferences leaned towards Screen B, which provided a clearer overview of sleep data.

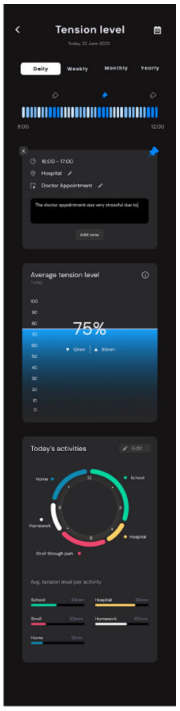


A B

In the tension level screens related to the calendar, participants shared feedback on design improvements, clarity of information, and the need for further explanations and details. Preferences varied, with some participants favoring the left screen, some preferring the right screen, and others suggesting a combination of elements from both screens.

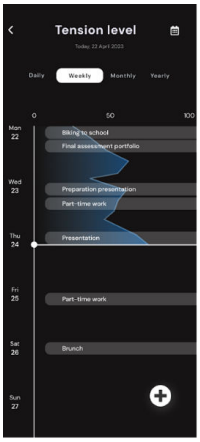


A

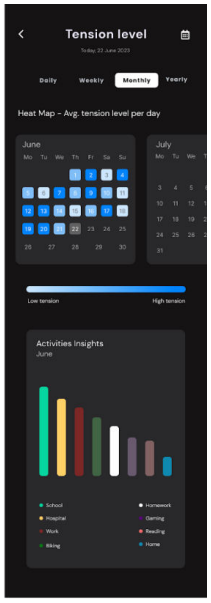


B

In the tension level screens for the weekly and monthly views, participants provided feedback on graph representations, colors, and overall understanding of stress levels. Preferences were divided between Screen A and Screen B, with some participants expressing the need for clearer indicators and accessibility considerations, such as user-friendliness for color-blind people.



A



B

In conclusion, the feedback from participants highlights the importance of clarity, meaningful explanations, intuitive design, and the provision of additional information for a better understanding of the data visualizations. Incorporating these suggestions can enhance the user experience and make the screens more informative and user-friendly.

3.2 Second Prototype

By analysing the collected data and user responses from the A/B testing, we gained insights into what worked well and what needed improvement. Using this feedback, we iterated on the first prototype and developed a second prototype that addressed the identified issues and incorporated the suggested enhancements.

The link to the second prototype can is as follows:
https://www.figma.com/proto/GxCASyBEFopEA4linWRWgN/Prototype?page-id=0%3A1&type=design&node-id=215-1115&viewport=22625%2C-8360%2C0.94&scaling=scale-down&starting-point-node-id=215%3A1115&show-proto-sidebar=1

Throughout the process, we prioritized user feedback and made iterative changes to ensure our final interactive prototype met the user's needs and expectations. The second prototype represented a more polished and refined version of our initial concept, incorporating the lessons learned from testing and feedback. We considered factors such as usability, aesthetics, and functionality to create a user-friendly and engaging experience.

3.3 What makes it unique?

What makes our visualizations unique is the fact that we connect activities with the stress data collected. People can look back on the data collected and see that for example when they were cycling, their stress levels were very high.

The visualization feature in the design solution plays a significant role in making it unique and effective. Here's how it works:

The app uses visualizations to show how stress levels relate to activities, helping users understand their stress patterns. It provides real-time feedback on stress levels, allowing users to adjust their actions and engage in stress-reducing activities. By visualizing stress triggers, users can proactively avoid or manage them, promoting better stress management and overall well-being. The visualizations also motivate behaviour change by showing the positive impact of activities on stress levels. Users can make data-driven decisions about their stress management strategies based on how their stress levels change in different circumstances. Moodmetric does relate the stress data collected to activities throughout the day. But it has them separate which doesn't make it user-friendly. From the interviews conducted, most participants didn't even know there was a feature to connect activity levels with the "Arousal" levels. We visualize that activity within the data visualization as well which makes it unique from Moodmetric.

Note

Keep in mind that this is an iterative process and changes could be made to the design based on the feedback collected from the tests. These designs are not final since they still need to be validated by the target audience. And for the designs that didn't quite work out as we hoped it would, new iterations will be made based on the feedback collected from the target audience during the tests.

Value Proposition

Overview

Our interviews and research have provided us with valuable insights into the experiences and needs of individuals with PPS (Persistent Physical Symptoms), stress, and stress management practices. We have conducted interviews with a diverse group of participants, including those suffering from conditions such as MS, Anxiety disorder, ME, ADHD, and CPTSD.

Based on our interviews and data analysis, we have identified needs and pain points of our target users. They are looking for personalized stress management solutions to deal with anxiety. They also desire personalized relaxation sounds or music playlists, integration with their calendars to connect stress overview with their activities, a feature to reach out to someone when feeling stressed, easy-to-understand data visualization with timestamps and triggers, stress journal with voice recording option, sleep cycle and heartbeat visualizations, notifications for stress levels, and identification of stress patterns.

We have carefully considered these insights and translated them into user requirements. Our data visualization application focuses on must-have features such as real-time stress level visualization, easy-to-understand stress data visualization throughout the day and displaying stress levels in relation to different activities. These features empower users to manage their stress effectively by providing immediate feedback and insights into their stress patterns and triggers.

Additionally, we offer should-have features like baseline establishment for average stress levels, tracking stress levels over an extended period to identify trends, and could-have features such as integrating heart rate measurements and incorporating additional data points like sleep patterns.

Our approach is user-centered, guided by personas and affinity mapping derived from our interviews. We prioritize the essential features based on the MOSCOW analysis, ensuring that we address the most critical user needs first while allowing flexibility for additional functionalities.

In our research on data visualization techniques, we have explored different industries that visualize big data and looked for innovative ways to display stress data effectively. We have identified the importance of clear and meaningful visualizations in conveying stress data to users with physical symptoms. Visualizations simplify complex data, highlight correlations between stress levels and physical symptoms, and serve as a motivational tool. They also facilitate communication between users and healthcare professionals.

The value proposition

Overall, our value proposition is to provide a stress data visualization application that meets the specific needs of individuals with PPS and stress. We offer personalized and easy-to-understand visualizations that empower users to manage their stress effectively, track their progress, and make

informed decisions. Our user-centered approach ensures that we address the most critical user requirements and provide a valuable tool for stress management.

Conclusion

Summary of the research

Persistent Physical Symptoms (PPS) is a complex medical condition characterized by long-term physical symptoms without a clear medical explanation. It significantly impacts patients' daily lives, causing physical discomfort, emotional distress, and challenges in relationships and employment. PPS symptoms can trigger a cycle of anxiety, depression, and additional physical symptoms. Research shows that PPS is prevalent in various medical fields. Creating a supportive environment is crucial for individuals with PPS, offering social support and professional help to improve their mental health and overall quality of life. Stress plays a significant role in worsening symptoms, and techniques like relaxation exercises, cognitive-behavioural therapy, and social support can help reduce stress levels and improve physical and mental well-being. Implementing these approaches can enhance coping mechanisms, alleviate anxiety and depression, improve sleep quality, and ultimately enhance the overall quality of life for people with PPS. Healthcare can better support individuals with PPS by combining empathetic support, effective stress management techniques, and comprehensive care.

Design solution & impact

The design solution strives to empower individuals experiencing Persistent Physical Symptoms (PPS) by providing them with the ability to visualize their stress data. This solution aims to support individuals on their path towards enhancing their overall quality of life.

Answering the main research question

For our group, the main research questions are:

" How might we design a solution for individuals with physical complaints, that provides meaningful data collected from stress wearables in a non-judgemental way?"

To answer our main research question, we have created multiple sub-questions. Combined with the methodology we used; we answered each sub-question:

1. What are the needs of individuals with PPS?
2. How can we design an interface that displays stress data in a non-judgmental way?
3. How are we going to measure the user-friendliness in data visualizations?

What are the needs of individuals with PPS?

We answered this question using literature study and interview methods. We first did research to understand what PPS is and how it affects people suffering with it, then conducted multiple interviews to gain a deeper understanding of our target users paint points and needs.

In conclusion, Persistent Physical Symptoms (PPS) is a complex medical condition characterized by long-term physical symptoms with no clear medical explanation. PPS patients face significant challenges in their daily lives, including physical discomfort and emotional distress, which can have an impact on their relationships and employment. PPS symptoms can set off a never-ending cycle of anxiety, depression, and other physical symptoms. PPS has been found to be common in a variety of medical fields, according to research.

Stress contributes significantly to the worsening of PPS symptoms. To better support people with PPS it is important to create a supportive and empathetic environment to help them feel heard, validated, and understood. Providing social support and professional assistance can improve their mental health and overall quality of life significantly.

How can we design an interface that displays stress data in a non-judgmental way?

To answer this question, we conducted literature study on the best practices for data visualization and additionally we investigated new ways of visualizing data by looking at different industries: energy consumption, air pilots, finance, and sport analytics.

The interviews that we conducted with our target audience gave us insights on what are their needs, what kind of data they want to see and how that data would look like when thinking about about colours and types of graphs. Our goal was to create graphs that do not alarm the user and give/BPM useful data in a quick way. We did this by making multiple prototypes where we used colors that were alarming (red/yellow/green colors) and non-alarming (blue color) and presented the actual current state of the Tension level, HRV/BPM and the sleep data so the user can make the assumptions presented the actual current state of the Tension level, HRV/BPM and the sleep data so the user can make the assumptions for themselves.for themselves. Based on the results of the A/B testing, the prototypes where we used non-alarming colors, which in this case was blue, was considered a preference because the participant was able to make their judgements based on the graphs for themselves.

Based on the results of the A/B testing, the prototypes in which we used non-alarming colors, in this case blue, were considered a preference because the participants were able to make their own decisions based on the graphs.

How are we going to measure the user-friendliness in data visualizations?

To answer this question, we measured user-friendliness in data visualization by conducting A/B testing with our testers. The participants' feedback provided valuable insights into their diverse

opinions and suggestions regarding different visualizations, including the overview page which contains tension level, HRV/BPM and sleep displays, tension level with current states, tension level with calendar and tension level with a weekly and a monthly view.

Overall, the participants' feedback underscored the importance of clarity, meaningful explanations, intuitive design such as colour choices and indicators, and the provision of additional information for better understanding of the data visualization. By incorporating these suggestions, we can enhance the user experience and make the visualizations more informative and user-friendly, which led to our final iteration.

Main research question

In conclusion, we have answered our main question, "**How might we design a solution for individuals with physical complaints that provides meaningful data collected from stress wearables in a non-judgmental way?"** through the exploration of three sub-questions.

Through literature study on PPS and interviews with our target audience, we found individuals with Persistent Physical Symptoms (PPS) face significant challenges due to long-term physical symptoms without a clear medical explanation. Stress plays a significant role in worsening PPS symptoms, emphasizing the need for a supportive and empathetic environment. By understanding the needs of individuals with PPS, we can create a solution that helps them feel heard, validated and understood in their journey towards managing their condition.

Through literature study and exploration of data visualization practices in various industries, we gained insights into best practices for presenting data in a user-friendly manner. We applied these insights into our sketches and prototype. Testing with our target audience further informed our design choices, such as using non-alarming colors and providing quick access to useful data. By empowering users to interpret the data themselves, we can create an interface that avoids judgment and promotes informed decision-making.

Through A/B testing, we measured the user-friendliness of our data visualizations. Valuable feedback from participants provided insights into their opinions and suggestions across various visualizations. By incorporating the suggestions from A/B testing into our design, we can enhance the user experience and make the visualization more informative.

Future Enhancements / Recommendations

These were feature preferences derived form out interviews that the target audience would like but are outside of our scope.

- Integration with Spotify.
- AI-driven insights: Utilize machine learning algorithms to analyse stress patterns and provide personalized insights and recommendations for stress management.
- Gamification elements: Incorporate gamification elements, such as achievements, rewards, or challenges, to enhance user engagement and motivation.
- Expanded social support: Develop features for users to connect with a supportive community of individuals with PPS, allowing for shared experiences and peer support.
- More detailed look into what is good and bad stress.

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