Noise Control

ICT & Media Design S6, Research Based
Fontys University of Applied Sciences
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Version

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Communication

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1. Project Assignment

1.1 Context

From the beginning of 2023, a new law in the Netherlands requires primary school children to have at least two hours of physical education per week. This means physical education teachers will have to spend more time in gymnasiums.

However, noise levels in gymnasiums often exceed 90 dB(A) during an eight-hour working day. This is equivalent to the constant decibel level of a leaf blower or an underground train. Even before the new law, many physical education teachers were experiencing the effects of high noise levels in these gymnasiums.

Exposure to high decibel levels can cause concentration problems, hearing loss, headaches and even tinnitus (tinnitus). We want to help them better understand the problem and take control of the noise level in the gymnasium by using technology.

1.2 Goal of the project

Design Challenge

From our stakeholders:
How can physical exercise teachers in primary school get more insight into the sound levels and stress during the class?

What problem are we solving?

PE/Gym teachers need to be aware of the negative effect of loud sounds because they can affect their hearing and stress levels.

Desired situation

If the project is executed well, the result (desired situation) would be that PE/Gym teachers are able to be easily made aware of noise levels in gym halls.

1.3 The assignment

The assignment is to design and create a prototype of a mobile smartphone app that can show important data to PE/Gym teachers to raise awareness in a user-friendly way.

The result should be, at minimum, a clickable prototype of the designed app, validated by user tests and research.

2. Research

2.1 Research design

2.1.1 What kind of research was done (qualitative and/or quantitative)?

This project used both qualitative and quantitative research. In the research, we used several methods from the CMD Methods Pack.

2.1.2 How did we collect information?

We initiated with expert interviews and a literature study, establishing a solid theoretical foundation. Surveys, interviews, and focus groups broadened our perspective, complemented by wireframes for visual clarity.

User testing and A/B testing validated our prototypes, ensuring their usability and effectiveness. Peer reviews, expos, and pitches enriched our work through constructive feedback and stakeholder engagement.

The creative process involved ideation, proof of concept, prototyping, and sketching. Moodboards set the visual tone, while detailed requirements and personas refined our understanding of target users.

2.1.3 What methods did we use for our research?

For our research, we used the following methods from the CMD Methods Pack:


Expert Interview, Literature Study


Survey, Interview, Wireframes, Focus Group


Usertesting, A/B testing

Peer review, Expo, Pitch


Ideation, Proof of Concept, Prototyping, Sketching


Moodboard, Requirements, Persona

2.2 Results and conclusions

2.2.1 Survey on awareness and possible solutions

We conducted a survey among physical education teachers, which received 24 responses. The conclusion of this survey indicates a clear need for awareness, prevention, and management of hearing damage among PE teachers. An app with functionalities like a daily noise limit, a decibel meter, tips to reduce noise pollution, and periodic hearing tests can provide an effective solution by supporting teachers in reducing noise pollution and protecting their hearing during PE lessons.

2.2.2 Focus Group on insight

We engaged in discussions with six physical education teachers to gain insights into their decision-making processes and triggers for taking action. We presented designs of the daily dose feature for a brief user testing session. Insights drawn from this focus group indicated a need for additional context clues on the daily dose page. Participants expressed a desire for a timeline feature, suggesting an interest in a more comprehensive view of data over time. These valuable inputs from the focus group underscore the importance of refining the user interface by enhancing contextual information and incorporating a timeline functionality to better cater to the needs and preferences of the end users.

2.2.3 A/B testing Daily Dose

During the design phase, we created several variants for the Daily Dose page. Through an A/B test in Maze, we received 29 responses, from which we concluded that the smiley and ear design are overwhelmingly better than the percentage in circle shape design. The smiley design works best when the user only has a short time to look, it sticks better. However, the assignment aims to create insight and awareness among the people in the target group. This works overwhelmingly (by 69%) better with the ear design. For this reason, the ear design is chosen.

2.2.4 Usability testing

For usability testing, we made use of moderated and unmoderated testing. Based on previous research (-.-.-.), the decision was made to use the usability testing method to validate our end-product.

Moderated testing has been done one-on-one with the user. A total of eight tests were conducted with users.

For unmoderated testing, a total of 27 results have been gathered. This was done by using maze. A link has been sent out to users, which helped us reach this amount. The users of the unmoderated tests range from IT specialists to PE teachers.

The main results gathered from these usability test range from small user errors until large confusion about functionalities. After having gathered results from our first session of usability tests, we could draw specific conclusions about our current product. The main notable results were as follows:

- Contrasting colors on a same page caused for unnecessary confusion
- Because of a calendar/date slider on multiple pages, the way of using this was unclear.
- The text that was present in the app, was either giving wrong messages, or was simply dummy text.

After concluding this, a new set of tests were conducted with the a new iteration on the prototype.

In general, the design was well received by users and was given mostly positive feedback. We see that there are some design flaws that could be improved, mostly in terms of navigation.

We also noticed that some questions weren't asked correctly, resulting in skewed results on some tasks. We realize that this impacts our analysis but we also looked at heatmaps and other data to see how skewed these results actually were.

The open-question feedback highlighted a generally positive user experience, with specific suggestions for improvement, such as adding a direct button for the current activity on the homepage and enhancing page navigation. Despite minor issues, the majority found the design clear and user-friendly. These insights will be valuable for refining the app's interface and addressing specific user concerns.

We were able to work out most design flaws by the last user testing round. The only important matter that is not yet resolved is figuring out which data is relevant to every user, and if we can find a way to make sure the user doesn't get overflooded with data, but more research is needed for this (for example: making a priority list of which data should be shown).

2.2.5 Branding

To start, we looked at color theory to define a base color palette for our brand. The goal for our brand was to radiate security (for health) and playfulness (for sports). After looking at some possible palettes, we settled on a combination of deep orange (primary) and royal blue (secondary), as these colors symbolized what we had in mind for the brand (security and playfulness) and have a great contrast when used together.

For the typography, we wanted to choose a variable font that would fit in a modern mobile app. The idea was to have a font that was serious but also playful, since the app incorporates values of both seriousness (health) and playfulness (sports). We looked at font examples, testing them with certain sizes and weights, and ended up with Inter because it fits our key values perfectly.

We also made the choice to incorporate Google's Material Icons since we are designing the app for the android platform, meaning android users will be generally familiar with these icons already as Material Icons are used throughout lots of android applications.

2.2.6 Light/dark mode research

In conclusion, we have chosen to opt for light mode for our app based on a few key points:

- The app will not be used for long hours at a time, therefore the eye strain and battery drain will be minimal.
- The app will only be used during the day, therefore light mode will be a lot more visible and easier to use during the normal usage times.

Light mode comes off as more professional and is has better visual performance. Since our demographic is young-adult and adult teachers, I think we should aim for a professional experience.

Since our stakeholder is a fan of dark mode and the app could be used by teachers checking in on statistics at home, we should still aim to have a theme toggle setting so we can provide our users with a choice, however our designs should be primarily based on light mode.

2.2.7 Testing methods research

In conclusion, usability testing has been chosen as main method to validate our prototype. This was done because one-on-one sessions were planned with users.

2.2.8 In-app features research

We came to the conclusion that playful elements are a really useful tool to incorporate behavioural changes into an app. However, after some talks with our stakeholder, he mentioned that while playful elements could be implemented - he would still prefer for the target audience to only be the PE teachers using the app, therefore sticking to the main research question of raising awareness for the noise issues, instead of solving the problem.

3. Technology Readiness Level

3.1 Current level

The prototype currently has a TRL of **5**. The product has been validated several times with users and we have shown its progress to stakeholders on multiple occasions. When the prototype is converted into an application, the TRL can be increased to **6**.

3.2 Actions to reach the next level

To advance to the next Technology Readiness Level (TRL 6), the app's design must transition into a functional prototype. Implementing the design into a working prototype will involve translating the conceptual aspects into tangible, interactive features. This phase aims to bridge the gap between the validated prototype (TRL 5) and the fully functional application (TRL 6). Execution of this crucial step will not only demonstrate the feasibility of the design but also pave the way for comprehensive testing and refinement, ultimately propelling the project toward a higher level of technological readiness. This phase signifies a pivotal transition from the conceptualization and validation stage to the practical realization of the app's envisioned functionalities.

4. Conclusion

4.1 Advice

4.1.1 Design

In the final phase of user testing, we successfully addressed most design flaws. However, a crucial aspect that remains unresolved pertains to determining the data relevance for each user and ensuring that users are not overwhelmed with information. Further research is necessary to explore potential solutions, such as creating a priority list for displaying relevant data.

Moving forward, there are specific features that require attention in the app development process. First and foremost, implementing and finalizing the tour feature will enhance user onboarding and navigation. Simultaneously, the settings screen is crucial for providing users with customization options and control over app preferences. Additionally, the account creation screen is pivotal for user registration, ensuring a seamless entry into the app's functionalities. Lastly, incorporating the ability to log out will provide users with the necessary flexibility in managing their accounts.

Addressing these features will not only refine the user experience but also contribute to the overall success of the app. As the app will continue to evolve, careful consideration of user feedback and ongoing research will guide the Noise Control team in optimizing data presentation and ensuring the app's effectiveness in meeting the needs of its diverse user base.

4.1.2 Code

We utilized Figma to craft the app, selecting the "Android Large" frame based on our client's indication that the app was intended for a Google Pixel phone. For this reason, we recommend realizing the app with code that could run on an Android phone. Think of using languages like Java, Kotlin or a Progressive Web App with HTML, CSS and JavaScript.

Given the app's requirement for a smartwatch connection, we recommend ensuring compatibility with software that supports this feature. However, our current knowledge on this aspect is limited, preventing us from providing detailed guidance.

Attachments

- CMD Methods pack
- Brandguide/Final prototype
- Git Repo
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