Bachelor’s Thesis

How can Elements of an Application regarding User Experience be designed to effectively promote User Motivation and Goal Achievement? - Using the Example of a Fitness Application

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Preface

This bachelor's thesis was written during my studies in Digitalization - Innovation - Society at the Paris Lodron University of Salzburg. I chose this specific topic because it combines two of my key interests: design and fitness. The aim of this thesis is to support designers and programmers who are either developing a new (fitness) application or looking to improve an existing one by helping them make relevant design decisions to enhance user experience.

I would like to express my sincere gratitude to my supervisor, Univ.-Prof. Dipl.-Ing. Dr. Johannes Scholz, for his guidance and support throughout this thesis. My gratitude also goes to all individuals who willingly participated in the user tests.

To ensure contemporary accuracy and relevance, artificial intelligence was used to check grammar and spelling. However, all AI-checked content was carefully reviewed and validated to maintain quality and correctness. No part of this thesis was generated by AI; it was solely used as a tool to support the writing process.

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1 Introduction

In today's digital and globalized world, where competition in the development of technologies and applications is constantly increasing, the strategic use of design is becoming more important. At the same time, the collective attention span of individuals is decreasing [1]. Lorenz-Spreen et al. explain this phenomenon, noting that the time people dedicate to a particular topic becomes shorter, partly due to the accelerated flow of information provided smartphones [1]. This trend extends beyond mobile and social media, directly influencing the design of (web) applications. Therefore, effective user experience and engaging, emotional design play a crucial role in this field because they determine whether a digital product keeps users motivated or leads them to lose interest [2]. To meet these conditions, digital products must deliver advanced and comprehensive offerings. They need to be aesthetically pleasing, easy to navigate, optimized, and offer a user-centered experience [3].

This design trend is particularly noticeable in the expanding market for fitness applications. More people are switching from analogue training methods to digital solutions. With an anticipated annual growth rate of 13.88% from 2025 to 2030 [4], the fitness app market underscores the growing demand for well-designed digital solutions, highlighting the relevance of this topic. Due to the growth trend in this industry, a significant digital shift can be expected, for example, from recording workout data on paper to using fitness apps. To thrive in this competitive market, an application must differentiate itself from other services through exceptional design [3].

1.1 Research Questions and Goal of Thesis

According to Walter, the most important user needs of an application include the qualities of being functional, reliable, usable, and pleasurable [2]. This bachelor's thesis focuses exclusively on the latter two components, as its primary research centers on usability and visual design. A relevant part of this research involves analyzing and evaluating specific elements found in existing fitness apps. Consequently, the first two components of Walter's model, functionality and reliability, are not addressed in this thesis, as they are assumed to be already in place and represent fundamental requirements for any functioning application. A more detailed explanation of Walter's concepts is provided in Chapter 1.3.

The main objective of this bachelor's thesis is to identify how these specific key elements of an application should be designed to enhance the user experience and support users in achieving their goals. After analyzing and evaluating these elements across various applications, they are reconstructed based on established design principles and implemented in a prototype within a simulated digital environment. Based on this, the following research questions are derived:

- How can elements of an application regarding user experience be designed to effectively encourage user motivation and engagement?
- What are the characteristics of an effective design?

As outlined in the preface, the goal of this research is to support developers and designers in making informed decisions before or during the application design process, recognizing that these decisions can have considerable time and cost implications and therefore require careful consideration. It offers guidance on what should and should not be included from a design perspective, identifies areas for improvement, highlighting effective examples.

1.2 Literature Review

To find appropriate answers to the questions outlined in the previous chapter, expertise from various fields is necessary to be included in this research. A well-known contribution to the field of user experience and the significance of emotional design comes from Aaron Walter, a renowned UX designer from the USA. In his book *Designing for Emotion* [2], he emphasizes that attributes such as color, spacing and contrast play a crucial role in design, noting that within seconds of opening an application, the human eye seeks out these attributes and therefore sends signals to the brain, which then determines whether the user will keep engaging with the app or lose interest [2].

Once users are engaged, designers and developers need to consider what happens next. At this point, the focus shifts to both the visual presentation and the app's usability. According to Krug, usability is easy to grasp, and anyone willing to explore the topic can learn it [5]. Krug's first law states the following:

> *"Don't make me think"* (Krug, 2014, p. 29).

By that statement he means that design only works when the user does not have to think about how to navigate it. Every element must communicate its function clearly and intuitively, reducing cognitive load, preventing frustration and thereby improving ease of use [5].

Another key figure in the field of usability is Jakob Nielsen, who has been researching this topic for decades. He is particularly known for his book *10 Usability Heuristics for User Interface Design* [6], which provides general principles to guide the design and evaluation of user interfaces. Together with Donald Norman, Jakob Nielsen founded the Nielsen Norman Group in 1998, which focuses on research and consulting in the field of user experience [7]. Norman has also made significant contributions to this field. Similar to Nielsen's Heuristics, Norman describes design principles in his book *The Design of Everyday Things* [8], with a particular focus on cognitive psychology. His work primarily addresses human interaction with interfaces and the psychological processes behind it.

As mentioned in Chapter 1, society is experiencing a decrease in attention span [1], while at the same time, the demand for applications that provide a unique user experience continues to increase [3]. Therefore, it is crucial to design applications in a way that engages users and captures their attention. Broadbent explains that, initially, the attention process occurs subconsciously. Before stimuli are consciously processed by the brain [9], such as the visual cue of a glowing app element, they are pre-filtered to distinguish between easily detectable inputs and those that require cognitive effort. This segmentation happens early and automatically. Consequently, this neurological mechanism should be considered in app design, as it plays a significant role in how users interact with intuitive interfaces and can significantly reduce cognitive load.

Optimized usability and well-established user experience are crucial for fitness apps, as highlighted by a study identifying key factors that effectively boost user motivation within digital health and diet products [10]. Lee and Cho explore these factors through an analysis of seven types of user gratification, finding that recordability, networkability, credibility, comprehensibility, and trendiness, significantly influence user motivation and engagement [10]. Similarly, Spenling highlights the motivational dimension of fitness apps, specifically focusing on their impact on users' willingness to engage in physical activity [11]. By applying Behavior Change Techniques, he evaluates twenty fitness apps to identify which strategies most effectively foster exercise motivation. Key design techniques identified include performance feedback, goal setting, and graded task assignments [11]. A related study by Thi and Duong primarily highlights motivational differences between females and males, focusing specifically on which types of entertainment serve as the most effective sources of motivation [12]. The results suggest that challenge and curiosity serve as the primary sources of motivation for men, while curiosity alone is the key factor for women and higher-income users. The study further recommends that developers should place special emphasis on interaction, gamification, and personalized content when designing applications.

The general subject of fitness is trendy and relevant, especially in the context of increasing digital trends. As outlined in Chapter 1, the fitness industry is currently undergoing a digital transformation

[4], making digital tools for successful workouts more accessible than ever before. Consequently, it is important to provide users with easily understandable fitness applications, especially given that close to 60% of adults and about a third of children in the Area of Europe are classified as overweight or obese, according to a 2022 report by the WHO [13]. In this context, well designed fitness apps have the potential to support individuals in adopting an active and healthy lifestyle.

1.3 Methodology

This thesis is divided into three main steps:

1. **Heuristic evaluation of fitness apps:** The first step involves a heuristic evaluation and analysis of five selected fitness apps. For each app, five key design elements, present across all apps, are scientifically assessed based on established design principles and guidelines. This process is guided by Aarron Walter's Pyramid of User Needs, which states that multiple attributes are required to create a high-quality product that meets user requirements, including functionality, reliability, usability, and pleasurability, as shown in Figure 1 [2]. As outlined in Chapter 1.1, this bachelor's thesis focuses primarily on usability and design. Therefore, the evaluation emphasizes the top two levels of the pyramid: usability and pleasurability. The heuristic evaluation is accordingly tailored to this focus and only relevant heuristics and design principles are applied. Specifically, three of Nielsen's Heuristics [6] are used, in combination with the three Gestalt principles similarity, symmetry, and closure, which are identified as particularly relevant for design [14].

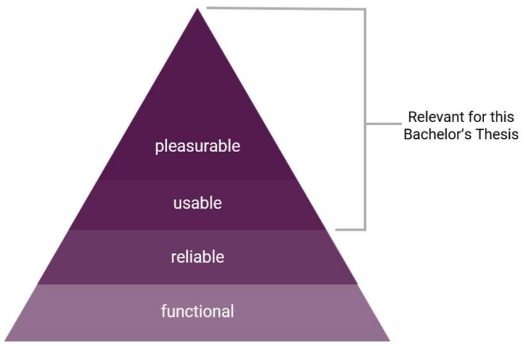

Figure 1: Modified Visualization of Walter's Hierarchy of User Needs [2]

- **Pleasurable:** A product's design should inspire positive feelings in users by featuring an attractive and thematically harmonious appearance. A consistent visual style not only improves the overall look but also creates a feeling of comfort and familiarity. [2].
- **Usable:** A product should be accessible and simple to navigate, having an organized layout. Therefore, it is essential to design it as minimalistic as possible, while preserving the necessary level of functional complexity [2].

The goal of the heuristic evaluation is to establish a foundation for steps two and three of this study. By scientifically assessing the selected elements, a guideline is developed that identifies the strengths and weaknesses of each app and proposes potential improvements.

2. **Designing elements of a simulated fitness app**: Following the analysis phase, the next step involves the design and simulation of key components within a prototype application. The tool Figma is selected for this purpose because it allows for the creation of interactive prototypes that support both the demonstration and evaluation of design elements [15]. Moreover, it serves as an effective way for conducting usability tests, enabling researchers

to observe how users interact with specific features of the prototype. In real-world development scenarios, building a prototype in advance is considered a practical approach, as it allows for the early identification of usability issues that might otherwise lead to significantly higher costs later in the development process [15]. The prototype's elements are created based on the design principles, guidelines, and heuristics outlined in Chapter 3. Instead of developing a fully functional application, the focus lies on visualizing essential design features. Therefore, backend, frontend, and database implementations are deliberately omitted, as these technologies are not required at this stage.

3. **User testing:** The last step aims to determine whether the scientifically grounded elements of the simulated app, based on design foundations, principles, and heuristics proves effective in practice. This part of the thesis focuses on the two key attributes that are essential for creating a high-quality product, identified in the first step: usability and pleasurability [2]. Usability is assessed using the System Usability Scale (SUS), a widely recognized and validated instrument in user experience research [16]. The SUS comprises ten standardized questions that enable participants to evaluate their experience with a product. Due to its simplicity and robustness, the SUS is particularly well-suited for early-stage prototypes or high-fidelity mockups where the application is not yet fully functional. In contrast, the attribute of pleasurability, referring to visual design, is evaluated using a method inspired by A/B testing [17] and the pairwise comparison method [18]. Participants are shown two versions of selected key design elements of different applications. They are then asked to select the version they find more visually appealing and to indicate the strength of their preference using a 5-point rating scale. The resulting data is structured into a pairwise comparison matrix [18] and analyzed using mathematical methods to derive the overall relative preference weights of each app. A detailed explanation of the applied user testing methods can be found in Chapter 2.3.

1.4 Expected Results

This research assumes that the simulated application will outperform the compared fitness apps in terms of visual design and will achieve an acceptable usability score, thereby demonstrating that a scientifically grounded design approach can positively influence user engagement and motivation. Another anticipated outcome of this thesis is the successful simulation of selected design elements of a fitness application and the establishment of an appropriate testing environment for participants during the user tests. To ensure the validity of the testing results, it is particularly important to create a neutral setting for participants, one that is free from bias and external distractions.

To achieve this, the study first aims to establish an understanding of what constitutes effective design. This understanding is then applied in practice to evaluate existing fitness apps, create simulated design elements, and subsequently analyze the results of user testing.

Should the simulated application not outperform the existing apps in the user tests, this thesis will examine potential causes. These include factors such as the sample size and limitations of the testing procedure. Moreover, the user tests can reveal which specific design elements are more effective in other applications, followed by an analysis of the underlying reasons. Regardless of whether the simulated app performs positively or negatively, the findings are intended to support developers and designers in their future decision-making and to contribute to the broader knowledge base in this field.

2 Theoretical Background

To establish a clear theoretical foundation, this chapter explains fundamental concepts that constitute a relevant part of this field of research.

2.1 User Experience

The term user experience, UX for short, refers to the complete experience and needs of a user before, during, and after acquisition of a product. It includes and integrates key concepts of design such as interaction design, interface design, visual design, and content management [5]. Krug notes that the meaning of UX only gained prominence in the 21st century, whereas prior to that, design-related discourse primarily focused on usability and user-centered design, with the term "UX" itself being largely unknown or unused [5]. Within this framework, usability means how effortlessly a product can be operated, whereas user-centered design emphasizes customizing the product to align precisely with its users' requirements. Both with the goal of improving the overall user experience [5]. However, these two terms should not be confused with user experience itself, which serves as an umbrella term encompassing various aspects of the general user interaction.

In summary, while usability and user-centered design are essential components, user experience encompasses a broader framework that integrates these and other concepts to capture the full scope of a user's interaction with a product.

2.2 Principles and Guidelines of Design

When examining design and its underlying principles, it is reasonable to assume that opinions on what constitutes objectively effective design can vary. There is no universal solution that functions equally well for all users in terms of motivation, task completion, or long-term engagement. This is supported by a 2023 study demonstrating that the effectiveness of design is primarily subjective, as it explores how design choices influence the subjective user experience [19]. In this study, users' subjective perceptions were investigated by varying visual elements such as color and orientation in bar charts. The findings reveal that individual design experiences can differ markedly from objectively measurable criteria, underscoring the importance of distinguishing between objective functionality and personal perception [19].

Although it is challenging to find a universal design solution that works equally well for all users of a product, it is possible to approximate an objectively effective design using widely accepted design principles and guidelines, which works well for the majority of users. Widely recognized examples of such guidelines include Nielsen's 10 Usability Heuristics [6] and Norman's Design Principles [8], which offer an established framework for structuring and guiding the design process of a product.

2.2.1 Nielsen's 10 Usability Heuristics

As the name implies, Nielsen's heuristics [6] primarily focus on a product's usability. To clarify each heuristic, a brief explanation is provided below:

- **Visibility of System Status:** A user should always be aware of the current step in a process. One effective way to achieve this is by including interactions that are predictable and intuitive for the user.
- **Match Between System And Real World:** The design of a product should not feel foreign to the user but rather create a sense of familiarity. Symbols, text, and interactions that can be linked to the real world should be incorporated into the product.

- **User Control And Freedom:** It is important that a user has a quick way to undo unwanted or incorrect actions without having to go through a lengthy process.
- **Consistency And Standards:** Users should not be confused by inconsistencies. While using a product, it should be clear and obvious that different words, symbols, or interactions lead to different outcomes. This is often achieved by adhering to established conventions.
- **Error Prevention:** User errors should be minimized as much as possible. Therefore, the product should be intuitive and easy to understand.
- **Recognition Rather Than Recall:** The experience should be intuitive. Minimizing cognitive effort through recognition supports this goal. Overloading the user with excessive information or workflows can negatively impact the overall experience.
- **Flexibility And Efficiency of Use:** A product should be tailored for both beginners and advanced users. It is important that shortcuts or more efficient workflows designed for experienced users do not distract or confuse beginners, and that advanced users are not hindered by simplified options.
- **Aesthetic And Minimalistic Design:** Users should be presented only with information that is directly relevant to their current context or task. Additionally, the overall design should align with the product's theme to evoke visual pleasure.
- **Help Users With Errors:** When an error occurs, it should be communicated clearly and transparently, enabling the user to understand what went wrong. The clarity of the message can be improved with visual elements.
- **Help And Documentation:** If users encounter a complicated issue with a part of the product, they should have access to clear and easy-to-understand documentation. A step-by-step guide can be particularly helpful in helping users resolve the problem.

2.2.2 Norman's Design Principles

In contrast to Nielsen's Heuristics, Norman's Principles [8] focus on the cognitive aspects of design and include the following concepts:

- **Discoverability:** Elements should be visible and discoverable in a way that allows users to intuitively understand how to interact with them.
- **Mappings:** Users should be able to relate interface elements to real-world analogies, creating a certain level of familiar understanding.
- **Signifiers:** "Signifiers" refer to tools that ensures the successful delivery of feedback and support the establishment of discoverability. For example, a play-symbol on a music app.
- **Conceptual Model:** The user's mental model - that is, their internal understanding of how something works based on experience - should be considered in the design of a product.
- **Affordances:** Interactions within the product should be implied by the structure and design of the elements themselves.
- **Feedback:** Users should receive appropriate feedback after interactions to understand the status of their action.
- **Constraints:** The product should limit what users can do in a certain way to prevent mistakes.

By combining Nielsen's heuristics [6] and Norman's design principles [8] in the product design or evaluation process, a solid foundation for enhancing the overall user experience can be established. At their core, both frameworks share similarities, which supports the idea that they can be effectively applied together.

2.2.3 Gestalt Principles

When it comes to organizing and structuring the world and its elements (e.g., trees, rocks, the horizon), the human brain unconsciously facilitates this process: rather than quantifying each individual element and measuring properties such as brightness or color, the brain differentiates shapes, groups them together, or perceives them as distinct entities [20]. This process serves as the foundation for the Gestalt Principles, investigated by Max Wertheimer within Gestalt Theory, which aim to better understand how humans organize visual input. He presented participants with specific visual stimuli and asked them to identify which ones they naturally grouped together [20].

Through his experiments, the Gestalt Principles were established, which can be directly applied in the design of websites, applications, and other digital products [14]. There are various gestalt principles but only select few are particularly relevant for successful application and website design [14]. To clarify these principles, a visual representation of examples is provided below in Figure 2:

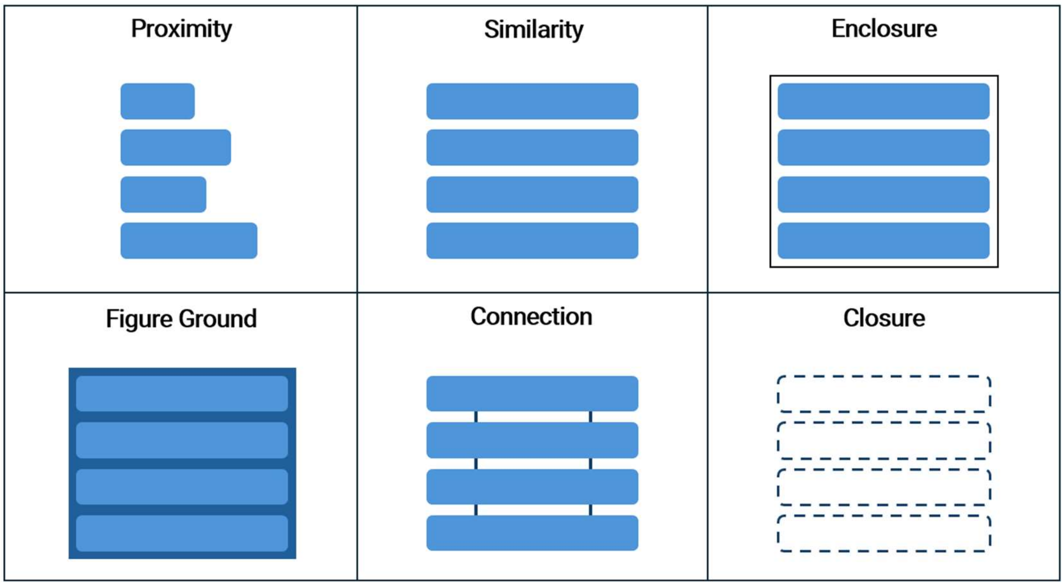

Figure 2: Examples of Gestalt Principles, Source: Own Illustration

Kapllani and Elmimouni examine how Gestalt principles can be used within design practices. In their study, they analyze thirty of the most visited websites alongside thirty websites that received Webby Awards in 2018 and 2019, placing particular emphasis on the use of three specific principles: similarity, symmetry, and closure [14].

In their research, they found that successful websites tend to exhibit a general symmetrical structure, approximately six major similarities in design elements, and a low degree of closure. Drawing from these findings, the research determines that harmonious symmetry and intentional repetition of design components can improve the overall user experience [14]. These insights further highlight the relevance of including gestalt principles in crafting visually appealing and intuitive user experiences.

2.2.4 Additional Design Guidelines

In the field of design, the brain plays a crucial role not only in structuring and organizing elements but also in processing information and influencing how users engage with content when interacting with a website or application. For example, when a user clicks on a website, they do not perceive the information in a strict, linear sequence but tend to unconsciously scan the interface in a non-linear and selective manner [21]. This process serves to quickly consolidate the most essential elements into an overview of the product. Hahn refers to this scanning behavior as F- and Z-scanning layouts, based on eye-tracking studies that reveal users often scan content in patterns resembling the letters F and Z as illustrated in Figure 3 [21]. These studies provide designers with insights into which areas of a product receive the most user attention. Accordingly, this knowledge can be utilized to position the most important and relevant elements along the F- and Z-patterns, helping to maintain user interest and engagement.

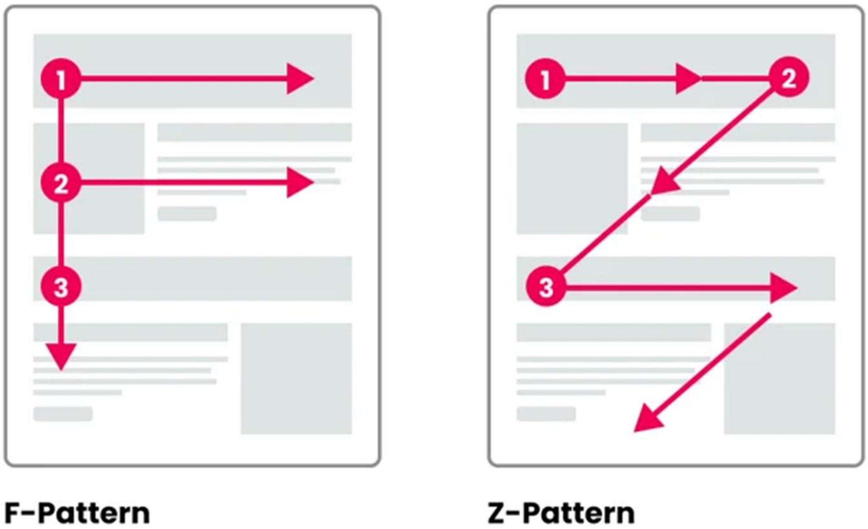

Figure 3: F- and Z-Layouts for Scanning Patterns,
Source: https://www.seerinteractive.com/insights/3-easy-dashboard-design-tips

Hahn [21] outlines that the typical structure of a website consists of three main parts: the header, the content section, and the footer. The header is designed to provide users with orientation by indicating their current location within the site, primarily achieved through the placement of the company or website logo, which serves as a clear visual identifier. Furthermore, the header serves as a holder for elements, differentiating between meta navigation and main navigation. Meta navigation includes links to supplementary services such as legal information, privacy policies, or login options, whereas main navigation comprises the core site structure, guiding users to primary content like services, products, or company information. The content area, serving as the heart of the website, aims to captivate users with a thematically attractive design. Although sidebars were once a common feature within this section, their relevance has diminished in modern web design, leading to wider layouts and a broader overall appearance. This area is typically divided into distinct content blocks that harmonize with each other while maintaining subtle variations. The footer acts as the visual endpoint of a webpage and has gained importance in recent years. It offers additional navigation options and frequently contains contact details, legal notices, and social media links. Additionally, the footer helps maintain visual harmony and is crafted to stay uniform across all subpages. This typical structure is not only found in websites but also in other applications, including mobile apps.

Another key aspect of modern web design is the use of cards: visual containers arranged in rows, columns, or grid layouts throughout a website. These cards typically present variations of a specific topic and function as standalone units of information [21]. From a design perspective, cards may adopt either a symmetrical or asymmetrical layout, depending on the website's nature and intended purpose, as illustrated in Figure 4:

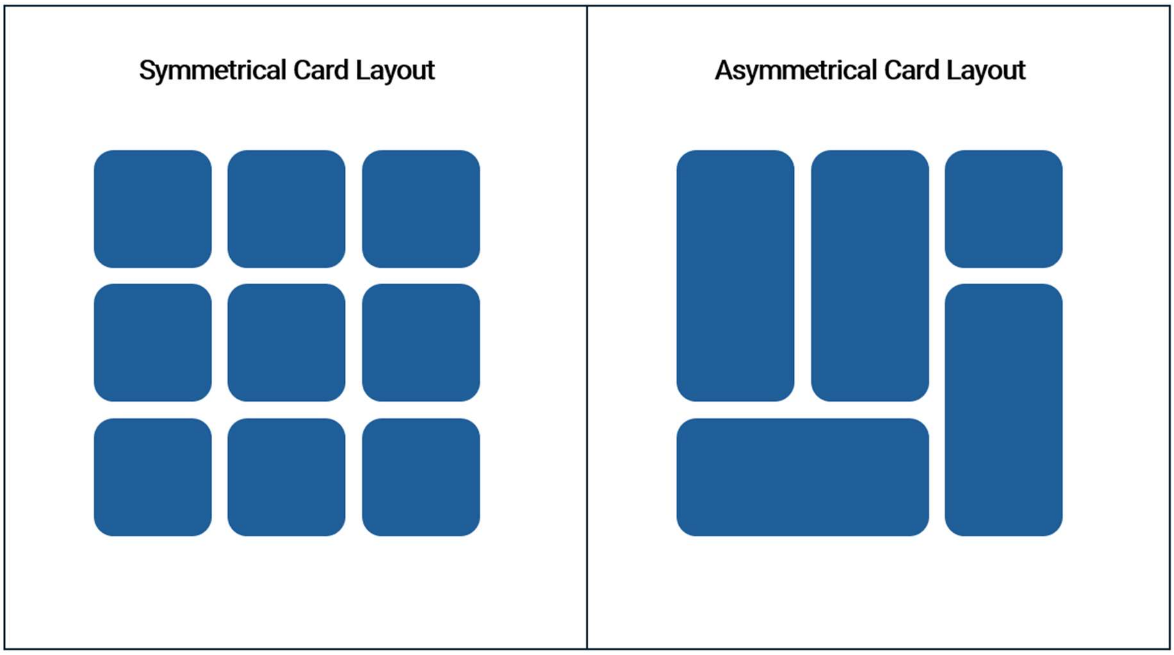

Figure 4: Comparison between Symmetrical and Asymmetrical Card Layout in Web Design, Source: Own Illustration

The clearly structured layout of web applications and similar digital products forms the foundation for an intuitive user experience. This is exactly what Krug's First Law of Usability [5] addresses:

> *"Don't make me think"* (Krug, 2014, p. 29).

Krug states that a website should be designed so that users do not have to constantly think about where they are, what the purpose of a function is, or whether clicking a button will have unknown consequences. A website should be as intuitive as possible and as complex as necessary [5]. His point is that the goal of every designer or developer should be to ensure that the average user can navigate a product with minimal cognitive effort [5], a principle that is especially relevant given today's decreasing attention spans [1].

2.3 User Testing

To create a product that satisfies the majority of users both technically and visually, user testing should be utilized, as it involves observing real users interacting with the product, enabling developers and designers to detect potential problems early. Consequently, the testing process plays a crucial role in the development cycle of digital products [22], with Bruun et al. emphasizing that testing has become an indispensable component of creating products.

Unlike heuristic evaluation, which relies on expert judgment and predefined principles to predict theoretical flaws, user testing generates quantifiable data based on actual user behavior [23]. This makes it particularly valuable for uncovering issues that may not be evident through theoretical analysis alone. However, conducting effective user tests requires careful preparation, including the recruitment of suitable participants and the selection of an appropriate testing environment to ensure smooth execution [23]. When it comes to testing methods, there is no single perfect approach, but rather a variety of frameworks suited to different scenarios that can be chosen depending on the specific use case. Three user testing methods relevant to this thesis are explained below.

2.3.1 System Usability Scale

The System Usability Scale method, SUS for short, is one of the most well-known approaches when it comes to user testing methods. It includes a usability questionnaire, which is deliberately designed to be brief and easy to administer, making it suitable for contexts where time and testing resources are limited [16]. Therefore, the goal of the SUS method is to provide a tool that is both reliable and efficient, yielding meaningful usability insights.

It consists of ten items, each designed to be easily understood by all participants. For every item, users indicate their level of agreement on a five-point Likert scale, ranging from "Strongly Disagree" to "Strongly Agree" [16]. It is calculated as follows:

- For odd-numbered questions (1, 3, 5, 7, 9), 1 is subtracted from each response.
- For even-numbered questions (2, 4, 6, 8, 10), each response is subtracted from 5.

The adjusted scores are then summed and multiplied by 2.5 to produce a final score ranging from 0 to 100 [24]. This score enables the classification of a product's usability into categories, as shown in Figure 5:

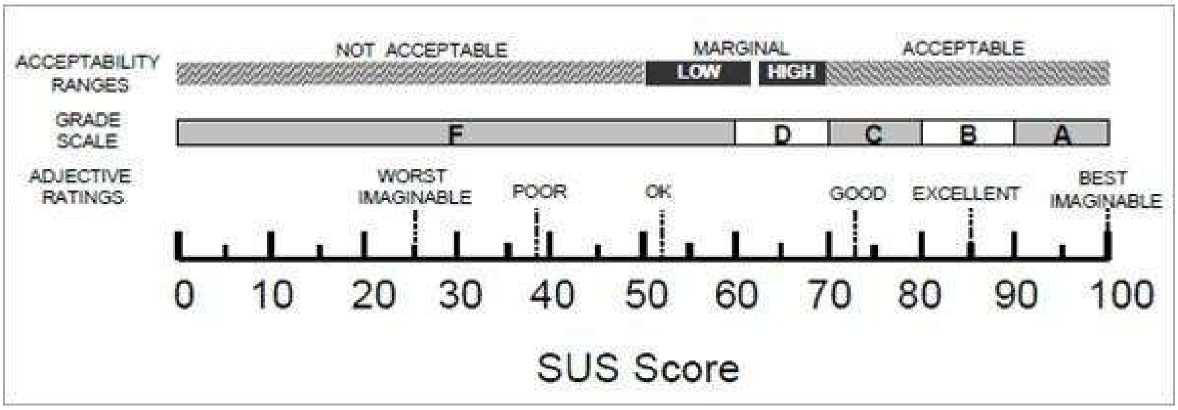

Figure 5: Different Rating Possibilities of The SUS Score [24]

To measure usability in this bachelor's thesis, the SUS method is employed to assess the simulated prototype developed in Chapter 4. To obtain meaningful results, the overall mean score of all participants' SUS questionnaire responses will be calculated and compared with the classification by Bangor et al. [24] to evaluate whether a scientific design approach contributes to an effective design in terms of usability.

2.3.2 A/B Testing

Another widely used method for user testing is A/B testing, which involves comparing two or more variants of an element to determine which version performs better. Users are randomly assigned to one of the two variants (e.g., Variant A or Variant B), with the randomness of this assignment being critically important to ensure unbiased results [25]. Afterwards, both variants are assessed, and their results or performance metrics, such as click-through rates, conversion rates, or user engagement, are compared.

To evaluate the visual design of the simulated prototype, this thesis employs a method inspired by A/B testing and complemented by a pairwise comparison approach, which is introduced in the following.

2.3.3 Pairwise Comparison

The pairwise comparison method is a structured approach for evaluating multiple alternatives by directly comparing them in pairs [18]. For example, different versions of a digital interface can be presented to participants to determine which one is most preferred. Participants indicate the degree of their preference using a predefined response scale. While the user selects from textual options, these choices are internally represented by numerical values for analysis purposes; reciprocal values are used to reflect inverse preferences:

- What the user sees: “I strongly prefer App A over App B.”
- What the designer sees: “App A: 3 | App B: 0.33.”

Results of these comparisons are organized into a Pairwise Comparison Matrix (PCM) [18], which offers a clear visual representation of all outcomes. A completed PCM comparing five applications may look like this:

	APP **A**	APP **B**	APP **C**	APP **D**	APP **E**
APP **A**	1	2	3	1	0.5
APP **B**	0.5	1	0.5	1	0.33
APP **C**	0.33	2	1	2	0.5
APP **D**	1	1	0.5	1	2
APP **E**	2	3	2	0.5	1

Various mathematical models, such as additive, fuzzy, and multiplicative approaches, can be applied to derive final rankings. A comparative study by Cavallo et al. [18] found the multiplicative method to be the most accurate, even when used with objective attributes such as geometric figure areas. This method involves multiplying all values in a matrix row, then applying the n-th root (where *n* is the number of alternatives) for normalization. This creates results that are comparable across any number of alternatives. Consequently, this approach is widely applied in established decision-making frameworks like the Analytic Hierarchy Process (AHP) and the Best-Worst Method (BWM) [18]. Applying the multiplicative method to the example matrix above results in:

$A = 1 \times 2 \times 3 \times 1 \times 0.5 = \mathbf{3} \quad \rightarrow 3^{1/5} \approx \mathbf{1.2457}$
$B = 0.5 \times 1 \times 0.5 \times 1 \times 0.33 \approx \mathbf{0.0825} \quad \rightarrow 0.0825^{1/5} \approx \mathbf{0.6071}$
$C = 0.33 \times 2 \times 1 \times 2 \times 0.5 \approx \mathbf{0.66} \quad \rightarrow 0.66^{1/5} \approx \mathbf{0.9203}$
$D = 1 \times 1 \times 0.5 \times 1 \times 2 = \mathbf{1} \quad \rightarrow 1^{1/5} = \mathbf{1}$
$E = 2 \times 3 \times 2 \times 0.5 \times 1 = \mathbf{6} \quad \rightarrow 6^{1/5} \approx \mathbf{1.4310}$

The last step involves normalizing the results to a scale between 0 and 1. This facilitates easier interpretation and enhances readability. The sum of the values is calculated:

$1.2457 + 0.6071 + 0.9203 + 1 + 1.4310 = 5.2041$

Each individual value is then divided by the total sum to obtain the normalized preference weights:

$A = 1.2457 / 5.2041 \approx 0.2394$ **(23.94%)**
$B = 0.6071 / 5.2041 \approx 0.1167$ **(11.67%)**
$C = 0.9203 / 5.2041 \approx 0.1768$ **(17.68%)**
$D = 1.0000 / 5.2041 \approx 0.1921$ **(19.21%)**
$E = 1.4310 / 5.2041 \approx 0.2750$ **(27.50%)**

These figures represent the comparative preference levels for each option in relation to the others. In this example, App E achieves the highest relative preference weight at 27.50%, suggesting it was most frequently favored in the comparisons. In contrast, App B shows the lowest weight at 11.67%. In a real-world scenario, however, evaluations are typically conducted with multiple participants.

Consequently, the normalized values for each app must be averaged across all participants to derive a reliable overall preference score.

In the context of this bachelor's thesis, participants are shown multiple alternatives, including the apps from Chapter 3 and the simulated prototype from Chapter 4. To avoid bias, users are not informed which app is the prototype. Participants compare these alternatives in pairs and express their visual design preference using a predefined 5-point scale. The scale used is inspired by Saaty's Nine-Point Scale [26]; however, based on a study showing that the optimal length of a scale is between 5 and 7 points to maximize effectiveness compared to scales with more or fewer response options [27], the original nine-point scale has been simplified to a five-point scale, which includes the following options:

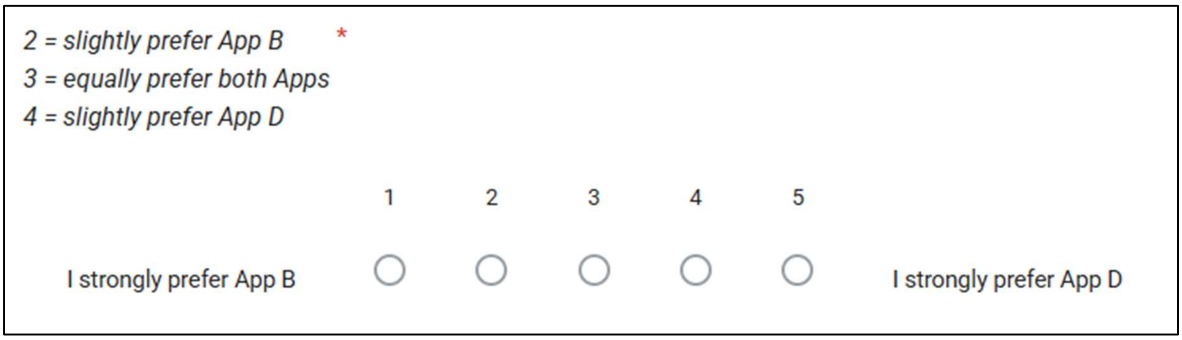

Figure 6: Example of the 5-point preference scale used in the pairwise comparison process, illustrated with App B and App D. Source: Own screenshot from Google Forms.

For each participant, results are documented in pairwise comparison matrices. The multiplicative method is applied per row for each matrix, the nth root is taken, and results are normalized. Finally, the mean normalized score per app is calculated to produce the final ranking. This user test aims to determine whether a scientific design approach achieves acceptable in terms of effective visual appearance.

3 Heuristic Evaluation of Selected Fitness Apps

With the theoretical foundation established, this chapter marks the beginning of the practical part of the thesis. It presents a heuristic evaluation of five selected mobile fitness applications and serves as an essential base for the creation of the simulated prototype in Chapter 4. The heuristic evaluation is based on selected principles and guidelines from Chapter 2.2, which are thematically aligned with the key attributes of design investigated in this study, namely usability and pleasurability (visual design), as defined by Walter [2], and are particularly relevant for addressing the research questions. Since this analysis aims to assess interface quality without involving end users directly, heuristic evaluation represents the most appropriate method. It serves as a subcategory of expert reviews and is particularly well-suited for examining the usability and effectiveness of user interfaces [28].

As Shneiderman and Plaisant note, a variety of heuristic sets can be applied depending on the specific context of the evaluation [28]. In this thesis, Nielsen's 10 Usability Heuristics [6] are used as the primary evaluation framework, as they represent one of the most widely recognized and applied methods in interface assessment [29]. However, in line with the specific focus of this study, based on Walter's attributes [2], only three of Nielsen's heuristics are applied: Aesthetic and Minimalist Design, Recognition Rather Than Recall, and Match Between System and the Real World [6]. These allow for the assessment of both visual design and usability. In addition to Nielsen's framework, the evaluation incorporates Gestalt principles, specifically similarity, symmetry, and closure, as highlighted by Kapllani and Elmimouni. As discussed in Chapter 2.2.3, their research underlines the importance of these principles in enhancing the user experience [14].

The fitness apps selected for the evaluation were carefully chosen, each having approximately 1 to 5 million downloads (as of May 4, 2025), and all sharing a common focus on fitness tracking, specifically, the documentation of workouts [30]. For the analysis, five consistently present and functionally relevant design elements are identified across all applications: the start screen, the navigation bar, the add-workout function, the workout detail view, and the calendar. The following apps are included in the evaluation:

- Strong Workout Tracker Gym Log [31]
- FitNotes - Gym Workout Log [32]
- JEFIT Gym Workout Tracker [33]
- Alpha Progression Gym Tracker [34]
- Hevy Gym Workout Tracker [35]

Each app is individually assessed using the principles outlined above, with the most relevant findings summarized accordingly. Onboarding processes, such as tutorials or account registration, are intentionally excluded from the analysis; the evaluation starts at the initial start screen. To enhance clarity throughout the evaluation, the selected heuristics are referred to by their abbreviated labels: “Aesthetic and Minimalist Design” as Heuristic 8, “Recognition Rather Than Recall” as Heuristic 6, and “Match Between System and the Real World” as Heuristic 2.

3.1 Selected Elements

To establish an understanding of the relevance of the analyzed elements, the individual fitness app components used in the heuristic evaluation are described below.

- **Start Screen:** Typically represents the user's first point of contact with the application. As such, it plays a crucial role in forming the initial impression. It frequently provides a thematic entry point, offering an overview of the application's core functions. If this element is overly complex, fails to appeal to the user, or does not align the apps intended purpose, it may lead to a loss of interest and disengagement [2].
- **Navigation Bar:** Functions as a key orientation element throughout the application. Typically positioned at the top or bottom of the screen, it helps users understand their current location within the app and serves as a guide to access additional features and sections of the interface [21].
- **Add-Workout Function:** This element represents the core functionality of a fitness app, reflecting its primary purpose. It should be prominently displayed and easily accessible, requiring minimal cognitive effort to locate. Usually, it appears as a prominent button placed centrally for easy visibility.
- **Workout Detail View:** Serves as a reflection space, presenting logged training data in a structured and accessible format. By organizing metrics visually and clearly, it supports users in understanding their performance and encourages continued engagement with the app.
- **Calendar:** Offers a visual overview of completed training days and acts as a historical log for retrieving workout data on specific dates. For users with long-term training histories, this function may become important. Therefore, the system should ensure that such information is easily and intuitively accessible.

3.2 Evaluation of App 1: Strong App

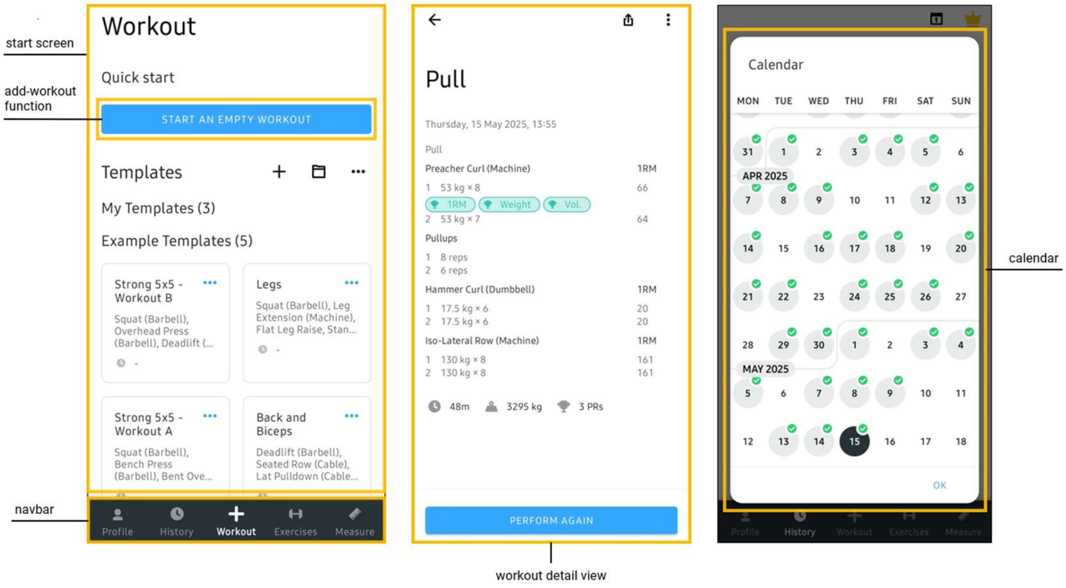

Figure 7: Screenshots from the Strong App [31] including the five elements selected for analysis, highlighted in yellow.

With regard to Heuristic 8, the start screen offers a minimalist design that avoids visual clutter however, it lacks clear workout-related visual cues such as icons or images that would reinforce the app's fitness focus. Heuristic 6 is moderately fulfilled: although most elements are intuitively designed, the hierarchy within the "Templates" section may cause confusion and increase cognitive load. Heuristic 2 is satisfied, as the interface employs commonly understood language. However, terms such as the "Strong 5x5" card may be unclear to users unfamiliar with the app's terminology. Similarity is achieved through consistent use of color, typography, and card layout. Symmetry is partially met. While the cards and main button are aligned, other interface elements, such as text placement, appear visually asymmetrically. Closure is not evident in the current layout.

Regarding Heuristic 8, the navigation bar includes only essential elements. Heuristic 6 is fulfilled, as the icons are recognizable and paired with text, minimizing cognitive load. Heuristic 2 is met through icons that represent analogies to real-world objects. Similarity and symmetry are effectively implemented due to uniform design and balanced spacing. Minimal closure is present in the profile icon, which combines shapes that hint at a human figure.

The add-workout function satisfies Heuristic 8 by solely focusing on its purpose to start a workout. Heuristic 6 is met, as the button is easy to identify, though a more central placement could enhance visibility. Heuristic 2 is less effective, as the absence of an icon may reduce understanding. Similarity is met as its color aligns with the rest of the design, although the element is unique. Symmetry is established due to central and evenly spaced placement. Closure is not observed.

In the workout detail view, Heuristic 8 is only partially met. While relevant information is included, the layout feels cluttered rather than minimalist; increased spacing would enhance readability. Heuristic 6 is moderately satisfied. While the "perform again" button is intuitively placed, the upper icons would benefit from supportive labels. Heuristic 2 is poorly addressed, as explanatory elements and descriptions for data are missing. Similarity is maintained through the consistency of individual workout elements, although they lack spacing to be easily distinguished from one another. Symmetry is poorly addressed, aside from the centered "perform again" button. Closure is not present.

The calendar performs well across all three heuristics: it is minimalistic, intuitive, and resembles a physical calendar. Similarity is consistently maintained through uniform color and layout. Symmetry is achieved, although the offset start dates slightly affect visual balance. Closure is not present.

3.3 Evaluation of App 2: FitNotes App

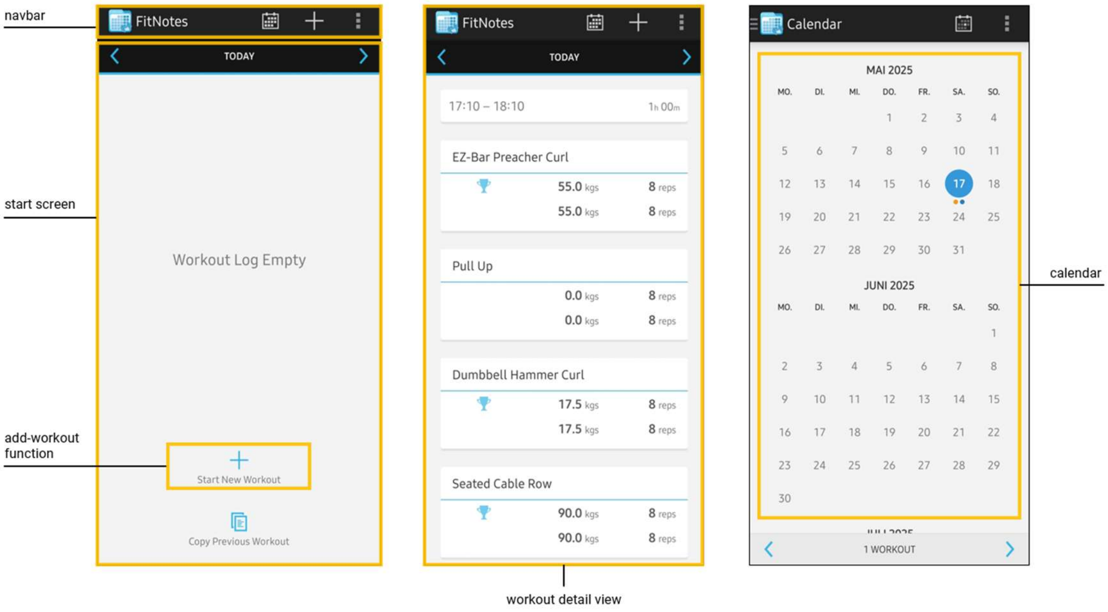

Figure 8: Screenshots from the FitNotes App [32] including the five elements selected for analysis, highlighted in yellow

The start screen aligns with Heuristic 8 through a successful minimalist presentation of information, though it lacks clear visual cues indicating the app's fitness focus, such as a pictogram or image related to workouts. Heuristic 6 is effectively met by icons accompanied by text, which reduce cognitive load. Heuristic 2 is also fulfilled, as familiar, industry-standard icons (e.g., the plus icon) support intuitive understanding. Regarding Gestalt principles, similarity is achieved via consistent color, typography, and icon size, while symmetry results from balanced central alignment.

Despite its functional clarity, the navigation bar has limitations regarding Heuristic 8, due to redundant elements like the duplicated "plus" icon, which is also visible on the start screen. Nevertheless, Heuristic 6 is satisfied, as functionality remains intuitive, and Heuristic 2 is addressed through recognizable and familiar symbols. Similarity is met through size and color, though the logo's resemblance to the calendar icon may cause confusion. Symmetry is achieved via even icon spacing as well as consistent spacing along the edges of the app.

The add-workout function partially fulfills Heuristic 8. It is minimalistic but lacks visual emphasis, affecting discoverability. Heuristic 6 is partially met due to ambiguity, as this symbol also appears in the navigation bar. Heuristic 2 is addressed via the widely recognized plus icon. Similarity is supported by consistent color and icon size, and symmetry is established through centrally aligned, evenly spaced positioning.

The workout detail view supports Heuristic 8 by avoiding irrelevant elements, presenting a clear layout. Heuristic 6 is fulfilled via an intuitive structure requiring minimal cognitive effort. Increased spacing between sections improves readability. Heuristic 2 is addressed by presenting general information first, followed by more specific workout data, mirroring real-world documentation analogies. Similarity appears in form, spacing, and color. Symmetry is ensured through central card positioning and even distribution, although the content within the cards is not symmetrical.

Focusing solely on essential information, the calendar aligns well with Heuristic 8. Heuristic 6 is supported through intuitive design and low cognitive demand, reinforcing Heuristic 8's emphasis on minimalism. Heuristic 2 is well addressed, as the interface reflects the structure of a physical calendar. Visual similarity is maintained across color and layout. Symmetry is partially achieved; the absence of adjacent-month days shifts the layout and disrupts alignment. Closure is absent in all sections.

3.4 Evaluation of App 3: JEFIT App

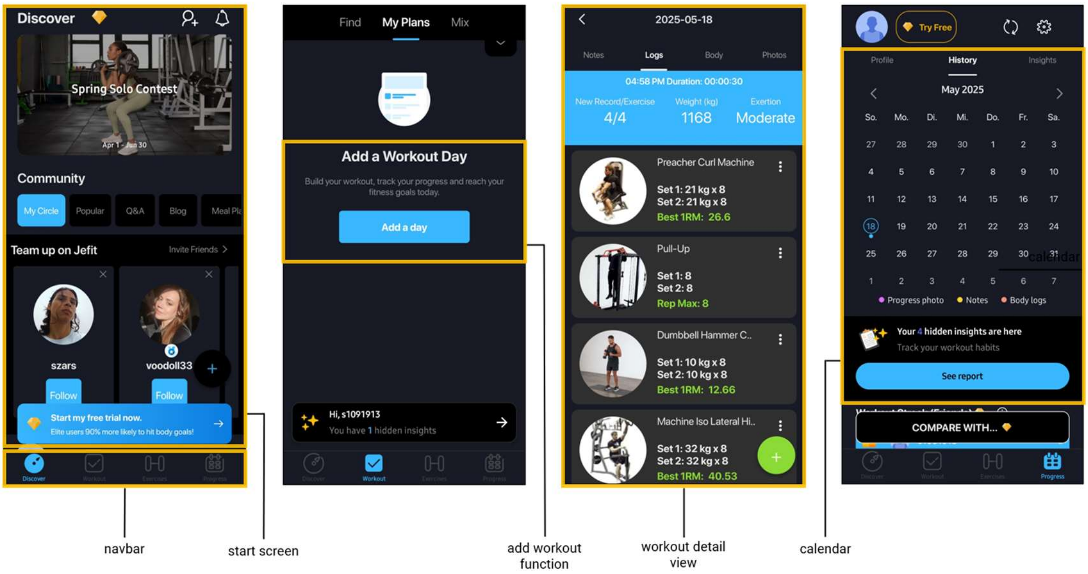

Figure 9: Screenshots from the JEFIT App [33] including the five elements selected for analysis, highlighted in yellow.

The start screen partially fulfills Heuristic 8, as using the “Discover” page as the entry point does not clearly convey the app’s core function. Focusing more on the workout creation feature could represent the app’s purpose more clearly. Heuristic 6 is limited due to a dense layout that increases cognitive effort. Heuristic 2 is addressed: workout images support real-world associations, and the friend-adding structure reflects familiar social media patterns. Regarding Gestalt principles, similarity is established through consistent color, typography, and hierarchy. Symmetry is only partially achieved, as horizontally scrollable cards disrupt visual balance. Minimal closure is found in the top-right profile icon.

Good alignment with Heuristic 8 is demonstrated by displaying only essential elements. Heuristic 6 is effectively supported through icons paired with text labels, minimizing cognitive effort. Heuristic 2 is met, though the workout and progress icons could be more conventional. Similarity and symmetry are well maintained by uniform colors and balanced spacing. Closure is not applied.

The add-workout function moderately fulfills Heuristic 8. The button is visually emphasized, though the “add a day” label may lack clarity. Heuristic 6 is fulfilled via intuitive navigation and clear emphasis on the button, reducing cognitive effort. Heuristic 2 is satisfied, but the missing supporting icon could limit quick recognition. Similarity is maintained through consistency of app colors. Symmetry is present due to the centered alignment of the button. Closure is not used.

Effective limitation of content to essentials, such as individual exercises, fulfills Heuristic 8. Heuristic 6 is supported with a clear visual hierarchy and helpful imagery that reduces cognitive load. Heuristic 2 is met through recognizable content and real-world workout references. Similarity is consistently applied across exercise cards in layout, color, and positioning. Symmetry is maintained through overall layout and spacing, despite asymmetry within the card interiors and text above the cards. Closure is not implemented.

The calendar falls short on Heuristic 8, as additional elements like premium advertisements and popups introduce visual clutter. This also negatively impacts Heuristic 6, increasing cognitive effort during navigation. Heuristic 2 is moderately fulfilled, as the calendar layout resembles its physical counterpart. Visual similarity is maintained through consistent size, color, and font, and symmetry is effectively applied within the calendar grid through consistent spacing. Closure is absent.

3.5 Evaluation of App 4: Alpha App

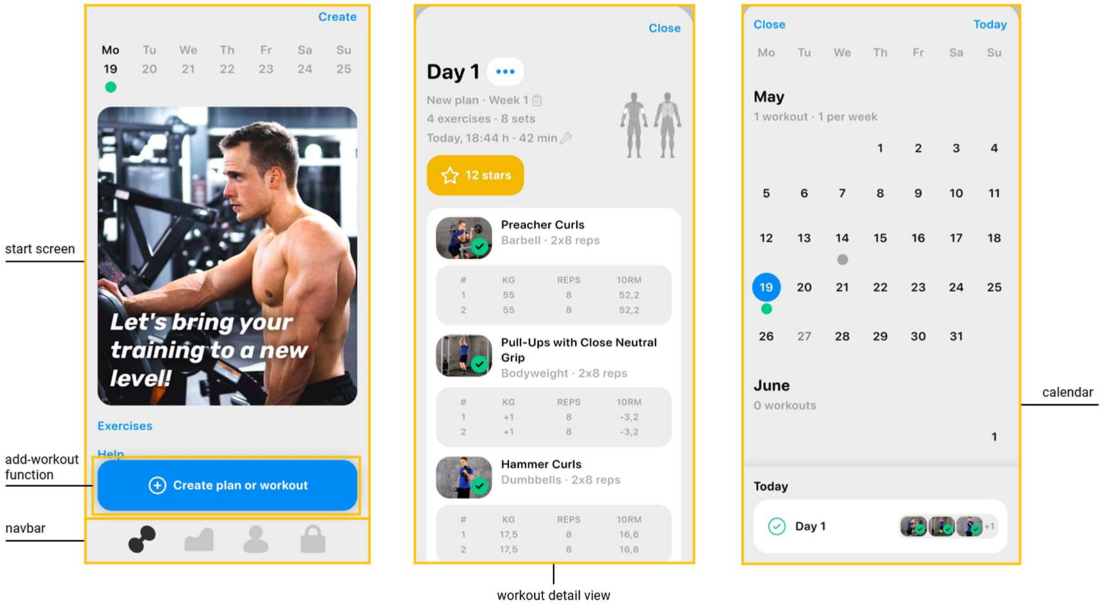

Figure 10: Screenshots from the Alpha App [34] including the five elements selected for analysis, highlighted in yellow.

The start screen aligns with Heuristic 8 by minimizing content, preventing visual overload. Heuristic 6 is supported by a simple layout with few elements, reducing cognitive effort. Heuristic 2 is addressed through the background image, which evokes a workout context. However, the "create" label in the top right, functionally similar to the "create plan or workout" button, is very unclear and not intuitive. Similarity is maintained through consistent font and color use. Symmetry is present due to centered elements and balanced spacing, though offset labels like "create" and "exercises" slightly disrupt it. Closure is not applied.

The navigation bar follows Heuristic 8 by focusing on essential elements. Heuristic 6 is only partially met; while most icons are recognizable, symbols like the shopping bag lack clarity without labels. Heuristic 2 is moderately addressed, as icons reflect established conventions, while others are too abstract without supporting text, which may reduce intuitiveness. Similarity and symmetry are maintained through uniform icon size and spacing. Minimal closure appears in the third icon.

Heuristic 8 is fulfilled by focusing on the app's core purpose and avoiding irrelevant content. Heuristic 6 is met through the button's strong visual emphasis, which reduces cognitive effort. Heuristic 2 is also addressed, as the "plus" icon represents a widely recognized convention, consistent with findings from other apps. Similarity is maintained through consistent font and color; symmetry is supported by even spacing, though a more central button placement could enhance discoverability. Closure is not observed.

In the workout detail view, Heuristic 8 is partially met: while key workout data is displayed, dense small text and the dominant yellow star button may reduce visual intuition. Heuristic 6 is well supported, as the clear overview keeps cognitive effort low. Heuristic 2 is addressed through exercise imagery and muscle group indicators, which serve as real-world analogies. Similarity is evident in the consistent use of color and hierarchy within exercise cards. Symmetry varies: the card section is balanced, but upper elements (e.g., labels) appear asymmetric. Closure is not used.

The calendar supports Heuristic 8 through its minimalistic layout. Heuristic 6 is partially addressed: weekday labels above the calendar grid could be mistaken for a navigation bar due to their position. Heuristic 2 is met, as the structure resembles a physical calendar. Similarity is preserved through consistent grid layout, color, and font. As in Apps 2 and 5, symmetry is mostly achieved within the grid, although missing days from adjacent months cause slight misalignment. Closure is not applied.

3.6 Evaluation of App: Hevy App

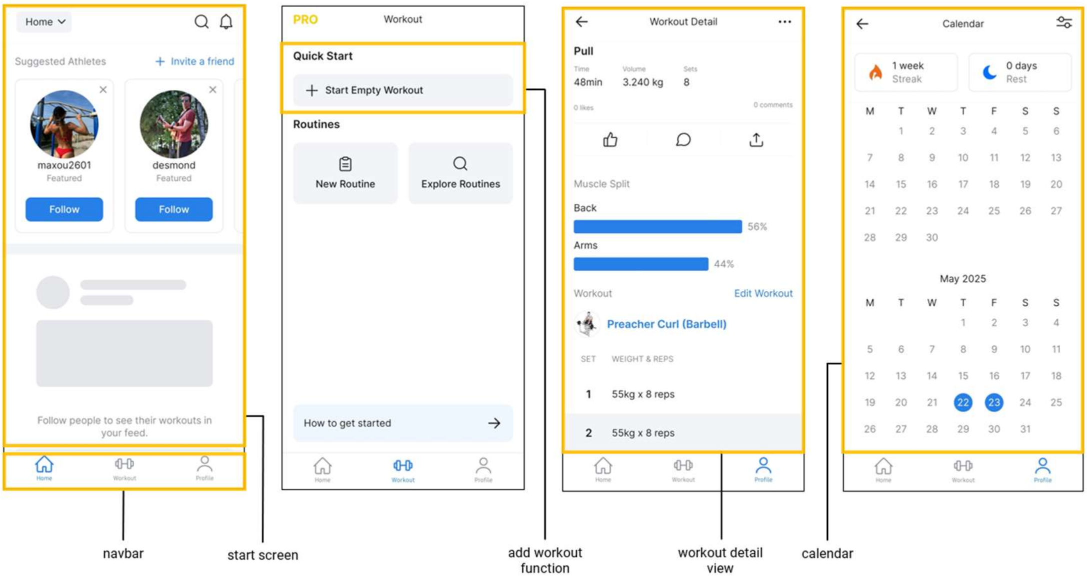

Figure 11: Screenshots from the Hevy App [35] including the five elements selected for analysis, highlighted in yellow.

Heuristic 8 is moderately addressed on the start screen. While the design is minimalistic, the layout resembles a social media feed rather than a clear fitness app entry point. Heuristic 6 is similarly moderate, as the social media resemblance may confuse or overwhelm users. Heuristic 2 is partially fulfilled through conventional icons, though the absence of explicit workout cues weakens the fitness association. In terms of Gestalt principles, similarity is maintained through consistent use of color and typography. Symmetry is minimal: while general spacing is balanced, it varies across individual elements. Closure appears subtly below “Suggested Athletes,” where shapes imply a user profile.

The navigation bar supports Heuristic 8 with a clean, minimalist design. However, a distinct icon for social media functions could improve content organization and reduce visual density on the start screen. Heuristic 6 is met due to the little number of icons used, which reduces cognitive effort. Heuristic 2 is fulfilled through conventional icons. Similarity is supported via uniform icon size and color; symmetry is achieved through balanced spacing. Minimal closure is present in the profile icon.

The add-workout function supports Heuristic 8 through a minimalist presentation. Heuristic 6 is moderately fulfilled: The function is not easy to find, and its subtle appearance is overshadowed by surrounding elements. More visual emphasis or central positioning could enhance visibility. Heuristic 2 is met via the familiar “plus” icon, though pairing it with a color could enhance discoverability. Similarity is maintained through consistent color and font choices. Symmetry is applied in the button’s balanced placement. Closure is not present.

Heuristic 8 is not fulfilled in the workout detail view due to a dense layout and information overload. Implementing collapsible sections could improve clarity. Heuristic 6 is also limited, as users must invest considerable effort to navigate the interface. Heuristic 2 is addressed: familiar icons and workout images aid understanding. Similarity is maintained via consistent color and font. Symmetry is partially achieved: workout cards and icons are balanced, while dense text blocks and the muscle overview cause visual imbalance. Closure is not applied.

Effective addressing of Heuristic 8 in the calendar is shown through the display of only essential data. Visual elements like streak indicators and rest days enhance engagement. Heuristic 6 is supported by strong readability, and Heuristic 2 is fulfilled by closely mimicking a physical calendar. Similarity is present in color, font, and grid layout. Symmetry is achieved, although the absence of adjacent-month days causes slight misalignment. Closure is not applied.

3.6 Design Takeaways

The heuristic evaluation of the five applications reveals both individual strengths and weaknesses as well as recurring patterns. While each app is unique in its design, they share common themes and structural similarities, which are presented in this chapter.

Across all evaluated apps, Heuristic 8 is consistently addressed, particularly in critical interaction points such as the navigation bar and the add-workout function. This trend leads to visual environments that mostly follow a minimalist layout, effectively avoiding unnecessary distractions and thereby supporting Heuristic 8. Another recurring pattern is the strong application of the Gestalt principle of similarity, often reinforced through cohesive color schemes and consistent iconography, which enhances visual clarity and improves recognition. Recognition and discoverability are further supported by the use of conventional elements, for example, the "plus" icon to indicate the addition of adding content, which strongly aligns with Heuristic 2. Throughout the evaluation, calendar views were found to be particularly well-implemented, as they consistently mirror the layout of physical calendars, creating a sense of familiarity through real-world analogy. Another notable strength across the majority of the apps is the combination of intuitive icons and supporting text labels, which significantly reduces cognitive load and contributes to a seamless user experience.

Although the implementation of Heuristic 8 is a strength across the evaluated applications, various apps fail to effectively communicate their core purpose on the start screen. In distinct cases, the layout and interface elements resemble a social media feed, shifting the focus away from workouts and potentially confusing inexperienced users. This reflects a thematic inconsistency, leading to a weakened first impression. A recurring challenge across the apps is the presence of dense interface layouts, particularly in workout detail views, which increases cognitive load and results in only partial compliance with Heuristic 6. Additionally, missing or ambiguous text labels further reduce immediate understanding and hinder discoverability. In distinct cases, unclear elements are neither explained nor intuitively designed, leading to uncertainty about their functionality. Features such as muscle group visuals or "add a day" buttons lack clear wording or visual cues, making their purpose difficult to interpret. The Gestalt principle of closure is rarely applied in a meaningful way, though occasionally visible in icons or profile representations. However, this absence may actually be beneficial in this context, as Kapllani and Elmimouni argue that an excessive or forced usage of closure can reduce usability [14].

Summary: The evaluation reveals that function-focused entry points are more effective than social media–styled start screens, especially in fitness apps where users primarily aim to track their progress rather than engage with a social feed. Across all applications, the combination of icons with labels consistently enhances usability and reduces the cognitive effort required to interpret more complex features. However, visibility and discoverability of key actions vary, with essential functions lacking prominent placement or clear visual emphasis, which could hinder user interaction. Workout detail views often suffer from dense layouts; however, clarity could be significantly improved through increased spacing, collapsible content sections, and consistent use of textual labels or visual cues, resulting in a clear design. The use of real-world analogies, such as calendar views resembling physical calendars, plays a crucial role in facilitating user orientation and understanding. A notable consistency across most apps is the application of design principles such as similarity and symmetry, which positively impact both usability and visual appeal. As Kapllani and Elmimouni note, these principles contribute to an improved user experience [14]. Furthermore, establishing a clear visual hierarchy is essential for guiding users effectively and enabling quick information processing.

4 Designing The Simulated Prototype

Building on the theoretical foundations and insights presented in Chapters 2 and 3, including established design principles and the heuristic evaluation of five popular fitness apps, this section outlines how these factors influence the creation of the individual components within the simulated prototype. The previous chapters have established a base of knowledge that is relevant for the design process. Central to this process are Nielsen's usability heuristics [6], specifically Heuristic 2, Heuristic 6, and Heuristic 8, as well as Gestalt principles such as similarity and symmetry. The principle of closure is applied only to a minimal extent, as a study indicates that it is absent in the design of successful websites. [14]. In addition, the layout design considers natural user scanning behaviors, such as Z- and F-shaped reading patterns [21], to enhance content accessibility and flow.

The focus throughout this chapter is on the design of elements that contribute to a clear, intuitive, and harmonious user experience. To achieve this, special attention is given to the criticism identified in the previous chapters, and the corresponding insights are applied to the design process. This includes, in particular, the creation of features that do not resemble a social media feed, but instead emphasize the core function of the app, which focuses on fitness documentation. Additionally, the layout is designed to avoid nested structures and instead follows a minimalist approach that makes use of conventional icons and symbols, as well as supportive text labels. In doing so, the design aligns with Heuristics 8, 6, and 2 [6]. The simulated prototype also aims to establish a clear and focused first impression for users, without distractions such as advertisements or premium pop-ups.

To support this endeavor, a fictional fitness application named *FITMODE* is introduced. It serves exclusively academic purposes and is not intended for current or future commercial use. The following sub-chapters explain how and why theoretical design principles, along with the identified shortcomings of existing fitness apps, are translated into specific design elements within *FITMODE*.

Figure 12 provides an overview of the simulated prototype. The left image shows the start screen, navigation bar, and add workout function. The middle image displays the workout detail view, while the right image shows the calendar.

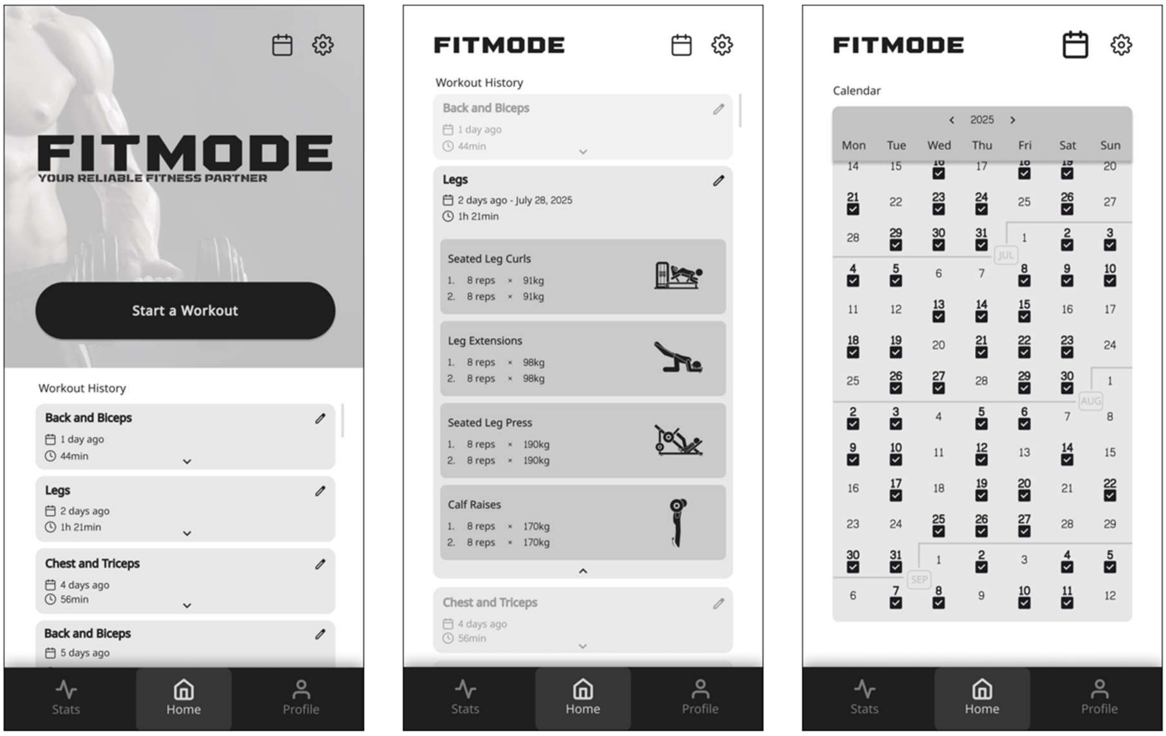

Figure 12: Overview of the simulated prototype. Source: Own screenshot.

4.1 Start Screen

The start screen is deliberately designed to avoid resembling typical social media platforms in both appearance and behavior, as this is identified as a point of criticism in the heuristic evaluation. Rather than promoting social interaction or content feeds, the primary focus is on providing users with an effective first impression of the app. Therefore, the screen layout is structured into an upper section that primarily serves as an introduction to the app and a lower section dedicated to interacting with recently recorded workouts, an important feature warranting direct accessibility.

In accordance with Heuristic 8, only essential information is presented to support users' primary tasks of starting and documenting a workout. Visual clutter is minimized, and the layout adopts a clean, minimalist structure. For example, a consistent black-and-white color scheme with varying brightness levels enhances visual clarity and aesthetic coherence throughout the app. This approach is further reinforced by the deliberate exclusion of advertisements, premium offers, or other promotional content. To reduce cognitive load in line with Heuristic 6, icons and interface elements adhere to established design conventions and are intuitively positioned to correspond with common scanning patterns [21]. Particular care is taken to ensure visual consistency; for example, individual workout history cards are designed to resemble each other while maintaining enough spacing to allow easy differentiation. Heuristic 2 is addressed via a contextual background image, which fosters real-world associations related to workouts. Additionally, standard icons, such as calendar and settings located at the top right, follow widely recognized standards to further enhance intuitive use.

Gestalt principles of similarity and symmetry are also incorporated into the design. Similarity is reflected in consistent fonts, color usage, and uniform card layouts, while symmetry is achieved through equal horizontal spacing and centered alignment of components. Even asymmetrical elements, such as icons positioned on only one side of the screen (e.g., the calendar and settings symbols), maintain uniform spacing and alignment relative to the app's edges to preserve visual balance.

4.2 Navigation Bar

Designed to promote clarity, ease of use, and a minimalist aesthetic that complements the app's overall design, the navigation bar addresses shortcomings found in various fitness applications reviewed in Chapter 3. These apps are criticized for unclear or abstract icons, missing explanatory labels, or an overload of non-essential features, issues that the simulated navigation bar tries to resolve.

The navigation bar fulfills Heuristic 8 by limiting content to essential navigational elements and maintaining a design consistent with the rest of the interface, for example, in terms of color. By reducing the number of navigation items to three, the interface appears less cluttered and also contributes to reducing cognitive load. Heuristic 6 is realized through the use of familiar, easily recognizable icons supported by clear descriptive labels, thereby minimizing factors of confusion during navigation and enabling quick comprehension without reliance on memory. Heuristic 2 is implemented via standard icons and terminology that reflect real-world associations, complemented by supporting labels for users unfamiliar with specific icons.

Consistent visual language reflects the Gestalt principle of similarity through color palette, typography, and icon sizes, while symmetry is maintained by equal horizontal spacing, especially between the icons. Central positioning of the home icon acts as a visual anchor and is highlighted to indicate the user's current location within the app.

4.3 Add-Workout Function

A relevant criticism of the analyzed app is that the add-workout function is neither prominently emphasized nor accessible from the start screen. Given its core importance, this function must be immediately visible, avoiding complex or nested navigation. To address this, the button is placed clearly and prominently directly on the start screen.

Similar to the navigation bar, the add workout function adheres to Heuristic 8 by aligning with the app's minimalist design and focusing solely on essential elements, excluding unnecessary text or decorative components. Heuristic 6 is primarily addressed through strategic placement: the add-workout button is the first key component users encounter following natural scanning patterns [21]. This positioning significantly reduces the cognitive effort needed to locate the feature. Heuristic 2 is supported by the button's placement within the app. A common criticism of the analyzed apps is that the function lacks visual elements creating a real-world analogy. In the simulated prototype, this analogy is established through a strategically chosen background designed to evoke associations with sports and training.

The Gestalt principle of similarity is demonstrated through font, color, and design style that harmonize with the rest of the app, ensuring a unified and cohesive look. Symmetry is maintained by applying equal horizontal margins and centering the text alignment within the button, contributing to a balanced and visually appealing design.

4.4 Workout Detail View

During the app analysis, it became evident that the workout detail view in various cases is overly cluttered, making it difficult for users to distinguish between individual exercise cards without cognitive effort, due to a lack of clear indicators or spacing. Accordingly, the simulated prototype aimed to create strong visual similarity among the individual cards while ensuring they remain clearly distinguishable from one another. A key design priority in achieving this was the removal of unnecessary content that adds to visual complexity and may cause user confusion.

This element effectively adheres to Heuristic 8 by eliminating non-essential content, such as the total weight lifted across all exercises: a feature present in distinct cases the analyzed apps, which could otherwise distract users or contribute to visual overload. To ensure a coherent and aesthetically pleasing visual experience, the color scheme is consistently applied across text, icons, cards, and background elements, aligning with the app's overall design. In accordance with Heuristic 6, content complexity is intentionally reduced to lower cognitive effort, making the interface intuitive and accessible for both novice and experienced users. Overly nested structures are avoided entirely, and clear visual cues, such as arrow icons, indicate whether individual cards can be expanded or collapsed. Heuristic 2 is addressed through two key strategies: first, the use of exercise related illustrations supports real-world associations; second, the overall card system is inspired by traditional analog file folders, featuring a clear chapter structure and paper like divisions.

Similarity is demonstrated through consistent use of font, color palette, layout hierarchy, and uniform card design. Symmetry is established via equal horizontal spacing between interface elements and screen edges, as well as through visual balance within each individual card. However, the text inside the cards is intentionally not perfectly symmetrical, in order to avoid a static or overly uniform appearance, this subtle asymmetry contributes to a more dynamic user experience.

4.5 Calendar

In the calendar of the simulated prototype, the focus lies on avoiding visual misalignment caused by missing days from adjacent months, a key point of criticism in various analyzed apps. Such misalignments introduce asymmetry that creates subtle visual disturbances, making it a design priority to address this issue. Accordingly, the calendar design in the simulated prototype draws inspiration from the calendar of the *Strong App* [31], which successfully addresses this aspect through the use of divider lines.

To fulfill Heuristic 8, the design intentionally presents only the essential information a calendar should convey, specifically, a time reference and a visual indicator of completed workouts, while avoiding unnecessary visual complexity. This approach also supports Heuristic 6 by minimizing cognitive load. Workout days are visually highlighted in black and marked with a checkmark icon, enabling users to quickly identify completed training sessions. A subtle box shadow beneath the weekday labels (MON–SUN) acts as a visual cue, indicating that the calendar is vertically scrollable and allowing users to locate specific dates with ease. To enhance structural clarity, divider lines labeled with abbreviated month names are embedded within the calendar grid to separate individual months. Heuristic 2 is addressed through the calendar's clear resemblance to a familiar real-world analog calendar.

The Gestalt principle of similarity is demonstrated through consistent color scheme, font choice, grid element sizes, and overall visual language, all of which align with the rest of the app. Symmetry is maintained by equal horizontal margins on both sides of the screen and uniform spacing between weekdays within the calendar grid. While the visual cues for months, such as divider lines, introduce asymmetry, this is both necessary and unavoidable to solve the issue of misalignment caused by missing days from adjacent months.

5 Conducting the User Tests

The primary objective of the user testing phase is to evaluate whether the simulated prototype, developed based on scientific guidelines, design principles, and insights from a heuristic evaluation, is perceived effective regarding usability and visual design according to real users. The results directly address the key research questions of this bachelor's thesis and help determine whether a scientifically grounded design approach offers value in the context of app creation. Furthermore, the findings provide insight into specific design characteristics that contribute to positive and effective user experience.

User tests methods in this research follow an exploratory approach, incorporating both qualitative and quantitative data. Standardized tools like the SUS questionnaire [16] and Pairwise Comparison [18] provide quantitative data, while qualitative insights are collected through open-ended user feedback during the visual design assessment. This qualitative feedback serves as a valuable complementary data source, offering deeper understanding of user behavior and individual perceptions [36].

5.1 Testing Procedure

The user testing is divided into two parts:

1. **Evaluation of Visual Design:** This part is conducted the modified Pairwise Comparison Method [18]. For each comparison, users are presented with two versions of different fitness apps and asked to indicate which version they prefer and why. Additionally, users rate on a

scale how strongly they prefer one variant over the other in each comparison. Based on this rating, a reciprocal value is automatically assigned to the other app in the comparison, which is essential for the evaluation process. Users are also optionally invited to explain their choices. These values are then compiled into a Pairwise Comparison Matrix and analyzed using mathematical methods to produce meaningful results. This analysis reveals which app performed best and which performed worst in terms of visual design.

2. **Evaluation of Usability:** In the second part, only the simulated prototype is evaluated to specifically determine whether the scientifically grounded design approach effectively supports usability, using the System Usability Scale questionnaire [16]. After navigating the prototype, users are asked to honestly respond to the ten items of the questionnaire, providing their genuine assessment of the prototype's usability.

To avoid bias, the order of the tests is carefully considered. The visual design evaluation is conducted first, as it requires participants to be unaware of which app is the prototype and which are the analyzed apps. Conducting usability testing beforehand would reveal the simulated prototype, since only it is evaluated during that phase, making it easy for participants to identify the apps in the subsequent visual design evaluation. Therefore, the testing sequence places the visual design evaluation before the usability testing.

5.2 Testing Environment

The test environment is tailored to the specific attribute being evaluated. Usability testing takes place individually on-site in a quiet, controlled setting free from distractions. Participants are provided with a computer and monitor where the Figma testing environment is pre-installed, allowing them to freely explore the prototype. They are encouraged to navigate at their own pace to form a thorough and personal impression of the app's usability.

In contrast, the visual design evaluation via the Pairwise Comparison method is conducted remotely using Google Forms. This flexible setup allows participants to complete the test at a location of their choice. To maintain test quality, users are advised to find a quiet, undisturbed space and complete the task individually, ensuring full concentration.

5.3 Selection of Participants

Exactly ten participants are selected, with an equal gender distribution of five female and five male participants. This sample size is justified based on Faulkner's argument that ten testers are often sufficient to identify at least 80% of usability problems in an application, particularly during the initial stages of product development [37]. This approach ensures a balance between gathering meaningful user feedback and managing available resources effectively.

To ensure the feedback collected is both relevant and representative of the target audience, participants must meet specific criteria:

- Participants must have prior experience with fitness apps.
- Participants must be actively engaged in fitness activities (e.g., workouts or training).
- Participants must represent a mix of genders to ensure diverse insights.

Selecting participants with firsthand experience is crucial, as these users are often aware of the shortcomings in current products and can offer valuable insights into potential improvements.

5.4 User Test Outcomes

After successfully completing the user tests, this sub-chapter presents and explains the respective results.

5.4.1 Pairwise Comparison Findings

The Pairwise Comparison [18] yields both quantitative and qualitative insights that are highly relevant to this thesis and its central research questions. As outlined in Chapter 2.3.3, participants initially indicate their preference level for each app using a linear scale. These inputs are then used to create an individual pairwise comparison matrix for each participant, containing specific values from their responses. The multiplicative method is applied to each matrix, followed by calculating the n-th root of the resulting product. To enhance the clarity and comparability of the results, these values are normalized to fall within a range from 0 to 1. Finally, the normalized values are compiled into a summary table, from which a mean preference score is calculated for each app. These scores reflect the relative preference weights, allowing the apps to be ranked accordingly. Figure 16 visually illustrates this process to provide a simplified overview:

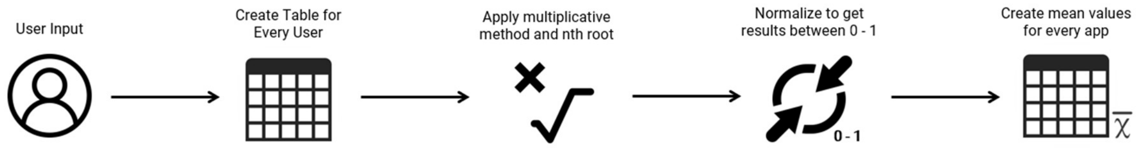

Figure 13: Visualization of the Pairwise Comparison Process, Source: Own Illustration

Ranking as the most preferred option on average in the Pairwise Comparison, the simulated prototype captures 25.1% of the total preference weight across all participants, making it the highest-rated app in terms of visual design. This outcome indicates that a scientifically grounded approach to app development and design can be effective, thus providing an answer to the first research question of this thesis. The following table illustrates this result, with the simulated app highlighted in green:

Preference weight of the apps in %	*User 1*	*User 2*	*User 3*	*User 4*	*User 5*	*User 6*	*User 7*	*User 8*	*User 9*	*User 10*	*Mean*	*Rank*
Strong App [31]	16	17	15	19	24	20	14	18	17	13	17.3	3
FitNotes App [32]	12	15	18	25	13	14	23	11	13	22	16.6	4
Simulated App	34	31	31	19	30	23	20	26	21	16	25.1	1
Alpha App [34]	22	17	14	18	17	20	26	26	28	14	20.2	2
Hevy App [35]	9	10	13	10	9	10	10	10	9	11	10.1	6
JEFIT App [33]	7	9	8	10	8	13	8	9	12	23	10.7	5

The prototype performed best, followed by the Alpha App and the Strong App, both of which also implement thoughtful design strategies, as positively highlighted in Chapter 3. Notably, the Hevy App and the JEFIT App received the least preference among participants. This may be attributed to their use of heavily nested layouts and the incorporation of social media-like features in certain sections, which may detract from the app's primary focus.

This suggests a clear trend toward favoring simpler, more scientifically grounded visual design approaches, where elements are presented in a minimalistic and focused manner, rather than overwhelming users with excessive information. These findings are reinforced by the qualitative feedback gathered during testing. The lowest-rated apps were particularly criticized for their cluttered interfaces and the distracting presence of advertisements. In contrast, higher-rated apps received praise for their clean structure, intuitive organization, and visually balanced layouts.

5.4.2 System Usability Scale Findings

The System Usability Scale [16], provides valuable insights into the prototype's usability. As outlined in Chapter 2.3.1, participants complete a ten-item questionnaire by indicating on a Likert scale how strongly they agree or disagree with each statement. Depending on whether a question is odd- or even-numbered, different mathematical procedures are applied to score the responses [16], resulting in a single usability score for each participant. The overall score is then calculated by averaging the individual scores of all participants. To make the result easier to interpret, it is categorized according to the *Adjective Ratings Classification* proposed by Bangor et al. [24]:

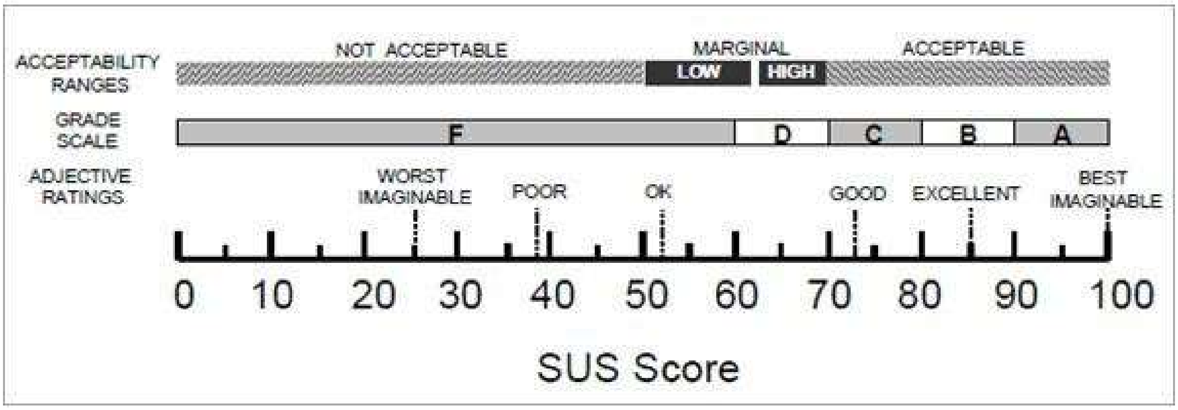

Figure 14: Different Rating Possibilities of The SUS Score [24]

An average SUS score of 82.5 was achieved for the prototype, placing it within the "Good to Excellent" category. This suggests that the scientifically grounded design approach was effective from a usability perspective. The score also lies well within the accepted usability range and corresponds to a B grade in academic terms [24]. A standard deviation of 9.8 indicates that most individual scores fall between approximately 72.8 and 92.3, remaining within the acceptable spectrum. This wide spread can be partially explained by the small sample size of ten participants, which is still considered appropriate for exploratory usability testing [37].

The table below presents the individual SUS scores of all participants, with the overall mean highlighted in green and the corresponding standard deviation:

SUS Scores of the Users	User 1	User 2	User 3	User 4	User 5	User 6	User 7	User 8	User 9	User 10	Mean	SD
Score	87.5	85	87.5	70	90	87.5	90	85	60	82.5	82.55	9.8

The simulated prototype achieves an acceptable result that falls within the upper range of the SUS classification [24], suggesting that a scientifically grounded design approach proves effective in terms of usability, addressing the research questions of this thesis. These findings support the notion that scientifically informed design decisions can lead to interfaces that are not only functional but also intuitive and user-friendly.

6 Conclusion

This thesis set out to explore how app elements should be designed to effectively enhance user motivation and engagement. To achieve this, a relevant theoretical foundation in the field of user experience was first established. This foundation covered both the concept of UX itself [5] and commonly accepted principles and guidelines that contribute to a more successful user experience from the user's perspective. A key insight from this theoretical base was that no perfect, objectively "correct" design exists that works equally well for all users [19]. Instead, UX is shaped by subjective user perception. With this in mind, the research aimed to apply a scientifically grounded design approach to a simulated prototype, in an attempt to approximate what could be considered an objectively effective design. To make this possible, a heuristic evaluation was conducted on five real-world fitness apps. For each app, five elements relevant to fitness applications were selected for analysis, namely, the start screen, navigation bar, add-workout function, workout detail view, and calendar. This evaluation aims to merge practical insights from existing market solutions with the theoretical knowledge derived from the design guidelines and principles discussed in Chapter 2. These combined findings served as the foundation for developing the scientifically grounded prototype. Both the evaluation and the design of the simulated prototype focused on two primary attributes: usability and pleasurability (i.e., visual design) [2]. Accordingly, specific guidelines relevant to these two dimensions were applied. Following the development of the prototype, two types of user tests were conducted to evaluate the effectiveness of the design approach in these areas: usability was assessed using the System Usability Scale [16], while visual design was evaluated through a modified version of the Pairwise Comparison Method [18]. The structure and sequence of the tests were deliberately designed to minimize bias and ensure optimal data quality.

The findings support the hypothesis that a scientifically grounded design approach can effectively enhance both usability and visual design, two essential factors in fostering user motivation and engagement. In particular, the effective application of Gestalt principles, namely symmetry and similarity [14], alongside Nielsen's Usability Heuristics [6], proved valuable in guiding the design process toward better user outcomes. In the context of fitness apps, the results indicate that function-oriented visuals are more effective than complex, nested interfaces inspired by social media feeds. Users tend to favor interfaces that are immediately understandable, minimizing the need for interpretation or exploration. Additionally, the use of real-world analogies further enhances intuitiveness.

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