

# Couch: Investigating the Relationship between Aesthetics and Persuasion in a Mobile Application

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## ABSTRACT

Aesthetics, specifically visual appeal, is an important aspect of user experience. It is included as a principle in frameworks such as Fogg’s Functional Triad and the Persuasive Systems Design. Yet, literature that directly investigates the influence of aesthetics on persuasion is limited, especially in the context of mobile applications. To understand how aesthetics influences persuasion if it includes the concept of operant conditioning, we designed a mobile app called Couch, which aims to reduce sedentary behaviour. We devised a 2x2 between-subject experiment, creating four versions of the app with two levels of aesthetics and two levels of persuasion (with and without). Measuring persuasion through self-reports, we found that higher levels of persuasion had a significant impact in reducing sedentary behaviour over aesthetics. However, visual appeal had no significant effect on persuasion. We comment on the level of visual appeal of the app and discuss the implications for future work.

**Keywords:** Human Computer Interaction, Aesthetics, Persuasion, Mobile, Aversive stimuli, Sedentary behavior.

**Index Terms:** H.5.2 User Interfaces - Graphical user interfaces

## 1 INTRODUCTION

B.J. Fogg [11] introduced the concept of persuasive technology as “any interactive computing system designed to change people’s attitudes or behaviours” in 2003. Since then, his principles of persuasion and his Functional Triad can be found in many domains, including health and wellness [26,31]. They have been adopted into new frameworks, such as the Persuasive System Design (PSD) framework [40]. Studies of persuasive systems differ in terms of principles utilized and in duration, but most of the works demonstrating persuasion attempts report positive results, according to a survey by Orji and Moffat [41].

Nevertheless, there are gaps in the literature. First, aesthetics is not given equal attention to the other persuasive principles. Visually attractive technology is thought to be more persuasive [11], yet Matthews et al. [31] found that none of the studies in his survey compared different levels of aesthetics, or investigated its effects on persuasion. Another apparent gap surrounds aversive stimuli and conditioning, which has not been thoroughly tested. On one hand, Fogg’s functional triad makes use of positive reinforcement and conditioning [11], on the other PSD Framework completely excludes conditioning. Finally, some argue the importance of using aversive stimuli, and recommend a

combination of punishment, positive and negative feedback, to fully benefit from operant conditioning [7,23].

This study contributes to the discourse on persuasion by investigating these gaps and answering the following research questions: 1) Can a mobile app following persuasive design principles, while also utilizing aversive stimuli, succeed at persuading its users? 2) Does aesthetics influence the persuasiveness of an app?

Following the persuasive principles, we designed an app called Couch, which aims to persuade users to stand up more and reduce their sedentary behaviour. Increased physical activity can be beneficial to overall health [14,25]. We developed four variants of Couch, with two levels each of persuasion and aesthetics, to answer the research questions we set above. We analyzed participants’ evaluation of aesthetics and persuasiveness of the system in a short-term, between-subject study. We discuss the findings and their implications, in addition to the limitations of the study.

## 2 RELATED WORK

### 2.1 Aesthetics: Definition and Studies on Usability

Aesthetics has been increasingly of interest in HCI, since Alben’s [1] emphasis on aesthetics as a part of quality user experience in 1996. Philosophers, such as Plato and Aristotle, defined aesthetics as “beautiful objects incorporate[ing] proportion, harmony, and unity among their parts” and stated that the “universal elements of beauty are order, symmetry, and definitiveness” [46]. Hassenzahl [17] states that aesthetics can be narrowed down to the visual attractiveness, that is beauty. We note a lack of agreement from authors in the terminology on this topic. Given this, we reproduce in this paper the terminology used in each study.

In an early work on perceived aesthetics and perceived usability, Kurosu & Kashimura [24] found that aesthetics strongly influences usability even before use. These findings are supported by Tractinsky et al. [50], who reported a high correlation between perceived usability and aesthetics before use and, further, also found that those ratings remained the same after actual use, concluding, “what is beautiful is usable”. It should be noted that these results suggest a strong effect of aesthetics on perceived usability, rather than the actual usability of the system. Subsequent works have both supported [20,27,46,48] and challenged this linkage of aesthetics and usability [29,30]. Hassenzahl [17] concludes that whether “what is beautiful is usable” remains unproven. While the positive influence of aesthetics on a system’s usability is still debated, aesthetics is still considered to be an important part of overall user experience, the impact of which might simply depend on context [2].

### 2.2 Persuasion and Behaviour Change

Fogg [11] defines persuasive technology as “any interactive computing system designed to change people’s attitudes or behaviours”. He investigates persuasive technology under three different roles, referred to as the Functional Triad. These roles are tools, medium and social actors. As a tool, the product can persuade

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by making target behaviours easier to perform, such as by providing calculations and measurements. As a medium, the product can reveal the relationship between cause-and-effect and enable people to explore those experiences, achieving persuasion. Lastly, as a social actor, the product can use the same principles humans use to influence and persuade others, such as by providing feedback and social support. Most products use a mix of those functions and blend different roles for the successful strategy of eliciting the target behaviour.

Harjumaa & Oinas-Kukkonen [40] created the Persuasive Systems Design (PSD) framework, adapting Fogg's Functional Triad to overcome its limitations regarding the design and development of persuasive systems and its lack of guidelines for transforming and implementing persuasive principles into software requirements and features. One of the differences their principles have from Fogg's Functional Triad is the lack of surveillance and conditioning. The authors argue that these methods are not acceptable for persuasive systems, due to people often being unable to choose whether they may be observed or not, and conditioning being not open/apparent. Moreover, they state that users act and behave based on beliefs and values, not conditioning. Under Fogg's conditioning principle, positive reinforcement can shape complex behaviours or turn existing ones into habits [11]. Conversely, in a study of a social persuasion system designed to motivate office workers to drink healthy amounts of water, Chiu et al. [7] recommend mixed feedback to create contrast between positive and negative reinforcement, causing the former to "stand out".

Similarly, Kirman et al. [23] argue that persuasive systems must also implement negative feedback and punishment to fully benefit from operant conditioning, stating that when only positive feedback and rewards are utilized, there is no meaningful feedback when the user does not perform the target behaviour. Lastly, in their exploratory study to promote better food management and reduce waste using a mobile app, Aydin et al. [3] reported that aversive stimuli were effective in eliciting desire to change behaviour.

Overall, literature on negative reinforcement is limited. Orji and Moffatt [41] reported that, of 85 studies they reviewed on persuasive technology for health and wellness, only 3 used negative reinforcement. Furthermore, they state that studies using the PSD Framework, which excludes operant conditioning and only uses rewards, to design and evaluate systems often lack negative reinforcements. More recently, Orji et al. [42] investigated the relationship between persuasion and user experience on the effectiveness of personalized persuasive systems. They found that tailoring should be linked to personality types.

### 2.3 Persuasion and Aesthetics

Fogg suggests that visually attractive technology is likely to be more persuasive [11], potentially due to a halo effect, where positive traits are associated with more attractive individuals [9]. This includes positive judgment of attributes like intelligence [36]. Moreover, Fogg states that a more attractive or cute on-screen character would have greater persuasive power. Similarly, in PSD the Liking Principle denotes the attractiveness of the system; it requires that the "system should have a look and feel that appeals to its users" [40]. This is supported by Khan and Sutcliffe [21]: more attractive virtual agents were perceived as more persuasive, associated with higher quality traits by participants.

Moreover, Matthews et al. [31] found that, out of the 20 studies on mobile applications promoting physical activity they reviewed using PSD framework, 6 of them utilized "liking" principle. Some studies used "fun" as a way to represent information [15], and some

featured "visually pleasing display features" to convey complex information [22], in addition to metaphorical representations [4,35]. Nevertheless, none of the studies compared different levels of aesthetics or investigated its effects on persuasion.

Prior works suggest that aesthetics and operant conditioning could increase the persuasiveness of a system. In this study, we aim to understand how aesthetics affects the persuasiveness of a system when it includes operant conditioning.

## 3 DESIGN

To evaluate the effect of aesthetics on persuasion with operant conditioning, we present **Couch**, a mobile app to help people reduce prolonged sitting; a behaviour that can have detrimental effects on health, as cancer [5,44], cardiovascular disease and diabetes [5,6,10,13]. We selected a mobile app as Fogg suggests that mobile devices are more persuasive [11], due to their ubiquitous nature. Couch has four variations: with two persuasion levels (persuasive variants and control variants) and two aesthetic levels (high aesthetics and low aesthetics). Figure 1 illustrates the four conditions for the main screens of the app.

### 3.1 Manipulation of Aesthetics Levels

We designed our high and low aesthetic conditions using common guidelines for visual design [16,38,39]. We manipulated colour, the aspect ratio of visual elements, symmetry, and the alignment of the layout. To keep all the conditions functionally identical, we chose manipulations shown not to impact usability [8,27].

In the high aesthetic variants, we followed Gestalt principles (closure, proximity, similarity, symmetry, continuity, figure ground), as studies have shown the effect of visual layout on aesthetics [27,47,49,50]. We used harmonious colour combinations [43] and higher saturations to attract, as people perceive such colours to be more exciting and dynamic [51]. We chose the colour orange (associated with energy, activity and excitement [37]), and used Adobe Color CC1, a tool to help designers create colour palettes, based on colour theory, to select the other colours. Font styles also impact aesthetic levels [8,28]. Researchers recommend using consistent fonts to improve overall design [32,51]. We chose Valken as Couch's main font, a free alternative to the VAG Rounded font that is "informal" and "dynamic" [53], combined with Monaco, for numerals, and Montserrat. These fonts are the only fonts used on the control and high aesthetics variant due to lack of potato figure.

We reversed these same Gestalt guidelines to create the low aesthetics variants. We visually misaligned, avoided symmetry, and distorted the aspect ratio of icons. We selected highly saturated magenta (considered "zany and whimsical" [37]) coupled with other highly saturated colours, red and cyan, to create an inharmonious palette. We chose the background colour of the low aesthetic profile screen to have a similar contrast ratio to the high contrast variants' orange and dark blue; the greenish-brown colour, Pantone 448C, was found to have the "ability to minimize appeal" [52]. Lastly, we chose the Impact and Playbill, fonts, which were rated the lowest in terms of aesthetics in a study by Shaikh [45] to disrupt the overall aesthetics of the typography [51].

### 3.2 Persuasive Design

We designed the persuasive variants of the app following Fogg's functional triad and the Persuasive System Design framework. We expanded our system to include aversive stimuli [3,7,23]. We

<sup>1</sup> <https://color.adobe.com/>

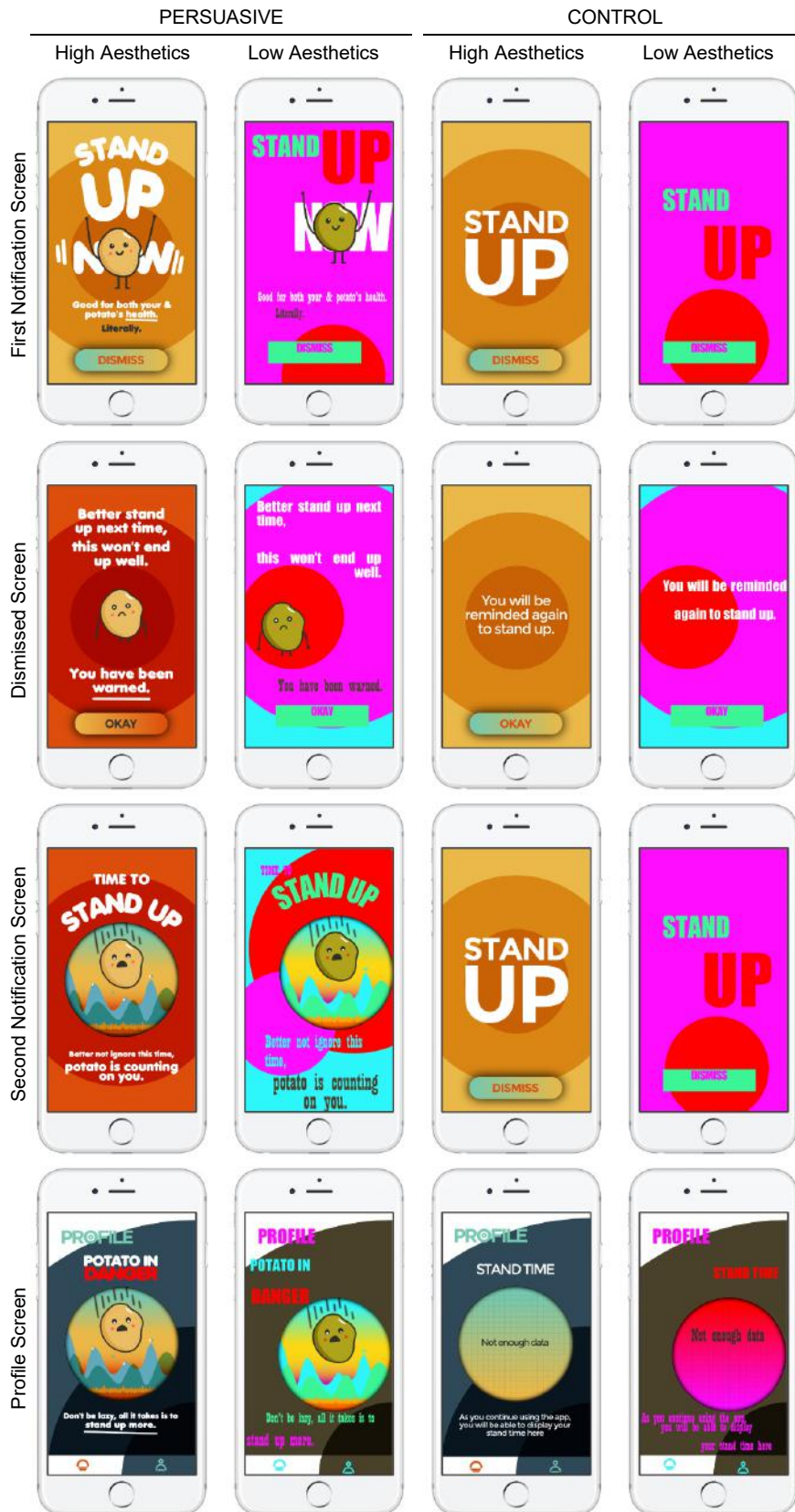


Figure 1: Main screens (rows) for each version (columns). For the persuasive variants (left two columns), the *Dismissed screen*, *Second Notification screen* and *Profile screen* showed a negative feedback (persuasive condition). In addition, the *Profile screen* also displayed punishment.

Table 1: Persuasive Design Principles [11] as applied to the Couch mobile app.

Principle	Application
Reduction	Predefined goal of reducing sedentary behaviour; making it easier for users to remember when to stand up.
Suggestion	Use of full-screen reminders to stand up.
Self-Monitoring	Collecting and presenting data on standing and sitting time.
Surveillance	As people behave differently when they know they are being observed [11], users are made aware that the app is observing them and recording their data.
Conditioning	When the user dismisses a notification, the app employs <i>negative reinforcement</i> , showing a warning. After another dismissal, the second warning places the potato character in danger. <i>Punishment</i> is applied by displaying progressively worse effects on the potato character and connecting this outcome to the user's poor behaviour.
Cause-Effect	Users can see the link between their behaviour (standing up or not) and its effect on the status of the potato character, visible on the profile screen.
Physical cues	Use of the potato character as a part of social and physical cues.
Psychological Cues	The potato character uses facial expressions and language [40]. This leads users to subconsciously conclude that the product has a psychology [11]. The potato character portrays emotions: happy, sad, and scared, in response to users' behaviour.
Language	Use of positive and negative language to persuade by social presence; the potato character uses human-like expression (e.g. "don't be lazy") to augment its social role.
Social Dynamics	The potato character makes the overall experience more engaging, displays emotions and gives limited options to make it hard for users to say "no" to.
Social Roles	The potato character acts as a friend by making suggestions, such as by stating that standing up is healthy for both the potato and the user, and also by presenting itself as someone that is directly influenced by actions of the user.

also followed Fogg's 8-step process in the early design phase of persuasive technologies [12] for the design of the app.

We chose a simple behaviour to target, standing up, as it is recommended in several health guidelines [14,25]. We target adults who are comfortable using smartphones, as young adults and adults are recommended to reduce their sedentary behaviour the most [14,25]. We believe that, especially when focused on a task, people lose track of how long they have been sitting, and that this is an obstacle to avoiding unhealthy sedentary behaviour. Table 1 displays the persuasive principles employed by the Couch app. We created a potato character to fill a social role, in this case, a friend, allowing us to employ social persuasive principles.

### 3.3 App Preparation

We built the prototype variations using Origami Studio<sup>2</sup> on the macOS system. Each variant has the same structure and timers. The notifications appeared with a slide-in from bottom and utilized vibrations. We used the Origami app for iOS, deployed on an iPhone 6 device, for the study sessions.

## 4 STUDY

This study aims to answer the following questions: (1) Can a mobile app, designed using persuasive principles and aversive stimuli, help its users to reduce their sedentary behaviour? (2) Does aesthetics influence the persuasiveness of an app? To answer these questions, we devised a 2x2 between-subject design study, where each participant interacted with a single variant of the Couch app. Each participant had the same tasks and answered the same questions. The independent variables are aesthetics level (high or low) and persuasion level (persuasive or control). The dependent variables are the reported persuasion level, obtained through participants' responses, observed behaviours, and participants' evaluation of usability and aesthetics through the AttrakDiff questionnaire [18].

We hypothesize that (H1) the persuasive variants of the app will result in reports of higher persuasion than the control (non-persuasive) variants with regards to reducing prolonged sitting; and (H2) the high aesthetics variants will elicit higher reports of persuasion than the low aesthetics variants.

### 4.1 Data Collection

We employed pre- and post-study questionnaires, verbal follow-up questions, a think-aloud protocol, and recorded observations of participant behaviour. These methods aim to capture participants' overall experience, how they felt using the app, what they thought of the feedback and notifications given by the app, whether they felt motivated or encouraged, and whether they felt like this app might change their sedentary sitting behaviour. These methods allowed participants to postulate on the potential long-term effects of the app on their behaviour and attitude towards sedentary behaviour. We used the short version of the AttrakDiff [19] questionnaire to understand participants' perception of usability and aesthetics of the app. We chose this questionnaire for its focus on hedonic, pragmatic and attractiveness qualities, where subscales are presented as word pairs on a 7-point Likert scale.

We recorded the sessions for further analysis using Quicktime software deployed on a MacBook Pro computer and using the built-in microphone. The iPhone was connected to the computer during the study and the device's screen was recorded.

### 4.2 Procedure

Participants filled a pre-study demographic questionnaire. We then briefed them about the app, its purpose, their tasks and the study steps overall. We asked participants to think aloud while interacting with the device.

To observe a person's natural reaction to a notification while they are engaged in a primary task, we asked participants to read a short article on paper. The phone was on the table next to them. After

<sup>2</sup> <https://origami.design/>

Table 2: Examples of Persuasion Reactions Coding.

Positive	Negative
“I would stand up”, “I want to stand up”, “I love the potato”, “Potato is so cute”, “I feel like I should stand up”, “Oh no, I want to make my profile status better”, “I want to use the app and change my profile”, etc.	“I do not feel like standing up”, “I do not want to stand up”, “This is stupid”, “It is just a potato on the screen”, “It is just a reminder, it is not going to make me do it”, “I do not like being told what to do”, etc.

five minutes, the *First Notification screen* appeared (Figure 1, top row). We did not warn participants or make them aware of the notification, participants could choose to continue reading rather than stop to respond to the notification. If they had finished reading before notification appeared, we asked them prepared questions about the article to keep them occupied, to simulate the way we use smartphones.

Once participants detected the notification screen, we asked them how they were feeling and to describe what they would do in response, we then instructed all participants to continue sitting and to tap dismiss. If participants stood before receiving instruction, we noted the behaviour.

Upon dismissal, the app immediately presents the *Dismissed screen* (Figure 1, second row). Again, we asked participants to describe their feelings and to report what action they would take, to understand if they felt motivated to stand up. Once tapped okay, as instructed, the *home screen* was presented and we gave participants another article to read.

After three minutes, the *Second Notification screen* (Figure 1, third row) is presented. As previously, we did not interrupt participants if they were not aware of or chose not to respond to the notification. Once participants identified the notification, we followed the same procedure as with the first notification.

Following this, participants visited the *Profile screen* (Figure 1, bottom row) and we asked them to reflect on their status as reported by the app. We asked participants how they felt and what they thought of their profile status. In addition, we asked what they would do next.

Finally, we asked participants general follow-up questions and asked them to complete the AttrakDiff questionnaire. The study session took approximately 30–45 minutes.

### 4.3 Participants

We equally and randomly assigned participants into each of the four conditions: high aesthetics with persuasion, low aesthetics with persuasion, high aesthetics with no persuasion (control) and low aesthetics and no persuasion. We recruited participants from the local university community. Among the 48 participants, 31 were female, 15 were male and 2 chose not to indicate their sex. Participants’ ages ranged from 18 to 57, with a mean of 24. The

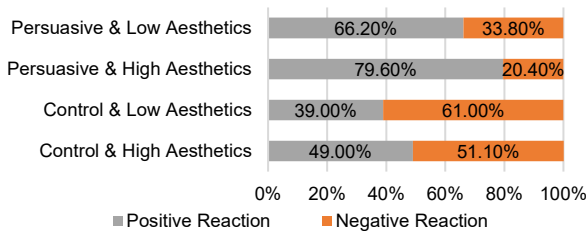


Figure 2: Percentages of Coding Frequencies for Reported Persuasion.

completed education level ranged from high school to doctorate. They were compensated \$10 for their participation. This study was approved by the institution’s ethics board.

## 5 RESULTS

### 5.1 Reported Persuasion

Using our recording and notes, we coded participant reactions as positive or negative. When a participant responded both positive and negative to same question or the screen, the reaction was coded as both positive and negative. Table 2 reports examples of the positive and negative coding, while Figure 2 categorizes frequency of reactions from each category by condition.

We ran a two-way between subjects ANOVA, with two independent variables (*aesthetics level* and *persuasion level*), and reported persuasion as the dependent variable, with a confidence level of 95%. We found *persuasion level* to be significant, with higher reported persuasion after experiencing the persuasive variants compared to the control variants ( $p < 0.005$ ). However, we did not find *aesthetics level* to be significantly different ( $p = 0.059$ ). We did not find a significant interaction between the independent variables

### 5.2 Comparison of Response to Different Screens of the App

We investigated the reported persuasion levels, after exposure to the different screens of the app, to understand if there was any difference that arises from the types of feedback, due to implementation of aversive stimuli. The present study utilizes negative reinforcement and punishment in addition to positive reinforcement to fully benefit from operant conditioning. Figure 3 illustrates the percentages of both positive and negative reactions the screens received. There is no significant difference between different screens of the app (e.g. first notification screen versus dismissed screen) in terms of the reactions they received, hence there is not enough evidence to conclude that one type of feedback resulted in higher levels of reported persuasion than the other.

### 5.3 Aesthetics Ratings

Figure 4 reports the AttrakDiff results. Despite the aesthetics manipulations, Hedonic Quality (HQ) ratings for each variant are close to each other, except for the control & low aesthetics variant, which had the only negative value. To further investigate, we looked at the word-pair ratings for each variant (Figure 5). High aesthetics variants rated higher on every item on Hedonic Quality scale except for the pairs “dull-captivating” and “unimaginative-creative”. This could be due to the interpretation of the word pairs, where for instance, some participants exposed to low aesthetics variants commented that the app was captivating and attention grabbing because of the unmatched colours.

While we found the high aesthetics variants rated higher in Attractiveness (ATT), participants still rated the low aesthetics variants neutral on the scale ( $0 \pm 0.5$ ). This indicates that our low

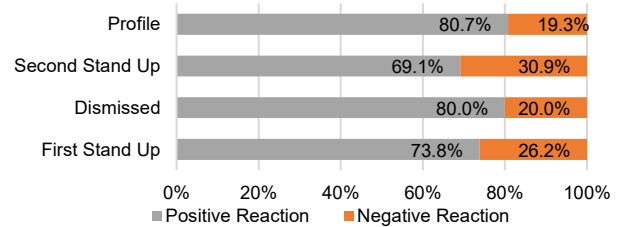


Figure 3: Reaction Percentages to Different Screens, Reported Persuasion Levels.

aesthetics variations might not have been “ugly” enough. Note that ATT inquires about how “attractive” the system is overall, not necessarily only based on aesthetics. The Pragmatic Quality (PQ) results are rated positively on the scale, supporting our goal of keeping similar usability levels across all variants.

#### 5.4 Observations and Comments

Participants commented on the app’s persuasive elements, graphic elements, and whether or not they would use the app. Six participants said they liked the guilt factor, and eight participants stated they would prefer it over other apps with just positive feedback. One participant even regretted their choice of sitting down after seeing the profile screen, and added they would like to use the app again and would follow the instructions. Some found the potato character helpful, and felt an emotional connection. One interesting comment on the character was “Will there be a graveyard of figures I killed if I keep sitting down?” This contrasted with some other interpretations: “It is just a potato at the end, there will be a new one if this one dies”. One person, exposed to the low aesthetics, said “there must be better looking alternatives” and that they would not use the app, even though it functioned.

Participants also described how one would respond in situations where standing up is not possible, such as in a class or a meeting. One person said they would stand anyway, whereas seven others said they would ignore notifications at those times.

Lastly, three participants stated that they were already more conscious about reducing sedentary behaviour. 35 participants stated they would use the app, where six stated that, although they were motivated, they were unsure about long-term usage. Participants also reported anticipating the second notification and one stated they were “racing” the app to finish reading before the notification appeared again. Two participants found the app to be useless, and added, “My body would tell me when to stand up”.

### 6 DISCUSSION

Overall, Couch’s persuasive variants were successful in persuading its users; motivating and informing them to reduce sedentary behaviour. Participants of persuasive variants reported significantly higher levels of persuasion than the control variants, and noted the persuasive effects in different ways, confirming H1. On the other hand, aesthetics did not influence the persuasiveness of the app as expected, and we reject H2. We discuss these findings and their implications, in addition to limitations of the study.

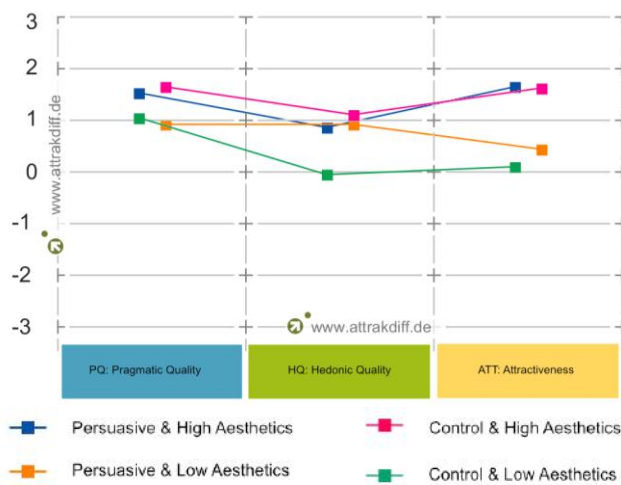


Figure 4: AttrakDiff results: averages of pragmatic quality, hedonic quality and attractiveness.

### 6.1 Persuasion and Aversive Stimuli

Our results show that Couch successfully utilized our chosen persuasive design elements. While the control condition did utilize some persuasive elements, such as reminders, to keep the features and the structure of the app same, it did not include the other persuasive elements such as potato character and operant conditioning. Participants of that group were significantly less persuaded than the persuasive group.

Including aversive stimuli appeared to increase persuasion, as stated by participant comments, such as “I feel obligated to stand up because of the warning” and “I feel encouraged to stand up, Potato is counting on me”. Specifically, participants felt motivated by their emotional connection with the potato character, saying “this potato wants me to stand up, I am not just disappointing myself but someone else too”. Participants appreciated being able to see both aversive stimuli and positive feedback; that it was better than seeing a constantly positive status. Contrast in stimuli appears to have created a stronger emotional connection, resulting in comments such as “I liked the way screens build the sense of urgency” and “a worse status made me more invested, because of my own laziness, I killed something else”.

This finding underlines the impact of using social roles, like that of a friend. Participants had an emotional connection, felt responsible for their actions, and wanted to “save the potato” by standing up. The potato character appeared to help overcome the “I do not like being told what to do” attitude, 8 participants showed/mentioned in the control group; in the persuasive group, they felt like they were helping someone else rather than doing it because the app told them to do so. Considering the lack of roles other than authority in the PSD Framework, this finding shows the importance of investigating the effects of alternative roles in persuasion. Reflecting on the work of Orji et al. [42], it would be interesting to further evaluate the persuasion in this work given the user’s personality.

Lastly, eight out of 48 participants felt interrupted when they received notifications while still reading. This is in line with Fogg’s suggestion that persuasive technology should intervene at the right moment, but it may not always be easy to detect and act on that moment. Interruptions might cause people to make errors and disrupt from making good decisions [33,34]. However, this is beyond the scope of this study.

### 6.2 Influence of Aesthetics

Results from the AttrakDiff survey showed that our manipulation of aesthetic levels did not have an influence on reported persuasion.

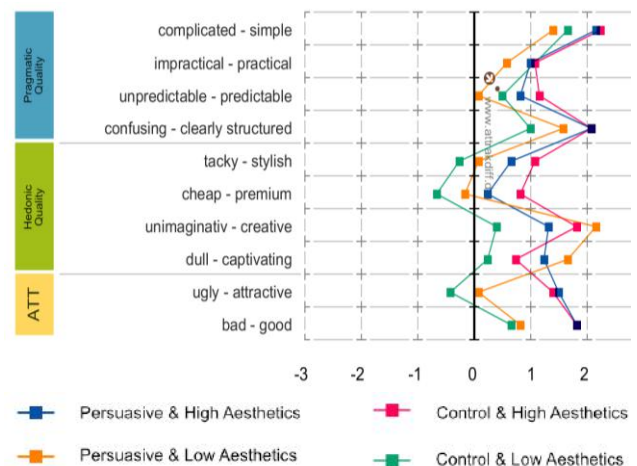


Figure 5: AttrakDiff results: word-pair results.

This is an interesting result especially considering that aesthetics is a principle in both Functional Triad and the PSD Framework. However, further work is required to investigate if this still holds with larger differences in level of aesthetics.

When considering both the survey results and comments from participants, it is possible to argue that the app needs a minimum level of aesthetics to be usable. Expression of desire to look for an alternative or to change the design of the app might be indicative of this minimum expectation, which would then determine the success of any persuasion attempt; without adequate level of aesthetics, people may not start using the app, even before being exposed to any persuasive element of the app. This would require verification through future investigation and would help clarify the role of aesthetics in persuasive systems.

### 6.3 Limitations

This short-term study only evaluates reported one persuasion level, which means the results may not generalize to other settings. A long-term study on the effectiveness of the app and persuasive principles utilized is needed to confirm the results. We used participants' reactions as a measure of understanding how persuaded they felt, this is not a standardized approach. Our qualitative approach, sampling throughout the experiment, allowed us to capture great detail and insight, however, it makes comparison to other works difficult. We acknowledge our small sample size of twelve participants per condition; more participants would perhaps provide more accurate, generalizable results. More importantly, we did not evaluate the perceived visual appeal of the aesthetics variants beforehand to ensure that our application of in gestalt principles, colour combinations and font styles provided sufficiently different. This might have revealed the smaller differences between the two levels and allowed us to increase them for a better comparison.

### 7 CONCLUSION

The aim of this research is to evaluate the effects of aesthetics on the persuasiveness of a mobile system when it includes operant conditioning. Our app, Couch, encourages people to decrease prolonged sitting. We found that persuasive principles, implementing both positive and negative feedback, are indeed successful and participants in the persuasive group felt more motivated and persuaded to stand up. However, aesthetics did not significantly affect the persuasiveness of the app. This paper contributed the first study to look at the influence of aesthetics on persuasion in the context of a mobile app. We note that we evaluated a single persuasion level hence our results may not generalize to other settings. Nevertheless, our findings can inform the design of other persuasive systems in the domain of physical activity, though more research is necessary to validate maintained persuasion over time, and behaviour change. We suggest conducting a field trial in which participants use the application over time in their everyday setting and further explore different elements of the stimuli as suggested by the authors. It would also be beneficial to reproducing this study with greater differences between the two aesthetics levels and with a larger sample size to validate the long-term effects of persuasion and aesthetics on behaviour.

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