Behaviour & Information Technology

ISSN: (Print) (Online) Journal homepage: https://www.tandfonline.com/loi/tbit20

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To cite this article: Christof Van Nimwegen & Emiel Van Rijn (2023) Time swipes when you’re having fun: reducing perceived waiting time while making it more enjoyable, Behaviour & Information Technology, 42:3, 307-315, DOI: 10.1080/0144929X.2022.2155576

To link to this article: https://doi.org/10.1080/0144929X.2022.2155576

Published online: 30 Dec 2022.

BEHAVIOUR & INFORMATION TECHNOLOGY
2023, VOL. 42, NO. 3, 307–315
https://doi.org/10.1080/0144929X.2022.2155576

Time swipes when you're having fun: reducing perceived waiting time while making it more enjoyable

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ABSTRACT
Waiting for a system to respond always will be a factor in human–computer interaction. This is deployed by spinners, progress bars, skeleton-screens and other means. This project studies experiencing longer waits along the lines of 'no activity' (progress bar), 'passive waiting' (reading) and 'active waiting' (doing something). For the latter, a novel method is introduced: users actively swipe an image after which it disappears and the content underneath will unveil, as if it were a scratch card. A between-subjects experiment (n = 410) was conducted using a mobile website in 3 conditions to gauge the effects on estimated waiting time and enjoyment. The 'no activity' and 'active waiting' conditions were estimated faster than the 'passive waiting' condition. The 'passive' and 'active' waiting conditions were significantly more enjoyable than the 'no activity' condition. When combining waiting time estimation (shorter is preferable) and enjoyment (higher is preferable) the 'active waiting' condition yielded better results.

ARTICLE HISTORY
Received 13 August 2022
Accepted 29 November 2022

KEYWORDS
Time experience; enjoyment; active waiting; passive waiting; progress indicators; swiping

1. Introduction

Humans are terrible at estimating time. When we have fun, time seems to fly while fewer favourable moments seem to take ages, and so does waiting. Waiting time during artefact use, whether it is using a phone, an ATM-teller, a website or a software installation process: waiting is often experienced as annoying. A question then is how waiting time can be more enjoyable or even be utilised in a *positive way*. In the waiting room of the doctor mostly people are quiet, and one can do several things, among which 'nothing at all', 'reading' or 'doing something' (such as working on a laptop, or in the case of children playing, e.g. Lego or toys that are provided for them).

In an HCI context, although we clearly live in times where the bandwidth for data is huge compared to earlier times, when on the go a complex query, such as with a plane-ticket brokerage site or loading a credit card statement can still easily take up to 15–20 seconds. This research project investigates the concept of waiting in HCI, but specifically in an *on-the-go touch*/swipe-situation, e.g. with a phone or a tablet. Firstly, relevant theories from psychology, concerning the experience of time and time estimation, in general, were reviewed, after which the experience of time in HCI is discussed. Some interventions to improve the user experience during waiting periods were evaluated in an online experiment in 3 waiting conditions: 'no activity' (do nothing), 'passive waiting' (read a text)' and 'active waiting' (do something, swipe an image). This last condition is operationalised by a novel (to our knowledge) waiting strategy interaction: participants perform an interactive activity by swiping their finger over a photo on the screen to reveal a piece of information.

It showed that the 'no activity' and 'active waiting' conditions were estimated *faster* than the 'passive waiting' condition. The 'passive' and 'active' waiting conditions were significantly more *enjoyable* than the 'no activity' condition. When combining waiting time estimation and enjoyment, the 'active waiting' condition yielded better results.

2. Related work

2.1. Experiencing time

One way to look at how humans experience and estimate time, in general, is to distinguish between prospective or retrospective time duration estimation. In the prospective paradigm, the time an event will take is to be estimated beforehand, or at least a person is made aware that the event will involve timing. In the retrospective paradigm, one is not made aware of timing and only gets to know about this after the event has occurred.

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2.1.1. Attentional gate model (AGM)

The AGM (Daniel and Block 1997) explains the cognitive process of time estimation through several components and is specifically relevant to the prospective paradigm. There is the *pacemaker* which acts like a natural ticker and pulses indefinitely. In regular situations, these pulses are blocked by the *gate*. This gate 'opens' when attention is directed towards time, allowing the pulses to pass: the cognitive counter does its job accumulating the pulses while attention is directed towards time and keeps track of the pulses in the working memory. When an end signal is given the gate closes, and the accumulated pulses are sent to the reference memory. Then, when one estimates the time the event took, a cognitive comparison is made between the accumulated pulse total in working memory and 'labels' that have previously been stored in memory for similar events. In the retrospective paradigm when time is estimated *after* the event and a person is *not* aware of the involvement of timing during the event, pulses are *not* collected; when estimating time afterwards one will do so by accumulating the estimations of the time of these events. Then there is Vierordt's Law, stating that retrospectively, shorter time intervals are generally overestimated, while longer intervals are underestimated (Gibbon 1977). Specifically in HCI, short intervals are typically those less than 2 seconds and longer intervals are more than 4 seconds. Between these thresholds users estimate time quite accurately (Liikkanen and Gómez 2013).

2.1.2. Theory of flow

When a person engages in a highly challenging task while this person's skill to perform this task is equally high, this person can experience a *state of flow*. One of the factors of experiencing flow is 'a distortion of temporal experience, or in other words, one's subjective experience of time is altered'. This experience can be directly related to the AGM because an important factor of flow is 'an intense and focused concentration on the present moment' (Jeanne and Csikszentmihalyi 2001). As this concentration on the task at hand takes up (nearly) all attention, not much attention is left for temporal cues (Daniel and Block 1997), thus one can lose the sense of time, mostly seen as a good thing since it indicates a full commitment to a task.

2.2. Experiencing time, waiting and feedback in HCI

Liikkanen and Gómez (2013) *introduced* two concepts for the relation between response times and episodic user experience: subjective response time (SRT), which is the perception of system responsiveness, e.g. 'system is too slow', and subjectively experienced time (SXT), the assessment of system response timeliness based on time estimation, past experiences and information from the environment. These two concepts seem closely related to the constructs proposed by Hui and Tse (1996) associated with waiting evaluation: perceived waiting duration, affective response to the wait and acceptability of the wait, where subjectively experienced time represents the latter two.

2.2.1. System response thresholds in HCI

Different types of tasks involve different expectations regarding system response times, thus several thresholds exist. (Nielsen 1994) proposes to indicate to the user that the system is busy when a delay longer than 1 second is expected. In addition, delays longer than 10 seconds should have a 'percentage-done indicator' and a way for the user to interrupt the operation. Lallemand and Gronier (2012) also found 10 seconds in their results as the average reasonableness of the wait to be under-average after this threshold. Building further on this delay of 10 seconds, Hong and Lockwood (2011) found through an eye-tracking study that providing feedback on a 10-second delay led to a higher acceptability of this delay than providing no feedback. Seow (2008) states that tolerances roughly equate to 100–200 milliseconds for instantaneous tasks (press key on keyboard and character appearing on the screen), 0.5–1.0 seconds for immediate tasks (easy calculations performed by computer based on the user input), 2–5 seconds for continuous tasks and 7–10 seconds for captive tasks. Shneiderman et al. (2016) propose slightly adjusted thresholds: 50–150 milliseconds for tasks that require continuous feedback (instantaneous), 1 second for simple tasks (immediate), 2–4 seconds for common tasks (continuous) and 8–12 seconds for complex tasks (captive).

2.2.2. Waiting and providing feedback

Delays can interrupt the sense of flow and reduce feelings of control and *engagement* leading to a negative feeling (Branaghan and Sanchez 2009). Therefore, multiple methods exist to enable users to cope with waiting, for example, by showing a loading screen combined with progress indicators. These loading screens resolve an important factor in usability problems: *visibility of system status* (Nielsen 1994), they provide status information and indicate progress in task performance (Sherwin 2014). There are two types of loading: loading all content up-front before interactions and loading bits of content in-between interactions. Up-front loading is mainly performed through splash screens. These screens are shown when starting an application. Inherently, a user could potentially perform another task during this loading, which would further reduce *perceived* waiting time.

2.2.3. Types of progress indicators

Two types of progress indicators are distinguished in design-guidelines by Apple (Apple Inc. 2019) and Google (Google Inc. 2016). These can be determinate and indeterminate. Determinate progress indicators indicate actual progress towards completion (e.g. progress bar), while indeterminate progress indicators only indicate the system is 'busy' (e.g. a spinner). Sherwin (2014) proposed (based on interaction thresholds proposed by Nielsen 1994) for 'instantaneous' actions (<1 second) one should *not* provide any visual feedback. When actions take longer than 1 second, but less than ten, feedback can be provided by an indeterminate progress indicator. When actions take longer than 10 seconds users should be provided with a determinate progress indication as users tend to quickly grow impatient at this duration. Other resources, however, suggest that a spinner should only be used for up to 5 seconds, as interactions with a longer duration break continuity (Shneiderman et al. 2016; Google Inc. 2016). The following progress indicators are common:

Static text – One of the simplest ways of providing an indication of the system's response is by showing a static text, e.g. 'Loading … '. However, this method shows no actual progress (Sherwin 2014).

Spinner – A spinner (Figure 1(a)) shows the user that the system is now processing the request. Showing the spinner reduces anxiety by the user as it indicates the system has not 'frozen'. However, showing a spinner for too long can result in an increase in anxiety by the user as this might indicate that the system stopped responding (Sherwin 2014).

Progress Bar – A progress bar gives information concerning progress and how much there still is to be done (Figure 1(b)). This is useful for long waits, as one can decide to keep waiting, or perform some other task and come back later. A problem with progress bars is that it is hard to determine how long the waiting will exactly take (Sherwin 2014). However, they do reduce uncertainty and anxiety about the system's status and set user expectations (thus facilitating for example, multi-tasking).

Skeleton screens – A more recent phenomenon is skeleton screens (Wroblewski 2013), essentially a blank version of a page into which information is gradually loaded (Figure 1(c)), creating the sense that things are happening immediately. The focus is on the *content* being loaded, not the fact *that it's loading*. An exploratory study by Mejtoft (Mejtoft, Långström, and Söderström 2018) and test results on skeleton screens by Bill (2018) suggest that skeleton screens are perceived faster and are easier to navigate. One of the design recommendations by Liikkanen and Gómez (2013) is to prioritise the loading order of elements so users can create a mental model of the page's structure and can already interact with some elements, while other elements are still loading ('progressive loading').

2.3. Improving the user's experience of time

2.3.1. Decreasing the system's response time

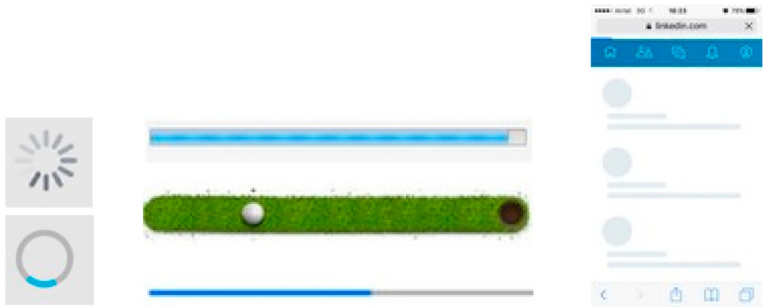
The most obvious way to make waiting less annoying is by making users wait for less. Different software engineering practices have been developed for optimising code (Seow 2008), but such activities cost time and money and users might not even notice improvements. When decreasing system response time is not feasible, another option is to *make users feel they waited less* by decreasing the *perceived* waiting time. Several studies have been conducted on decreasing perceived waiting time. This can be done by providing additional information about the wait, enhancing the loading screens and progress indicators with animations and aesthetics or by distraction.

2.3.2. Additional information

Additional feedback helps users adjust to the delay. If users can make sense of the delay, the subjectively experienced time changes, which influences the emotional experience (Liikkanen and Gómez 2013). To help understand the delay, feedback about why the user is waiting and for how long should be communicated promptly when the system's response time exceeds the user's threshold. Especially feedback about the time remaining is important. Lallemand and Gronier (2012) found a significant link between the amount of informational feedback during loading and wait time estimations, where more informational feedback led to participants estimating the waiting time as being longer.

2.3.3. Animation and aesthetics

Söderström, Bååth, and Mejtoft (2018) found that the waiting time for looped animations (spinners) is perceived as shorter with a higher animation speed. Harrison et al. (2007) found that progress bars filled by a fast power function (slow in the beginning and fast at the end) are preferred. Branaghan and Sanchez (2009) showed that for 15 and 30 seconds, users preferred a progress bar (determinate, motion) over sequentially moving dots (indeterminate, motion) and preferred dots over a static display (indeterminate, no motion).



(a) Spinners (b) Three different progress bars (c) Skeleton screen

Figure 1. Different methods deployed when users have to wait.

Bill (2018) suggests that a skeleton screen, enhanced with animation, will further decrease perceived waiting time, especially a slow, left to right, wave animation. Also, aesthetics can play a role. In a study by Chien-Hsiung and Sasha (2020) a progress indicator featuring an 'attractive cartoon' (such as the second progress bar in Figure 1(b)) lowered perceived waiting time, progress indication with a cartoon was also preferred (65%) over a progress bar and a spinner.

2.3.4. Distraction

Another way to influence time perception is by making use of the interference effect. Here a non-temporal task competes for attentional resources with a temporal task, thus distorting timekeeping (Brown 1997). This is also supported by Daniel and Block (1997) who state that to reduce duration estimates, arousal should be reduced or attention should be taken away from the temporal information. Providing distraction, creating a waiting time 'filler' can be done from within as well as outside the context of the current task. During longer waiting times, it might be beneficial to aid users in performing another task related to the main task, or a different task. The distraction can be 'passive' or 'active'.

Passive entertainment – A positive impact of passive entertainment on a user's perceived waiting time is mainly due to attentional and affective influences (Liikkanen and Gómez 2013). A good example of this is the quotes presented during the loading of the Slack app: the user gets something to read during the waiting time, thus directing attention towards this non-temporal quote, instead of the other temporal cues presented.

Active entertainment – Hurter et al. (2012) proposed an active progress bar. Whenever a loading situation of at least 5 seconds (but generally more like twenty or more) occurs, a system would prompt users with something to read (a passive activity) or something to do (active entertainment). They also found that participants, who were presented with an idle control condition, were significantly *less* satisfied with their main task in comparison with passive and active entertainment. Hohenstein et al. (2016) showed that for a waiting time of 10 seconds an *interactive* animation is perceived faster and enjoyed more than a progress bar and a passive animation. Other examples of *active entertainment* during waiting can be found in games. One of the earliest active waiting screens was the mini-game Galaxian shown during loading the game Ridge Racer. Also in the popular game-series FIFA, players can practise their free kicks until the game has been loaded (Tapsell 2019).

2.4. Research question

The *experience* of time is influenced by many factors. What has been learnt about the experience of time, in general, within psychology is at the heart of user experience during waiting. Waiting for less than a second is generally not perceived as waiting, waiting for 1–5 seconds can be managed by a spinner. For waiting longer than 5 seconds but less than ten, a progress bar will do the job. For longer than 10 seconds, it is not so clear. It showed that the user experience of waiting can be improved by providing more elaborate feedback and enhancing progress indicators, e.g. through animations and visuals. Another option is distracting the user by providing a passive or active task during the wait. Most existing studies focus on a classical set-up (on a computer) while most internet traffic flows through mobile devices (Statista 2021). The interactions with mobile devices occur mainly through touching and swiping. It is *exactly* the phenomenon of *touching and swiping* (regarded as doing something active) that we incorporate in our study as 'active waiting'. Different aspects of experiencing (longer) waiting are taken into consideration, see 3.1.2. The question we will attempt to answer here is

> With longer waits on mobile devices, is there a difference between how waiting is experienced between different waiting strategies (no activity, passive waiting or active waiting)?

3. Method

To answer the research question an experiment was designed focused on using mobile phones. A mobile website in the style of the National Railways was created where one can book a train journey using their smartphone (see Figure 2(a)).

3.1. Experimental design – variables

The experiment is a between-subjects experiment. The independent variable 'waiting strategy' has three conditions: *no activity*, *passive waiting* and *active waiting* (see the next section). Querying online sources, and combining and comparing them is generally seen as a complex task that can take time. The tasks to be performed are such that subjects understand it takes time to act. According to Nielsen (1994) a long delay (>10 seconds) would cause the user to lose interest and possibly perform another task in the meantime.

3.1.1. Independent variable: waiting strategy (3 conditions)

(1) *No activity* – For this (control) condition (see Figure 2(b)) the most common form of progress indication was picked: a progress bar. In addition, a simple informational feedback text was displayed (translated) 'While we search … '.
(2) *Passive waiting* – For the passive waiting condition (see Figure 2(c)) participants were presented with a text consisting of interesting facts about the destination. Reading a text can be seen as a temporary task with a relatively low cognitive load. This text was approximately 44 words and as an average person reads about four words per second; reading the text takes about 11 seconds. The total waiting time was set at 12 seconds.
(3) *Active Waiting* – In the active waiting condition (Figure 2(d)) participants perform an interactive activity: scratching a photo by swiping their finger over the screen to reveal a fact about the city. Because of the switching between sub-tasks (reading the instructions, scratching the photo and reading the fact), this waiting activity might be more distracting (entertaining, duration *seeming* shorter) than the other two conditions.

3.1.2. Dependent variables

To measure the waiting experience participants answered three questions:

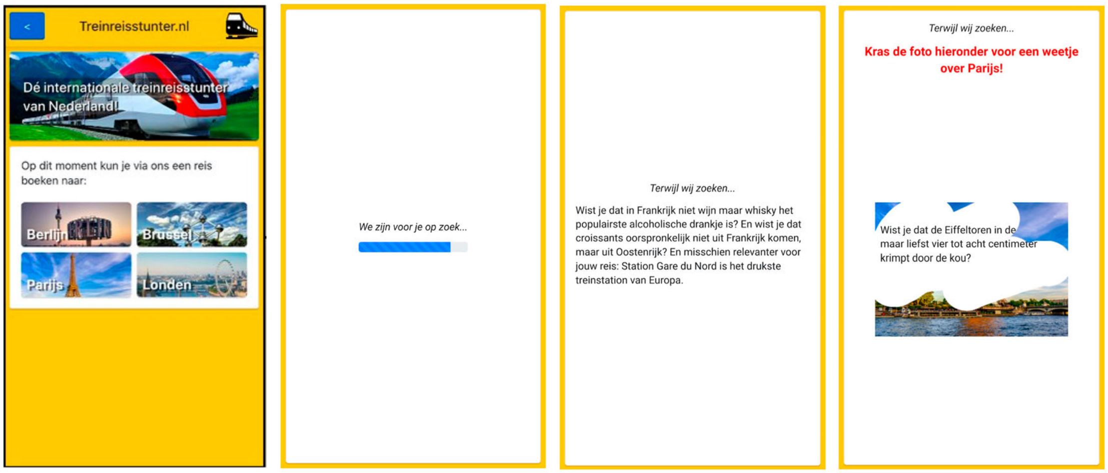
- **Perceived waiting time** (feeling) – *What do you think of the duration of the waiting?* A 7-point Likert scale ranging from 'very long' to 'very short' is used.
- **Estimated waiting time** (seconds) – *How many seconds do you think you have waited?* Participants saw a grid with values one to twenty where they had to select a number.
- **Enjoyment** (feeling) – *What do you think of waiting in general?* A 7-point Likert scale ranging from 'very boring' to 'very entertaining' was used to determine the user's affective response to the waiting experience.

3.2. Material and task

The website was a single-page (web)app for mobile browsers developed with HTML5, CSS3 & JS. The prototype was built in React, and Using MongoDB Stitch ('serverless' platform) data was pushed to a MongoDB Atlas NoSQL database. For the *active waiting* condition an open-source JavaScript package react-scratchcard was utilised. Several styles were adjusted to be more consistent with the existing design of applications of the National Railways to provide some feeling of similarity. Participants went through a total of 11 'pages' of the mobile website after entering the experiment. They were not made aware of the goal of the experiment to simulate a real situation, which makes it a retrospective timing experiment where participants were made aware of the time estimation goal after exposure. The task was as follows.

3.3. Participants and procedure

A total of 410 participants were recruited via WhatsApp, Facebook, Instagram and email. They received an invitation to follow a link (on their mobile device) to the experiment. To keep the participation threshold extremely low, the only personal information asked was their current status. This means we do not know their exact ages, but by approximation. The options were 'secondary scholar', 'university student' or 'employed/unemployed'. In the Netherlands, these categories respectively roughly equal ages '13-18', '19-24' and '24+'. 192 (46.8%) were secondary scholars (aged 13-18), 136 (33.2%) were



(a) Travel website (b) No activity (c) Passive waiting (d) Active waiting

Figure 2. The mobile website (a) and the three conditions in the experiment (b, c and d).

university students (aged 19-24) and 82 (20%) were employed/unemployed (aged 24+). They performed the experiment in their own environment: anywhere they like. Participants were divided into three conditions: No activity n = 134, Passive waiting n = 142 and Active waiting, n = 134. Their task was to book a trip by train to a certain city in Europe. Afterwards participants filled out a questionnaire, see step 9 in Table 1.

4. Results

To be able to answer our research question, three dependent variables were used: Perceived waiting time (feeling) Estimated waiting time (estimate in seconds) and Enjoyment (feeling) as experienced.

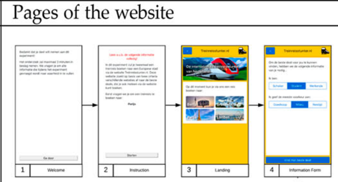
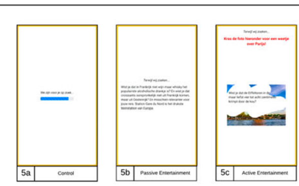
4.1. Perceived waiting time

There was no significant difference between the scores on Perceived waiting time between the 3 conditions when estimated with a 7-point Likert scale (very slow) to (very fast), $F(2,407) = 1.79$, $p = .17$). As shown in Figure 3 (dark blue bars), Perceived waiting time in the No activity condition (M = 4.82, SD = 1.59) is very close to that of the Active waiting condition (M = 4.87, SD = 1.51) and Passive waiting condition (M = 4.54, SD = 1.61).

4.2. Estimated waiting time

There was a significant effect of condition on the Estimated waiting time (in seconds) ($F(2,407) = 25.72$,

Table 1. Separate steps in the participants' task.

Separate steps in the participants' task	Pages of the website
(1) participants entered experiment at this welcome page (2) instructions for the task (e.g. book trip to Paris), click next (3) the website's landing page: choose between four different cities (4) after choosing city some personal information had to be entered. Clicking "Find best deal" brings participants to wait screen	
(5) after screen 4 participants were directed to *one* of the 3 "waiting pages" as the system fictionally searched the best deals in these three pages the different waiting strategies are operationalized, they form ***the three conditions*** as explained in Fig. 2d, 2c and 2b.	
(6) after the wait participants choose one of three train ticket offers (7) here the chosen offer must be confirmed (8) payment page (dis-functional): participants skip to questionnaire (9) questionnaire: rating time experiences and enjoyment (10) this was a page where participants could leave comments (11) final screen: participants were thanked for their participation	

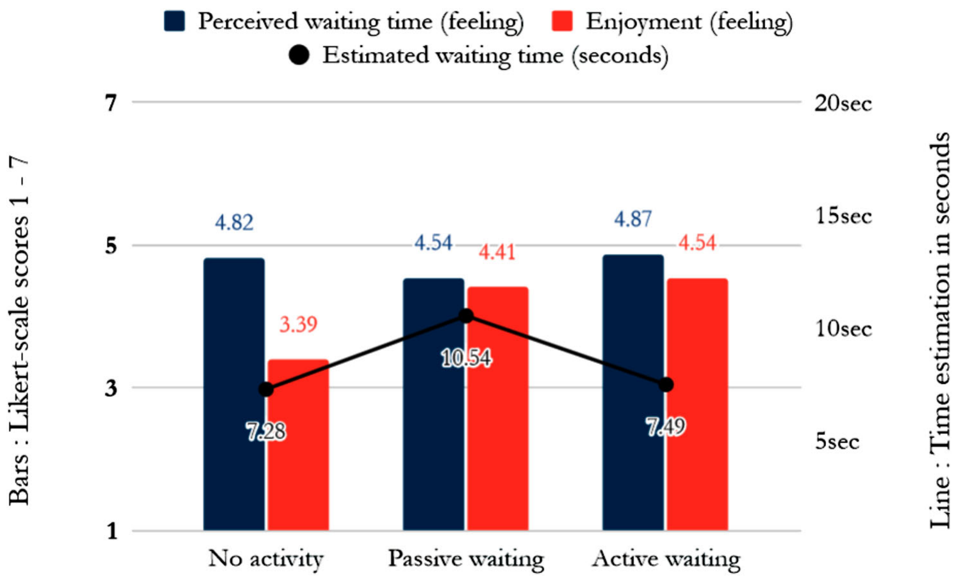


Figure 3. Scores on perceived waiting time, estimated waiting time and enjoyment per condition.

$p < .001$). A post-hoc Tukey test showed that in the Passive waiting condition (M = 10.54, SD = 3.90) this duration was estimated significantly longer than in the No activity condition (M = 7.65, SD = 4.01) *and* the Active waiting condition (M = 7.67, SD = 3.65). Time was estimated equally in the No activity condition and the Active waiting condition (black line, Figure 3).

4.3. Enjoyment

There was a significant effect of the waiting condition on scores on enjoyment of the waiting activity ($F(2,407) = 29.20$, $p < .001$) as measured through a 7-point Likert scale (very boring to very entertaining). A post-hoc Tukey test showed that the No activity condition (M = 3.39, SD = 1.96) was perceived significantly less enjoyable than the passive condition (M = 4.41, SD = 1.39) *and* active condition (M = 4.54, SD = 1.30). The passive condition and the active condition were both perceived roughly equally enjoyable (red bars in Figure 3).

5. Discussion

The independent variable in this study was the *deployed waiting* strategy users had to indulge. There were three conditions (versions of a mobile website): *no activity* (progress bar), passive waiting (reading text) and active waiting (doing something). The dependent variables were user's Perceived waiting time (the feeling, very short to very long), the Estimated waiting time (in seconds) and Enjoyment (affective response in terms of boring to entertaining).

The variable 'Perceived waiting time', expressed with adjectives and reflecting a feeling, was scored equally across conditions. In reality, the wait also *was* the same in all three conditions, so in a way the participants were right. Perhaps the 7-point Likert scale was too restrictive to enable participants to express their time perception accurately enough, there are indications that the *preference* of respondents themselves is a 10-item likert scale (Carolyn and Colman 2020). Perhaps this preference could have led to higher accuracy.

However, it showed that when participants are asked to express the waiting experience (Estimated waiting time) in measurable units such as in this case 'seconds' the story is different. The Passive condition was estimated longer than the No activity and Active waiting conditions. One explanation could be the fact that the Passive condition lead participants to think this condition must have taken a long time as they read this text in the meantime and did nothing else. In the Active waiting condition participants were kept busy doing different things. In the No activity condition, we actually do not know what participants did during the wait since there was no instruction, only the well-known progress indicator. Participants could have stared at the progress indicator, perhaps focusing on its animation, and also other things, such as checking their mail in the meanwhile (deciding how to spend the wait). In addition, the Passive condition was the only condition where visible cues were static. In the No activity condition the progress bar was animated and changed appearance over time, and in the Active waiting condition participants switched tasks three times (from reading swipe-instruction text to scratching the photo to reading the unveiled fact). Perhaps the earlier mentioned animation (which the progress bar contained) might have caused rather short time estimates as proposed by Bill (2018), at least shorter than in the Passive waiting condition. Concluding, apparently the act of sitting back and just read a presented text is estimated taking longer (seconds) than the Active waiting condition and the No activity condition.

Concerning Enjoyment, the fact that when users had 'something to do', be it passively reading a text, or actively scratching a photo to reveal something, lead to higher Enjoyment of the waiting time, higher than when watching (or not) a progress bar. But we can also see that when combining this with the scores on Perceived waiting time and Estimated waiting time it seems that a higher Enjoyment does not necessarily mean a shorter experience of the waiting.

6. Conclusion

If the objective is to have users experience time going faster, the Passive waiting condition, which consisted of participants just reading a piece of text, is perhaps not the way to go. The fact that Active waiting yielded lower time estimations (regarded as desirable) than the Passive waiting condition does not come as a surprise. However, the fact that Active, Christof van Nimwegen and Emiel van Rijn waiting time in seconds was the same as in the No activity condition, is peculiar. The results on the measurements Estimated waiting time and Enjoyment are influenced by our dependent variable: deployed waiting strategy (our 3 conditions). In any case, the Active waiting condition scores equally well with or higher than the other conditions.

Probably the most important conclusion of this experiment was that when having to make a user wait for longer durations during a task performed on a mobile device, using either a progress bar that is animated, or providing the user with some active entertainment during this time will be sufficient when looking purely at waiting time estimation. However, when also taking into account the user's enjoyment during the waiting duration, providing a real activity during waiting time is significantly more enjoyable than presenting a progress bar. Therefore, when having to make the user wait around 12 seconds or more, giving the user something to actively interact with in the meantime seems a good idea.

Reviewing the current literature and combining them with the results of this experiment, user experience designers can be provided with some guidelines of when to use which progress indicator and how to enhance these to make the waiting experience of users a lot less sufferable in several ways.

In this experiment, a novel (to our knowledge) waiting strategy is introduced. For certain situations, this looks quite promising. In the active waiting situation, with the digital scratch card users perform the activity and read. It is, of course, true that the material we chose (a ticket booking website), lends itself well for presenting fun, trivia or interesting facts about the very city you intend to go. What we do not know, is whether this keeps being enjoyable or experienced as quickly passing. Again, the earlier mentioned fact that we actually do not know what participants did during the 'passive wait' is a limitation. It is true that time was perceived longer, but is this always a bad thing? Perhaps in terms of cognitive load it would show that a 'break' of that type is a good thing, or perhaps it simply gives way to other forms of contemplation, or perhaps this break is good to take a sip of coffee?. Resuming, the remote set-up we used only using a mobile phone did not allow us to collect more information than we did, in a follow-up study it would clearly be interesting to know more about the context and other tasks/activities that take place during interaction. Finally, the scratching activity itself can be seen as a form of gamification of waiting durations. It could be interesting to see if small (potentially unrelated) mini-games would have a similar effect on a user's waiting experience.

Lastly, because of the touch/swipe paradigm we chose for a mobile context. This paradigm might also have fertile ground also in non-mobile situations, be it that the 'swiping' as such, is not standard on e.g. laptops/pcs. An alternative for scratching a card seems far fetched here and poses an interesting challenge. In further research we will focus on translating the innocent joy of unveiling a piece of interesting information by swiping, to other situations such as a mouse, or why not, voice interfaces or gesture input. Regarding the latter, it would be interesting to see whether it is possible to come up with comparable waiting strategies in other types of interaction; currently enormous strides are being made with Virtual/Augmented Reality. On laptops/pcs, 'natural' swiping is not the standard, but in immersive environments, the virtual scratch cards could be interesting since gestures and touch are central to these environments.

Disclosure statement

No potential conflict of interest was reported by the author(s).

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