User Experience of Loading Design: the Influence of Different Presentation Duration and Type on Time Perception

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Abstract. This study simulates the situation that users are required to wait when they encounter a buffer when watching online video, and investigates the influence of the duration and type of loading on time perception. The task was to estimate the perceived loading time. Results (1) the accuracy of time perception decreased with the time of loading. (2) the type of loading is related to time perception. The larger the amount of information contained in loading, the shorter the time perception of viewing video. (3) there is interaction between the duration of loading presentation and the type of loading. The results show that the amount of information and waiting time are related to time perception.

1. Introduction
Waiting is just an inevitable thing in people's daily life. Research on time waiting has been a subject in cognitive psychology, social psychology, and even consumer psychology. A key factor affecting user experience - waiting time, is often difficult to change in length. Meanwhile, waiting will make the customer's scorch dry mood develop. With the prolongation of waiting time, the scorch dry mood will intensify, making the waiting appear longer. When the actual waiting time cannot be reduced, how to improve the user experience becomes one of the important problems in waiting research. When users wait, by enriching their waiting time, they can increase the user's cognitive activities and offset a certain amount of negative effects of delay. There are many successful examples of this approach, such as the hotel providing chess and card entertainment and snacks to keep customers; waiting for the phone to be connected to play music to divert attention.

Studies on time span estimation in psychology show that time span estimation can be explained by the memory model, event structure model and piecewise synthesis model (Yang Zhen, 2006). The common point of the three models is that they all emphasize people's memory (or previous experience) for the prediction of time distance estimation, that is, people's "expectation" of time distance. People's positive or negative feelings of waiting are formed after comparing with their own expectations. In addition, an individual's cognition of time depends on a variety of factors, mainly including the length of time, interval, sequence, the time when the stimulus appears, as well as the individual's cognitive factors and personality characteristics (Huang Xiting, 1993).

In addition, people's attention level is also a factor affecting the estimation of time distance. The higher the attention level is, the more accurate the estimation of time distance is. In other words, if people are successfully distracted, then they are more difficult to detect the length of waiting time.
(Zou Zhiling & Huang Xiting, 2007). At the same time, meaningful things can attract people's attention more quickly (Thomas & weaver, 1975). It can be said that the more information a thing contains, the more attention it can attract.

Combined with the above theoretical point of view, under the premise of controlling the previous cognitive experience and waiting interval, this study simulated the real situation of watching online video buffer waiting, and studied the influence of the length of loading presentation and the amount of information contained in loading on the time perception of the subjects.

2. Experiment

2.1. Research methods

2.1.1 Selection of subjects
138 undergraduates volunteered to participate in the experiment, including 55 boys and 83 girls, aged 18-23. All subjects have normal vision or corrected vision and normal hearing. After the test, appropriate compensation shall be given.

2.1.2 Experimental design
Control variables: laboratory lighting, temperature, sound insulation effect.

The experiment was designed in groups of 3 (stimulus type: loading mode box, picture, video) × 4 (presentation time: 5S, 15s, 30s, 60s). The independent variables were all internal factors. The dependent variable is time perception.

2.1.3 Test materials
The instrument is a computer, equipped with headphones, keyboard and mouse. The display of stimulus display is 17 inch LCD, the screen color temperature is 6500k, the resolution is 1440 × 900, and the refresh frequency is 60Hz.

Stimulation is 15 loading materials (3 exercise stimuli and 12 formal stimuli), and can be divided into three categories according to the information volume: loading mode box (loading animation), picture (advertising picture), video (advertising video). Two background videos, the training background video is CCTV weather forecast (1min42s) on March 17, 2013, and the official experimental background video is the movie "emperor penguin diary" (7min04s).

2.2. Experimental procedures
The experimental program was compiled by e-prime2.0 software, and the test was about 40cm away from the computer screen.

The subjects entered the laboratory and sat in the designated position, and each seat would have numbered paper for the experiment record. The distance between the subjects and the computer screen is 50cm. After the guidance is displayed on the display, the practice begins. The subjects need to estimate the waiting time of subjective perception after each load disappears (unit s, which can be accurate to two decimal places), and record it in the designated position of the experimental paper. At the end of the exercise, the guide appears.

Formal experiment is similar to practice stage. According to the number of loading time levels, four modules are divided, each of which presents three levels of loading. The background video is a documentary film "emperor penguin diary". The subjects were asked to estimate the waiting time perception after reading each load and fill in the paper for the experiment. In order to prevent fatigue and series effects, the experimental sequence of loading mode frame loading, picture loading and video loading was balanced among the subjects in 5S, 15s, 30s and 60s.
3. Result

3.1. Descriptive statistical analysis

Descriptive statistical analysis of the data. The data show that the average time perception of the subjects increases with the increase of the duration of loading. There are some differences in the time perception of different types of loading, which needs further analysis of variance. (see Table 1)

Table 1. The results of time perception under different loading duration and types.

|                | n  | M     | SD  |
|----------------|----|-------|-----|
| 5000ms picture | 121| 4609  | 2182|
| 5000ms video   | 121| 5082  | 2901|
| 5000ms modal box | 121| 4684  | 3747|
| 15000ms modal box | 121| 12488 | 5524|
| 15000ms video  | 121| 11917 | 4781|
| 15000ms picture | 121| 11306 | 4274|
| 30000ms picture | 121| 23521 | 8608|
| 30000ms modal box | 121| 23337 | 9355|
| 30000ms video  | 121| 20941 | 7426|
| 60000ms video  | 121| 41058 | 16668|
| 60000ms picture | 121| 45504 | 18739|
| 60000ms modal box | 121| 47040 | 20130|

3.2. The main effect of loading time

The results showed that the main effect of loading duration was significant, $f = 602.12$, $P < 0.01$; the time perception of loading waiting increased with the increase of loading duration.

From the average, the average time perception of the three types of subjects was 4.79s, 11.91s for 15s, 22.6s for 30s and 44.53 for 60s when they presented 5S loading. The time perception of the three types of subjects was longer than that of the actual loading, and the difference increased with the increase of the presenting time.

3.3. Main effect of loading type

The results of ANOVA showed that the main effect of loading type was significant, $f = 4.00$, $P < 0.05$; the time perception of video type was the shortest, and the time perception of loading mode box and picture type was longer.

3.4. Interaction between duration and type of presentation

The interaction between loading duration and loading type was significant ($F = 10.04$, $P < 0.01$). It shows that the rendering time of loading is affected by the loading type, and the loading type is also affected by the loading time. Further simple effect test showed that at 5s level, the simple effect of loading type was not significant, $f = 1.99$, $P = 0.14$; at 15s level, the simple effect of loading type was significant, $f = 3.50$, $P = 0.03$; at 30s level, the simple effect of loading type was significant, $f = 8.39$, $P < 0.01$; At the 60s level, the simple effect of loading type was also significant, $f = 9.71$, $P < 0.01$. These results show that the effect of loading type is affected by the duration of loading. Compared with the short-term condition, the effect of long-term condition is greater.

In short time, there was no significant difference in time perception between loading types, while in long time, video perception was significantly lower than the other two types.

4. Discuss

The study compares the effects of loading presentation time and loading type on time perception. It is found that load shows time duration and load type have significant effect on time perception, and load shows significant interaction with load type, which is consistent with experimental hypothesis.
According to d.kahneman's central capacity theory (tombu & jolic ur, 2003), the cognitive resources consumed by the subjects with the increase of information will also increase correspondingly, and the cognitive allocation of time-span perception will be reduced, which will have an impact (gopher & Navon, 1980). The load information in video form is large and the cognitive resources are large. Therefore, the longer the load is, the longer the time perception is, which is consistent with the research of Yang Zhen (2006) and Wang Enlai, Zhang Kan (1999). This shows that the less time information the brain processes, the shorter the perceived time span. The results show that loading is longer and the accuracy of time perception is decreased. It is found that the time interval estimation in different periods may have different processing mechanisms, and the results of the ratio fraction (time interval estimation / target time interval) decrease with the increase of the target time span.

The results also show that the impact of loading type on time perception is different under different loading time. In short time, the difference of time perception between loading types is not significant. Under long-term conditions, video is significantly lower than other two types, the difference of types is significant, which indicates that people are more sensitive to the perception of time in the scene with less information, and the time and information amount are stored in psychological representation In touch. This is consistent with the results of the study (tombu & jolic ur, 2003).

Reviewing the experimental research, we found that there are some shortcomings. The individual time perception depends on a variety of factors. In this experiment, only two variables, the presentation time and the type of stimulation, are selected to study, which is not enough to fully understand the factors influencing time perception. In the future, more relevant variables such as time sequence, time point of stimulation and individual cognitive factors and personality characteristics will be explored more carefully and systematically. Only by understanding these variables and their interaction can we really understand the mechanism of time perception. In addition, two factors were used in the study, which may produce sequence effect in the experiment, which leads to inaccurate results.

5. Conclusion
The results of this study are as follows: (1) the accuracy of time perception decreases with the increase of the presentation time of loading.
(2) The type of loading is related to time perception. The larger the amount of information contained in loading, the shorter the time perception of watching video loading.
(3) There is interaction between loading rendering duration and loading type.

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