
Do I Care? How Losing a Living Object Triggers Empathy and Motivate Water Intake Behavior

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ABSTRACT

It is important to drink enough water every day yet many individuals tend to forget this easy task. To motivate individual water intake behavior, we present, H2O, an android-based application that

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KEYWORDS

Water intake; loss aversion; empathy; behavior change, mHealth application

incorporates the concept of loss aversion. In our 15-day field evaluation study and interviews, we aim to explore how losing living objects could trigger users' empathy and subsequently motivate their water intake behavior. Based on the collected mobile log data and interview results, we present results on user reactions to losing different living objects and their overall user experience toward the H2O application. Our findings shed light on the influence of individual preference on one's empathy towards living objects, which resulted in different water intake patterns. Finally, we conclude by discussing several considerations for future research on designing a water intake system based on the loss aversion concept.

1 INTRODUCTION

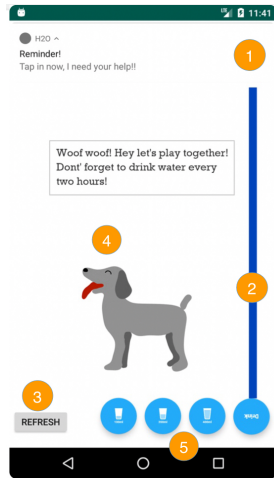
Drinking water is essential in our daily lives. In order to maintain our health, we need to consume at least 2000 ml of water every day. While it seems an easy task to do, many people tend to forget this easy task. In fact, statistics showed that more than 50% adults in countries such as United States, Germany, Australia, France did not drink enough water [1].

In the past decade, numerous studies attempted to motivate water intake behavior by using different objects such as tree and fish as a way to provide users informational feedback. However, these studies did not explain why those objects were chosen. Moreover, while previous studies have shown that water intake behavior can be motivated through different ways such as gamification [2] and social persuasion [3], none of prior studies adopt the concept of loss aversion as the design mechanism. Loss aversion refers to a situation in which the emotion of individual experience when losing something is stronger than gaining something. Many studies in the field of behavioral economics have evaluated the effectiveness of loss aversion to trigger behavior by using financial incentive but none of them used living objects as the incentive.

Based on these research gaps on loss aversion, we developed an application called H2O, which exposes users to three different types of living objects. The lives of these objects represent user's hydration status. The objects will gradually lose their health and perish as a penalty if the user does not intake sufficient water regularly. These situations then slowly invoke individual's empathy toward the object and consequently motivate them to drink more water as a mean to save the object from perishing.

By developing the H2O app, conducting a 15-day field evaluation session and interviews, we intend to examine how different objects trigger different empathy levels for different people. In the study, we focused on three types of living objects: human, animal, and plant. We argue that people's empathy to objects, which triggered by loss aversion, will affect their water intake behavior.

The contribution of this paper is two-fold. First, our study sheds light on the importance of an individual's object preference and how losing those objects might trigger one's empathy and consequently motivate the individual's water intake behavior. Second, we provide implications for future research on building an engaging water intake system.



Design Features

1 Notification

Message to remind the user to drink some water and save the object.

2 Hydration Bar

Represent a 400ml of hydration, which is our recommended water intake every two-hours. We set the hydration bar into four stages and as the level bar decrease by 35ml for every 10 minutes, the living object image will transition to its four stages of life correspondingly.

3 Refresh Button

Optionally refresh the interface with the newest data.

4 Living Objects

Showing the current condition of the objects.

5 Drink button (100ml/200ml/400ml)

The hydration bar will be added accords to which button pressed.

Figure 1: Design features of the H2O app.

2 RELATED WORK

2.1 Design for Water Intake

Most existing studies use various objects to visualize individual level of hydration to motivate water intake. For instance, Mug-Tree [4], and Playful Bottle [3] both show a withering tree to trigger water intake whereas WaterCoaster [2] uses a virtual fish to encourage users to reach the intended water intake goal. However, none of these works explained why they specifically choose those objects to show water consumption feedback.

2.2 Loss Aversion

Loss aversion is a concept commonly used in the field of behavior economics [6]. For instance, Eat and Tell [6], a dietary behavior tracking program, showed that participants were more likely to continue their self-tracking behavior in order to avoid losing the prize. The outcome from another prior study [7] trying to increase physical activity through different financial incentive mechanisms also showed similar result - losing incentives appeared to be more effective than gaining incentives. In this study, we would like to use the concept of loss aversion to motivate water intake to trigger people's empathy toward losing objects.

2.3 Empathy

Empathy has been shown to be a factor that promotes behavior change, and that individuals could show different empathy levels toward different objects. For example, [8] indicates that empathy toward different objects may differ based on various factors, such as ownership of pets or having a child. People who currently have a child had greater human-oriented empathy while others who currently own a pet were related to animal-oriented empathy. Berenguer [9] also pointed out how bird and tree created different levels of empathy, affecting people's attitudes and behaviors. Informed by these studies, we would like to examine how people's empathy develop toward different types of living objects, and how this would influence their water intake behavior.

3 THE DESIGN OF H2O

3.1 Design Rationale

Informed by the concept of loss aversion, our design aims to further investigate the relationship between one's empathy level and water intake behavior through three types of living objects (i.e., human, animal and plant). We design the objects look neutral without giving much visual details such as color to anticipate personal preferences as confounding variable. The H2O app makes the objects dehydrate gradually over time and perish if the user did not drink any water during a two-hour interval. Thus, to prevent the objects from dying, users need to give water to the objects, serving as a reminder for them to drink water for themselves at the same time. Moreover, we create four different stages for each object as a means to actively trigger user's empathy. For instance, we illustrate a cheerful boy in the first stage and a dying boy in the fourth stage for the *human* object (Figure 2). Figures 3 and 4 illustrated the *animal* and *plant* objects, respectively.

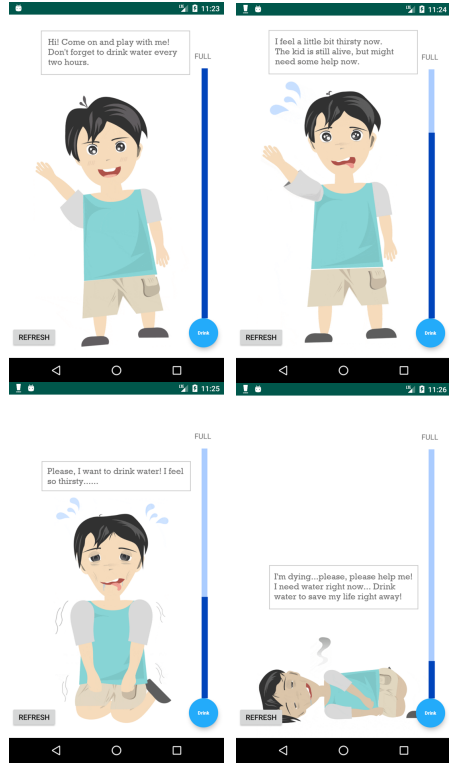


Figure 2: The four life stages of the human object (boy).

Table 1: Mobile Log Summary Statistic

Living Object	Average Water Consumption	Average Object Die
Animal	1398 mL	5.08
Human	1185 mL	5.25
Plant	1261 mL	5.44
Average	1281 mL	5.25

3.2 Technical Implementation

The H2O app is an android application. This app communicates with our Heroku server through API call. For every 10 minutes between 8am and 10pm, the server runs a background job that automatically deducts participants' hydration point. Participants will receive a notification if the hydration point is below 100. More detailed information related to technical implementation and source code can be found here: <https://github.com/bhimasta/water-app>.

4 METHODS

We conducted a 15-day field evaluation study. First, we recruited 17 participants (8 men, 9 women, mean age = 22 years old) from diverse backgrounds, including students, teachers, public servants, and corporate employees. Participants were instructed to install the H2O application on their mobile phones one day before the study, so they have a chance to familiarize with the app.

Each participant was exposed to three different living objects throughout the study - human, animal, and plant. We randomized the order of displaying the objects for each participant. For example, a participant would start by seeing a human in the app for the first five days, followed by a plant in the next five days, and an animal in the last five days.

The H2O app recorded several events into our database (mobile log data), including the amount of water taken and the times each user lost the objects. This data set was essential to distinguish which object(s) had more influence on motivating participant behavior. At the end of the study, we also invited participants for a semi-structured interview to discuss their experience.

Prior to data analysis, we did some data processing and cleaning on the mobile log data by removing outliers such those who never use the app for more than two consecutive days. As a result, we removed 4 participants from our final data analysis. We also identified suspicious repeated clicking behavior with the drink record button. Finally, we analyzed both mobile log data as well as data collected from online surveys and post-study interviews.

5 RESULTS

Table 1 shows the total amount of water intake and the times objects died. To our surprise, there was no significant difference regarding participants' overall empathy toward the three objects. The overall total amount of water intake was moderate (1281mL), yet the average times that objects died in the app was high (5.25 out of 7). In addition, only one participant reached 100% of the daily recommended water intake goal. Although the H2O app failed to make participants hit the recommended daily water intake goal, qualitative data from the post-study interviews revealed several interesting points which are presented in the following paragraphs.

Overall, over half of the participant reactions toward the H2O app were positive. 61% of the participants subjectively felt that they had drank more water. Among the three objects, 7 participants (41.2%) said the *animal* object influenced them the most, followed by the plant object (3 participants). Another 3 participants said they didn't have any preference. Surprisingly, none preferred the *human* object. As expected, the influence of the objects differs from one participant

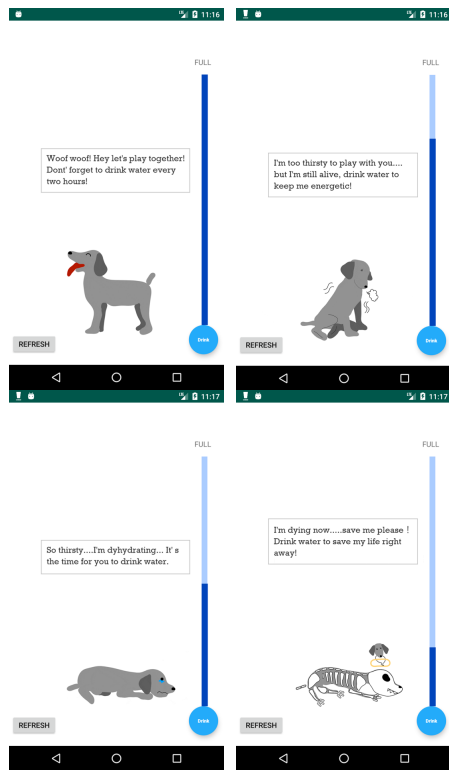


Figure 3: The four life stages of the animal object (dog).

to another, and is usually tied to participants' life experience and personal preferences towards the objects. For instance, participants who own pets have more empathy toward animals. Similarly, participants with agronomy background have more empathy toward plants.

Eight out of the 13 participants (61%) responded that they drank more water than before in order not to lose the living object. These 8 participants generally felt guilty and sad to see the object die ("...I felt like if I didn't drink much water, they'll be dehydrated and feel painful. Therefore, I want to drink to make them alive...". -P7). On the other hand, the remaining participants mentioned they had no feeling toward losing the object, and that it was the notifications that reminded them to drink water ("...I don't really care about them. Even when I saw them dying, I didn't feel anything... but I see this app as self-recording and the notification reminds me to drink water...". -P10).

There is a mismatch between mobile log results and the post-interview results, which is related to our study design. Our study made participants manually input their water intake amount, and the object will die if they didn't drink enough water within a 2-hour interval. The majority of participants mentioned that they did not always remember to record the water intake event ("...I can't open my phone often during work hour...". -P5). This might also explain why only one participant was able to hit 100% of the daily recommended water intake ("... I always open my phone every hour....". -P11).

6 DISCUSSION

In this present study, we developed the H2O mobile application that utilizes the loss-aversion mechanism to trigger empathy toward an object and eventually motivate water intake behavior. To our surprise, we discovered that the concept of loss aversion does not seem to be completely effective. Interestingly, during the post-interview, we noticed that some participants generated empathy by taking care of the object while others generated empathy through saving the object. Also, participants had their own preferences toward each object. Our study sheds light on how people generated empathy from the objects, and showed different levels of empathy toward various objects. Lastly, we identified several considerations for further research.

According to the interview results, it is important to refine the app's performance quality across different android versions. We found that participants felt frustrated by the inconsistent performance of the application, such as app crashing, malfunction, graph disfunction, and not getting notification. We suspect that these problems happened due to the incompatibility of various android versions and phones that participants used. In our study, most of our participants still used old android version, causing some features such as gif image and notification not performing well in those versions. Though we were aware of those issues and tried to handle them during the development, these issues remained.

Many participants suggested adding more features into the H2O app. For instance, several participants mentioned they would like to have daily reports of their water intake behavior. Improving the aesthetics of the objects such as unifying the drawing and painting style of the object is important as participants reported these influenced their empathy towards the objects. How to balance between the completeness of the app features and the evaluation of an app's central construct (loss aversion in this case) is worth further exploration in the future.

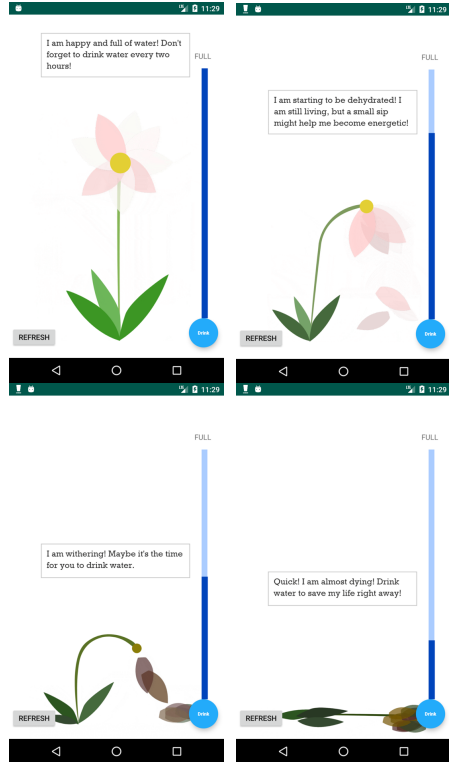


Figure 4: The four life stages of plant object (flower).

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We found it is important to provide personalized features to users particularly in the context of loss aversion. Participants indicated that being able to choose, personalize, and also able to interact with their preferred objects will make them more motivated to drink water more regularly. In line with the results of our study, this was reflected in participants' different empathy levels toward the living objects. Some showed more empathy toward the plant object than the human object.

Last but not least, our field evaluation study assumed that all participants need the same daily amount of water intake and have the same daily routines. In fact, these differ from one individual to another depending on many physical and environmental factors as well as the activity level. Accounting for all of these individual differences is important to be addressed for future study.

7 CONCLUSION AND FUTURE WORK

In conclusion, our study suggested that people had different empathy toward the same object due to their preferences, which consequently influenced their water intake behavior. As part of the future work, we would like to conduct a formal field experiment with improved methodological design (e.g. include control group) and a larger and more diverse sample. Lastly, we would also like to further strengthen the capabilities of the H2O app, and integrate it with a smart water bottle.

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