

# Visual Framing: Nudging Toward Health Behavior Change

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## Abstract

Self-monitoring is one of the core drivers of health behavior change. While there are many consumer health applications that help people collect varying types of self-monitoring data, technology designers have placed considerably less attention on how to design health monitoring feedback in a way to help people easily infer what is problematic and be motivated to change behaviors. In this article, I explore ways to design health monitoring feedback with the aim of promoting health behavior change. In creating influential and persuasive health monitoring feedback, I leverage the “Framing Effects” from behavioral economics literature. Called “Visual Framing,” I describe two ways to frame visuals for health monitoring data—(1) manipulating the valence of a target behavior, and (2) manipulating the valence of an outcome. I discuss evaluation methods and implications for Visual Framing.

## Introduction

Self-monitoring is one of the core drivers of behavior change. A number of research projects and consumer health applications exist to support self-monitoring of health data such as sleep, activity, blood glucose, blood pressure, and weight. One of the promises of ubiquitous computing is to provide the ability to help people collect self-monitoring data in the wild while reducing the user burden. ZEO personal sleep coach<sup>1</sup>, for example, allows people to collect detailed sleep data in their own bedroom, including sleep duration, sleep quality, and sleep phases. However, similar to other existing self-monitoring technologies, ZEO interface merely presents collected data, but does not interpret what the data means. As a result, people are still left wondering what problems they might have, how to set the right level of goal, and how to improve their performance to achieve the goal. As the purpose of self-monitoring is not simply to quantify one’s behavior but to improve it, there are plenty of opportunities and room for designing self-monitoring feedback to help people better understand their data and make healthy choices.

To create health monitoring feedback that can effectively draw people toward health behavior change, I leverage the framing effect<sup>2</sup> in visualizing health data. Framing effect suggests that we can frame the same information in different ways—for example, either positively or negatively, and that people’s decisions are heavily influenced by how the information is framed. While framing effects have been mainly explored using text descriptions, I investigate whether it is viable to frame visual representations of health data (visual framing) in a positive or negative way, and which framing is more effective in nudging people toward better health decisions and health-enhancing behaviors. In what follows, I describe design dimensions of creating visual framing for health monitoring data. I provide examples of visual framing and propose a study method to test how visual framing affects people’s perception and understanding of their data, and motivation for health behavior change.

## Design Dimensions

Self-monitoring results in changes of behavior under observation. “Reactivity” or “reactive effect” refers to the act of self-monitoring causing the change in frequency of that behavior<sup>3</sup>. Reactivity is occurred often in a desirable/therapeutic direction. Thus, the purpose of designing health monitoring feedback for behavior change should be to maximize the reactive effect toward the therapeutic direction. Self-monitoring literature denotes that **valence information** affects the direction of the reactive changes<sup>3</sup>. This suggests that we can frame the valence differently in order to affect people’s perception and understanding of self-monitoring data. Specifically, we can manipulate (1) valence of a target behavior, and (2) valence of an outcome.

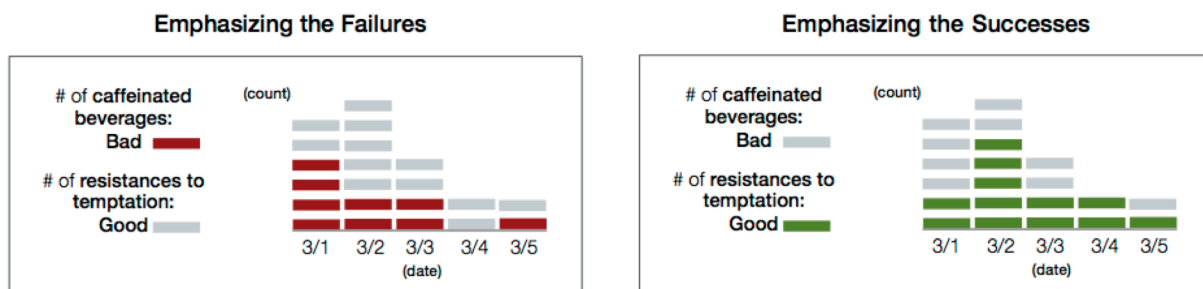


Figure 1. Manipulating the valence of a target behavior by emphasizing the failures or successes.

**Valence of a target behavior.** When manipulating valence of a target behavior, positive valence leads to an increase, negative valence leads to a decrease, and absence of a specific valence leads to no real change in the target behavior<sup>4</sup>. Therefore, if the goal is to increase a desirable behavior, self-monitoring feedback can convey positive valence of the target behavior under observation. On the contrary, if the goal is to decrease an undesirable behavior, self-monitoring feedback may convey negative valence of the target behavior under observation. This finding is meaningful when there is more than one way to monitor a target behavior—for example, by counting the number of failures versus successes. There have been mixed results in regard to which framing (monitoring negative events versus positive events) draws higher reactivity. Thus, I explore the effect of visualizations emphasizing different valence information, and measure the size of reactive effects for each framing (positive, negative, and neutral). Figure 1 shows an example of how the valence of a target behavior can be framed differently (good behavior vs. bad behavior) and how the valence information can be conveyed through colors (red vs. green).

Failure rate						Success rate					
(# of caffeinated beverages out of all urges)						(# of resistances to temptation out of all urges)					
date	3/1	3/2	3/3	3/4	3/5	date	3/1	3/2	3/3	3/4	3/5
(%)	67%	29%	50%	0%	50%	(%)	33%	71%	50%	100%	50%

**Figure 2.** Manipulating the valence of an outcome by calculating either the failure rate or success rate.

**Valence of an outcome.** There are multiple ways to interpret raw data by emphasizing different aspects of the information. When presenting an outcome, health monitoring feedback can provide either positively framed information (by highlighting the success), or negatively framed information (by highlighting the failure). While these two types of feedback contain the same information that is numerically equivalent, it is not clear which one would draw higher reactivity toward a desirable direction. Figure 2 shows an example of manipulating the valence of an outcome by highlighting different aspects of the same dataset.

### Study Design

The visual framing described above will be studied in two settings—(1) a scenario-based online survey, and (2) a diary study combined with a survey. The goals of the two studies are not only to test the occurrence of the framing effects, but also to use the visuals as probes to help people think about various use of the self-monitoring feedback, feelings of encountering health information via technology, and ethics behind framing and persuasive technology. The scenario-based survey will provide with hypothetical situations where respondents receive health monitoring feedback from various self-monitoring technologies. The dependent measures will include the level of understanding of the information provided, feelings, motivation toward behavior change, and actions to take upon receiving the feedback. I will recruit respondents whose health interests are aligned with the goal of self-monitoring scenarios provided in the survey. The diary study combined with a survey will address some of the limitations of the scenario-based online survey. Participants will be asked to self-monitor themselves (e.g., sleep, caffeine intake) for two weeks. Then, I will create a customized survey containing visualizations of participants’ own data so that they can envision the use of the self-monitoring feedback in a more realistic sense.

### Conclusions

I argue that merely presenting self-monitoring data is not enough to nudge people toward health behavior change, and that framing effect can be a helpful approach for the design of persuasive health monitoring feedback. I describe the concept of *Visual Framing* and its design dimensions, which has implications for designing health monitoring feedback to maximize people’s reactive effects.

### References

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