The Effect of The Precision of Exercise Data on Food Selection

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Abstract. Replacing calorie information with the exercise data has been a new direction for public policies on food marketing and an alternative for food enterprises. Behavioral studies on the effect of data precision on food selection in real-life scenarios indicate that more precise exercise data will make consumers to select healthy food with lower calories. These findings shed light on the managerial application for policymakers and food enterprises.

Keywords: Exercise data; calorie; numerical precision; food choice

1. Introduction
In the epidemic of obesity worldwide, many countries have initiated intervention on the presentation of food calorie information, for example, mandating that the absolute calorie information must be included on the packaging of pre-packed food or on the menu in restaurants [1-3]. More recently, some scientists also called for printing exercise data on food packages in order to deliver calorie information in a more straightforward manner [4-6]. For example, it is far more effective to tell consumers that it would take 9 km walk to burn off the calories of a double cheese burger, or 7 km jog or 42-minute walk to burn off the calories of a can of coke [7].

However, as the exercise ability and strength may vary along with the differences in physical features, such as gender, age, weight, and so on, it may result in interpreting the same food calories into multiple exercise data with similar scales but of much different precisions [5] [8] [9]. For instance, the calorie of a chocolate bar is about 300 kilocalorie, which can be equivalent to “5 kilometers walk”, or, more precisely, “4.87 kilometers walk” or “5.03 kilometers walk”.

In this study, we expect the numerical precision of exercise data to burn off calorie will affect consumers’ calorie estimation and food choice, which may shed lights to the managerial applications for policymakers and food enterprises.

2. Theoretical interpretation and research hypotheses

2.1. Processing Fluency and Numerical Precision
The objective perspective of processing fluency refers to the dynamic features of information processing inside human brains (mainly referring to processing speed and accuracy) [10]. Its subjective perspective refers to the subjective experience on the ease with which information is
processed by the individual. Processing fluency includes three categories: perceptual fluency (the ease of processing perceptual objects based on perceptual knowledge), retrieval fluency (the ease with which information can be retrieved from memory), and conceptual fluency (the ease of processing the meaning of information and its relation with semantic knowledge) [10-11]. Since exercise data have not been presented on food package in the market, such information is relatively new to most consumers. The processing of such information is mostly heuristic, concerning with perceptual fluency and retrieval fluency [11]. Round number or approximate number can provide more general knowledge and they are easier to process [12]. People tend to use round numbers in estimation; most information given by or to which people are exposed to is presented with estimation or approximate number; compared with precise number, people, in real life, are faced more with round number or approximate number, while the latter are more familiar to consumers [13-14]. Therefore, people are able to process the numerical information in less precise or round number faster. In other words, it shows high perceptual fluency. However, round numbers imply imprecision and less rigorous [15], so people may put less attention to less precise exercise data and seldom make association or take time to really think. Namely, it shows low retrieval fluency. On the contrary, the information processing features low perceptual fluency and high retrieval fluency, when shown highly precise exercise data to burn off food calorie.

2.2. Exercise Data Precision and Food Decision-making

According to the fluency theory [10-11], when people see less precise exercise data (for instance, 5 km, or half an hour), they would pay less attention, seldom conduct indepth-processing, and easily overlook the negative influence brought about by high calorie intake; and they would be more tolerant of the risk of gaining weight. Thus, people would put less weight on calorie information and perceive lower food calories when choosing food.

On the other hand, precise numbers are associated with accuracy, authenticity, and reliability [15], so the preciseness of a number can easily induce people to think more thoughtfully [12]. When people observe an exercise data that is precise (for instance 4.87 km), they may infer that the food manufacturer has calculated the data carefully by scientifically measuring the calorie content and converting it in accordance with scientific and reasonable standard, and therefore it is more accurate and reliable information which should be taken seriously. Thus, people would consider and estimate the calorie information more carefully, recall or imagine scenarios related to the information (for example, the difficulty of keeping running, hiking, and the sweating scenarios in walking, or an obese figure), and take into consideration the relationship between calorie intake with our body (in terms of figure, weight, or health), which may persuade consumer not to choose high calorie unhealthy foods.

Therefore, this paper posits:

H: In the process of food selection, if the movement information of burning food calorie is provided, the more accurate the number of movement information, the less people choose high calorie non-health food.

3. Experimental examination

3.1. Experimental stimulation

In the process of food decision-making, will the precision of the exercise data to burn off food reduce people's choice of high-calorie unhealthy food? We tested this possibility in the following experiments. We made calorie labels with exercise information, designed real life scenarios of food selection for these labels, and randomly chose exercise distance information as stimuli (Fig.1) for the study.
3.2. Procedure

72 students (51.4% female, Mage=23) were randomly assigned to a 2 (precision of exercise data: high VS. low) × 2 (types of food: healthy VS. unhealthy) mixed factorial design, with the precision of exercise data as the between-group factor and the types of food as within-group factor. In accordance with the food stimuli in Study 3 by Pandelaere et al. (2011) [16], we chose Dove chocolate as unhealthy food (net weight: 43 grams; the brand name “Dove” was concealed to eliminate the influence of the brand name), and chose apple as healthy food. In the scenario of “low precision of exercise data”, the exercise data of apple and chocolate were corresponded with “1 kilometer” and “5 kilometers” respectively. In “high precision of exercise data” scenario, the exercise data of apple and chocolate were separately corresponded with “0.92 kilometer” and “4.82 kilometers”.

Firstly, participants were asked to complete an irrelevant experiment for about 15 minutes. After they had to fill the registry forms (number, gender, age, and education background). Then, participants were told that they could select between apple and chocolate to decide the reward for their participation. To ensure that they did make use of “the calorie labels of exercise data” during their food selection, they were asked to read the introduction to “the calorie labels of exercise data (Fig.1: 100 grams of a food contains x kilojoules, which is equivalent to the calorie consumed by walking y km)” before they saw and selected the food.

After that, they could select their reward. Participants were asked to observe apples juxtapose with chocolate, and their calorie labels on the table. The labels sized 5x15cm, which was twice the size of that used in Study 3 by Pandelaere et al. (2011) [16], so as to increase the visibility and usage of the label in food selection process. They were also told that the price of apple and chocolate were identical. After they finished selection of their reward, they were asked to fill in the “reward registry form” (number, and the name of their reward). Our staff took correspondent food from the food box and gave them to the participants, instead of taking those samples on the table, which ensured that all participants observed identical food samples in the study.

3.3. Results and Discussion

We recorded those cases selected apples as healthy food, while those selected chocolate as unhealthy food. A Chi-square analysis of food healthfulness selection, with the precision of exercise data as the independent variable, was conducted. The results revealed that, less participants selected unhealthy food in the “high precision of exercise data” scenario (Wald x2(1) = 6.294, p = .012), compared with the “low precision” scenario. Specifically, when the exercise data was less precise, 48.5% of participants selected chocolate; when the data was more precise, 20.5% selected chocolate. This means that, although the difference in exercise data of apples and chocolate (4.87km-0.92km) is 3.95 km in the “high precision” scenario is lower than the 4-km differences in the “low precision” scenario, participants would choose far less unhealthy food in “high precision of exercise data” scenario, compared with “low precision” scenario. Alternatively interpreted, the precision of exercise data effectively influences people’s decision-making in food selection. It reduces people’s selection on unhealthy food, and may prompts consumers to select healthy food with less calorie.
4. Management enlightenment and future research prospect

4.1. Conclusions
A significant managerial implication is to provide evidence or reference to the identification and selection of a scientific, efficient and even uniform standard for the labeling scheme of “relevant calorie information” in three ways. First of all, it specifically identified more effective presentation of equivalent calorie information, i.e., presenting exercise data as precise as possible within reasonable range (within consumers’ cognitive load) when providing exercise data. Secondly, when displaying exercise data or price information in APPs or wearable devices related to health, diet, and medical care, the precision effect in the field of numerical cognition should be taken into consideration, which would help improving data labeling related to public health. Thirdly, image-text calorie labels should be simple and easy to understand and it is recommended to promote “calorie labels of exercise data” in food package.

Moreover, our study has implications for the effective marketing of food. Food enterprises in China seldom adopt front-of-pack nutrition information labels. Thus, this paper suggests the adoption of FOP-NL to attract the attention by consumers and make promotion of products. If consumers perceive the measurement of nutrition is scientific, precise, and strict by easily reading the “relevant calorie information” and other important nutrition information front-of-pack, the persuasiveness of nutrition information is increased, which may stimulate consumers’ purchase demand.

4.2. Suggestions
However, this study also existed some shortcomings such as the data collection was limited. So, we suggest that further research can expand from the following aspects: firstly, it can employ more scientific and objective methods, such as eye-tracking and event-related brain potential (ERP). Moreover, the research on consumer behavior related to calorie information may combine field experiment and laboratory experiment, or the analysis of laboratory experiment and the analysis of sales data. Third, comprehensive and systematic research on the numerical precision effect may be feasible from the perspective of the precision effect of large-magnitude and small-magnitude numbers within nutrition content, reference information and quantitative information such as the size, volume, weight, or sales of products.

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