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Yasuto Okamura*

Mere Recollection of Food Reduces Altruistic Behavior

Abstract: The purpose of the study was twofold: Experiment 1 tested the possibility that the mere recollection of food aroused a state of hunger and that different types of food influenced the state of hunger differently; Experiment 2 tested the possibility that food cues affected altruistic behavior. In Experiment 1, 28 participants reported how hungry they felt before and after their recollection of certain foods (noodles and pudding). Results suggest that recollection of food increased hunger and that the type of food influenced the degree of hunger ($F(2,54) = 31.88, p < .001, \eta^2 = .54$). In Experiment 2, 63 participants were randomly assigned to one of three recollection conditions: (1) noodles, (2) pudding, and (3) control. Participants in the two conditions described each food in detail; control group participants did not. Participants were then asked how much they would be willing to participate in an ostensible experiment. Results indicate that recollection-induced hunger reduced altruistic behavior ($F(2, 60) = 4.11, p = .021, \eta^2 = .12$). Cue reactivity theory and the hierarchy of needs could explain these results.

Key words: food cue, the hierarchy of needs, altruistic behavior

How do food cues influence our behavior? A body of research has suggested that food cue exposure can increase both our desire to eat and actual food intake (e.g., Rogers & Blundell, 1989; Nederkoorn, Smulders, & Jansen, 2000). Exposure to the smell of pizza, for instance, increased subsequent pizza intake, particularly in participants who are relatively sensitive to internal states of hunger (Fedoroff, Polivy, & Herman, 1997). The same effect was also found for participants who were full (Cornell, Rodin, & Weingarten, 1989). Similarly, it was found that visual food cues also trigger food-related cognition and motivation to eat (Kemps, Tiggemann, & Hollitt, 2014). This can be explained by priming theory. The presentation of direct olfactory, gustatory and visual food cues can act as a priming stimulus causing activation of the representation of food. This in turn arouses the state of hunger in participants. In fact, many priming experiments have demonstrated that the activation of representation can influence subsequent cognition and behavior (e.g., Bargh, Chen, & Burrows, 1996; Strahan, Spencer, & Zanna, 2002).

Olfactory, gustatory and visual stimulation is understood to naturally activate representation of food and bring about subjective hunger, but does the same effect occur in the case of merely recollecting food without any direct sensory stimulus? One answer to such a question came from an experiment by Oakes and Slotterback (2000). They found that participants who were exposed to a food

list (mere verbal cues) reported increases in hunger and the desire to eat. Thus, mere recollection of food without any direct sensory stimulus could, to some extent, also affect our behavior. Yet the strength of the impact of the effect still remained in question.

One kind of behavior that the state of hunger has been found to affect is altruistic behavior. For example, Harel and Kogut (2015) suggested that hungry people tend to be less responsive to others' needs. Similarly, Haruvy, Ioannou, and Golshirazi (2015) found that food abstinence is related to lower prosocial behavior. In fact, some physiological research indicates that glucose intake (Gailliot & Baumeister, 2007) and higher blood glucose levels (Aarøe & Petersen, 2013) are related to prosocial behavior. These results imply that being hungry, which is the state of lack of glucose in our body, is related to low prosocial and high selfish behavior.

The current study aimed to examine firstly whether mere recollection of food actually aroused the state of hunger, and secondly whether the food cues affected the altruistic behavior of participants. In much the same way as previous studies on the priming effect, this study used the standard priming procedure for arousing the state of hunger. The hypothesis was that recollection of food had an effect similar to direct stimuli on hunger and that participants who were exposed to food cues felt hungry and were more reluctant to behave altruistically.

* Graduate School of Psychology, Otemon Gakuin University, 2-1-15 Nishiai, Ibaraki City, Osaka 567-8502 Japan

Experiment 1

Experiment 1 examined whether mere recollection of food actually aroused the state of hunger and whether different types of food influenced the state of hunger differently.

Method

Ethics Statement

The experiment was approved by the Academic Committee of the School of Psychology at Koshien University. All participants provided written informed consent before participating in the experiments. At the end of the experiment, they were debriefed.

Participants

Twenty-eight university undergraduate and graduate students (18 male, 10 female; $M_{age} = 20.79$, $SD = 1.75$) participated in the study. No participant was aware of the purpose of the study.

Design

Noodles and pudding were used as stimuli for recollection. It was hypothesized that the two different stimuli influenced the state of hunger differently.

Procedure

The experiment was conducted immediately after a lecture. The participants participated together. Just prior to the recollecting task, all 28 participants answered a preliminary question asking how hungry they were. Following this preliminary question, 14 of the participants were asked to use their memory to recollect noodles. They were then asked to state how hungry they were. For this same group of 14 participants, the same procedure was again followed, only this time the participants were asked to recollect pudding. The other 14 participants followed a similar procedure, but the order of recollection was reversed. They were asked to recollect pudding first and noodles second, so that the two conditions were counterbalanced. In order to weaken the influence of the initial task on the follow-up task, all participants were instructed to eliminate, to the extent possible, their recollected images of the first stimulus before recollecting the second. A visual analogue scale (10 cm) was used to measure hunger.

Results

The mean and standard deviation values for each group are presented in Table 1. It was found that the levels of the subjective state of hunger were highest for the noodle condition, followed by the pudding condition; the lowest levels were in the before recollecting condition. According to repeated-measure ANOVA, a significant main effect of condition was revealed ($F(2,54) = 31.88$, $p < .001$, $\eta^2 = .54$). Bonferroni's test revealed a significant difference between all conditions – the before recollecting condition and the noodle condition ($p < .001$), the pudding condition and the noodle condition ($p < .001$), and the before recollecting condition and the pudding condition ($p < .05$).

In order to confirm that the two conditions were counterbalanced, a one-way ANOVA was conducted and no

difference was found between the pudding first condition ($F(1,26) = 1.42$, $p = .25$, *n.s.*) and the noodle first condition ($F(1,26) = 2.51$, $p = .13$, *n.s.*).

Table 1. Mean and SD values of the degree of hunger in each condition

| | before recollecting (n = 28) | noodle (n = 28) | pudding (n = 28) |
|------|------------------------------------|--------------------|---------------------|
| Mean | 3.20 | 6.21 | 4.28 |
| SD | 1.60 | 2.28 | 1.78 |

Discussion

The hypothesis was confirmed that mere recollection of food increases hunger and that the type of food influences the degree of hunger. The implication is that the noodles are a stronger stimulus than pudding for arousing hunger. More research is needed regarding the reason why noodles are a stronger stimulus than pudding, but one of the factors which may explain the difference is that noodles are a staple food whereas pudding is a dessert. People typically start each meal by eating a staple food not a dessert, meaning that a staple food is eaten at the peak of hunger. The difference could thus be interpreted as a result of the experiential correlation between staple foods and hunger.

The result is consistent with Oakes and Slotterback (2000) in that verbal cues and their recollection increase hunger. This can be explained by cue reactivity theory (Jansen, 1998). The main assumption of the theory is that food cues can trigger a series of physiological and psychological responses. For example, physiological responses might include increased heartrate, gastric motility and salivation (Nederkoorn et al., 2000; Castellanos et al., 2009; Alonso-Alonso et al., 2015), while psychological responses can include increased thoughts about food (Nijs, Muris, Euser, & Franken, 2015). Therefore, recollecting food motivates a desire and hunger for that food.

Experiment 2

Experiment 2 examined the relationship between the levels of hunger aroused by a mere recollection of food and the levels of intention to participate in an altruistic activity.

Method

Ethics Statement

See the ethics statement provided for Experiment 1.

Participants

Sixty-three university undergraduate and graduate students (16 male, 47 female; $M_{age} = 21.14$, $SD = 1.96$) participated in the study. No participant was aware of the purpose of the study.

Design

Participants were randomly assigned to one of three between-subjects conditions: (1) the noodle condition, (2) the pudding condition, and (3) the control condition. The task in

the two experimental conditions was to write down a detailed description of one of two foods based on the participants' recollection of the food; participants in the control condition did not engage in any food recollection task.

Procedure

The experiment was conducted immediately after a lecture. Participants in the two experimental conditions participated together in the experiment, while participants in the control condition participated in another room. Participants in the experimental conditions were told that the aim of the study was to examine what kinds of words are used to describe a particular food. They were asked to engage in the task described above. Two stimuli were used corresponding to how strongly participants feel hunger (noodles for strong condition; pudding for weak condition).

In each of the two food conditions (noodles and pudding), participants were asked to describe the food in detail. They worked on the task for four minutes. No such instruction was given to participants in the control condition, and four minutes were not provided as a tasking period. Participants in the experimental conditions subsequently completed an ostensibly unrelated questionnaire that lasted approximately thirty seconds. Participants in the control condition started with this questionnaire. The questionnaire stated that a graduate student was looking for participants willing to volunteer for his experiment. The exact date of the experiment was not yet decided, but it would be during spring holidays (February and March). Participants were asked to indicate how much of their time they would be willing to volunteer, on a 1–8 scale (1 for 0 minutes to 8 for over 60 minutes). The scale, which is a revised version of one used in Study 5 of Meier, Moeller, Rimer-Peltz, and Robinson (2012), was used as the dependent variable because participants who are altruistic are more willing to help.

Results

The mean and standard deviation values for each group are presented in Table 2. It was found that the levels of intention for altruistic behavior were lowest for the noodle condition, followed by the pudding condition and the control condition (in that order). According to one-way ANOVA, a significant difference was found between the three conditions ($F(2, 60) = 4.11, p = .021, \eta^2 = .12$). Tukey's test revealed that there were significant differences between the pudding and noodle conditions ($p = .048$), as well as the noodle and control conditions ($p = .036$). However, no significant differences were found between the control and pudding conditions ($p = .992$).

Table 2. Mean and SD values of the levels of intention for altruistic behavior in each condition

| | noodle (n = 21) | pudding (n = 21) | control (n = 21) |
|------|--------------------|---------------------|---------------------|
| Mean | 1.48 | 2.43 | 2.48 |
| SD | 0.75 | 1.63 | 1.29 |

Discussion

Experiment 2 results revealed that the participants in the noodle condition were least likely to participate in altruistic behavior as compared to the participants in the pudding and control conditions. This confirmed the hypothesis that mere recollection of food reduces an individual's altruistic behavior. This is consistent with previous studies. The relationship between subjective hunger and participation in altruistic behavior may be explained by Maslow's hierarchy of needs. Robbins (1996) explained it in these terms, suggesting that Maslow's five needs can be divided into two types, one higher and the other lower. The higher group includes social needs, esteem needs, and self-actualization, all of which are satisfied internally within the person. The lower needs are physiological and are satisfied externally (e.g., money). The hierarchy postulates that physiological needs such as hunger and thirst are related to survival, and they must be satisfied preferentially. Therefore, high order needs are inhibited if low order needs are not satisfied. For example, Briers, Pandelaere, Dewitte, and Warlop (2006) found that hungry participants were less likely to donate than satisfied participants. In another example, Danziger, Jonathan, and Liora (2011) demonstrated that experienced Israeli judges become harsher in their rulings as they get hungrier. Moreover, hungry means not only feeling the need for food but also having other strong needs (e.g., hungry for affection.). Thus, it is assumed that people who have a strong desire are not willing to behave altruistically. The hypothesis was proved by Piff, Stancato, Côté, Mendoza-Denton, and Keltner (2012). They found that upper-class individuals behaved more unethically than lower-class individuals. Upper-class individuals are supposed to be hungrier for needs (e.g., money, position) than lower-class individuals. This is because upper-class individuals are successful, and becoming a successful person implies a hunger for success that might be labeled greed, ambition, or aspiration. These results suggest that being hungry makes us concentrate on satisfying our own needs (e.g., eating something) and insensitive to the needs of others (e.g., helping others). The relationship between hunger and altruistic behavior can be looked at from the opposite point of view. In other words, research has found that people who are full become generous to others' needs. The "Luncheon Technique" (Razran, 1938) is one of the classic examples, well-known in the art of persuasion.

The result of Experiment 2 confirmed that the mere recollection of food is sufficient to elicit low altruistic behavior.

General Discussion

Recollection is more powerful than expected. Experiment 1 revealed that mere recollection of food increased actual hunger. Experiment 2 revealed that hunger aroused by mere recollection reduced altruistic behavior. Thus recollection can change both our subjective feelings and our actual behavior.

Recent non-invasive measurements such as fMRI have advanced rapidly and the mysteries of our brain are gradually being clarified. According to knowledge gained through such research, imagination is a virtual bodily movement (Tsukimoto, 2001). For example, Porro et al. (1996) found that the same regions in the brain are activated in both actual movement and imaginary movement. Moreover, Tsukimoto (2005) suggested that imagination is a neurologic activity without muscular movements and activation of the peripheral nervous system. It is suggested that hunger aroused by the recollection of food is activated in the same way as hunger aroused by direct stimuli. Therefore, it could be assumed that hunger aroused by direct stimuli and hunger aroused by recollection of food both reduce altruistic behavior.

More research is needed regarding the reason why there was no difference between the pudding and the control condition in Experiment 2, while a difference in the levels of hunger was found between the conditions in Experiment 1. One of the possible explanations is that the activation of hunger did not lead to a change in behavior or attitude because the activation was weak. The process by which the recollection of food reduces altruistic behavior is assumed to be mediated by aroused hunger. In Experiment 1, the recollection of pudding improved the levels of hunger, but the influence was not so strong as the recollection of noodles, as Table 1 indicates (Before recollecting (3.20)→pudding (4.28): Before recollecting (3.20)→noodles (6.21)). Therefore, it is assumed that the recollection of pudding was not so strong that it activated behavioral representations.

Limitations and future directions

This study has some limitations. In Experiment 1, a within-subject experiment was conducted in order to set a baseline for hunger level. Two conditions were counterbalanced, but the possibility that hunger aroused in the initial task influenced the next task cannot be denied despite the instruction to participants to erase their recollected images of the first stimulus. Some index to establish whether the instruction was effective should be used in future research. Furthermore, the emotion generated during recollection was not measured in Experiment 2 despite the possibility that it can influence altruistic behavior. That point deserves special consideration in future research.

Experiment 2 was conducted just before the start of the spring holidays. The fictitious experiment sought participation in an activity to be conducted during the spring holidays. Thus, it may be that study participants in all conditions were unwilling to behave altruistically because they simply did not want to come to school to participate in the experiment. It is suggested that replication studies should be conducted at a more appropriate time.

Finally, study participants were all undergraduate or graduate students around age 20. Future studies should recruit participants within a much wider range of ages to validate generalizability.

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