Effects of Economic Recession on Women's Preference or Avoidance of High-Calorie Foods

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From an evolutionary psychology perspective, different predictions can be made about the effects of economic recession on women's attitudes toward high-calorie foods. Therefore, this study aimed to examine the factors moderating the effects of economic recession on women's preference for, or avoidance of, high-calorie foods. We focused on the presence of a boyfriend and BMI (Body Mass Index) as moderators of the effects of economic recession. The results of the study showed that female participants with a partner preferred high-calorie foods when economic recession was primed, as did those with a low BMI in the implicit measure when economic recession was primed. These results indicate that the presence of a boyfriend and levels of BMI are moderators of the effects of economic recession on women's preference for, or avoidance of, high-calorie foods.

Keywords

economic recession, high-calorie food, implicit measure, explicit measure, BMI, women

Introduction

A significant problem in modern societies is related to eating. It concerns not only obesity but also anorexia and overeating, which are associated with a desire for thinness in women. Although traditionally, cultural and media influences have been reported as the causes of these issues (e.g., Bhattacharya et al., 2022; Derenne & Beresin, 2006; Haines & Neumark-Sztainer, 2006; Nasser, 1988), evolutionary motives have also recently been considered (e.g., Hill et al., 2012; Hill et al., 2013). For example, in the environment of evolutionary adaptation, there is a psychological mechanism for eating high-calorie foods to avoid the risk of starvation (Breslin, 2013). This mechanism can lead to problems, such as obesity in today's environment, which is characterized by the easy availability of high-calorie foods at low prices (Swinburn et al., 2004). This study focused on the

evolved psychological mechanism and examined women's preference for, or avoidance of, high-calorie foods based on such mechanisms during environmental harshness.

In the evolutionary adaptation environment, two adaptive problems faced by women during environment harshness have been pointed out: 1) the availability of males suitable for long-term mating and 2) the maintenance of fat mass for pregnancy and childbirth (Buss, 1994). The first problem refers to securing a suitable partner for long-term mating. Humans are considered to be born prematurely owing to the biological characteristics of an enlarged neocortex and upright walking (Bogin, 1999). Therefore, for both children and the women raising them, it is imperative that men be available to provide resources (Geary, 2000). Harsh environments marked by the scarcity of ecological resources result in a decline in the number of males who can provide resources, which makes it difficult for women to secure good long-term partners. Therefore, women are expected to intensify their strategies to win the competition among the same gender for superior long-term partners. Hill et al. (2012) analyzed archival data (1992–2011) in the US and found that the consumption of products that enhance women's attractiveness ("lipstick effect") increased during environmental harshness (i.e., high unemployment). In an experiment in which economic recession primed environmental harshness, researchers established women's purchase intentions increased only for beauty-related products, which seemingly gave them an advantage in the competition for a partner. Furthermore, Hill et al. (2012) demonstrated that these effects of the priming of environmental harshness were mediated by a heightened preference for mates with resources. Based on this theory and empirical studies, it is predicted that as many women in modern society perceive thinness as a criterion for selection by men (e.g., Bergstrom et al., 2004; Grossbard et al., 2011), their avoidance of high-calorie foods will occur during environmental harshness.

The second adaptive problem for women is maintaining sufficient fat mass for pregnancy and childbirth. Although starvation is a common adaptive problem for both men and women, according to the critical fat hypothesis (Frisch, 1985), women require a certain amount of fat for pregnancy and childbirth; additionally, they need to store more fat than men for reproduction, especially during environmental harshness. Therefore, when environmental harshness is expected—such as a shortage of ecological resources—a preference for high-calorie foods is more likely to occur, particularly in women who are expected to become pregnant. Thus, these two problems result in women's preference for, or avoidance of, high-calorie foods during environmental harshness. In other words, securing a suitable partner for long-term mating could lead to the avoidance of high-calorie foods, whereas maintaining fat mass for pregnancy and childbirth could result in a preference for such foods. In this study, we focused on these contradictory predictions and examined the factors

that moderate the effects of environmental harshness on women's attitudes toward high-calorie foods.

We focused on two moderators. The first was the presence or absence of a boyfriend. As mentioned above, an adaptive problem for women is securing a long-term partner. For women who already have a potential long-term partner in the form of a boyfriend, this adaptive problem is relatively less important, while that of maintaining fat mass is more critical. Additionally, the presence of a boyfriend may increase the interest in reproduction, so fat storage becomes important. Therefore, we predicted that the presence or absence of a boyfriend will moderate women's tendency to avoid or prefer high-calorie foods during environmental harshness.

The second factor was body mass index (BMI), which measures how much fat is already stored in an individual. Hill et al. (2013) showed that only women who adopted a fast life history strategy (Ellis et al., 2009), anticipated early pregnancy and childbirth, and had lower BMI would prefer high-calorie foods because of their need to store fat during environmental harshness. The second women's adaptive problem is likely to be critical for women with a low BMI and who are not storing fat. Women with a pre-pregnancy low BMI (< 18.5) are known to have an increased risk of spontaneous abortion (e.g., Maconochie et al., 2007). Meanwhile, this adaptation problem will be relatively less critical for women with a high BMI who already have the fat necessary for pregnancy and childbirth. Therefore, women with a low BMI would be more likely to prefer high-calorie foods, whereas those with a high BMI would be more likely to avoid high-calorie foods during environmental harshness. Although previous studies have found that women's waist-to-hip ratio (WHR) is an important indicator of mate desirability (e.g., Singh, 1993), several previous studies have indicated that BMI explains variability in ratings of physical attractiveness more than WHR (e.g., Fernandez et al., 2014; Henss, 2000; Kościński, 2013; Smith et al., 2007; Tassinary & Hansen, 1998; Tovée & Cornelissen, 1999; Tovée et al., 2002; Tovée et al., 1999; Wang et al., 2015). In addition, the value of WHR at which one is considered physically attractive by men is fixed (e.g., Marlowe & Wetsman, 2001), and changes in the value of WHR are unlikely to affect the degree of attractiveness from men. In contrast, BMI must be high in environmental harshness, such as hunger, and low in physical attractiveness in modern society. Therefore, we can predict that the desired BMI will vary depending on the relative importance of the adaptive problems. We also focused on BMI in this study because BMI, rather than WHR, is a better indicator for testing our predictions.

To test these hypotheses, we recruited women who had previously responded to whether they had a boyfriend and provided their BMI as participants. Thereafter, in the experiment, the economic recession was primed as environmental-harshness information (see for detail, Bradshaw et al., 2020; Garza et al., 2021; Griskevicius, Delton, et al., 2011; Griskevicius, Tybur, et al., 2011; Hill et al., 2014; Hill et al., 2012), and their preferences for high-calorie foods and beverages, as well as low-calorie healthy foods and drinks, were measured as dependent variables. We measured both implicit and explicit aspects of preference because both need to be considered in eating

research (e.g., Czyzewska & Graham, 2008; Finlayson et al., 2008).

Methods

Participants

A total of 147 women who were undergraduates participated in both the pre-survey and the main experiment. Of these, data from 144 students (M_{age} = 18.78, SD_{age} = 1.08; M_{BMI} = 20.65, SD_{BMI} = 2.45) were included in the analysis. Three participants—two did not answer the questions for calculating BMI in the pre-survey and the other did not follow the instructions for responding to the paper-pencil Implicit Association Test (IAT)—were excluded. Thirty-eight participants (26%) had a boyfriend, and 106 (74%) did not.

Measurements

(a) Explicit measure

The participants were shown color photographs of foods and drinks and were asked to rate how much they currently wanted to eat or drink each item on a seven-point scale. Six low-calorie foods (such as salad and Japanese soba noodles), five low-calorie beverages (such as black oolong and Japanese teas), six high-calorie foods (such as steak and shortcake), and five high-calorie drinks (such as Coca-Cola and milk tea with sugar) were presented. The mean of the degree to which the participants wanted to eat or drink low-calorie food and drinks, minus that of the high-calorie food and drink, was standardized and used as an index of explicit high-calorie avoidance.

(b) Implicit measure

Participants answered the paper-pencil IAT (Lemm et al., 2008). The labels (items) used were low-calorie foods and drinks (soy milk, black oolong tea, salad, green pepper, and bitter melon), high-calorie foods and drinks (cider, cola, steak, carbonara, and chocolate), favorable words (pleasant, beautiful, likable, wonderful, and happy), and unfavorable words (unpleasant, ugly, dislike, dirty, and loud). The participants were first presented with a questionnaire containing a combination of low-calorie foods and beverages and favorable words, and they classified the items during their practice and main trials. Thereafter, they were provided with a combination of high-calorie drinks and favorable words, and they performed a practice and main trial in which they classified the presented words. Each trial lasted three minutes. The number of correct answers in the "low-calorie/favorable" trial minus the number of correct answers in the "high-calorie/favorable" trial was standardized and used as an index of implicit high-calorie avoidance.

Procedure

(a) Pre-study

During their class, the participants were asked to complete a pre-survey with items regarding the presence of a boyfriend, their height and weight to calculate BMI, and other relevant aspects.

(b) Main study

The participants were told that the experiment aimed to examine the effect of hunger on task performance;

they were instructed not to eat anything after lunch until the experiment was conducted in the evening. This condition was used following Hoefling and Strack's (2008) study, wherein being hungry was shown to be effective in examining attitudes toward high-calorie foods. To prime economic recession, we used an established priming methodology that raised concerns about resource scarcity to prime ecological harshness (e.g., Hill et al., 2012). The participants were asked to read a newspaper article and memorize sentences from it in three minutes for the purported purpose of examining a memory task performance. In the recession condition, they were presented with sentences stating that economic conditions would worsen owing to a consumption tax hike. In contrast, in the control condition, participants were provided sentences regarding safety on the way to school, which was not related to the economy. They were then told that they would be allowed time to examine their memory, both explicit and implicit measures of high-calorie avoidance were measured. The order of these two measures was counterbalanced. Thereafter, the participants answered questions about their attitudes toward food and the opposite gender. Finally, the experiment was completed when the participants described the contents of the memorized newspaper articles on a blank paper. Debriefing was conducted at a later date.

Results

To examine the hypothesis, we analyzed the data using a general linear model of mixed factors, including all interactions of condition (recession vs. control) × boyfriend (presence vs. absence) × BMI (centered) × measure (explicit vs. implicit). The results revealed that the interaction of condition × boyfriend [F (1, 136) = 10.27, p = .002, η_p^2 = .070; Table 1] and the interaction of condition × BMI × measure [F (1, 136) = 4.35, p = .039, η_p^2 = .031] was significant. For the condition × boyfriend interaction, as shown in Figure 1, participants with a boyfriend in the recession condition showed a preference for high-calorie food compared to those in the control condition [F (1, 136) = 7.14, p = .008, η_p^2 = .050]. By contrast,

participants without a boyfriend in the recession condition avoided high-calorie food compared to those in the control condition [F (1, 136) = 3.17, p = .077, η_p^2 = .023]. No interaction effect of condition × boyfriend × measurer was found [F (1, 136) = 0.23, p = .629, η_p^2 = .002]. Thus, the pattern was similar for both manifest and latent indicators. These results supported our hypothesis.
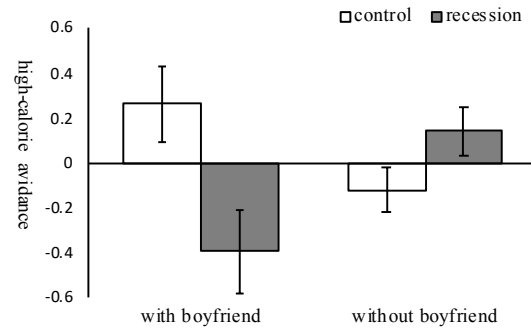

Figure 1. Effects of the presence of boyfriends and the condition

As for the condition × BMI × measure interaction, we examined the simple main effect of the condition. According to the results, only for the implicit measure in lower-BMI participants in the recession condition, preference for high-calorie food was significantly higher than those in the control condition [F (1, 136) = 4.89, p = .029, η_p^2 = .035; Figure 2]. These results support the hypothesis that the tendency to consume high-calorie foods increases at the subconscious rather than the conscious level in participants with inadequate fat stores when an economic recession is primed. In the explicit measure, no differences were observed between the control and recession conditions among the lower-BMI participants [F (1, 136) = 0.02, p = .878, η_p^2 = .000]. Among the higher-BMI participants, there were no differences between the conditions in both implicit [F (1, 136) = 0.00, p = .988, η_p^2 = .000] and explicit [F (1, 136) = 1.21, p = .274, η_p^2 = .009] measures.

Table 1. Results of the general linear model

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Condition	F (1, 136) = 0.03, p = .866, η_p^2 = .000
Boyfriend	F (1, 136) = 0.09, p = .763, η_p^2 = .001
BMI	F (1, 136) = 1.58, p = .211, η_p^2 = .011
Measure	F (1, 136) = 0.001, p = .978, η_p^2 = .000
Condition*boyfriend	F (1, 136) =10.27, p = .002, η_p^2 = .070
Condition*BMI	F (1, 136) = 0.18, p = .674, η_p^2 = .001
Condition*measure	F (1, 136) = 1.07, p = .303, η_p^2 = .008
Boyfriend*BMI	F (1, 136) = 1.06, p = .306, η_p^2 = .008
Boyfriend*measure	F (1, 136) = 2.90, p = .091, η_p^2 = .021
BMI*measure	F (1, 136) = 2.98, p = .009, η_p^2 = .021
Condition*boyfriend*BMI	F (1, 136) = 0.52, p = .472, η_p^2 = .004
Condition*boyfriend*measure	F (1, 136) = 0.23, p = .629, η_p^2 = .002
Condition*BMI*measure	F (1, 136) = 4.35, p = .039, η_p^2 = .031
Boyfriend*BMI*measure	F (1, 136) = 0.85, p = .357, η_p^2 = .006
Condition*boyfriend*BMI*measure	F (1, 136) = 1.46, p = .229, η_p^2 = .011
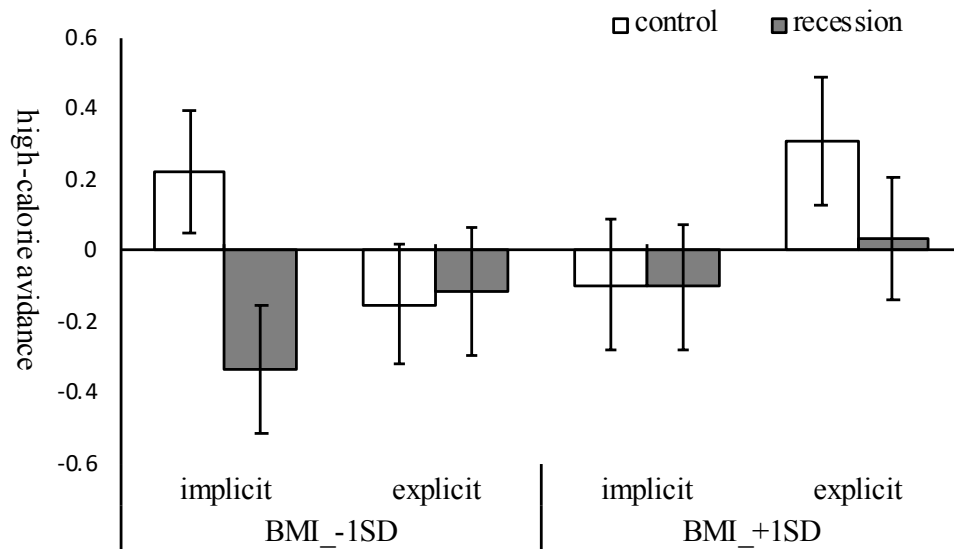
Figure. 2 Effects of the condition, BMI, and measure

Discussion

We examined factors moderating the effects of an economic recession on women's preference for, or avoidance of, high-calorie foods. For women with boyfriends (who would have already resolved the adaptive problem of securing a long-term partner), a preference for high-calorie foods occurred when the economic recession was primed. By contrast, women without boyfriends (who had to compete for a long-term partner) avoided high-calorie foods when the economic recession was primed. These results reflect the use of a strategy to win the competition for a long-term partner, consistent with the belief that slimmer women are more attractive in modern society (e.g., Bergstrom et al., 2004; Grossbard et al., 2011). This moderation effect by the presence or absence of a boyfriend occurred independently of explicit and implicit measures. These results supported the hypothesis of the adaptation problem related to the acquisition of long-term partners.

According to the BMI results, a preference for high-calorie foods among lower-BMI participants was significant only in implicit measures. This supports the hypothesis that economic recession would lead women to store fat for pregnancy and childbirth (Frisch, 1985; Hill et al., 2013). This finding suggests that preference for high-calorie foods is difficult on explicit measures because young women are less likely to be conscious, owing to the norm that being slim is desirable. However, avoidance of high-calorie food did not occur even when economic recession was primed in the explicit measures for higher-BMI participants. These results may be because the participants' BMI in this study was generally low, and even the mean + 1 SD was within the standard weight.

These results support evolutionary psychology's predictions. Amid the challenges associated with today's environmental harshness, such as an economic recession, a potential conflict can be observed between survival- and mating-related adaptive problems in women's eating behaviors. Women who have already solved survival-related adaptative problems are more likely to develop preferences based on mating-related adaptative problems, while women who have already solved the marital problem are more likely to develop preferences based on the survival-related adaptative problem. These findings illustrate human behavior in contexts where evolved psychological mechanisms are in conflict. While previous research has already shown that affiliation needs moderated in situations where affiliation and disease-avoidance goals conflict are in conflict (Sacco et al., 2014; for a review on the tradeoff between affiliation and disease-avoidance goals, see Young et al., 2021), this study revealed moderators in situations where the survival and the mating motives are in conflict.

We measured women's avoidance of, or preference for, high-calorie foods using implicit and explicit measures. In eating research, both implicit and explicit aspects of liking should be considered (e.g., Czyzewska & Graham, 2008; Finlayson et al., 2008; Goldstein et al., 2014). Modern women show a high interest in beauty and diet (e.g., Bergstrom et al., 2004; Grossbard et al., 2011). Therefore, avoidance of high-calorie foods is considered to be a more critical issue. It is challenging to be aware of hunger as an adaptive problem in modern society, and storing fat is not desirable from the perspective of beauty and health norms. Our results showed that the interaction of condition × BMI × measure was significant, and a preference for high-calorie foods among lower-BMI participants was significant only in implicit measures. These findings also suggest that when examining eating behaviors (especially women's attitudes toward high-calorie foods), it is important to measure both implicit and explicit factors.

These results could carry significant implications for research methods in evolutionary psychology. They suggest that even if psychological mechanisms are shaped in an evolutionary adaptation environment, they might not be measurable by explicit measures (i.e., not salient as conscious preferences) if their outcomes do not align with contemporary norms. Thus, employing implicit measures

Several limitations exist in this study. First, because the participants were undergraduate students, it is possible that their boyfriends could not be assumed to be candidates for long-term partners. This study did not directly ask participants who had a boyfriend whether or not they seriously assumed a long-term partner relationship with their boyfriend, so it is not clear to what extent participants seriously assumed a long-term relationship with their boyfriend. However, it is conceivable that the presence of a boyfriend could function as information indicating that the likelihood of obtaining a long-term partner is relatively high at this stage. In future studies, the participants should be directly asked whether or not they assumed their boyfriends as their long-term partners. Another limitation of this study is that the participants' actual eating behaviors were not measured. In the future, it will be necessary to examine how the preference or avoidance measured by explicit and implicit measures (which change with environmental harshness) predicts eating behaviors. According to Goldstein et al.'s (2014) study, neither implicit nor explicit attitudes alone predicted chocolate consumption, and the discrepancy between implicit and explicit attitudes toward chocolate positively predicted its consumption. In line with these findings, it would be necessary to consider the effects of the discrepancy between explicit and implicit measures on the actual eating behaviors during environmental harshness. Another limitation was that our participants were only undergraduate students, who are more likely to come from middle- and upper-class backgrounds and follow slower life-history strategies. Future studies should include non-student participants.

In conclusion, this study examined the effect of economic recession on women's preference for, or avoidance of high-calorie foods. The results showed that participants with a boyfriend preferred high-calorie foods and those with low BMI showed a preference for high-calorie products only in implicit measures when economic recession was primed. These results suggest that the presence of a boyfriend and BMI are moderators of the effects of economic recession on women's preference for, or avoidance of, high-calorie foods.

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Author contribution
YI and MN conceptualized the study; YI and MN analyzed the data; and YI and MN jointly wrote the manuscript. Both authors approved the final version.

Ethical statement
In this study, all participants were informed of the study procedures and they provided their informed consent. This study was conducted when there was no formal research ethics committee at the first author's institute (Hitotsubashi University). Therefore, it was reviewed and approved by a group of impartial researchers led by Prof. Koji Murata at Hitotsubashi University. Research for this study was performed in accordance with the Declaration of Helsinki.

Data accessibility & program code
The data that support the findings of this study are available from the corresponding author upon reasonable request.

Supplementary material
Not applicable.

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