BEHAVIORAL INTERVENTIONS FOR CHOICE DECISIONS: CONVENIENCE AND VISIBILITY INTERVENTIONS VERSUS TASTE PREFERENCE

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ABSTRACT

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Successful behavioral interventions to reduce the consumption of unhealthy food help lessen the burden of non-communicable diseases. In prior research, a conventional approach such as providing nutrition information could not overcome the "tasty" impact of unhealthy food. This study is a field experiment, conducting in a casual restaurant, designed to assess the effects of behavioral- and cognitively-oriented interventions on healthy meal choice. The interventions include convenience enhancement, visibility enhancement and a combination of the two. The results show that adding difficulty in ordering high-calorie food along with visibility enhancement could reduce calorie intake and compensate for the calorie increase caused by the taste effect. However, the effectiveness of interventions is different across different types of participants.

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CHAPTER 1

INTRODUCTION

1.1 Non-Communicable Diseases and Health

It is evident that non-communicable diseases (NCDs) have been one of the leading preventable causes of disease and death throughout the world. The death toll of NCDs is unprecedentedly high. These diseases carry a cost that extends more than health to make people absent from their works, weaken workforce productivity, dampen economic growth, and create disparities of opportunity, wealth, and power (Bloom et al., 2011; World Health Organization, 2018). Additionally, NCDs bear on psychological and social effects as hidden costs to NCDs' patients and their household members. Over the next twenty years, Bloom et al. (2011) estimated that NCDs would cost more than US$ 30 trillion and predicted that a significant and persistent economic impact would be expected worldwide.

It is a time of great chance to provide interventions for the prevention and cure of NCDs since the world is approaching a turning point. Efforts must be employed to decrease the risk factor prevalence. The World Health Organization (WHO) global targets have been set to reduce one-third of premature death from NCDs through prevention and treatment by 2030 and to promote mental health and well-being. Without meaningful efforts at this time, 15 million people, between the ages of 30 and 70, will continue to prematurely die each year from NCDs during their adulthood, demonstrating that NCDs are not only a problem for older generations. However, every US$1 invested in the valid interventions for NCDs will earn a return of at least US$7 by 2030 (World Health Organization, 2018).

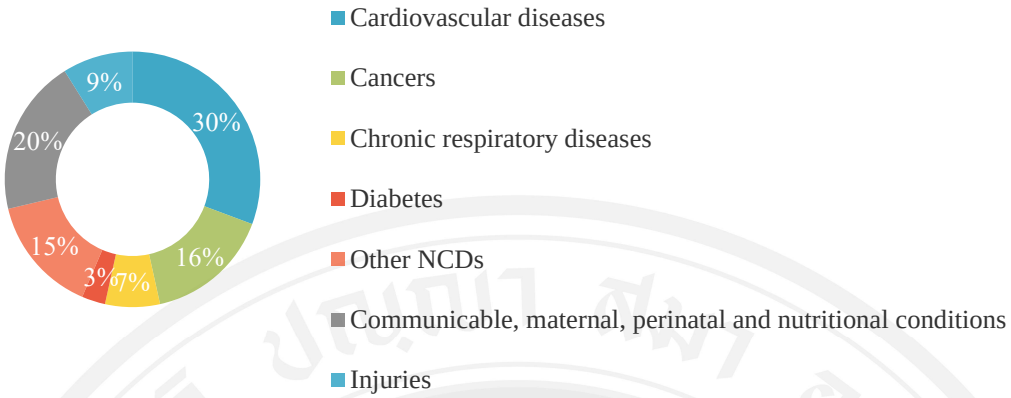


Figure 1.1 Global Mortality (% of Total Deaths), All Ages, Both Sexes, 2016
Source: World Health Organization (2018).

In 2016, Global NCD burden remains incredibly high. NCDs were responsible for 71% or 41 million of the world's 57 million deaths. The major NCDs responsible for these deaths, as shown in Figure 1.1, included cardiovascular diseases 31%; cancers 16%; chronic respiratory diseases 7%; and diabetes 3%.

Alarmingly, low-income and middle-income countries bear the highest burden. As shown in Figure 1.2, the proportion of all premature NCD deaths in low-income and middle-income countries was almost double the rate of premature NCD death in high-income countries. The highest probability was observed in the South-East Asian Region 50%, followed by African and Eastern Mediterranean Regions, 45% and 41% respectively, compared with the Region of the Americas 36%, Western Pacific Region 33%, and the European Region 28%. Overall, the probability of dying from an NCD was higher for males than for females in all regions.

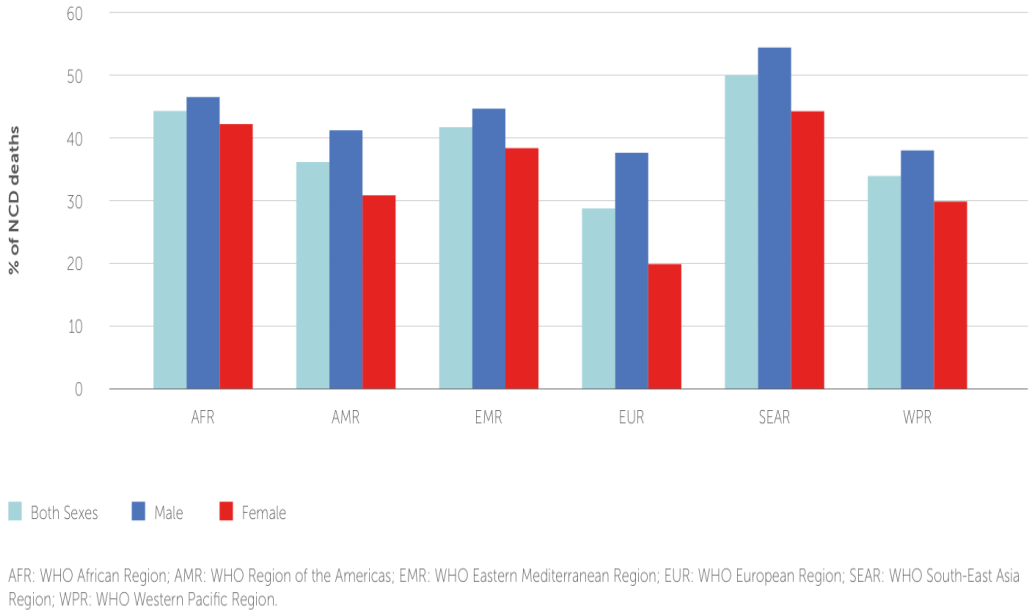


Figure 1.2 Proportion of NCD Deaths Occurring Among Those Aged 30-69 Years, By WHO Region, 2016

Source: World Health Organization (2018).

Several behavioral risk factors mostly cause the NCD burden; namely, alcohol and tobacco consumption, physical inactivity, and unhealthy eating. While alcohol consumption rates have been varied across WHO regions and tobacco consumption have been reduced over the last 15 years, both physical inactivity and unhealthy eating have been increased in recent decades (World Health Organization, 2018). The dietary and physical activity behaviors have been changed due to the globalization of high in sugar, fat, & salt processed foods and sedentary lifestyles, resulting in an imbalance between caloric intake and energy expenditure (Cohen & Farley, 2008; Hawkes, 2006; World Health Organization, 2018). Although there is an unclear contribution of physical inactivity to the NCD problem, the evidence pointed out that the dietary behavior has become more of the main risk factors; for example, estimates from 2010 showed that most people consume twice the recommended daily salt intake.

As a consequence, globally, one-fourth of men and one-fifth of women or nearly a quarter of adults aged 18 years and over had raised blood pressure in 2015. Whereas raised blood pressure prevalence in adults has fallen in high-income countries over the last decades, it has remained steady or been increasing in numerous low-income and middle-income countries. The number of people diagnosed with diabetes has almost four times as great as 1980. Recently, the prevalence of obesity in adults, aged 18 years and above, was 650 million (World Health Organization, 2018). While specific risk-factor prevalence has been regionally reduced, progress is still varied. If trends persist and there is still no shift in dietary behavior, the global targets will not likely be achieved (Marteau, Hollands, & Fletcher, 2012; World Health Organization, 2018).

In September 2015, economically feasible & expandable WHO interventions were set to tackle behavioral risk factors in regard to country capacity to prevent and control NCDs. From a financial viewpoint, interventions must be practical and affordable for countries to incorporate NCD interventions into their health care policies. The WHO interventions were estimated to cost as low as $1 per person annually, between 2018 and 2025, in a lower-income country context. These interventions will not only give health benefits to people but also lower expenditure for a government. Implementing all interventions in all countries successfully between 2018 and 2025 would save millions of premature deaths and move countries closer to the NCD mortality reduction targets (World Health Organization, 2018).

Several interventions have been designed by the World Health Organization to reduce unhealthy diet as shown in Table 1.1. Two core strategies have essentially underlying these efforts. First, strategies create healthier environments through a reformulation of food products and an establishment of a supportive public environment. Second, strategies increase health knowledge through a behavior change communication & media campaign and implementation of nutrition labeling. In essence, the following strategies have often depended on the assumption that people are rational: people will behave rationally if they are shown with the correct health information in a form that they can apprehend.

Table 1.1 Noncommunicable Disease Intervention to Reduce Unhealthy Diet

Core strategies	Intervention	Description
Create healthy environments	Food reformulation	Reformulate food products to contain less unhealthy ingredients and set the amount of unhealthy ingredient target in foods and meals
	Supportive environments	Initiate a supportive environment in public organization such as hospitals, schools, workplaces, and nursing homes, to enable less unhealthy options to be provided
Increase health knowledge	Education	Change people's behavior through communication and mass media campaign
	Repackaging	Implement front-of-pack labeling

Source: World Health Organization (2018).

However, in the case of NCDs, people usually know the consequences of their unhealthy behaviors and have options to choose a healthier lifestyle. Interventions, using health information to convince people to change their behaviors such as health education or nutrition labeling, may have little or no effects on unhealthy behaviors. From human behavior that is not led by their careful health action-consequence consideration, but is unconsciously influenced by the change in the health environment such as reformulation of food products or making healthy food more salience, the usefulness of health knowledge and information is quite limited (Marteau et al., 2012).

Previous interventions have focused mainly on persuading people through health information, if these interventions work, NCDs would be much less prevalent than they are now. It implies that future interventions should potentially be creating a healthy food environment. This research, therefore, gives thorough attention to the role of behavioral economics in building on healthier food environments.

1.2 Behavioral Economics and Health

The focus and attention of economists have been shifted from rational decision making of individuals towards the limits of rationality. Since individuals do not have full rationality in making a decision, rational aspects of individual decision need to be revised. This shift is fundamentally essential for shaping a theoretical and an empirical model of human decision making in social sciences, mainly behavioral economics. The bounded rationality, coined by Simon (2000), is the term that used to describe individual decision making that is limited by people knowledge, people ability to apply relevant knowledge, and time. The theory of bounded rationality concerns with the quality of people to deal with consequences of their action, to optimize among choices & outcome, and to handle external uncertainty environment.

In the earlier days, standard economic theories assume individual rational decision. They failed to explain individual in some circumstances; for instance, an individual makes choices that are not in his or her best interest or sometimes even harmful to him or her. These irrational decisions are typical and affect human behavior to a significant degree.

With this new body of knowledge, a new research method is needed. Theories are required to build upon the more realistic model of the bounded rational individual which will alter the outcome of the simple model. Kahneman (2011) proposed a dual system of cognition that explains how people think before making the decision. System one is dominated by fast thinking associated with people's intuition. People use system one automatically for everyday decisions or repetitive tasks with low thinking effort; however, system one is prone to error. System two, on the other hand, is controlled by slow thinking which requires deliberate thinking effort. The activity that demand system two thinking is; for example, complex computations. Even though system two requires more time to process, it is more reliable. Mapping it to Thaler (2015), the homo economicus would think slow and make careful decisions by considering all the benefits and costs. Humans, on the other hand, would think fast by applying intuition and heuristics. As a result, the human is error-prone and misbehave which differentiate human from homo economicus.

Food choices are perfect examples of system one thinking where visibility, desirability, & availability of food dominate human decision making (Cohen & Farley, 2008; Marteau et al., 2012; Wansink & Sobal, 2007). Concerning the best interest of human decision-making processes, behavioral economists introduce interventions that unconsciously urge people to make decisions that optimize their long-term benefits and at the same time do not rule out any options people can make, regardless of how weak or harmful those options are to people. These interventions are widely acknowledged as a nudge or libertarian paternalism or non-coercive push toward desirable behavior that is judged to be desirable by individuals or policymakers. On the opposite side of the spectrum, coercive paternalism uses force to influence people decisions. These interventions will mandate people to maximize their benefits and people cannot opt out of the mandate. The relationship between coercive paternalism and libertarian paternalism is shown in Table 1.2.

Table 1.2 Regulatory Paradigms

		Policy Target	
		Paternalism	Welfarism
Implementation Methods	Coercive	Coercive Paternalism	Coercive Welfarism
	Non-coercive	Libertarian Paternalism	Libertarian Welfarism

Source: Korobkin (2016).

Generally, libertarian paternalism has an intention to target “System One” decisions, where thinking efforts are low, and objections are weak; as a consequence, the choice environment is rather important compared to coercive paternalism (Kahneman, 2011; Sunstein, 2013). However, only small changes in the choice environment are needed to implement this libertarian paternalism, while prices and the choice set can remain unchanged. To be precise, libertarian paternalism is not

mandated; therefore, there will be low associated implementing costs or low costs of choice blocking. Also, libertarian paternalism must be effortless and cheap for people to reject (Thaler & Sunstein, 2003, 2008).

As in libertarian paternalism, libertarian welfarism is also implemented without force. Despite that, libertarian welfarism maximize social benefits instead of individual benefits. When the force is used to promote social benefits and some people may be worse off, these interventions are called coercive welfarism.

Korobkin (2016) suggested that libertarian welfarism is less preferred to libertarian paternalism when 1) policymakers know the long-term costs and benefits of individuals contingent on policy implementation, 2) the long-term costs and benefits of individual are quite homogenous, and 3) the effect of the policy is low towards the third party. Alternatively, when policymakers know social costs and social benefits of a society rather than individual and the effect to bystanders are large, libertarian welfarism is a desirable policy as illustrated in Table 1.2. Sunstein (2013) argued that the welfarist arguments against paternalist are controversial, regardless of non-coercive or coercive ones, because welfarist's claim is just normative and may not be true.

Recently, behavioral economics theories have been implemented in the healthcare sector to address the risk behaviors that have affected poor health and have increased healthcare costs. Behavioral economic interventions, employed to tackle risk behaviors in the context of NCDs, need to alter unhealthy eating habits and have an adequate impact in order to mitigate significant death toll from NCDs. This paper aims to identify behavioral interventions that are more effective at changing unhealthy eating behaviors and to investigate their impacts on particular group of people.. Successful behavioral interventions that reduce the consumption of unhealthy food will lessen the burden of NCDs.

In the flourishing field of behavioral economics, accumulated number of literature involves eating habits, health, and interventions. In this research, different types of interventions designed to alter the food intake of restaurant customers are experimented. These interventions are relied upon behavioral economics insights to help customers choosing healthier food options. Various types of behavioral economics interventions used to alter unhealthy habits or enhance healthy habits are discussed further. The objectives of this research are as follows:

1) Identify whether tasty food is always unhealthy

2) Compare the effectiveness of combined interventions and single intervention

3) Assess whether the impacts of combined interventions prevail over taste preference

4) Evaluate the compensatory effect between main dish and side dish consumption, and

5) Explore the key factors such as education, age, gender, income, or weight that influence the effectiveness of intervention

CHAPTER 2

LITERATURE REVIEW

According to the development outlook by World Health Organization (2018), affordable and abundant food had helped to solve a malnourishing problem in underdeveloped countries in the past; however, they also create problems arising from the food over consuming now. As a result, obesity has been one of the top causes of premature adult death, not only in developed countries but in other developing countries also.

Traditional interventions, such as subsidies on healthy foods or tax on unhealthy foods and nutrition education, have been employed to tackle the aforementioned problem. In spite of these interventions, results show the adult obesity rate is never be subsided (World Health Organization, 2018). Afshin et al. (2017), conducting meta-analysis of healthy food subsidizing and unhealthy food taxing studies, found healthy food subsidies are more effective than taxing unhealthy food. Tax on sugary beverages has an only moderate effect on normal weight individuals and no effect on overweight individuals. These results guide to the possibility that other factors such as nutrition education or food attractiveness may involve in subsidizing and taxing interventions. Murimi et al. (2017) studied nutrition education interventions (e.g., counseling and education on increasing fruit and vegetable consumption) and suggested that insufficient time for interventions, incomplete intervention delivery, and inadequate support for the choice environment, contribute to less effective interventions.

In the last few years, evaluating the health consequences of eating habits has loomed as an important and meaningful research topic (Antúnez, Giménez, Alcaire, Vidal, & Ares, 2017; Denize, Gastón, & Rosires, 2018; Jo & Lusk, 2018; Kurz, 2018; Tangtammaruk, 2017). The following research objective is to explore the critical but overlooked factors in unhealthy eating. Intuitively, consumers may be drawn into food because of its unhealthiness.

2.1 "Tasty = Unhealthy?"

The profit-maximizing company and restaurants where promote unhealthy eating behaviors are often held responsible for consumers' overconsumption. However, in company and restaurants' opinions, consumers are unquestionably responsible for their actions (Nestle 2003, as cited in Raghunathan, Walker, Naylor, & Hoyer, 2006). There are many reasons behind the choice that consumer makes on her food, taste, health concerns, image, social & cultural influences, and buying habit buying all come into play when a consumer is making a food decision. Taste is generally cited as the first reason or among the top reason for a consumer choosing a food, followed by health concerns and other reasons (Glanz, Basil, Maibach, Goldberg, & Snyder, 1998; Lennernäs et al., 1997; Tepper & Trail, 1998). Consequently, it is challenging to promote healthy food because taste is enriched by unhealthy ingredients such as sugar, fat, and salt (Drewnowski, 1997) and consumers are not willing to substitute taste for their health benefits (Verbeke, 2006).

Informing health benefits & nutritions to consumers does not only contribute to the change in health perceptions, but also consumers' taste perception as well (Mai & Hoffmann, 2015; Teisl, Bockstael, & Levy, 2001). Previous research has revealed a negative relationship between perceived healthiness and taste. Raghunathan, Naylor, and Hoyer (2006) found the support of the "tasty=unhealthy" intuition such that consumers see less healthy food as having better taste, more enjoyable during actual consumption, and more preferred when they value joy more than health. They also concluded that American consumers tend to over-consume unhealthy foods because consumers, without their awareness, consider unhealthy foods as having better taste than healthy foods.

In spite of the strongly "tasty=unhealthy" intuition, there is some evidence of a positive relationship between health and taste. Unlike American consumers, Jo and Lusk (2018) found that Chinese consumers tend to view healthy foods as tasty. Likewise, Jo, Lusk, Muller, and Ruffieux (2016) and Werle, Trendel, and Ardito (2013) evidenced that "tasty=unhealthy" may not be universal, they found the opposing intuition: "tasty=healthy", in France where healthier food is rated as tastier. Ultimately, Werle et al. (2013) concluded that cultural and product differences play a role in a

divergence of consumers' perception. Because of these international differences, there is more divergence between the US and Eastern countries than that between US and Western European countries.

Recently, some groups of consumers were demonstrated to have less adherence to the "tasty=unhealthy" intuition (Howlett, Burton, Bates, & Huggins, 2009; Irmak, Vallen, & Robinson, 2011). Evidence indicated that health-conscious consumers tended to believe that their actions mattered to their health more and took more preventive health actions than less health-conscious consumers (Gould, 1988; Jayanti & Burns, 1998). Furthermore, Verbeke (2005) found that female and older consumers are willing to substitute some loss of taste to more health benefits in functional foods. Also, when food is in dire need in underdeveloped countries, where people survive on barely enough food, tastiness is believed to have a positive relationship with healthiness (Drewnowski, 1997; Smith, 2004).

People's judgments about tastiness and healthiness can be changed over time. Oakes (2005) demonstrated that healthiness judgments are sensitive to contexts. When consumers trust in health claims of higher-calorie snacks more than lower-calorie snacks, lower-calorie snacks are perceived to contribute more to weight gain.

Pointing out the common limitations of the research mentioned above is essential. They are fundamentally based on consumers' intentions, and intentions do not always match up with their real behavior. Intentions only explain some of the variances in actual behavior, and the gap between intentions and behavior is not negligible (Morwitz, Steckel, & Gupta, 2007; Sheeran, 2002; Sun & Morwitz, 2010).

Alternatively, methods of evaluating consumers' sensory and hedonic perception or consumers' perceived value through a tasting of actual food products, such as tasting reduced-sugar products or reduced-salt products, are more direct measures and better behavior predictors than intention methods. Oliveira, Ares, and Deliza (2018) studied the influence of health and hedonic claims on consumer perception and found that consumers do not have negative expectations about sugar-reduced beverages; however, reduction in sweetness intensity is the main determinants of consumers' hedonic reaction towards the beverages. Positively, Chang and Chiou (2006), Hoppert, Zahn, Puschmann, Ullmann, and Rohm (2012) and Pineli et al. (2016) suggested that certain sugar reductions in cakes, dairy products, and beverages are

possible without affecting consumers' sensory and hedonic perception and further recommended a gradual reduction of added sugar products. On the other hand, salt is also an ingredient that significantly contributes to NCDs. Vázquez, Curia, and Hough (2009) and Antúnez et al. (2017) found the results similar to the sugar added products that biscuits and bread with certain salt content do not alter consumer's perception, and salt-reduced biscuits even have high acceptability among teenagers who are used to consuming high-sodium products.

However, Chollet, Gille, Schmid, Walther, and Piccinali (2013) pointed out a decrease in consumers' overall preferences with reduced-sugar yogurt. This result is in line with reduced-salt soup. Liem, Toraman Aydin, and Zandstra (2012) reported that health claims related to salt reduction soup decreased consumers' sensory and hedonic expectations, and also their real taste experience. These conflicting findings suggest that a recommendation for sugar or salt reduction is product specific and highlights the need to research to find the different threshold of sugar or salt reduction products.

The methods of evaluating consumers' sensory and hedonic through real products under controlled environment also have limitation. Even though consumers have opportunities to taste real products, the environment is different from an open restaurant or a grocery store where choices are swiftly made. Therefore, these methods may not reflect the actual behavior of consumers.

Consumers make quite a number of meal decisions per year and food choices are a complex process influenced by many factors; for example, the characteristics of the products, the consumers themselves and the contexts. In order to ease decision making, these decisions are deeply influenced by a heuristic approach to accelerate the decision process (Haws, Reczek, & Sample, 2017; Wansink & Chandon, 2006).

2.2 Heuristic, Biases, and Interventions

To help consumers make healthier meal choices, given that people's choice is not entirely rational, interventions altering the environments where people make a decision are needed and become more popular. Hollands et al. (2013) defined interventions that consist of changing the properties, i.e., packaging design or size of the product, and placement of items or stimuli as a part of small environments with the aim of influencing people behavior unconsciously as choice architecture. Their health-related behavioral intervention definition and category highly correspond and contain three key foundations of other works: 1) nutrition labeling interventions; 2) changing proximity interventions, e.g., placing less healthy foods further away; and 3) changing default portion sizes.

These three general categories of health-related behavioral intervention map out empirical evidence for the effects of behavioral interventions related to eating habits.

2.2.1 Nutrition Labeling Interventions

One of the widely used interventions by both public and private organizations to promote healthy eating habits is nutrition labeling. The results of Wisdom, Downs, and Loewenstein (2010) supported that provision of calorie information and calorie recommendation can affect the food choices of fast-food restaurant consumers. Both calorie information and daily calorie target labeling decrease total consumers' calories ordered.

Moreover, Thunström and Nordström (2015) suggested that demand for chips and bread may increase by the healthy label and consumers' experienced taste remains the same by the food bearing a healthy label. Likewise, Jo and Lusk (2018) found that when people are exposed to health information, they signal stronger buying intentions for the foods perceived healthier and also tastier. On the contrary, Thunström and Nordström (2015) involved taste in the analysis; the healthy label no longer determines the demand for food.

2.2.2 Changing Proximity Interventions

These changing proximity interventions are relying on two main biases; present-biased preferences and default option bias.

2.2.2.1 Present-Biased Preferences

Individuals who have present-biased preferences put a higher value on present payoffs in relation to future payoffs (O'Donoghue & Rabin, 1999). In eating behavior context, time-inconsistent preferences of people cause them to choose less healthy food in the present at the expense of poor health in the future. The intervention relying on this present-biased preferences needs to put disproportionate weight in favor of healthier options.

Changes in convenience, either making more healthy food more convenience or making less healthy food less convenience, have been shown to reduce food intake (Hanks, Just, Smith, & Wansink, 2012; Rozin et al., 2011; Wisdom et al., 2010). This statement is equivalent to push up an extra cost to present by making unhealthy option less accessible. After some period of time, making unhealthy food harder to access helps contribute to body weight loss and potentially is an exceptional strategy amongst all other healthy eating strategies (Meiselman, Hedderley, Staddon, Pierson, & Symonds, 1994; Rozin et al., 2011). In addition, making healthy food more visible by changing the menu order or serving healthy food first increase healthy food order and intake (Dayan & Bar-Hillel, 2011; Elsbernd et al., 2016; Kurz, 2018). Despite significant results on convenience and visibility interventions, Painter, Wansink, and Hieggelke (2002) went on to test the effectiveness of both convenience and visibility simultaneously and found that food that is the convenience to consume contributes more to overeating than the visibility strategy.

Other studies have shown different results, Harnack et al. (2012) showed that serving both fruit and vegetables before other meal items increases only fruit intake but not vegetables, which may reflect compensatory effect between fruits and vegetables with other menu items. Worst of all, de Wijk et al. (2016) found that making whole grain bread more accessible compared to white bread does not increase its sales. A couple of reasons might explain this lack of effect. First, people with strong preferences might not be affected primarily by the intervention (Kurz, 2018). Second,

the effectiveness of interventions is context-specific (de Wijk et al., 2016). Hence, interventions require the specific effectiveness to influence consumer decision making.

2.2.2.2 Default Option Bias

The default option bias is the tendency for individuals to find the default option more appealing and to hold on to the default option, despite other superior options availability (Samuelson & Zeckhauser, 1988).

Conflicting results are often observed as a consequence of interventions based on default option bias. While (Potipiti et al., 2016b) exhibited that a default option increases the chance that people will choose healthier fast food choice, Wansink and Just (2016) found that children probably choose French fries instead of sticking to apples as a default option. Rather than concluded that default option can potentially influence consumers towards healthier default option as in Potipiti et al. (2016b), Wansink and Just (2016) stated that default options, especially in a fast-food restaurant, are not probably an answer for a behavioral eating problem.

In addition to assessing the default option of food choice, Tangtammaruk (2017) examined the effect of default option on beverages and found that offering healthier beverage as a default option can influence individual consumption behavior. However, Potipiti et al. (2016b) observed that a default option increases the chance that people choose healthier beverages only in some circumstances. Ultimately, Just and Price (2013) concluded that even default option is more cost-effective than other inventions, it has an only small impact on eating habits.

2.2.3 Changing Default Portion Size

Portion size is considered one of the main reasons why people are over-consuming in Western countries (Marchiori, Papies, & Klein, 2014). Habitually, people take the size of the plate as a starting point to decide how much to consume, leading to anchoring bias.

2.2.3.1 Anchoring Bias

The anchoring bias is a cognitive shortcut that allows people to use as a reference point to make decisions under uncertain circumstances. Generally, the decision process is biased towards a reference point and is unconscious to people.

Adding complex information to help people become more conscious and make better judgment are difficult (Tversky & Kahneman, 1974).

In food decision, anchoring bias refers to the effect of portion size that acts as an anchor influencing people consumption. Typically, people relatively consume more when served with a large portion size compared with small portion size (Marchiori et al., 2014).

Recent research has shown that people who are given a bigger package of popcorn consumed more than people who are given a smaller package popcorn (Potipiti et al., 2016a). When considering freshness of popcorn, people still over-consume popcorn with a larger package regardless of its freshness (Potipiti et al., 2016a; Wansink & Kim, 2005).

In a restaurant setting, enlarging the size of a dish served before meal results in more food intake, supporting the claim that large portion size at the restaurant may partially contribute to the obesity (Diliberti, Bordi, Conklin, Roe, & Rolls, 2004). Moreover, not only adults are prone to be affected by a bowl size and portion size when serving themselves. Children tend to serve themselves more and consume more, resulting in more waste with larger plates and bowls (DiSantis et al., 2013; Wansink, van Ittersum, & Payne, 2014). These results shed light on the evidence that people could potentially replace bigger bowls and serving spoons with smaller ones at home to reduce over-consumption (Wansink, van Ittersum, & Painter, 2006).

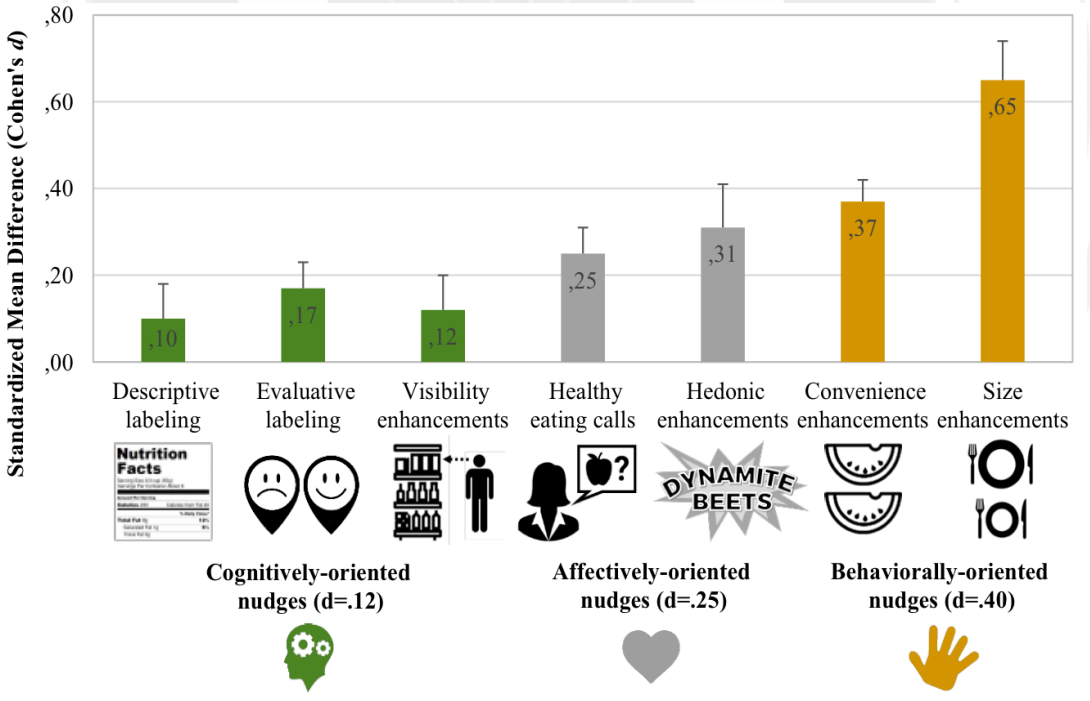
An unexpected finding was observed in Ayaz, Akyol, Cetin, and Besler (2016) where they found that plate size did not influence food intake in normal weight women. The different results may be credited to differences in research populations, a manner of meal serving, and study design.

2.3 Which Behavioral Intervention is the Most Effective?

Cadario and Chandon (2020) reanalyzed the data across meta-analysis of healthy eating interventions and made a comparison between them. They divided seven interventions into three types of nudges; namely cognitively-oriented nudges, affectively-oriented nudges, and behavioral-oriented nudges as shown in Figure 2.1. First, the cognitively-oriented nudges are interventions that attempt to change people's

thoughts; for example, food labeling give nutrition information to people, and visibility enhancements indirectly change the information about food options. Second, affectively-oriented nudges attempt to change people's feeling without changing people's thoughts. These interventions provide hedonic enhancement through attractive food picture or mouth-watering food descriptions. Third, behavioral-oriented nudges attempt to change people's behaviors unconsciously. Change in convenience and portion size are in this category.

When comparing each intervention type, results have shown that the effect sizes increase changing from cognitively-oriented nudges to behaviorally-oriented nudges as shown in Figure 2.1. Interestingly, the best intervention is expected to have six times in effectiveness than standard intervention and reducing unhealthy food consumption through interventions is more effective than increasing healthy food consumption or reducing total consumption (Cadario & Chandon, 2020).



Note: Error bar represent standard error.

Figure 2.1 Effect Sizes by Nudge Type

Source: Cadario & Chandon (2020).

These results give an insight into where the following research should be heading towards. First, it is likely more useful to conduct a study on behavioral-oriented interventions for reducing unhealthy eating. Second, a lack of evidence towards the effectiveness of combined interventions encourages further study to focus on the effectiveness of mixed interventions such as a combination of behaviorally-oriented nudges and other nudges.

2.4 Theoretical Framework and Expected Behaviors

It is widely acknowledged in economic studies that people attempt to make decisions that benefit them the most. Even with different objectives and preferences, people are all striving to make the best decisions for themselves. Other factors remaining constant, a person who enjoys tasty but unhealthy foods will consume more unhealthy food. Conversely, a person who prioritizes health over taste will consume less unhealthy food. In economics, this enjoyment that a person receives from consumption is called utility. The fundamental assumption in the basic economic model has been that people maximize utility over their lifetime. The utility from food consumption of individual may be represented in the following model.

2.4.1 Food Consumption Model

The following form of food utility is taken from O'Donoghue and Rabin, 2006

$$u = \frac{\rho}{1-r}x^{1-r} - \gamma x + I - x \quad (1)$$

The taste utility is $\frac{\rho}{1-r}$, obtained from the first unit of food consumption where ρ captures people's heterogeneous tastes. The decreasing marginal enjoyment of food is exhibited by x^{1-r} where x is the number of units of food consumption, and r is the rate at which marginal enjoyment is declining, taking a value between 0 and 1. The marginal enjoyment decreases faster when the value of r is higher. As a person consumes more food units, the enjoyment of a person decreases.

From equation (1), every additional unit of food consumed increases the likelihood of developing negative effects on health, assuming that consumption and negative health impact are proportional to each other. For each unit of food consumed, health gets γ units worse. Hence, the health impact on health is $-\gamma x$.

Additionally, the individual has budget constraint and must allocate his/her budget between food and composite good - everything else except food. If I is an individual's income and z is a composite good he could spend money on, then: $I = x + z$. The units of each good (x and z) are normalized to 1, so that they have the same measurement unit. The utility of composite good z can be written as: $z = I - x$

The value of food (x) that maximizes the value of u ($\frac{du}{dx} = 0$) is:

$$x = \left(\frac{\rho}{\gamma+1}\right)^{\frac{1}{r}} \tag{2}$$

2.4.2 Present Bias Model

However, evidence suggests that an individual's relative preference changes over time because of present bias (Laibson, 1997). In other words, people give more weight towards utility that currently happens than the later ones.

O'Donoghue and Rabin (2006) used quasi-hyperbolic discounting to account for present bias and assumed that health impact happened in the period after consumption. Therefore, the biased utility over time is:

$$U = \frac{\rho}{1-r}{x_1}^{1-r} + I - x_1 + \beta\sum_{t=2}^{T}\left(\frac{\rho}{1-r}{x_t}^{1-r} - \gamma x_{t-1} + I - x_t\right)\delta^{t-1} \tag{3}$$

where the lifetime utility over T periods represented by U. While x_t is food consumption in period t, x_{t-1} is food consumption in period $t-1$ (assuming that consumption in period t affects health in period $t+1$). δ is the exponential discount factor or standard time-consistent impatience, which has a value of $\delta \leq 1$. For simplicity, δ is assumed to equal to 1. β is a present-bias preference and is applied to any utility component that occurs in the future. If people have a strong present bias or β close to 0, they might excessively discount the health impact of unhealthy food consumption in the future.

In this model, consumption decision in one period is independent of consumption in other periods (additive separability). In other words, the benefits and costs from consumption in one-period are independent of those of other periods. Also, individual faces an identical consumption decision in every period. The present-bias preference causes an individual to maximize his lifetime utility which results in a consumption decision of:

$$x_t = \left(\frac{\rho}{\beta\gamma+1}\right)^{\frac{1}{r}} \tag{4}$$

which implies that present bias increases consumption of unhealthy food relative to the unbiased preference.

However, O'Donoghue and Rabin (2015) suggested that many behaviors attributed to present bias were, in fact, the result of other factors.

2.4.3 Internal-Deal Model

Sandilands (2020) proposed that individual was completely aware of their optimal consumption. However, an individual is prone to visceral influences (hunger, boredom, stress, tiredness, mood, emotion), causing him to put more weight on taste utility from eating food now at the expense of other sources of utility in the future. These visceral influences make an individual to heavily discount the health impact of current food consumption.

The visceral influences lead an individual to optimize:

$$u_{visceral} = \frac{\rho}{1-r}{x_1}^{1-r} - \theta\gamma x_1 + \theta(I - x_1) \tag{5}$$

where θ is a discount factor with $0 < \theta < 1$. $\theta = 0$ corresponds to a case of completely neglecting non-taste utility (health and composite good), and $\theta = 1$ corresponds to no discounting. If θ is near zero, neither knowledge about the immediate benefits of consuming healthy food nor negative health consequences of eating unhealthy food has a significant impact on utility.

This visceral utility has an optimal consumption of:

$$x_{visceral} = \left(\frac{\rho}{\theta(1+\gamma)}\right)^{\frac{1}{r}} \quad (6)$$

In this internal-deal model, the individual is on the verge of deciding how much he should consume based on prior health knowledge (rational self) and how much he wants to consume right now (visceral self)

Consider a utility function with two-period consumption, an individual maximizes:

$$\max_{x_1, x_2} U_{visceral} = \frac{\rho}{1-r} {x_1}^{1-r} + \theta \frac{\rho}{1-r} {x_2}^{1-r} - \theta\gamma(x_1+x_2) + \theta(I - x_1) + \theta(I - x_2) \quad (7)$$

The individual's optimal food consumption for the first period is:

$$x_1 = \frac{2}{2+\theta^{\frac{1}{r}}}\left(\frac{\rho}{(1+\gamma)}\right)^{\frac{1}{r}} \quad (8)$$

Moreover, an individual's planned consumption for the second period is:

$$x_2 = \frac{2\theta^{\frac{1}{r}}}{2+\theta^{\frac{1}{r}}}\left(\frac{\rho}{(1+\gamma)}\right)^{\frac{1}{r}} \quad (9)$$

It is worth pointing out that the term $\left(\frac{\rho}{(1+\gamma)}\right)^{\frac{1}{r}}$ appears in both x_1 and x_2 solutions, which reflects average optimal consumption of two periods. On the other hand, $\frac{2}{2+\theta^{\frac{1}{r}}}$ and $\frac{2\theta^{\frac{1}{r}}}{2+\theta^{\frac{1}{r}}}$ represent the deviation portions from the optimal consumption.

To maintain an individual's health, he must consume on average either by consuming an equal amount of food in each period or by trading-off between over-consuming in one period with under-consuming in another period (and vice versa). Any consumption combination is possible if the total consumption of both periods equals to

$2\left(\frac{\rho}{(1+\gamma)}\right)^{\frac{1}{r}}$. Note that an individual is often under the visceral influence in both periods and susceptible to over-consumption. However, given a specific level of discounting, an individual under the internal-deal model is anticipated to eat in moderation or reduce his consumption more than an individual under the present bias model (Sandilands, 2020).

CHAPTER 3

METHODOLOGY

Based on effect sizes by intervention type in prior research, the robust approach would be size enhancements; for example, the larger the portion size of the pasta entree the more consumption of pasta, vice versa (Diliberti et al., 2004). However, cooperation to alter portion size to conduct an experiment in an actual restaurant is difficult to obtain. Still, the convenience enhancements are anticipated to be amongst the most effective interventions and more robust than the nutrition labeling. There are two main reasons why labeling may have limited effects. First, nutrition information alone cannot overpower other influences, e.g., unpalatable, low-sugar or low-salt and low-fat food (Thunström & Nordström, 2015) or the delayed benefits of healthy eating (Lynch & Zauberman, 2006; Rick & Loewenstein, 2008). Second, when consumers are hungry, they tend to be hastily in need of food and less prompted to process nutrition information (Wisdom et al., 2010). Arguably, the power of combined cognitive and behavioral interventions may prevail over taste preference, but this statement still needs to be proven. Therefore, this research is designed to assess the effects of taste and eating-related behavioral intervention particularly the combination of convenience enhancements and visibility enhancements on healthy meal choices and compare with visibility enhancements alone.

The behavioral bias exploited in this research is present-biased preferences where convenience and visibility interventions intend to increase the immediate cost to consumers, requiring consumers' extra efforts to order a less healthy meal, to offset the immediate benefit of a tasty but less healthy meal.

Interestingly, there are no studies in Thailand examining the combined effect of interventions and taste controlling. The hypothesis is that combining convenience and visibility interventions can overcome the taste effect of less healthy food choice and the effectiveness of combined interventions is higher than visibility interventions alone.

However, without taste influences, the effectiveness of combined interventions is even greater.

The intention of this paper is twofold. First, to explore the effectiveness of the combination of convenience and visibility interventions on food intake when individuals' experienced taste from food is taken into account. Second, to investigate whether other factors, such as individuals' eating behavior and demographic characteristics, may influence the effectiveness of interventions.

3.1 Experimental Design

The following procedure as shown in Table 3.1 will be employed in the study.

Table 3.1 Steps in the Experiment

Step	Activity	
1	Participants are recruited	PARTICIPATIONS
2	Participants rate tastiness of eight pasta dishes	INTERVENTIONS
3	Participants order food from a menu	
4	Participants answer surveys	MEASURES

To recruit participants, the test experiment is advertised via restaurant's onsite advertisement and social media. Participants who agreed to participate needed to buy a lunch set (pasta dish, side dish, drink, and sweet) at a cost of 300 Thai baht. A lucky draw to win a 1%, 10%, 20%, 50% discount or a free meal at the restaurant was offered to participants who completed the taste experiment and survey. Participants who agreed to participate in the experiment was appointed the date for the taste experiment.

3.1.1 Participants

Three hundred and ninety participants were recruited in this study over a period of six-month long experiment (15 February 2019 – 15 September 2019) at an Italian fusion restaurant, named Barefoot, in Chiangmai, Thailand. The experiment was conducted every day during lunch time from 11.00 A.M. to 3.00 P.M.; except on Tuesday and Wednesday, when the restaurant was closed.

3.1.2 Interventions

The study implemented a 2 (taste experiment or not) × 3 (visibility of most caloric, least caloric, or a mix of pasta dishes) × 2 (less convenience of pasta dishes or not) experiment.

3.1.2.1 Taste Experiment

Participants were invited into the restaurant and lined up to taste different types of pasta dishes, labeled A to H. Each pasta dish was served in one-bite portion and presented one at a time in a random order. To minimize social influence, participants were seated in a small group. Then, participants were asked to give a score for eight different pasta dishes on a scale from 1 (“very poor”) to 7 (“very good”). The scores were written down on the form provided.

3.1.2.2 Visibility Intervention

After having rated the taste of the different pasta dishes, participants were asked to pick their meal from the menu, starting with a pasta dish from those they had just tasted, followed by a side dish (seasonal salad, caprese salad, fried tofu, or potato fries), a drink (latte, milk tea, green tea, or water), and finally a sweet (panna cotta or Greek yogurt). Nonetheless the visibility of side dishes, drinks, and sweets on the menu were the same across treatments. The only difference across treatments was the visibility of pasta dishes.

The visibility intervention was involved in this experiment by listing the non-highlighted after the highlighted pasta dishes on the menu. The highlighted menu, however, listed four of the eight pasta dishes. This menu consisted of three treatments either 1) the two most caloric (i.e., carbonara pasta and lasagna), 2) the two least caloric (i.e., olio mushroom pasta and chicken sausage pasta), or 3) a mix of both types of pasta

dishes (i.e., carbonara pasta and olio mushroom pasta), as a regular setting environment, see Appendix A.

3.1.2.3 Convenience Intervention

The convenience intervention came into play when participants choose the pasta dish from the supplementary menu. Participants were instructed at the bottom of the main menu that they could either order the pasta dish from the main menu or the supplementary menu, which was on the back of the menu page. Participants needed to write the name of the dish from the supplementary menu down, while they only needed to check their choice of pasta dish from the main menu, see Appendix A.

Both convenience and visibility interventions were implemented only for a choice of pasta dishes to observe a compensatory effect on non-pasta dishes. Such that, choosing between the least caloric pasta dishes might cause participants to compensate themselves with higher-calorie side dishes, drinks, and sweets later on.

3.1.3 Measures

Following the meal selection, participants were asked to complete the survey and informed once again that they would be awarded a random draw of either a discount coupon or a free meal coupon for participating in the taste experiment after the meals. The survey asked participants their demographic characteristics, their weight & height to calculate Body Mass Index (BMI), their estimation of the calorie intake of their meal, and their dieting habit. In particular, the survey asked participants to rate their hunger on a seven-point scale (extremely hungry = 7; not at all hungry = 1), their intention to lose weight (yes = 1; no = 0), their health concerns about what to order from 1 to 7 (strongest health concern = 7; least health concern = 1), and their frequency of eating at the restaurant on 1-to-7 scale (twice a week or more = 7; once a year or less =1). All survey questions are included in Appendix B.

To check whether the interventions work, two dummy variables are created for the visible effect of both most caloric, least caloric pasta dishes, compared to mix caloric pasta selection (more visibility of most caloric and least caloric menu = 1; less visibility of most caloric and least caloric menu or mix caloric menu = 0). Also, the dummy variable is created to indicate convenient effect (less convenience of most caloric and least caloric pasta dishes =1; otherwise = 0).

3.1.3.1 Effect of Interventions on Calorie Intake

The impact of both visibility and convenience interventions on total calorie intake is estimated with Ordinary Least Square (OLS) regression, controlled with the taste score from the taste experiment and participant characteristics. To compare the impact of the combined interventions and separate intervention, the interaction term between the visibility intervention and convenience intervention is included.

$$\begin{aligned}\text{totalcal} = {} & C_1 + \beta_1 \text{taste} + \beta_2 \text{vishigh} + \beta_3 \text{vislow} + \beta_4 \text{visconhigh} + \beta_5 \text{visconlow} \\ & + \beta_6 \text{vishigh} + \beta_7 \text{age} + \beta_8 \text{bmi} + \beta_9 \text{female} + \beta_{10} \text{diet} + \beta_{11} \text{yearedu} \\ & + \beta_{12} \text{income} + \beta_{13} \text{enjoymeal} + \beta_{14} \text{hungry}\end{aligned} \tag{10}$$

$$\begin{aligned}\text{pastacal} = {} & C_2 + x_1 \text{taste} + x_2 \text{vishigh} + x_3 \text{vislow} + x_4 \text{visconhigh} + x_5 \text{visconlow} \\ & + x_6 \text{vishigh} + x_7 \text{age} + x_8 \text{bmi} + x_9 \text{female} + x_{10} \text{diet} + x_{11} \text{yearedu} \\ & + x_{12} \text{income} + x_{13} \text{enjoymeal} + x_{14} \text{hungry}\end{aligned} \tag{11}$$

A separate OLS is estimated to examine the compensatory effect on non-pasta dishes (i.e., side dish, drink, and sweet) calorie intake.

$$\begin{aligned}\text{nonpastacal} = {} & C_3 + y_1 \text{taste} + y_2 \text{vishigh} + y_3 \text{vislow} + y_4 \text{visconhigh} \\ & + y_5 \text{visconlow} + y_6 \text{vishigh} + y_7 \text{age} + y_8 \text{bmi} + y_9 \text{female} + y_{10} \text{diet} \\ & + y_{11} \text{yearedu} + y_{12} \text{income} + y_{13} \text{enjoymeal} + y_{14} \text{hungry}\end{aligned} \tag{12}$$

3.1.3.2 Effect of Interventions on Least Caloric Dishes

To control for both the impact of taste and the interventions on the choice of the four least caloric pasta dishes, a logistic regression is estimated. The dependent variable is the dummy variable that takes the value 1 if a participant chooses the four least caloric pasta dishes and 0 otherwise. The explanatory variables included

in this model are taste score and dummy variables for the interventions and other variable representing participant background.

$$\text{choselowcalpasta} = C_4 + z_1\text{taste} + z_2\text{vishigh} + z_3\text{vislow} + z_4\text{visconhigh} + z_5\text{visconlow} + z_6\text{vishigh} + z_7\text{age} + z_8\text{bmi} + z_9\text{female} + z_{10}\text{diet} + z_{11}\text{yearedu} + z_{12}\text{income} + z_{13}\text{enjoymeal} + z_{14}\text{hungry} \quad (13)$$

Dependent variables and explanatory variables included in this model are as follows:

Table 3.2 Variables and Definitions

Variable	Definition
totalcal	Total calorie intake of participant's meal
choselowcalpasta (dummy)	Choice of low-calorie pasta, taking value of "1" if participant chooses one of the two least calorific pastas (olio mushroom pasta & chicken sausage pasta), and "0" otherwise
pastacal	Pasta calorie intake of participant's meal
nonpastacal	Non-pasta calorie intake of participant's meal (side dish, drink, and sweet)
taste (dummy)	Participant involvement in the taste experiment, taking value of "1" if participant engages in the pasta taste experiment or otherwise "0"
vishigh (dummy)	Visible intervention on most calorific pasta menu, taking value of "1" if participant receives this menu, and "0" otherwise
vislow (dummy)	Visible intervention on least calorific pasta menu, taking value of "1" if participant receives this menu, and "0" otherwise
vismixed (dummy)	Visible intervention on mix of both most and least calorific pasta menu, taking value of "1" if participant receives this menu, and "0" otherwise
visconhigh (dummy)	Visible and convenient intervention on most calorific pasta menu, taking value of "1" if participant receives this menu, and "0" otherwise
visconlow (dummy)	Visible and convenient intervention on least calorific pasta menu, taking value of "1" if participant receives this menu, and "0" otherwise
visconmixed (dummy)	Visible and convenient intervention on mix of both most and least calorific pasta menu, taking value of "1" if participant receives this menu, and "0" otherwise

Variable	Definition
age	Participant's age
bmi	Body Mass Index is ratio of participant's weight (kilograms) to square of participant's height (meters)
female (dummy)	Female participant, taking value of "1" if participant is female, or "0" otherwise
diet (dummy)	On diet participant, taking value of "1" if participant states that he/she is currently watching or restricting their number of calories, and "0" otherwise
yearedu	Participant's years of education
income	Participant's monthly salary, ranging from "1" (below 5,000 baht) to "7" (30,001 and higher)
enjoymeal	Participant's response to "How much do you think you will enjoy your meal?", on a scale from "1" (won't enjoy very much) to "7" (will really enjoy it)
hungry	Participant's response to "How hungry do you feel right now?" on a scale from "1" (not at all hungry) to "7" (extremely hungry)

CHAPTER 4

RESULTS

4.1 Participants and Treatments

A total of 360 participants engaged in the experiment; one-half of the participants were in a tasting treatment, and the other half were under no tasting treatment. Of 180 participants in each group, 90 were received visibility treatments: 30 most calorific, 30 least calorific, and 30 a mix of pasta dishes, and the other 90 were received visibility & convenience treatments: 30 most calorific, 30 least calorific, and 30 a mix of pasta dishes, also. Additionally, this experiment included an extra 30 individuals who represented the super control environment: no visibility and convenience treatment. This super control group was used to compare with the experiment group later on (see Appendix E for descriptive statistics of the super control group).

The majority of participants reserved seats in advance to take part in the experiment. Sixty-five percent were female, 94.36 percent Thai, 4.6 percent other Asian, and 1.04 percent American/European. The average age of participants was 29.77 years old, ranging from 5 to 69. The average body mass index (BMI), calculated from participant-reported weight (kilograms) divided by squared height in meters squared was 22.62, ranging from 13.76 to 37.83 (see Appendix E). Twenty-four percent of participants were overweight by the commonly accepted threshold (BMI $\geq$ 25). Thirty-three percent of participants reported that they were currently dieting. Participants reported a mean hunger level of 6 and a mean anticipated meal enjoyment of 4.97 (both on 1-to-7 scales). The majority of participants had income higher than 30,001 Thai Baht per month, and on average, they had a bachelor's degree. About two-thirds of participants reported that they visited the Barefoot restaurant, where the study was conducted, about once a year or less.

Table 4.1 summarizes the characteristics of the participants of each group. The descriptive statistics show no significant differences found among each group of participants.

Table 4.1 Descriptive Statistics of Participants' Characteristics

Characteristics	**Tasting (N =180)**		**No Tasting (N =180)**		**Total (N=360)**	
	Obs.	Percent	Obs.	Percent	Obs.	Percent
Thai	165	91.67	173	96.11	338	93.89
Female	115	63.89	120	66.67	235	65.28
Overweight	36	20	52	28.89	88	24.44
On diet	66	36.67	55	30.56	121	33.61
Casual customer	122	67.78	102	56.67	224	62.22
Income >30,001 baht/month	56	31.11	80	44.44	136	37.78
	Mean	Standard Deviation	Mean	Standard Deviation	Mean	Standard Deviation
Age	29.27	0.60	30.79	0.80	30.03	0.50
BMI	22.43	0.34	22.85	0.31	22.64	0.23
Year of education	16.16	20.27	16.30	0.14	16.23	0.12
Hunger level	5.77	0.10	6.17	0.10	5.97	0.07
Meal enjoyment	4.75	0.07	5.12	0.07	4.936	0.05

Source: Authors' Elaboration.

4.2 Tastiness Versus Healthiness

Figure 4.1 shows how tastiness correlates with the number of calories of each pasta type. Lasagna was the most scored, whereas olio mushroom, chicken sausage, and bacon sun-dried chili were among the least scored. The taste scores for all pasta dishes range from 4.24 to 5.84 (on 1-to-7 scales), with an average score of 4.76. For the top two least calorific pasta dishes (a healthy alternative), the average taste score is 4.29, compared to 5.22 of the top two most calorific pasta dishes (an unhealthy alternative).

The taste tends to have a positive relationship with the number of calories since taste is boosted by fatty, sugary, and salty components (Drewnowski, 1997), all of which are considered unhealthy as seen by the mean taste score of pasta, that was strongly correlated to number of calories (r (6) = .52, P = .18). However, this positive relationship between tastiness and the number of calories is true with the maximum calorie threshold of 365 kcal. Beyond this level, the positive correlation deviates. Therefore, if the top three highest calorie pasta are removed, the finding here allies with previous studies to support the UTI (unhealthy=tastiness) hypothesis, where tastiness and healthiness have negative relationships. From this study, there is a strong positive correlation between the calorie of pasta and average taste scores (for those under the threshold of 356 kcal), which confirms the previous hypothesis (r (3) = .86, P = .06).

Essentially, tastiness could likely be enhanced by unhealthy food ingredients. Without health consciousness and other influencing environments, food choices are mainly based on food flavor (Glanz et al., 1998; Lennernäs et al., 1997; Tepper & Trail, 1998). Fortunately, from this study, there was one particular pasta named Summer, which had the average number of calories yet received a higher taste score than Carbonara - the pasta with the highest number of calories. This suggested that healthier food can be made without compromising taste. Consequently, people’s calorie intake can be reduced by creating tasty yet healthy food.

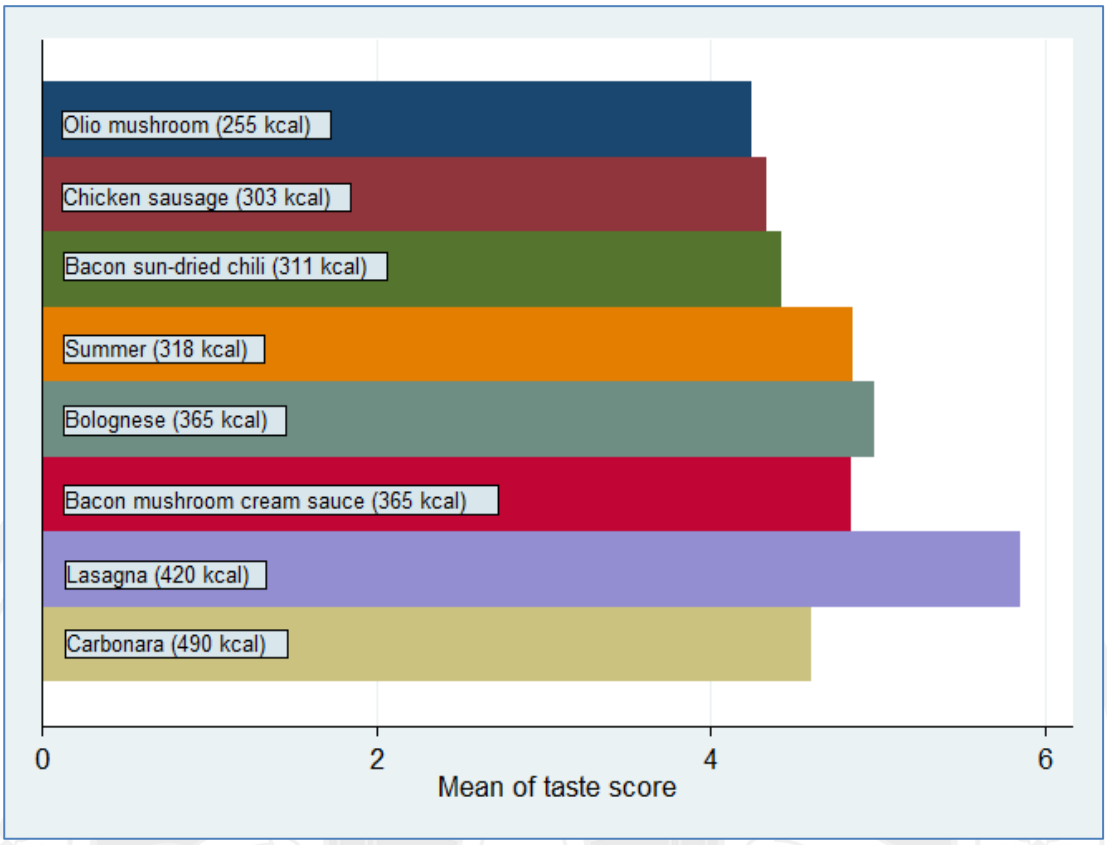


Figure 4.1 Taste Score

Source: Authors' Elaboration.

The taste experiment is included in the regressions to estimate the impact of taste and the visibility and convenience treatments on pasta choice and calorie intake. The result from the taste experiment is reported first, followed by the regressions on calorie intake determinants.

The result from the taste experiment confirms a strong positive effect of taste on calorie intake (Figure 4.2). Compared to the no-taste group, tasting led to a higher calorie intake for every menu offered. Taste could boost pasta calories and total meal calories by around 30 calories and 100 calories, respectively.

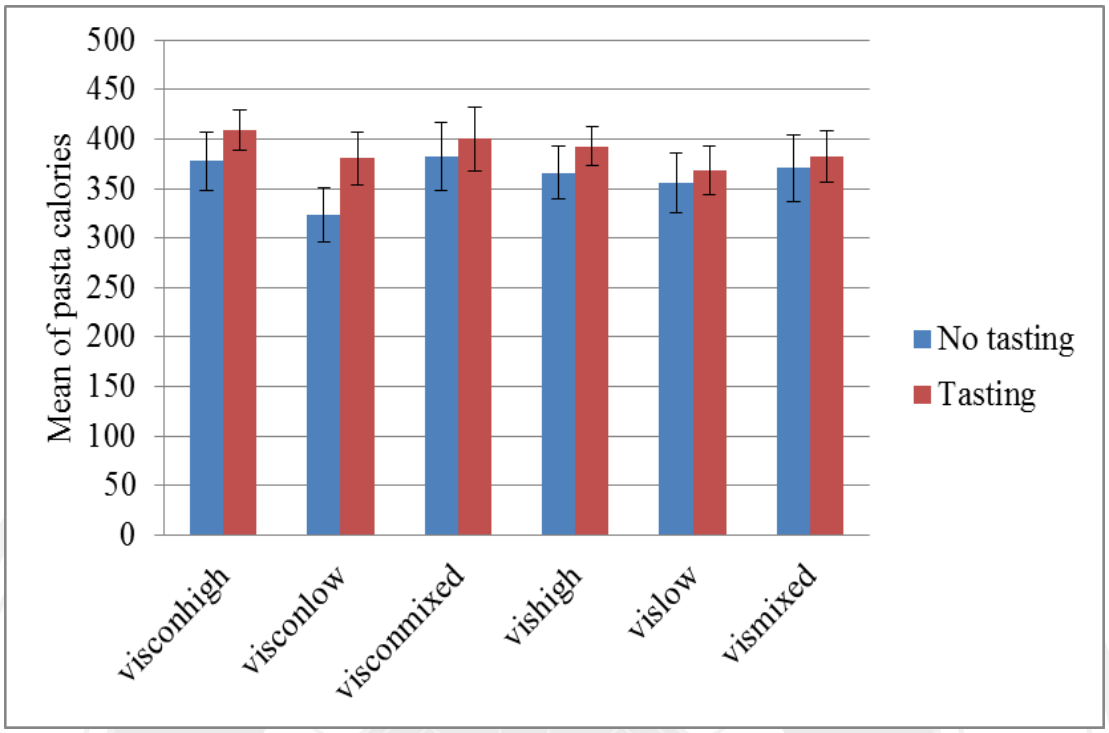


Figure 4.2 Comparison of Mean Pasta Calories Consumed and 95% Confident Intervals Across Menu

Source: Authors' Elaboration.

Statistically, if participants gave a taste score of more than 4 to any type of pasta, their chance of picking low-calorie pasta was reduced by 41%. It is worth suggesting choosing between the highest calorie pasta and the lowest calorie pasta was an easy choice for participants to make. On the other hand, participants might have difficulty choosing between the top two highest-calorie pasta and might end up choosing the second-highest calorie pasta instead of the highest one. This difficulty was subsided when the pasta was tasted before ordering. However, the mixed menu was still harder for participants to choose from because, on average, the highest and lowest calorie pastas received a similar taste score.

Surprisingly, the taste had an effect not only on pasta calories but also on non-pasta calories, even if participants only did taste the pasta. One possible explanation is that taste of pasta might work as an anchor that strongly influences non-pasta orders. Participants tended to order more non-pasta calories when they tasted pasta first.

Overall, the results imply that the less healthy the food, the higher the taste score and the more calories consumed by participants.

4.3 Nudge Effects on Pasta and Meal Calories

A regression analysis was implemented to test hypotheses and the impact of nudge effects on calorie intake, controlling for demographic characteristics. At the designated restaurant, the salience of the low-calorie or high-calorie, or mix-calorie pasta was increased by adjusting the menu (visibility) and manner of ordering (convenience). Table 4.2 shows three groups of results based on interventions: 1) only visibility, 2) visibility and convenience, and 3) aggregating 1 & 2

4.3.1 Visibility

Two dummy variables of nudges were included in the regression to test the visibility effect of both least calorific and most calorific pasta menus, compared to mixed calorific pasta menus. In visibility intervention (Column (2) in Table 4.2), the least calorific menu (vislow) had a significant negative impact on total meal calories with an estimated coefficient of −50.17, even though it intended to have an impact only on pasta calorie intake. However, the visibility intervention of the most caloric menu did not significantly affect total meal calories. Moreover, the super control group (where participants do not receive both visibility and convenience treatments) and the visibility treatment group were also compared against each other to account for the visibility effect. The result showed that a mixed menu (of visibility treatment group) could potentially increase the chance of choosing low-calorie pasta (see Appendix F).

Table 4.2 Regression on Total Calorie Consumption & Pasta Calorie Consumption

VARIABLES	(1) All totalcal	(2) Visibility totalcal	(3) Vis+Con totalcal	(4) All pastacal	(5) Visibility pastacal	(6) Vis+Con pastacal
taste	106.1*** (17.79)	121.6*** (23.91)	91.27*** (27.20)	26.61*** (8.287)	13.45 (11.68)	39.31*** (12.20)
vishigh	-15.88 (26.07)	20.67 (28.06)		-7.019 (12.15)	3.722 (13.70)	
vislow	-82.31*** (26.36)	-50.17* (29.20)		-24.73** (12.28)	-18.14 (14.26)	
age	-2.665** (1.063)	-4.171** (1.765)	-2.567* (1.453)	-1.542*** (0.495)	-1.493* (0.862)	-1.452** (0.652)
bmi	9.425*** (2.201)	11.92*** (2.734)	8.074** (3.689)	2.136** (1.025)	2.749** (1.335)	1.853 (1.655)
female	16.71 (18.94)	-0.730 (24.97)	29.44 (29.06)	1.810 (8.824)	-9.974 (12.19)	12.91 (13.04)
diet	-46.14** (18.98)	-82.40*** (25.15)	-15.42 (29.10)	-1.902 (8.845)	-2.688 (12.28)	-3.753 (13.06)
yearedu	6.159 (13.06)	3.031 (5.301)	8.237 (6.357)	1.535 (1.890)	-0.109 (2.588)	1.677 (2.852)
income	1.295 (5.012)	6.301 (6.928)	0.0248 (7.544)	1.334 (2.335)	0.184 (3.383)	3.085 (3.385)
enjoymeal	-4.786 (9.696)	-9.596 (13.12)	0.467 (14.78)	0.634 (4.517)	-2.560 (6.404)	2.015 (6.632)
hungry	25.00*** (6.644)	25.24*** (8.902)	28.23*** (10.09)	-0.559 (3.095)	-6.133 (4.347)	6.611 (4.529)
visconhigh	-20.58 (26.12)		-53.84* (32.40)	10.05 (12.17)		0.729 (14.54)
visconlow	-55.64** (25.42)		-84.36*** (31.78)	-30.37** (11.84)		-41.07*** (14.26)
Constant	445.6*** (101.7)	464.2*** (133.7)	420.6*** (155.9)	338.3*** (47.37)	409.5*** (65.27)	279.4*** (69.95)
Observations	349	175	174	349	175	174
R-squared	0.209	0.305	0.170	0.110	0.103	0.166

Standard errors in parentheses, *** p<0.01, ** p<0.05, * p<0.1

Source**:** Authors' Elaboration.

4.3.2 Visibility and Convenience

Results indicate that visibility and convenience interventions can influence calorie intake almost as much as taste in case that the total meal calories are considered (Column (3)). Visibility and convenience interventions on both the low-calorie menu (visconlow) and the high-calorie menu (visconhigh) led participants to order significantly fewer calories than the control group ordering set menu with a mixed menu. Hypothetically, the visibility and convenience interventions on the high-calorie

menu were expected to lead people to order more calories, yet the lower-than-expected mean of taste score of the highest-calorie pasta (Figure 4.1) dominated the intervention effects. Rather, participants chose the second highest calorie pasta (highest taste rating) instead, which resulted in the reduction in total meal calories consumed.

Interestingly, if only pasta calories consumed are considered, which is the main focus of the intervention, the combined visibility and convenience interventions in the low-calorie menu can outperform the taste effect. Figuratively, visibility and convenience could reduce the pasta calories consumers ordered by 41.07 calories compared to a 39.31 increase in pasta calories by taste (Column (6)). That is, the taste had less influence on what participants chose to eat than it normally did under the uncontrolled environment.

4.3.3 Aggregating All Interventions

Comparison of an impact of aggregating all interventions (combining all samples) on total calories and pasta calories can be observed in Columns 1 & 4 in Table 4.2. The significant negative interaction between the visibility intervention and total calories signifies that weaker intervention (only visibility: vislow) had a significantly larger impact on total calories than did stronger intervention (both visibility and convenience interventions: visconlow) (Column (1)). However, this effect could not overpower the taste effect.

When considering pasta calories instead of total calories, the effect was the opposite. The stronger intervention overpowers both the weaker intervention and taste (Column 4). This discrepancy might be due to the change in drink options during the taste experiment period. The restaurant had moved to a nearby location, and the latte was replaced by peach tea, which was more popular among participants. Almost half of the participants ordered peach tea compared to only 18 percent who had ordered latte previously. This indicated that coffee and peach tea were not close substitutes. Therefore, peach tea might have boosted the overall total calories of the meal, providing evidence that the change of drink at the restaurant significantly changed the impact of the nudge on total calories.

While overall calorie intake can be decreased with the help of nudges, the data show that some participants' characteristics may also strengthen nudge power. Older participants and those who self-reported as being on a diet consumed significantly fewer total calories. However, participants with higher BMIs and levels of hungriness took in more calories (Table 4.1). Surprisingly, female participants tended not to order low-calorie pasta, and education, income, and enjoyment were not significant.

4.4 Pasta Versus Non-Pasta Calories and Compensatory Effect

Figure 4.3 gives a brief overview of how each intervention interacted with low-calorie pasta choices. Visibility intervention on the least-caloric menu combined with convenience intervention responded best to low-calorie pasta choice. Such that about 35 percent of participants who received both interventions chose low calories pasta. On the other hand, visibility on the most-caloric menu alone or combined with convenience was among the worst.

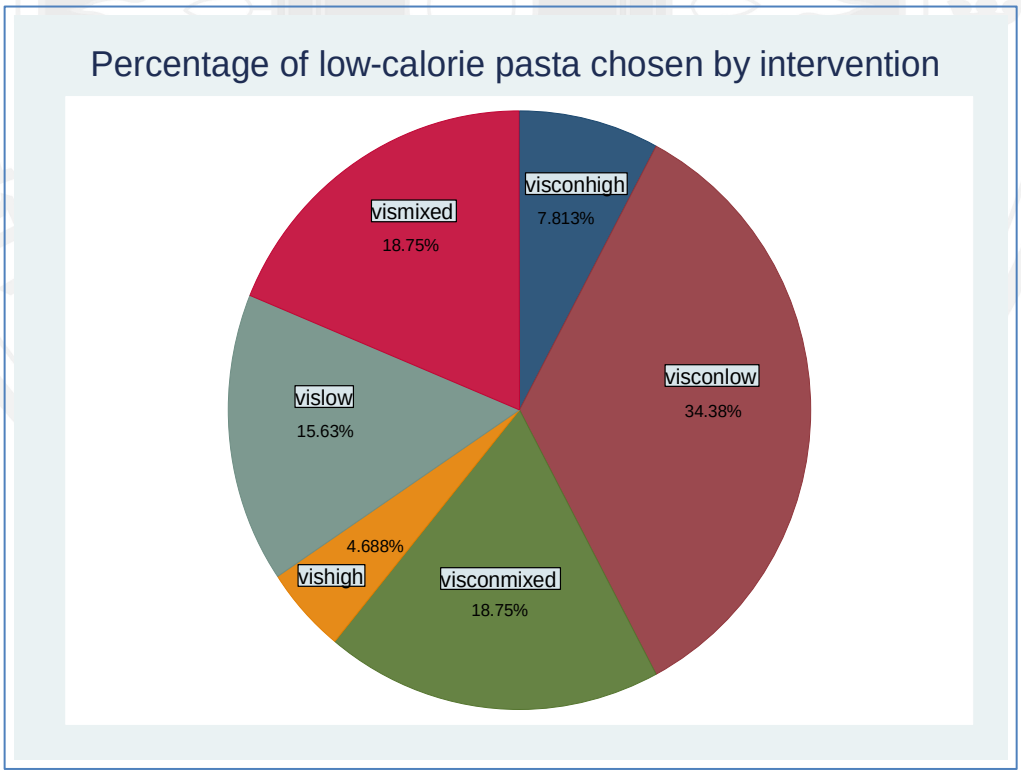


Figure 4.3 Percentage of Low-Calorie Pasta Chosen by Intervention

Source: Authors' Elaboration.

The reasons behind whether each intervention worked or not were explored further through separate regressions. The determinants of low-calorie pasta choice and non-pasta calories (e.g., side dish, sweet, and drink) were regressed (Tables 4.4 & 4.3).

The visibility intervention alone on the low-calorie menu (vislow) or the combined visibility and convenience on the high-calorie menu (visconhigh) could significantly help participants but could indirectly result in the total calorie-reduction objective (Columns (1) & (3) in Table 4.2) through lowering 57.78 and 54.57 non-pasta calories, respectively (Columns (1) & (3) in Table 4.3).

Table 4.3 Regression on Non-Pasta Calorie Consumption

VARIABLES	(1) All	(2) Visibility	(3) Vis+Con
	nonpastacal	nonpastacal	nonpastacal
taste	79.48*** (15.57)	108.2*** (21.25)	51.96** (23.58)
vishigh	-8.858 (22.82)	16.95 (24.93)	
vislow	-57.58** (23.07)	-32.03 (25.94)	
age	-1.122 (0.930)	-2.678* (1.569)	-1.115 (1.260)
bmi	7.288*** (1.926)	9.166*** (2.429)	6.221* (3.198)
female	14.90 (16.58)	9.244 (22.19)	16.53 (25.20)
diet	-44.24*** (16.62)	-79.71*** (22.35)	-11.67 (25.22)
yearedu	4.624 (3.552)	3.140 (4.711)	6.560 (5.511)
income	-0.0392 (4.387)	6.117 (6.156)	-3.060 (6.540)
enjoymeal	-5.420 (8.487)	-7.036 (11.65)	-1.549 (12.81)
hungry	25.56*** (5.816)	31.37*** (7.911)	21.62** (8.749)
visconhigh	-30.63 (22.86)		-54.57* (28.09)
visconlow	-25.27 (22.25)		-43.29 (27.55)
Constant	107.3 (88.99)	54.76 (118.8)	141.2 (135.1)
Observations	349	175	174
R-squared	0.174	0.290	0.109

Standard errors in parentheses, *** p<0.01, ** p<0.05, * p<0.1

Source: Authors' Elaboration.

Column 1 in Table 4.4 shows that there was no significant impact on participant's pasta choice when applying visibility intervention on the low-calorie menu (vislow). Nor was there when applying the combined visibility and convenience interventions on the high-calorie menu (visconhigh), even though these interventions were intended to affect pasta decisions. One possible explanation is that there was a trade-off or a compensatory effect between consuming high-calorie pasta and consuming low non-pasta calories afterwards. Participants who had ordered high-calorie pasta might later decide to control an overall calorie intake by ordering low non-pasta calories. Although the strong negative correlation between pasta calories and non-pasta calories supported the compensatory effect of visibility intervention on the low-calorie menu, the correlation was weak on the combined visibility and convenience interventions on the high-calorie menu. However, there was still a negative correlation between a pasta dish and non-pasta dish for participants who tasted all pasta dishes before ordering (see Appendix G). It is worth noting that this effect is eliminated when drink calories are excluded. In other words, the impacts of interventions are not enhanced by compensatory effect.

Table 4.4 Logistic Regression on Choice of Low-Calorie Pasta

VARIABLES	(1) All choselowcalpasta	(2) Visibility choselowcalpasta	(3) Vis+Con choselowcalpasta
taste (dummy)	-0.992*** (0.207)	-0.642** (0.297)	-1.328*** (0.323)
vishigh (dummy)	-0.868** (0.360)	-0.974** (0.385)	
vislow (dummy)	-0.104 (0.273)	-0.240 (0.329)	
age	0.0369*** (0.0104)	0.0202 (0.0199)	0.0517*** (0.0142)
bmi	-0.101*** (0.0314)	-0.100** (0.0437)	-0.125*** (0.0475)
female (dummy)	-0.308 (0.212)	0.142 (0.333)	-0.754** (0.309)
diet (dummy)	0.571*** (0.210)	0.567* (0.306)	0.756** (0.332)
yearedu	-0.0308 (0.0411)	0.0319 (0.0623)	-0.0575 (0.0585)
income	-0.0619 (0.0548)	-0.0152 (0.0850)	-0.127 (0.0809)
enjoymeal	0.110 (0.100)	0.258 (0.162)	0.0205 (0.145)

VARIABLES	(1) All choselowcalpasta	(2) Visibility choselowcalpasta	(3) Vis+Con choselowcalpasta
hungry	-0.162** (0.0726)	-0.0905 (0.111)	-0.289*** (0.111)
visconhigh (dummy)	-0.593* (0.320)		-0.348 (0.396)
visconlow (dummy)	0.626*** (0.237)		0.962*** (0.332)
Constant	1.814 (1.146)	-0.388 (1.756)	3.847** (1.646)
Observations	349	175	174
Standard errors in parentheses, *** p<0.01, ** p<0.05, * p<0.1			

Source: Authors' Elaboration.

The combined visibility and convenience interventions on the least caloric menu, on the other hand, had their strongest effect on pasta choice. This strong impact was not beyond expectation because the interventions were aimed at pasta order. There were 36.67 percent of participants choosing the least caloric pasta when these interventions were implemented. The regression results supported this descriptive statistic. There was an increase in the predicted probability of participants choosing a low-calorie pasta when the least caloric menu was made visible and convenient (visconlow). Conversely, participants were less likely to order low-calorie pasta when the most caloric menu was made visible and convenient (visconhigh). Likewise, the weaker intervention on the high-caloric pasta menu (vishigh) decreased the predicted probability of choosing a low-calorie pasta choice (Table 4.4).

4.5 Effects among Overweight Participants

The aforementioned analyses are based on the entire population of this study, who may not have health problems and reasons to change their eating habits. This section, on the other hand, presents the impact of the interventions on overweight participants (BMI $\geq$ 25) who mostly need to cut down on meal calories.

Table 4.5 shows regression results within overweight participants (n = 95; 24.48 percent of the sample). Dependent variables are total meal calories, pasta calories, and non-pasta calories shown in Columns 1, 2, and 3, respectively. Independent variables are similar to the whole population analysis.

Table 4.5 Effects of Taste, Visibility, and Convenience on Overweight Participants (BMI≥25)

VARIABLES	(1) totalcal	(2) pastacal	(3) nonpastacal
taste (dummy)	72.56* (37.45)	4.753 (19.03)	67.81** (32.32)
vishigh (dummy)	-59.62 (58.16)	-8.226 (29.56)	-51.40 (50.20)
vislow (dummy)	22.23 (57.37)	-29.14 (29.16)	51.37 (49.51)
age	0.814 (1.758)	-1.980** (0.894)	2.794* (1.518)
bmi	11.77** (5.759)	5.437* (2.927)	6.336 (4.971)
female (dummy)	1.142 (35.15)	1.399 (17.87)	-0.257 (30.34)
diet (dummy)	-42.60 (36.08)	-0.277 (18.34)	-42.32 (31.14)
yearedu	9.704 (12.04)	4.706 (6.120)	4.998 (10.39)
income	-2.640 (10.20)	0.732 (5.183)	-3.373 (8.801)
enjoymeal	-11.90 (20.20)	-4.789 (10.27)	-7.115 (17.43)
hungry	24.69* (13.72)	-8.370 (6.971)	33.06*** (11.84)
visconhigh (dummy)	13.14 (55.72)	-16.09 (28.32)	29.23 (48.09)
visconlow (dummy)	-180.9*** (48.31)	-35.33 (24.55)	-145.5*** (41.70)
Constant	295.2 (284.6)	292.7** (144.6)	2.519 (245.6)
Observations	86	86	86
R-squared	0.344	0.219	0.329

Standard errors in parentheses, *** p<0.01, ** p<0.05, * p<0.1

Source: Authors' Elaboration.

Compared to the whole population, all nudges converted 15.46 percent of overweight individuals to choose low-calorie pasta, approximately 2 percent lower than that of the total population. Furthermore, the negative impact of the taste of pasta could only be counteracted by the combined interventions on the least-caloric pasta menu, meaning that the single intervention (vislow) did not work among overweight participants. In fact, the single intervention resulted in a movement in the opposite direction towards total calories, but it was not significant (Column 1 in Table 4.5).

Since only the combined visibility and convenience interventions worked on overweight participants rather than the visibility alone, this suggests that both the visibility and convenience interventions were significant in determining what overweight individuals would eat. Moreover, this finding emphasizes the need to further investigate the effectiveness of interventions in more detail on this sub-sample group. Due to the fact that this group of people urgently need a shift in their behavioral pattern to make sure that a certain desired effect is achieved.

CHAPTER 5

DISCUSSION

5.1 General Discussion

This study was among the first research to investigate the effects of both taste and nudges (visibility and convenience) on food consumption. The difference in nudging effectiveness across different types of participants, such as normal weight and overweight participants, is explored, which makes this topic more interesting and worth investigating. In addition, the taste effect that may alter the effectiveness of interventions is one of the research interests in this area.

The results of this field experiment show that consumers can be nudged to order lower-calorie food in a restaurant. Both visibility and convenience interventions played significant roles in determining consumption choice. This finding supports the claim of previous studies that behavioral interventions are among the most effective ways of reducing unhealthy eating. The evidence from this study also suggests that the combination of cognitive and behavioral interventions have a stronger impact on consumer's choice. Judging by the calorific intake of the sample, the combined interventions can nudge consumers, with or without the influence of taste, to reduce unhealthy eating. Considering broader samples, the combined visibility and convenience interventions on the least caloric menu decreased the total calories ordered. The combined interventions on the least caloric menu also reduced pasta calories and influenced pasta choice significantly, whereas the visibility intervention alone on the least caloric menu only reduced total calories but did not influence pasta choice. However, applying the single intervention on overweight consumers could neither help reduce calorie intake nor affect pasta choice.

Surprisingly, the impact of the combined interventions on high-caloric pasta was weakened by compensatory effects. The higher calorie content of pasta choice was compensated for and overpowered by the lower calorie content of the non-pasta choice.

This finding suggests that merely making a high-caloric menu more visible can succeed in reducing calorie intake if low-caloric non-main dish choices are involved in the decision. It should be noted that this distinguishing feature may be unique to this group of participants only because of their relatively high educational background. The results of these samples may not be generalized to participants with fewer years of schooling. On the contrary, this trade-off can have inverse consequences in case of more visibility of low-calorie main dish menus as well. Customers may order low-calorie pasta but subsequently order high non-pasta calories. The invention must be applied cautiously since the effect can be magnified or weakened by this trade-off.

While education was initially believed to potentially increase health knowledge and improve eating habits, the results showed that there were similar calorie intakes across participants with different education levels. This means that those with either low or high educations can equally be nudged to reduce calorie consumption.

5.2 Policy Recommendation and Concern

The ineffectiveness of visibility intervention on overweight participants suggests that a single intervention is not enough to change the eating behavior of this group. The combined interventions are considered stronger than a single intervention and should be considered to nudge the overweight group to make healthy changes. In this study, adding difficulty in ordering high-calorie food along with making healthy choices more visible could reduce total calorie intake and compensate for the calorie increase due to taste.

However, before scaling up a policy implementation, it is vital to find out the reasons why nudges work or do not work. One possible explanation could fall on the compensatory effect that caused the ineffectiveness of the interventions. Consumers who choose low-calorie main dishes because of visibility and convenience interventions may add extra calories later on via side dishes, drinks, and sweets. Further research is still needed to understand compensatory behaviors of the different population groups, for which this study could not get detailed results due to the small sample size of each subgroup. Additionally, social interaction at the restaurant might also influence and complicate compensatory behaviors. Customers who come in a

group may order a variety of food to share within the group without considering calories. The study of interrelationships in group dining that may influence compensatory behaviors is also worth exploring.

The question of whether this policy will become a burden to a restaurant if it were implemented can be answered in quite a straightforward manner. First, the implementation cost of nudging customers to make healthy food choices at a real restaurant is minimal. Restaurants only need minor adjustments to their menu. Second, such nudging can change a customer's eating habit without interfering with food prices. To sum up, nudging consumers toward better nutrition are not too difficult to implement in restaurants.

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APPENDICES

Appendix A

The Menu Used in the Study

M1: Most caloric pasta dishes on the highlighted menu

Please choose one from each course and check your choice on this form.

Menu

Main dishes

Highlighted Menu

____ Lasagna ____ Carbonara pasta

____ Olio mushroom pasta ____ Bacon mushroom cream sauce pasta
____ Bolognese pasta ____ Chicken sausage pasta
____ Bacon sun-dried chili pasta ____ Summer pasta

Side dishes

____ Caprese salad grilled cheese ____ Fried Shan tofu
____ Potato fries ____ Seasonal salad

Drinks

____ Iced green tea ____ Iced Thai milk tea
____ Iced Latte ____ Water

Sweets

____ Panna cotta with strawberry sauce ____ Greek yogurt with fresh strawberries

M2: Least caloric pasta dishes on the highlighted menu

Please choose one from each course and check your choice on this form.

Menu

Main dishes

Highlighted Menu

____ Olio mushroom pasta ____ Chicken sausage pasta

____ Carbonara pasta ____ Bacon sun-dried chili pasta
____ Summer pasta ____ Lasagna
____ Bacon mushroom cream sauce pasta ____ Bolognese pasta

Side dishes

____ Caprese salad grilled cheese ____ Fried Shan tofu

____ Potato fries ____ Seasonal salad

Drinks

____ Iced green tea ____ Iced Thai milk tea
____ Iced Latte ____ Water

Sweets

____ Panna cotta with strawberry sauce ____ Greek yogurt with fresh strawberries

M3: Mix both most and least caloric pasta dishes on the highlighted menu

Please choose one from each course and check your choice on this form.

Menu

Main dishes

Highlighted Menu

____ Olio mushroom pasta ____ Carbonara pasta

____ Bolognese pasta ____ Summer pasta
____ Bacon sun-dried chili pasta ____ Bacon mushroom cream sauce pasta
____ Lasagna ____ Chicken sausage pasta

Side dishes

____ Caprese salad grilled cheese ____ Fried Shan tofu
____ Potato fries ____ Seasonal salad

Drinks

____ Iced green tea ____ Iced Thai milk tea
____ Iced Latte ____ Water

Sweets

____ Panna cotta with strawberry sauce ____ Greek yogurt with fresh strawberries

M4: Most caloric pasta dishes on the main menu & corresponding supplementary menu at the back

Please choose one from each course and check your choice on this form.

Menu

Main dishes

____ Lasagna ____ Carbonara pasta

Side dishes

____ Caprese salad grilled cheese ____ Fried Shan tofu

____ Potato fries ____ Seasonal salad

Drinks

____ Iced green tea ____ Iced Thai milk tea
____ Iced Latte ____ Water

Sweets

____ Panna cotta with strawberry sauce ____ Greek yogurt with fresh strawberries

*Supplementary menu of main dishes is at the back

Supplementary menu of main dishes

Main dishes

Olio mushroom pasta	Bacon mushroom cream sauce pasta
Bolognese pasta	Chicken sausage pasta
Bacon sun-dried chili pasta	Summer pasta

Please write down your choice of main dishes from supplementary menu here

.....

M5: Least caloric pasta dishes on the main menu & corresponding supplementary menu at the back

Please choose one from each course and check your choice on this form.

Menu

Main dishes

____ Olio mushroom pasta ____ Chicken sausage pasta

Side dishes

____ Caprese salad grilled cheese ____ Fried Shan tofu
____ Potato fries ____ Seasonal salad

Drinks

____ Iced green tea ____ Iced Thai milk tea
____ Iced Latte ____ Water

Sweets

____ Panna cotta with strawberry sauce ____ Greek yogurt with fresh strawberries

*Supplementary menu of main dishes is at the back

Supplementary menu of main dishes

Main dishes

Carbonara pasta	Bacon sun-dried chili pasta
Summer pasta	Lasagna
Bacon mushroom cream sauce pasta	Bolognese pasta

Please write down your choice of main dishes from supplementary menu here

.....

M6: Mix both most and least caloric pasta dishes on the main menu & corresponding supplementary menu at the back

Please choose one from each course and check your choice on this form.

Menu

Main dishes

____ Olio mushroom pasta ____ Carbonara pasta

Side dishes

____ Caprese salad grilled cheese ____ Fried Shan tofu
____ Potato fries ____ Seasonal salad

Drinks

____ Iced green tea ____ Iced Thai milk tea
____ Iced Latte ____ Water

Sweets

____ Panna cotta with strawberry sauce ____ Greek yogurt with fresh strawberries

*Supplementary menu of main dishes is at the back

Supplementary menu of main dishes

	Main dishes
Bolognese pasta	Summer pasta
Bacon sun-dried chili pasta	Bacon mushroom cream sauce pasta
Lasagna	Chicken sausage pasta

Please write down your choice of main dishes from supplementary menu here

.....

M7: Mix both most and least caloric pasta dishes without the highlighted menu

Please choose one from each course and check your choice on this form.

Menu

Main dishes

____ Olio mushroom pasta
____ Carbonara pasta
____ Summer pasta
____ Bacon mushroom cream sauce pasta
____ Chicken sausage pasta
____ Bacon sun-dried chili pasta
____ Lasagna
____ Bolognese pasta

Side dishes

____ Caprese salad grilled cheese
____ Potato fries
____ Fried Shan tofu
____ Seasonal salad

Drinks

____ Iced green tea
____ Iced Latte
____ Iced Thai milk tea
____ Water

Sweets

____ Panna cotta with strawberry sauce
____ Greek yogurt with fresh strawberries

Appendix B

Survey

Survey questions

1. Age .....
2. Gender [ ] male [ ] female
3. Weight ..... kilo
4. Height ..... centimeters
5. Nationality .....

6. What is your highest level of education?

.....

7. What is your monthly salary ?

[ ] Below Baht 5,000 [ ] Baht 5,001-10,000 [ ] Baht 10,001-15,000

[ ] Baht 15,001-20,000[ ] Baht 20,001-25,000 [ ] Baht 25,001-30,000

[ ] Baht 30,001 and higher

8. how would you rate your current health?

Very poor (1) (2) (3) (4) (5) (6) (7) Very excellent

9. How would you describe your food intake during the day?

Very Unhealthy (1) (2) (3) (4) (5) (6) (7) Very healthy

10. How many calories do you think your entire meal contains?
(including pasta dish, side dish, drink, & sweet)

.....

11. How much do you think you will enjoy your meal?

Won't enjoy very much (1) (2) (3) (4) (5) (6) (7) Will really enjoy it

12. How hungry do you feel right now?

Not at all hungry (1) (2) (3) (4) (5) (6) (7) Extremely hungry

13. How often do you eat at this restaurant?

[ ] once a year or less [ ] once every 6-12 months [ ] once every 2-6months
[ ] once a month [ ] once every 2 weeks [ ] once a week
[ ] twice a week or more

14. How many calories do you think a doctor or nutritionist would recommend that you should eat for your daily diet?

.....

15. Are you currently dieting (watching or restricting the number of calories you eat)?

[ ] yes [ ] no

16. " I considered calories when ordering"

strongly disagree (1) (2) (3) (4) (5) (6) (7) strongly agree

17. " I considered, in the long run, people who take care of themselves stay healthy."

strongly disagree (1) (2) (3) (4) (5) (6) (7) strongly agree

Appendix C

Dishes Calories

Calories of each dish

Food item	Calories
Olio mushroom pasta	255 kcal
Chicken sausage pasta	303 kcal
Bacon sun-dried chili pasta	311 kcal
Summer pasta	318 kcal
Bolognese pasta	365 kcal
Bacon mushroom cream sauce pasta	365 kcal
Lasagna	420 kcal
Carbonara pasta	490 kcal
Seasonal salad	95 kcal
Caprese salad grilled cheese	187 kcal
Potato fries	197 kcal
Fried Shan tofu	211 kcal
Iced green tea	0 kcal
Water	0 kcal
Iced Thai milk tea	232 kcal
Iced peach tea	262 kcal
Iced latte	270 kcal
Greek yogurt with fresh strawberries	94 kcal
Panna cotta with strawberry sauce	170 kcal

Appendix D

Consent Form

NT: Consent form for participants without taste experiment

Informed Consent Form for Research Participant

Research Title: Behavioral interventions for food choice decision: convenience and visibility interventions versus taste preference.

(Activity 1)

Name of Researcher: Rapeepat Manasoontorn

Contact: School of Development Economics, National Institute of Development Administration

Telephone number 081-489-8388 E-mail topped_rm@hotmail.com

Purpose of the research

This research aims to study whether making healthier food choice more approachable and easier to see will help consumers make healthier food choice even when taste preferences of consumers are taking into account. The results of this study will be further used as policy recommendation for guiding consumers towards better food choice.

Procedures

You are being invited to take part in this research through Barefoot Cafe's social media, poster in Barefoot Cafe, or person approaching you when you entering Barefoot Cafe. You have to pass qualifications as follows to take part in this research.

- Never participant in this research before
- Can eat pork or chicken
- Can eat food containing wheat, nuts, and milk

After that you have to order 300 baht lunch set menu at Barefoot Cafe from the menu provided. You will get a lucky draw to receive discount of 100% / 50% / 20% / 10% / 1% for your lunch set menu after you have finished the meal.

During your waiting time for the meal to serve, you will be asked to complete the survey. After meal, you will be awarded a random draw of a discount for participating in this research.

Duration

The research takes about 120 minutes to complete including times for procedure explanation, eating, and lucky draw.

Research information provider

Researcher or assistants provide research information to you through documents and further explain more when you do not understand.

Risks

This research has low risk. The risk that may occur is when you have a food allergy. However, prior to other research procedures, you need to inform that you do not have food allergy. In the event of unexpected complications, you will be immediately taken to the nearest hospital for treatment.

Benefits

The direct benefit to you is the discount on lunch set menu at Barefoot Cafe and indirect benefit is to build behavioral economic knowledge regarding interventions for better food choice decision. The knowledge that we get from this research can be shared with you. Each participant can contact Mr. Rapeepat Manasoontorn (topped_rm@hotmail.com) for a research paper or a summary of the results.

Confidentiality

The information that we collect from this research project will be kept private. Any information about you will have a number on it instead of your name. Only the researchers will know what your number is. We will not be sharing information about you to anyone outside of the research team. The data containing personal identifiers be deleted after researchers finish analyzing the data.

Reimbursements

You will not be provided any reimbursement for time lost to take part in the research.

Voluntary Participation

Your participation is voluntary. You may stop participating in the research at any time that you wish without negative consequences.

Questions and Concerns

If you have any questions and complaints about the research, please feel free to contact Mr.Rapeepat Manasoontorn

Telephone number 081-489-8388

E-mail topped_rm@hotmail.com

Certificate of Consent

I confirm that I have read and understand the purpose, procedures, risks, and benefits of the research described above. I consent voluntarily to be a participant in this study and I may withdraw from this study any time and will not be penalized in any way for deciding to stop participation.

Signature of Participant.....

(.....)

Date.....

Day/month/year

Signature of Researcher.....

(Mr.Rapeepat Manasoontorn)

Date.....

Day/month/year

T: Consent form for participants with taste experiment

Informed Consent Form for Research Participant

Research Title: Behavioral interventions for food choice decision: convenience and visibility interventions versus taste preference.

(Activity 2)

Name of Researcher: Rapeepat Manasoontorn

Contact: School of Development Economics, National Institute of Development Administration

Telephone number 081-489-8388 E-mail topped_rm@hotmail.com

Purpose of the research

This research aims to study whether making healthier food choice more approachable and easier to see will help consumers make healthier food choice even when taste preferences of consumers are taking into account. The results of this study will be further used as policy recommendation for guiding consumers towards better food choice.

Procedures

You are being invited to take part in this research through Barefoot Cafe's social media, poster in Barefoot Cafe, or person approaching you when you entering Barefoot Cafe. You have to pass qualifications as follows to take part in this research.

- Never participant in this research before
- Can eat pork or chicken
- Can eat food containing wheat, nuts, and milk

If you accept, you will be asked to taste and score the Barefoot Cafe's food. After that you have to order 300 baht lunch set menu at Barefoot Cafe from the menu provided. You will get a lucky draw to receive discount of 100% / 50% / 20% / 10% / 1% for your lunch set menu after you have finished the meal.

During your waiting time for the meal to serve, you will be asked to complete the survey. After meal, you will be awarded a random draw of a discount for participating in this research.

Duration

The research takes about 120 minutes to complete including times for procedure explanation, eating, and lucky draw.

Research information provider

Researcher or assistants provide research information to you through documents and further explain more when you do not understand.

Risks

This research has low risk. The risk that may occur is when you have a food allergy. However, prior to other research procedures, you need to inform that you do not have food allergy. In the event of unexpected complications, you will be immediately taken to the nearest hospital for treatment.

Benefits

The direct benefit to you is the discount on lunch set menu at Barefoot Cafe and indirect benefit is to build behavioral economic knowledge regarding interventions for better food choice decision. The knowledge that we get from this research can be shared with you. Each participant can contact Mr. Rapeepat Manasoontorn (topped_rm@hotmail.com) for a research paper or a summary of the results.

Confidentiality

The information that we collect from this research project will be kept private. Any information about you will have a number on it instead of your name. Only the researchers will know what your number is. We will not be sharing information about you to anyone outside of the research team. The data containing personal identifiers be deleted after researchers finish analyzing the data.

Reimbursements

You will not be provided any reimbursement for time lost to take part in the research.

Voluntary Participation

Your participation is voluntary. You may stop participating in the research at any time that you wish without negative consequences.

Questions and Concerns

If you have any questions and complaints about the research, please feel free to contact Mr.Rapeepat Manasoontorn

Telephone number 081-489-8388

E-mail topped_rm@hotmail.com

Certificate of Consent

I confirm that I have read and understand the purpose, procedures, risks, and benefits of the research described above. I consent voluntarily to be a participant in this study and I may withdraw from this study any time and will not be penalized in any way for deciding to stop participation.

Signature of Participant.....

(.....)

Date.....

Day/month/year

Signature of Researcher.....

(Mr.Rapeepat Manasoontorn)

Date.....

Day/month/year

Appendix E

Additional Descriptive Statistics of Treatment and Super Control Groups

Characteristics	Tasting (N =180)		No Tasting (N =180)		Total (N=360)	
	Max	Min	Max	Min	Max	Min
Age	51	5	69	12	69	5
BMI	37.83	13.76	37.72	16.03	37.83	13.76
Year of education	21	0	23	7	23	0
Hunger level	8	1	8	3	8	1
Meal enjoyment	6	2	6	2	6	2

Characteristics	Super Control (N =30)	
	Obs.	Percent
Thai	30	100
Female	20	66.67
Overweight	7	23.33
On diet	7	23.33
Casual customer	19	63.33
Income >30,001 baht/month	10	33.33

Characteristics	**Super Control (N =30)**			
	Mean	Standard Deviation	Max	Min
Age	26.59	7.47	55	18
BMI	22.31	4.26	33.58	17.36
Year of education	16.18	1.99	21	13
Hunger level	6.37	1.38	8	4
Meal enjoyment	5.43	0.73	6	4

Appendix F

Logistic Regression on Choice of Low-Calorie Pasta Comparing the Visibility Treatment Group Against Super Control Group

VARIABLES	(1) choselowcalpasta
vismixed (dummy)	2.352**
	(1.122)
age	0.0247
	(0.0435)
bmi	-0.135
	(0.0918)
female (dummy)	1.071
	(0.873)
diet (dummy)	0.538
	(0.769)
yearedu	0.310**
	(0.155)
income	0.0329
	(0.250)
enjoymeal	0.457
	(0.500)
hungry	0.215
	(0.292)
Constant	-10.95*
	(5.779)
Observations	58

Standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Appendix G

Correlation Table for Main Dish and Side Dish

	Pastacal	Pastacal (taste)	Pastacal (no taste)
nonpastacal (vishigh)	0.1912	0.2493	0.0361
nonpastacal (vislow)	-0.0366	-0.4738*	0.2777
nonpastacal (visconhigh)	0.1633	-0.0818	0.214
nonpastacal (visconlow)	0.1229	-0.0439	0.1316

BIOGRAPHY

Name-Surname	Mr.Rapeepat Manasoontorn
Academic Background	- Master of Commerce (Finance Specialization), University of New South Wales, Australia in 2012 - Bachelors of Arts (Economics), International Program, Thammasat University, Thailand in 2010
Experience	- Lecturer, Bachelors of Business Administration, Rajamangala University of Technology Rattanakosin: RMUTR, Thailand in Jan 2013-Present - Second runner-up award in the Setthatat Economics Article competition in 2021 - NIDA Scholarship in 2016-2018 - RMUTR Scholarship in 2012