UNIVERSITI PUTRA MALAYSIA

EFFECTS OF SOCIAL FACILITATION AND OTHER FACTORS ON ENERGY INTAKE AMONG STUDENTS IN A PUBLIC UNIVERSITY IN MALAYSIA

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EFFECTS OF SOCIAL FACILITATION AND OTHER FACTORS ON ENERGY INTAKE AMONG STUDENTS IN A PUBLIC UNIVERSITY IN MALAYSIA

By

CHEAH KHANG JIN

Thesis Submitted to the School of Graduate Studies, Universiti Putra Malaysia, in Fulfilment of the Requirements for the Degree of Master of Science

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DEDICATION

This thesis is especially dedicated to my beloved parents,

brothers, sisters and those individuals behind the scene

who made it possible to complete my study successfully.

For their great assistance and support for this research throughout the course of this study.

My supervisor: Prof Dr Rosita Jamaluddin

For their endless support, encouragement and great inspiration all the way since the beginning of my research.
May Allah bless and protect them all.

Abstract of thesis presented to the Senate of Universiti Putra Malaysia in fulfilment of the requirement for the degree of Master of Science

EFFECTS OF SOCIAL FACILITATION AND OTHER FACTORS ON ENERGY INTAKE AMONG STUDENTS IN A PUBLIC UNIVERSITY IN MALAYSIA

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March 2021

Chairman : Professor Rosita binti Jamaluddin, PhD
Faculty : Medicine and Health Sciences

While obesity levels have continued to rise, the factors thought to influence weight gain have broadened. In the past, how much people eat is often explained by individual's hunger and satiety level. With the term "obesogenic environment" introduces into research literature, researchers have recognized environmental factor as part of the contributing factors for overweight and obese epidemic. The role of social influence as part of environmental factors may influence adoption of undesirable food intake and thus weight status.

While obesity levels have continued to rise, the factors thought to influence weight gain have broadened. Recent studies have shown that the role of social influence as part of environmental factors may influence adoption of undesirable food intake and thus weight status. There is no published study on social influence under experimental study in Malaysia. Therefore, this study assessed the social influence specifically social facilitation effects along with other factors on energy intake in a laboratory setting.

A within-subject experiment study design was utilized to investigate the social facilitation effects on energy intake. Multistage sampling method was used to select 64 subjects (50 female, 14 male) from a public university to participate in this study. After obtained the consent, a set of self-administered questionnaire on sociodemographic background, lifestyle factors (Global Physical Activity Questionnaire, GPAQ), trait anxiety (social interaction anxiety scale, SIAS), eating behavior (Eating Bevaior Questionnaire, EBQ) and nutrition knowledge (Nutrition Knowledge Survey) was distributed to the subjects. They were then invited to join three standardized lunch sessions under 3 social facilitation situations: ate alone (baseline), ate with unfamiliar peers, ate with familiar peers.

The lunch sessions were scheduled at 1 week apart for 3 consecutive weeks. They were required to rate their anxiety level during eating rated 0 (calm) to 7 (very tense) each time after finished the lunch intake in the lab.

A total of 64 university students (66% Malay, 34% Chinese) with a mean age of 23.6 years (SD=3.33 years) participated in this study. Majority of the subjects had normal BMI whereby the mean of BMI for male was 23.5 ± 6.74 kg/m^2 and female was 21.1 ± 2.42 kg/m^2. Repeated measures ANOVA revealed a statistically significant effect of social facilitation on energy intake with different social facilitation situations. On average, total energy intake at lunch was found to be increased when subjects ate with familiar peers (705 ± 170 kcal) compared to eating in a group with unfamiliar peers (587 ± 129 kcal) and eating alone (545 ± 119 kcal).

Friedman test showed that there were significant differences in anxiety level (state anxiety) between three different social facilitation situations (p= 0.001). They felt most comfortable when eating with their familiar peers. Furthermore, adjusted generalized estimating equation (GEE) analysis showed only social interaction anxiety scale (p= 0.004) and anxiety during eating (p= 0.011) were associated with energy intake during meal time.

This evidence supports the hypothesis that social facilitation affects subjects' energy intake, the impact is greater when eating in a group with familiar peers. Current findings also provide evidence that anxiety level during eating (state anxiety) could be the driver of social facilitation effects. It revealed that trait anxiety and state anxiety have dominant effects on energy intake during meal time compared to other influential factors such as body composition factors, physical activity level, nutrition knowledge level and eating behavior factor.

Keywords: Social context, social facilitation, energy intake, obesity, eating companions, trait anxiety, state anxiety

Abstrak tesis yang dikemukakan kepada Senat Universiti Putra Malaysia
sebagai memenuhi keperluan untuk ijazah Master Sains

KAJIAN TERHADAP KESAN DORONGAN SOSIAL DAN FAKTOR-FAKTOR LAIN TERHADAP PENGAMBILAN TENAGA DALAM KALANGAN PELAJAR DI SEBUAH UNIVERSITI AWAM DI MALAYSIA

Oleh

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Ketika tahap kegemukan semakin meningkat, faktor-faktor yang dianggap mempengaruhi kenaikan berat badan juga semakin banyak. Terdapat banyak kajian telah menunjukkan bahawa pengaruh sosial berperanan sebagai sebahagian daripada faktor persekitaran yang boleh mempengaruhi pengambilan makanan yang tidak diingini dan status berat badan. Tiada eksperimental kajian mengenai pengaruh social terhadap pengambilan makanan diterbitkan di Malaysia. Oleh itu, kajian ini bertujuan menilai pengaruh sosial khususnya kesan dorongan social dan faktor-faktor lain terhadap pengambilan tenaga dalam persekitaran makmal.

Reka bentuk kajian eksperimen dalam subjek digunakan untuk mengkaji kesan dorongan sosial terhadap pengambilan tenaga. Kaedah persampelan berbilang peringkat digunakan untuk memilih 64 orang subjek (50 perempuan, 14 lelaki) dari sebuah universiti awam untuk mengambil bahagian dalam kajian ini. Setelah mendapat persetujuan, satu set soal selidik swaguna mengenai latar belakang sosiodemografi, faktor gaya hidup (Soal Selidik Aktiviti Global), sifat keresahan (Social Selidik Skala Keresahan Sosial), tingkah laku makan (Soal Selidik Tingkah Laku Makan) dan pengetahuan pemakanan (Tinjauan Pengetahuan Pemakanan) diedarkan kepada subjek. Kemudian mereka dijemput untuk mengikuti tiga sesi makan tengah hari standard dalam 3 situasi dorongan sosial: makan bersendirian (garis asas), makan bersama rakan sebaya yang tidak dikenali, makan dengan rakan sebaya yang dikenali. Para peserta dijemput untuk menikmati hidangan bufet yang terdiri daripada nasi putih, hidangan ayam, tempe dan sayur goreng tumis dan dijadualkan pada tempoh 1 minggu selama 3 minggu berturut-turut. Mereka diminta untuk menilai tahap keresahan mereka semasa makan melalui nilai 0 (tenang) hingga 7 (sangat tegang) setiap kali setelah selesai makan tengah hari di makmal.

Seramai 64 orang pelajar universiti (66% Melayu, 34% Cina) dengan min usia 23.6 tahun (SD = 3.33 tahun) mengambil bahagian dalam kajian ini. Majoriti subjek mempunyai BMI normal yang mana min BMI untuk lelaki adalah 23,5 ± 6,74 kg / m2 dan perempuan adalah 21,1 ± 2,42 kg / m2. Pengulangan ANOVA mendedahkan bahawa kesan statisitik secara signifikan dorongan sosial terhadap pengambilan tenaga dengan situasi dorongan sosial yang berbeza. Secara purata, jumlah pengambilan tenaga semasa makan tengah hari didapati meningkat ketika subjek makan dengan rakan sebaya yang dikenali (705 ± 170 kkal) berbanding dengan makan dalam kumpulan dengan rakan sebaya yang tidak dikenali (587 ± 129 kkal) dan makan sendiri (545 ± 119 kkal).

Ujian Friedman menunjukkan bahawa terdapat perbezaan yang signifikan pada tahap keresahan (keadaan keresahan) antara tiga situasi dorongan sosial yang berbeza (p = 0.001). Mereka berasa lebih selesa ketika makan dengan rakan sebaya yang dikenali. Seterusnya, analisis anggaran persamaan umum disesuaikan (APU) hanya menunjukkan skala keresahan interaksi sosial (p = 0,004) dan keresahan semasa makan (p = 0,011) dikaitkan dengan pengambilan tenaga pada waktu makan.

Bukti ini menyokong hipotesis bahawa dorongan sosial mempengaruhi pengambilan tenaga subjek, kesannya lebih besar ketika makan dalam kumpulan dengan rakan sebaya yang dikenali. Penemuan semasa juga memberikan bukti bahawa tahap keresahan semasa makan (keadaan keresahan) boleh menjadi penyebab kepada kesan dorongan sosial. Ia menunjukkan bahawa sifat keresahan dan keadaan keresahan mempunyai pengaruh yang dominan terhadap pengambilan tenaga pada waktu makan berbanding dengan faktor lain yang berpengaruh seperti faktor komposisi badan, faktor status fizikal aktiviti, tahap pengetahuan pemakanan dan faktor tingkah laku makan.

Kata kunci: Konteks sosial, dorongan sosial, pengambilan tenaga, kegemukan, teman makan, sifat keresahan, keadaan kegelisahan

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This thesis was submitted to the Senate of the Universiti Putra Malaysia and has been accepted as fulfilment of the requirement for the degree of Master of Science. The members of the Supervisory Committee were as follows:

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BF%	Body Fat Percentage
BMI	Body Mass Index
BMR	Basal Metabolic Rate
FFQ	Food Frequency Questionnaire
G	Gram
IPH	Institute for Public Health
JKEUPM	*Jawatankuasa Etika Universiti Penyelidikan Melibatkan Manusia*
M	Mean
METs	Metabolic Equivalents
MOH	Ministry of Health Malaysia
NHMS	National Health and Morbidity Survey
RNI	Recommended Nutrient Intake
SD	Standard Deviation
WHO	World Health Organisation

CHAPTER 1

INTRODUCTION

1.1 Background of study

Globally, the epidemic of obesity is a major public health problem with much evidence proven that is it an important source of morbidity and increases overall mortality among human beings (Abdelaal, le Roux & Docherty, 2017). Weight gain and obesity are always considered as a result of long term overeating that leads to positive energy balance (Hill, Wyatt & Peters, 2012). Obesity has become a global epidemic and it is a notably major health concern all over the world including Malaysia.

According to the National Health and Mortality Survey (NHMS) 2019, the prevalence of obesity among the Malaysian population had increased to 19.7%. In general, the prevalence of obesity has increased by about 2.0% compared to the previous findings of NHMS 2015 (NHMS, 2015). A recent study has shown that suboptimal energy intake is associated with deaths due to heart disease, stroke and type 2 diabetes (Micha et al, 2017). In addition, improper food intake greatly influenced the obesity rate even among children (Huang & Qi, 2015).

Weight gain or obesity is the major contributor of chronic diseases at the population level (Kearns et al, 2014). In Malaysia, non-communicable diseases are estimated to account for 73% of total deaths (NHMS, 2015). These diseases include cardiovascular diseases, cancers and diabetes. It is recognized that such diseases could be prevented with proper weight control (Bullard et al., 2019). In this sense, knowing the factors that affect the amount of energy intake and thus weight status is an important area of research.

To explain the health behaviour including eating behaviour, various theories have been introduced such as social cognitive theory. Social cognitive theory describes that individual behaviour is determined by the interaction of personal and environmental factors. A review study has shown that it can be readily applied to nutrition intervention for preventing obesity. (Adhikari et al., 2018). People always interact in a variety of environments (Swinburn et al., 2004) which can influence the energy intake.

There are a number of environmental factors that affect how much people eat. In the past, the regulation of energy intake and how much people eat are primarily explained by hunger and satiety mechanism (Blundell et al., 2010). However, with the introduction of the term “obesogenic environment” into

scientific discourse, research on relationship between environmental factor and energy intake further gaining more attention. Such non-physiological factors include social influence, social norms and social modelling (Higgs & Thomas, 2016).

Obesogenic environments have been shown likely to promote weight gain or obesity among adults (Swinburn, Egger & Raza, 1999). At meal level, a review paper further classified the environment factors into two categories which are eating environment and food environment (Wansink, 2004). Eating environment such as social influence has been proved can contribute to high food consumption during dining (Ruddock et al., 2019). High consumption of meal intake has been associated with positive energy balance and in long term, obesity (Benton, 2015).

Eating a meal with friends, family members or work colleagues is a common social activity in daily life. It was found that eating together with other people will affect one's food intake. For example, we tend to eat less compared to when we eat with other people or vice versa (Higgs & Thomas, 2016). This effect is known as the social facilitation of eating (Ruddock et al., 2019). Social facilitation is a phenomenon in which certain behaviours including food intake of individuals are promoted by the presence of people (Herman, 2017).

The current study on social facilitation of eating was based on de Castro's hypothesis that we are also likely to eat a large amount if we eat in a group compared to eating alone. de Castro (1990) was first described the social facilitation of eating in details and he reported that when subjects ate with other people, the food intake increased by 40 to 50% on average. This implied that social facilitation of eating can lead to over-consumption of energy intake and lead to obesity. The present study focuses on how social facilitation affects the food intake among public university students. Past studies found that most university students prefer to eat with eating companions (Ulhoa, Rinaldi & Abdala, 2015). Therefore, it appears particularly important and interesting to investigate the social influence on energy intake among the university students.

Apart from environmental factors, during the period of transition from secondary school to graduate level, student's energy intake is likely to be influenced by other factors. Evidence has shown that human energy intake can be affected by sociodemographic factors (Chen et al., 2019), body composition, eating behaviour (Goggins, 2019), nutrition knowledge (Spronk et al., 2014), physical activity level (Elmagd et al., 2015) as well as anxiety level (Adams & Murcia, 2016). These individual characteristics could be important factors in determining an individual's energy intake during mealtime, but there is a paucity of research in this context.

Eating in a group of people and combination with other individual characteristics increase the likelihood of overeating. Understanding of its influence would be one possible mechanism to avoid weight gain since most of the eating occasion takes place in the presence of other people. Thus, we investigate the roles of social context in relation to food intake. At the same time, the relationship between socio-demographic, nutritional factors, nutrition knowledge, lifestyle factor, eating behaviour and anxiety factors will also be determined.

1.2 Problem statement

It is well known that a major contributor of obesity is overconsumption of food which results in excessive energy intake (Hill, Wyatt & Peters, 2012; Romieu et-al, 2017). With the recognition that obesity contributes to many chronic diseases which are preventable (Kearns et al., 2014), it is important to study the factors that influence the energy intake. This issue is linked to the complex interaction with the food consumption environments such as food package, food portion size, eating atmosphere, distraction during eating and social interaction that occur during eating (Wansink, 2004). In our daily life, people are always dining with other people, the impact of such social influence should be investigated.

The imbalanced energy intake could be influenced by social influence such as social facilitation factor. The social facilitation of eating is identified as one of the important environment cues that influence individual's consumption (Herman et al., 2015). The social facilitation of eating has been studied in diary studies, observation studies as well as experimental studies. It is a term referring to people eating more when they eat together in a group compared to when they eat alone (Herman, 2015).

Most eating take place in the presence of people, therefore it is not surprising that one's food intake is affected by social factors. Human as a social being often time will eat together with the social groups to enjoy their food. This is true for university students as published data showed that majority of students (81.1%) took meals with family or friends on a daily basis (Ganasegera et-al, 2012). Majority of young generation reported that they dine out with their friends as it is considered as one of the enjoyable social activities (Pawan, Langgat & Marzuki, 2014). This phenomenon provides the opportunity for the social facilitation effects to occur which might enhance the energy intake and thus weight status of an individual. However, there is a lack of available research studying the influence of social effects on eating experimentally.

It has been reported that social facilitation greatly affected the energy intake of university students (Deliens et al, 2014). It is unclear what effect eating with other people has on the amount of food consumed among the population in Malaysia especially in different eating occasion. Therefore, the current research aims to

examine if the social facilitation effects will be detected among university students across different experimental conditions.

For most students, university is a new environment and they need to make their financial expenses for living including eating expenses. Busy study time in the university, irregular eating behavior, nutrition knowledge and social factors could influence student's dietary intake which will affect their health. Exposure to the university life may increase the likelihood of overweight and obesity among university students (Haidar et al., 2018). Moreover, studies showed that many university students tend to gain weight during fresh entry (De Vos et-al, 2015; Deliens et-al, 2013; Girz et-al, 2013). Therefore, this research also attempts to look at relevant factors and its contribution on energy intake.

Nationally, Malaysia is a multiracial and multicultural country which is considered as a food paradise. Various ethnic groups holding national food fiesta during celebration for Muslim, Buddhist, Hindu and Christians which involved a big crowd of people eating together. This has become a culture for Malaysians to celebrate the blessed occasion with family members, friends as well as neighbors despite the rapid modernization and this might allow the social facilitation effects to occur.

The existing evidence on social facilitation study, however, is conducted in other countries, there is no study of social facilitation on energy intake in experimental setting carried out in Malaysia. Moreover, university students represent a target group with minimal variability for examining food consumption habits compared to population-based sample (El-Ansari, Stock & Mikolajczyk, 2012). Therefore, this research provides outcomes that examined the effects of social facilitation factor along with other factors (socio-demographic, body composition, physical activity status, anxiety factors, nutrition knowledge & eating behavior) on energy intake among university students.

1.3 Significance of study

Globally, the prevalence of obesity is tripled from 1975 to 2016 (WHO, 2017a). Obesity is considered as the major contributor to chronic diseases and has been responsible for 70% of all deaths globally each year which is equivalent to 40 million people (WHO, 2017b). Given the increasing rate of obesity and its negative outcomes, it is essential to address the factors related to over-food consumption essentially from the perspective of environmental factors.

Social influence as part of the environmental factors has been involved in the explanation for favouring the positive energy balance (Egger, Swinburn & Rossner, 2003). For example, the social facilitation effect has been found to

greatly increase food intake (Larson & Story, 2009). University students are exposed to social eating, whereby they tend to eat with friends or peers, evaluation of social facilitation effects may provide evidence for the possible explanations on obesity mechanism.

The links between weight status and social influence have been captured in an intervention study which identified social influence could be the main driver for behavioral weight loss program (Carson et al., 2013). Recently, the social facilitation concept has been incorporated into weight loss programs and it is recognized as a key in promoting long term weight maintenance approaches (Hilbert, 2016). Eating is one of our most common social activities, understanding of social facilitation effects is important to develop potential weight loss intervention.

The findings from this study could serve as a baseline data for future studies. They can reproduce the same research at different study locations and eventually help to enhance understanding of social influence on energy intake in the population. The policymaker can utilize this baseline evidence for the development of social facilitation treatment for obesity in Malaysia. The government or the policymaker could help alter the eating environment (e.g. alter the eating arrangement or number of diners) and educate people to be aware of how their energy intake is affected by the social factor (e.g. the presence of others people) as people are always eating with their companions.

The outcome of this study may not only be beneficial for the development of the intervention for weight management but also will provide better understanding on the psychological effects of eating for the health professionals. It would seem essential to determine the anxiety level during eating as it could be the driver for social facilitation effects. More research is needed to address if anxiety level is the contributor to eating issues among the population. University is a critical period for students to adopt a healthy lifestyle and students are likely to be engaged in social eating with different people. With identification of factors that affect energy intake of students, a proper health promotion could be implemented.

1.4 Research Objectives

1.4.1 General Objective

To determine the effects of social facilitation (eating alone, eating with unfamiliar peers and eating with familiar peers), socio-demographic factors, body composition factors, lifestyle factor, nutrition knowledge, eating behavior, social interaction anxiety scale (trait anxiety) and anxiety level during eating (state

anxiety) on energy intake among university students in Universiti Putra Malaysia, Selangor.

1.4.2 Specific Objectives

1. To determine the socio-demographic factors, body composition factors, lifestyle factor, nutrition knowledge, eating behaviour, social interaction anxiety scale (trait anxiety) and anxiety level during eating (state anxiety) of the subjects.

2. To determine and compare the effects of social facilitation on energy intake and macronutrients intake in three eating occasions (eating alone, eating with familiar peers, eating with unfamiliar peers).

3. To determine and compare the level of anxiety during eating (state anxiety) in three eating occasions (eating alone, eating with unfamiliar peers, eating with familiar peers).

4. To determine and compare the lunch energy intake between dietary recall and lunch intake for each experiment day.

5. To assess the associations between socio-demographic factors, body compositions factors, lifestyle factor, nutrition knowledge, eating behavior, social interaction anxiety scale (trait anxiety) and anxiety level during eating (state anxiety) on energy intake among subjects during meal time.

1.5 Alternative Hypothesis

1) There are significant differences in energy intake and macronutrients intake on three eating occasions (eating alone, eating with unfamiliar peers, eating with familiar peers).

2) There are significant differences of level of anxiety during eating (state anxiety) in three eating occasions (eating alone, eating with familiar peers, eating with unfamiliar peers).

3) There are significant differences of lunch energy intake between dietary recall and during experiment day.

4) There are associations between socio-demographic factors, nutritional factor, lifestyle factor, nutrition knowledge, eating behavior, social interaction anxiety scale (trait anxiety) and anxiety level during eating (state anxiety) on energy intake among subjects during meal time.

1.6 Conceptual Framework

Environmental factors have been recognized as one of the factors that can influence our energy balance. Researchers acknowledged environmental factor is a predominant contributor and changes on environment should be addressed as obesity prevention approach (Wilding, 2012). Social facilitation as micro-environmental factor has drawn attention among researchers as many studies revealed that the presence of other people is able to stimulate one's energy intake (Herman, 2015). The main purpose of the present study is to determine the effect of social facilitation in different eating occasions on energy intake among university students.As shown in Figure 1.1, this study covered another six aspects that may influence the food intake among university students.

Studying at the university is the period whereby students learn new eating habit due to changes in the environment and most of them tend to have unhealthy food intake (Bernardo et al., 2017). It has been shown that poor eating behaviour is associated with high energy intake (Munoz-Pareja et-al., 2013). Nutrition knowledge is defined as knowledge of health and nutrition (Worsely, 2002) which shows positive association with energy intake (Spronk et al., 2014). Physical activity has been shown to influence energy intake (Caudwell et-al, 2013). Similarly, socio-demographic factor also showed correlation with energy intake (Mittal, Kumar & Dwivedi, 2010). In short, socio-demographic factor, lifestyle factor, body composition factor, nutrition knowledge and eating behaviour are hypothesized as a contributor towards energy intake among university students.

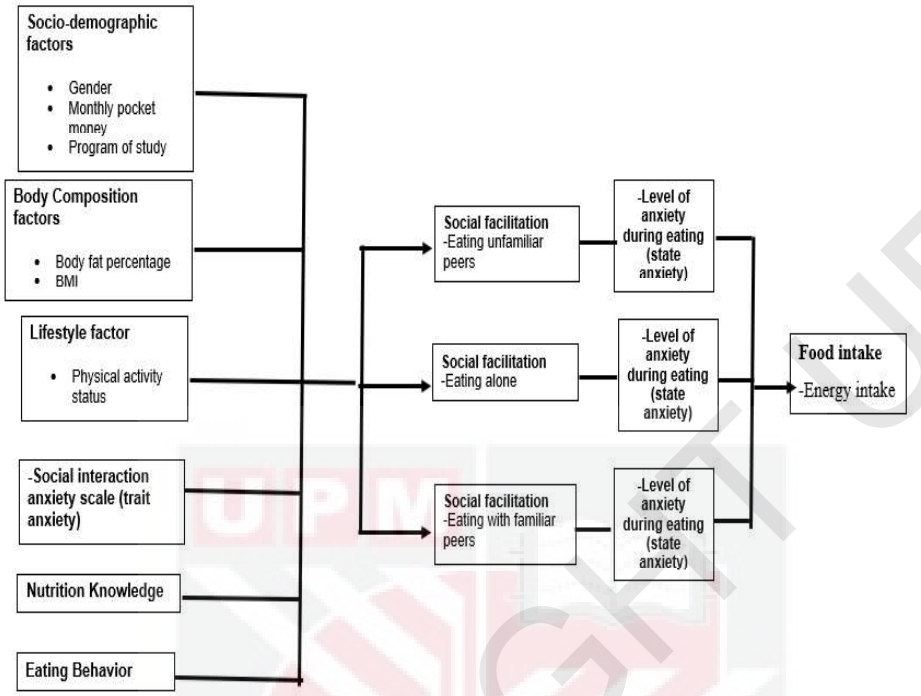

Figure 1.1 : Denotes the conceptual framework of this study. The framework emphasizes the interaction of factors such as nutrition knowledge, eating behavior, physical activity level and anxiety level factors (trait anxiety & state anxiety) on energy intake

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