



UNIVERSITI PUTRA MALAYSIA

**EVALUATION OF SCHOOL NUTRITION PROGRAMME FOR PRIMARY
SCHOOL CHILDREN IN BATU PAHAT, JOHOR, MALAYSIA**

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By

TEO CHOON HUEY

**Thesis submitted to the School of Graduate Studies,
Universiti Putra Malaysia, in fulfilment of the
requirement for the Degree of Master of Science**

June 2019

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

EVALUATION OF SCHOOL NUTRITION PROGRAMME FOR PRIMARY SCHOOL CHILDREN IN BATU PAHAT, JOHOR, MALAYSIA.

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TEO CHOON HUEY

June 2019

Chair: Chin Yit Siew, PhD
Faculty: Medicine and Health Sciences

Childhood malnutrition is increasing rapidly and contribute to adverse health consequences that may persist into adulthood. This quasi-experimental study aimed to evaluate the effectiveness of School Nutrition Programme (SNP) in improving knowledge, attitude and practice on nutrition, eating behaviours, physical activity, body composition, psychological distress, cognitive performance and healthy-related quality of life before the programme, after the programme and three-month follow-up after the programme between intervention and comparison groups.

A total of 532 primary school children (Standard 1-5) from six selected schools (251 children from three intervention schools and 272 children from three comparison schools) in Batu Pahat District, Johor participated in this study. In the present study, the SNP consisted of two main components, namely nutrition education and healthy school food environment to improve knowledge, attitude and practice on nutrition in intervention group and facilitate them with the environment to practise healthy eating habits over a period of three months. The children in the intervention group participated in three School Nutrition Campaigns in addition to the standard Physical and Health Curriculum. The children in the comparison group received only standard Physical and Health Curriculum. School canteen food handlers were reminded to follow canteen guidelines by the Ministry of Education.

All children completed anthropometric measurements and a set of self-administered questionnaires that assessed knowledge, attitude and practice on nutrition, eating behaviours, physical activity, psychological distress and health-related quality of life. Cognitive performance of the children was assessed by using the Raven's Coloured Progressive Matrices. All outcome measures were assessed at the beginning of the programme before the programme started (Pre-

Intervention), one-week right after completing the School Nutrition Campaigns (Post-Intervention I) and after three months follow-up without intervention (Post-Intervention II), respectively. Process evaluation of the SNP comprised evaluation of the attendance rate of intervention group and programme feedback by teachers and children among the intervention group.

At Pre-intervention of the study, the prevalence of thinness and stunting were 7.8% and 5.8%, respectively; whereas the prevalence of overweight and obesity were 13.4% and 16.6%, respectively. After Post-Intervention I and Post-Intervention II, the intervention group had higher knowledge, attitude and practice on nutrition, more frequent consumption of breakfast, lunch, dinner and morning tea, lower body weight and BMI-for-age (z-score), higher physical activity, higher cognitive performance and better health-related quality of life ($p < 0.05$) as compared to the comparison group. However, no significant differences were observed in afternoon tea snacking, supper snacking, height and psychological distress between intervention and comparison groups after three months of SNP. All the teachers (100.0%) were satisfied with the SNP, and all of them were confident in delivering the nutrition education to the children. All the children (100.0%) liked the School Nutrition Campaigns.

In conclusion, SNP was effective in improving knowledge on nutrition, eating behaviours, physical activity, cognitive performance and health-related quality of life and reducing BMI-for-age z-score among Batu Pahat primary school children. Hence, the SNP is highly recommended to be rolled-out to all Malaysian primary schools.

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

**PENILAIAN PROGRAM PEMAKANAN SEKOLAH UNTUK KANAK-KANAK
SEKOLAH RENDAH DI BATU PAHAT, JOHOR, MALAYSIA.**

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Kekurangan zat makanan di kalangan kanak-kanak semakin meningkat dengan pesat dan menyumbang kepada kesan buruk kesihatan yang mungkin berterusan sehingga ke zaman dewasa. Kajian kuasi eksperimen ini bertujuan untuk menilai keberkesanan sebelum dan selepas serta tindakan susulan selepas tiga bulan Program Pemakanan Sekolah dijalankan terhadap kumpulan intervensi dan kumpulan perbandingan dalam meningkatkan pengetahuan, sikap dan amalan pemakanan, tingkah laku semasa makan, aktiviti fizikal, komposisi tubuh, tekanan psikologi, prestasi kognitif dan kualiti kehidupan yang sihat.

Seramai 532 orang murid sekolah rendah yang terdiri daripada Darjah 1-5 dari enam buah sekolah rendah yang terpilih (251 orang murid dari tiga sekolah intervensi dan 272 orang murid dari tiga sekolah perbandingan) di Daerah Batu Pahat, Johor telah mengambil bahagian dalam kajian ini. Dalam kajian ini, Program Pemakanan Sekolah terdiri daripada dua komponen, iaitu pendidikan pemakanan dan persekitaran makanan sekolah yang sihat untuk meningkatkan pengetahuan, sikap dan amalan pemakanan di kalangan kumpulan intervensi dan menyediakan persekitaran untuk amalan tabiat pemakanan yang sihat sepanjang tiga bulan. Kanak-kanak yang berada di dalam kumpulan intervensi telah mengambil bahagian dalam Kempen Pemakanan Sekolah sebagai tambahan kepada kurikulum Pendidikan Jasmani dan Kesihatan yang sedia ada. Manakala kanak-kanak dalam kumpulan perbandingan telah mengikut kurikulum Pendidikan Jasmani dan Kesihatan dan penjualan makanan dan minuman di kantin sekolah adalah tertakluk kepada garis panduan kantin Kementerian Pendidikan Malaysia.

Semua kanak-kanak telah melengkapkan pengukuran antropometri dan menjawab satu set soal selidik tentang pengetahuan, sikap dan amalan pemakanan, tingkah laku semasa makan, aktiviti fizikal, tekanan psikologi dan kualiti hidup yang berkaitan kesihatan kanak-kanak. Prestasi kognitif dinilai dengan menggunakan *Raven's Coloured Progressive Matrices*. Semua hasil dinilai sebelum program bermula (Pre-Intervensi), seminggu selepas Kempen Pemakanan Sekolah diselesaikan (Pasca-Intervensi I) dan tindakan susulan tiga bulan tanpa intervensi (Pasca-Intervensi II). Penilaian proses Program Pemakanan Sekolah terdiri daripada kehadiran kelompok intervensi dan maklum balas program daripada guru dan kanak-kanak daripada kalangan kumpulan intervensi.

Sebelum intervensi dijalankan, prevalen susut dan bantut di kalangan kanak-kanak adalah 7.8% dan 5.8%, manakala prevalen berlebihan berat badan dan obesiti adalah 13.4% dan 16.6%. Setelah intervensi dijalankan, kumpulan intervensi mempunyai pengetahuan, sikap dan amalan yang lebih tinggi terhadap pemakanan, pengambilan lebih kerap sarapan, makan tengahari, makan malam dan minum pagi, berat badan dan BMI untuk umur (skor z) yang lebih rendah, aktiviti fizikal yang lebih tinggi, prestasi kognitif yang lebih tinggi dan kualiti kehidupan yang lebih baik berkaitan kesihatan ($p < 0.05$) berbanding kumpulan perbandingan. Walau bagaimanapun, tiada perbezaan yang ketara diperhatikan pada snek minum petang, snek minum malam, ketinggian dan tekanan psikologi antara kumpulan intervensi dan perbandingan selepas tiga bulan intervensi dijalankan. Semua guru (100.0%) berpuas hati dengan Program Pemakanan Sekolah, dan mereka semua berkeyakinan dalam menyampaikan Pendidikan pemakanan kepada kanak-kanak. Semua kanak-kanak (100.0%) menyukai Program Pemakanan Sekolah ini.

Kesimpulannya, Program Pemakanan Sekolah berkesan dalam meningkatkan pengetahuan tentang pemakanan, tingkah laku semasa makan, aktiviti fizikal, prestasi kognitif dan kualiti kehidupan yang berkaitan dengan kesihatan dan mengurangkan skor BMI untuk umur di kalangan kanak-kanak sekolah rendah Batu Pahat. Oleh itu, Program Pemakanan Sekolah amat disyorkan untuk melancarkan ke semua sekolah rendah di Malaysia.

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Teo Choon Huey
30 January 2019



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

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LIST OF ABBREVIATIONS

BAZ	Body mass index-for-age z score
BMI	Body Mass Index
CDC	Centre for Disease Control
CG	Comparison group
CVD	Cardiovascular disease
EBQ	Eating Behaviour Questionnaire
HAZ	Height-for-age z score
HLP	Healthy Lifestyle Programme
HRQoL	Health-Related Quality of Life
IG	Intervention group
IPH	Institute of Public Health
	International Society for the Advancement of
ISAK	Kinanthropometry
LOCF	Last Observation Carried Forward
MOE	Ministry of Education
MOH	Ministry of Health
MREC	Medical Research Ethics Committee
NHANES	National Health and Nutrition Examination Survey
NHMS	National Health and Morbidity Survey
NPANM	National Plan of Action for Nutrition of Malaysia
PAQ-C	Physical activity questionnaire for children
PE	Physical education
PedsQL	Pediatric Quality of Life Inventory
PTA	Parent Teacher Association
Raven's CPM	Raven's Coloured Progressive Matrices
RCADS	Revised Child Anxiety and Depression Scale
SCT	Social Cognitive Theory
SEANUTS	South East Asia Nutrition Survey
SEGAK	National Standard of Physical Fitness
SJKC	<i>Sekolah Jenis Kebangsaan Cina</i>
SJKT	<i>Sekolah Jenis Kebangsaan Tamil</i>

SK	<i>Sekolah Kebangsaan</i>
SMP	School Meal Programme
SNP	School Nutrition Programme
TOT	Training of Trainer
WAZ	Weight-for-age z score
WHO	World Health Organisation



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CHAPTER 1

INTRODUCTION

1.1 Background of the Study

Malnutrition refers to deficiencies, excesses or imbalances in a person's intake of energy and/or nutrients (World Health Organization [WHO], 2018a). The term malnutrition covers two broad groups of conditions, which are undernutrition and overnutrition. Undernutrition include stunting (low height-for-age), wasting (low weight-for-height), underweight (low weight-for-age) and micronutrient deficiencies or insufficiencies (a lack of important vitamins and minerals) (WHO, 2018a). Meanwhile, overnutrition include overweight and obesity with frequent and habitual over consumption of nutrients by eating too much food (Langford et al., 2014).

The global double burden of malnutrition showed that 51 million children under five years of age were wasted and 151 million were stunted; and the number of overweight or obese children under the age of five were 38 million in the year 2017 (WHO, 2018b). The number of overweight children under five increased from 30.4 million in year 2000 to 38 million in year 2017. Childhood overweight and obesity in both developed and developing countries are increasing rapidly and is perceived as a major public health concern to many health authorities (WHO, 2006). The growth and development of children (aged 7-9 years) and adolescents (aged 10-12 years) could be affected as well as their future livelihood as adults in future.

Based on a report by WHO on children under five with malnutrition, more than half of stunted children, more than two third of wasted children and almost half of overweight children lived in Asia (WHO, 2018b). Malaysia faced the problem of dual burden of malnutrition (Khambalia, Lim, Gill, & Bulgiba, 2012; Poh et al., 2013), sometimes within the same family (Khor & Sharif, 2003). The South East Asia Nutrition Survey of Malaysian children (SEANUTS Malaysia) showed that the prevalence of undernutrition was 13.8% and overnutrition was 21.6% among children from aged 7 to 12 years (Poh et al., 2013).

In year 2015, MyBreakfast Study reported that Malaysian children aged 6 to 17 years old with overweight and obesity problems were observed as 14.0% and 14.4%, respectively; on the other hand, 6.4% had thinness and 7.2% were stunted (Tee et al., 2015). Based on the recent National Health and Morbidity Survey 2017: Adolescent Nutrition Survey (NHMS 2017), the prevalence of thinness and stunting among children 10 to 12 years old were 6.7% and 7.8%, respectively; while prevalence of overweight and obesity were 16.3% and 17.4%, respectively (Institut of Public Health [IPH], 2017). Therefore, actions should be

taken to combat the dual burden of malnutrition, especially overweight and obesity problems among children.

The National Standard of Physical Fitness (SEGAK) from the Ministry of Education (MOE) reported the nutritional status among 18,987 students aged 10-12 years from Batu Pahat district (Batu Pahat Education Office, 2014). The prevalence of overweight and obesity was 17.4% and 15.4% respectively, higher than the prevalence from NHMS 2017 (IPH, 2017) and MyBreakfast study (Tee et al., 2015); while the prevalence of thinness and stunting was 8.0% and 9.4%, respectively. With the high prevalence of overweight and obesity and the existence of thinness and stunting in Batu Pahat school-aged children, there is an urgent need for an intervention programme to be implemented among primary school children in Batu Pahat District.

Malnutrition during childhood may contribute to adverse health consequences. Undernutrition may increase risk of impaired physical and cognitive development, as well as morbidity and mortality during childhood (Lazzeri et al., 2008; Luder & Alton, 2005). On the other hand, overnutrition such as overweight and obesity are likely to lead to the development of non-communicable chronic diseases (WHO, 2016a). Children who are obese have a greater risk of high blood pressure and high cholesterol during childhood (Freedman, Mei, Srinivasan, Berenson, & Dietz, 2007); and also, breathing problems, such as sleep apnea and asthma (Han & Lawlor, 2010); increased risk of impaired glucose tolerance, insulin resistance and type 2 diabetes in adulthood (Whitlock, Williams, Gold, Smith, & Shipman, 2005).

Studies showed that obese children were prone to have higher risk of psychological distress such as depression, behavioural problems and issues in school, which may cause low self-esteem, low quality of life and cognitive deficits (Halfon, Larson, & Slusser, 2013; Morrison, Shin, Tarnopolsky, & Taylor, 2015; Smith, Hay, Campbell, & Trollor, 2011; Taylor, Forhan, Vigod, McIntyre, & Morrison, 2013). From an economic viewpoint, obesity places a strain on the healthcare system (Ickes, McMullen, Haider, & Sharma, 2014; Withrow & Alter, 2011). Knowing the consequences of malnutrition among primary school children, a study is needed to determine potential school nutrition programmes in primary school that can effectively overcome this public health concern.

1.2 Problem Statement

In United States, Brazil and China, the overweight epidemic has increased at a faster rate in children than in adults (Popkin, Conde, Hou, & Monteiro, 2006). The recent National Health and Nutrition Examination Survey (NHANES) reported that 31.7% of 2-19 years old children in the United States were overweight and 16.9% were obese, which indicates that overweight and obesity

problems have become more prevalent than underweight among children in the United States (Ogden, Carroll, Kit, & Flegal, 2012).

In Malaysia, studies have also shown that the problem of overweight and obesity were more prevalent than the problem of thinness and stunting (Shariff et al., 2008; Soo, Manan, Manaf, & Lee, 2011). The NHMS (2017) showed that the prevalence of overnutrition (overweight 16.3% and obesity 17.4%, respectively) was higher than the prevalence of undernutrition (thinness 6.7% and stunting 7.8%, respectively) among Malaysian children aged 10 to 12 years (IPH, 2017). Therefore, the National Plan of Action for Nutrition of Malaysia III (2016-2025) has emphasised the reduction of the incidence of overweight and obesity among primary school children in Malaysia as one of its key strategies (Ministry of Health [MOH], 2015).

There are many factors that contribute towards overweight and obesity problems. A cohort study showed that high birth weight, maternal smoking, parental obesity, poor sleep duration and sedentary behaviour were independently associated with increased prevalence of obesity at age 7 (Reilly et al., 2005). Childhood obesity is also associated with unhealthy eating and sedentary activities (Langford et al., 2014). Previous studies reported that Malaysian primary school children are at risk of poor dietary behaviours, including breakfast skipping, low fruits and vegetables intake, unhealthy snacking and low physical activity (Chong et al., 2016; IPH, 2017; Lee et al., 2014), which may affect their nutritional status, and cause lower cognitive performance and poor quality of life (Lee, Cheah, Chang, & Raudzah, 2012; Nasir et al., 2012; Poh et al., 2013). Hence, there is a need to have a holistic nutrition intervention programme that promotes healthy eating and active living for all primary school children, so that they can practise healthy eating, have good nutritional status, prevent from psychological distress, have better cognitive performance and health-related quality of life.

Primary school children are children 7 to 12 years old, referred to as Standards 1 to 6 in schools (MOE, 2018a). Perera and colleagues (2015) reported that lifelong nutrition patterns can be formed during childhood (Perera, Frei, Wong, & Bobe, 2015). Meyer and colleagues (2013) stated that the importance of healthy eating is to enable children to establish or reinforce personal skills, healthy perceptions and useful knowledge in nutrition and physical activity to promote their own health. The study also reported that it is beneficial to teach healthy eating patterns during childhood since eating patterns are established early in life and are difficult to change during youth (Meyer, Yoon, & Kaufmann, 2013). Therefore, an intervention, which consists of promoting healthy eating and physical activity is important to educate children and encourage them to practise it during their school days in order to prevent overweight or obesity problems.

Nutrition interventions have been carried out in Malaysia to assess the effectiveness of these programmes that aimed to improve nutrition knowledge, attitude and practices and to reduce obesity among primary school children

(Ruzita, Wan Azdie, & Ismail, 2007; Shariff et al., 2008; Karim, Tee, Hashim, & Chin, 2014). The efforts were mainly focused on educating the children on healthy eating and physical activity. A 3-week nutrition education programme by Ruzita and colleagues (2007) showed that there was an improvement in knowledge and attitude on nutrition at post-intervention and 6-month follow-up, but not in practices among 8-year old children (Ruzita, Wan Azdie, & Ismail, 2007).

In order to improve nutrition practices among school children, Shariff and colleagues (2008) suggested that nutrition information, healthy family environment, healthy food availability and accessibility in school should be included in nutrition intervention (Shariff et al., 2008). Tee and colleagues (2015) suggested a successful nutrition intervention should consist of content and teaching strategies that are developmentally appropriate for children and address the changes in the school environment (Tee et al., 2015). To date, there is no intervention that integrates nutrition education and school food environment, namely the school canteen in Malaysia. The foods in school canteen must reflect what has been taught in nutrition education and can exert a strong influence on children's food decisions (Mensink, Schwinghammer, & Smeets, 2012).

In Malaysia, primary school children consume morning tea break during school recess at 10.00 am; some children will consume their lunch at 1.00 pm before they continue their additional tutorial classes or cocurricular activities. Therefore, ensuring that school canteen is serving a healthy and safe menu is crucial. In the year 2011, the Healthy School Canteen Guidelines had been published by MOE, aiming to improve school canteen services and cultivate a balanced and healthy food intake in schools (MOE, 2011). The guideline categorised the foods and drinks into three groups, namely foods and drinks that are prohibited to be sold, foods and drinks that are encouraged to be sold and foods and drinks that are not encouraged to be sold (such as instant noodle, confection ice-cream, ice-cream, coffee and tea, carbonated drinks, sugar and cream coated foods and processed foods like burger patty, hotdog and nugget).

In year 2015, a total of 113 national primary school canteens in the Batu Pahat District were evaluated by nutritionists and environmental health assistant officers from the MOH during school recess. Only 18 (15.9%) school canteens which scored within 80-100% were categorised as "good", and 57 (50.4%) school canteens were "satisfied" (60-79%) and 38 (33.6%) school canteens were "not satisfied" (0-59%). The reasons were due to cordial drinks, carbonated drinks and fried foods, especially processed foods such as nugget, burger and hotdog that were served in the school canteens; while insufficient green vegetables and fruits were prepared for the children (Batu Pahat Health Centre, 2015). Hence, the issues of foods and drinks in the category of not encouraged to be sold must be revised in order to allow primary school children better access to healthier foods and beverages.

A systematic review and meta-analysis study reported that the promising school food environment policies include direct provision of healthful foods and beverages such as fruits and vegetables, and quality foods for school meals during lunch and breakfast (Micha et al., 2018). In contemplation of increased healthy food availability in primary school canteens, food handlers' knowledge and concerns should be considered (Obbagy, Condrasky, Roe, Sharp, & Rolls, 2011).

A study by Lessa and colleagues (2017) reported that food handlers had significantly lower nutrition knowledge than the general public (Lessa, Cortes, Frigola, & Esteve, 2017). A local study conducted by Siow and Norrakiah (2011) involving food handlers at residential colleges and canteens in Universiti Kebangsaan Malaysia found that, food handlers' knowledge on food hygiene and control of foodborne diseases were categorized as moderate level, with an average score of 57.8%. Therefore, an intervention which includes canteen food handler is needed to ensure that an appealing, healthy and safe menu is prepared for the primary school children, in order to reinforce knowledge, skills and behaviours about healthy eating and lifestyle, which are taught in the classroom.

In year 2007, the President of Parent Teacher Association (PTA) and school principal from the National Chinese Primary School (SJKC) Chin Kwang Wahyu, Johor had started a healthy school food environment, namely the School Meal Programme (SMP) in their school canteen during school recess time. This programme aimed to reduce less healthy foods and beverages in the school canteen, promote balanced foods and improve dietary habits among school children (Tuong & Lee, 2017). This effort was consistent with a study from Arsenault and colleagues (2009), where by the provision of healthy foods in school canteens was significantly related to improve linear growth and decreased reported morbidity (Arsenault et al., 2009).

The Healthy School Canteen Programme of the Netherlands Nutrition Centre is an intervention that helps schools to make their canteen in offering healthier foods and beverages. Besides, the Netherlands Nutrition Centre suggested that schools should strive for structural changes in the school canteen and incorporate healthy eating in the regular curriculum (Mensink, Schwinghammer & Smeets, 2012).

Scientific evidences have shown the effectiveness of integrated nutrition education and school food environment interventions in improving the nutrition knowledge, attitude and practice, eating behaviours, physical activity, body composition, psychological distress, cognitive performance and health-related quality of life (Mensink, Schwinghammer, & Smeets, 2012; Micha et al., 2018; Arsenault et al., 2009). In Malaysia, there is no published study report on the impact of such integrated intervention. Hence, the current study proposed a School Nutrition Programme (SNP) that consists of two main components,

nutrition education and healthy school food environment. The intervention programme is needed to effectively affect primary school children's food choices and healthy eating habits, which is in line with World Health Organization's Health Promoting Schools framework (Langford et al., 2014).

This study intends to answer the following research questions:

- 1) Are there any differences in knowledge, attitude and practices on nutrition, eating behaviours, physical activity, body composition, psychological distress, cognitive performance and health-related quality of life among primary school children in Batu Pahat before and after completing the School Nutrition Programme?

1.3 Significance of the Study

The findings of the present study can provide an update concerning the prevalence of malnutrition in Batu Pahat district, which can be used by future researchers, health professionals, policy makers and school authorities to plan and implement the intervention in preventing severe consequences of malnutrition among Batu Pahat primary school children.

In the present study, the trained school teachers conducted the three School Nutrition Campaigns to the children and the trained canteen food handlers prepared healthy menu to the children during school recess time for three months. The feedback of the teachers and canteen food handlers reflect the competency and confidence of the teachers and canteen food handlers. The school teachers and canteen food handlers can be trained by using the module of the current SNP. Most importantly, the menus that are developed in the present study can be used in the future.

The protocol of the current study can be used by future researchers, health professionals, policy makers and school authorities (including Parent Teacher Association) for planning, implementing and evaluating the effective policies for Malaysian children in order to promote healthy eating to reduce malnutrition and the burden of diseases, which is in line with the Sustainable Development Goals (WHO, 2015). The results of the present study can answer the feasibility of providing healthy menus in school canteens to improve dietary practices among primary school children, which is priorities by the Ministry of Health (Nutrition Research Priorities in Malaysia for 11th Malaysia Plan, 2016-2020) (MOH, 2016).

1.4 General objective

To evaluate the effectiveness of School Nutrition Programme (SNP) among primary school children in Batu Pahat district, Johor.

1.4.1 Specific objectives

1. To determine socio-demographic background (sex, age, ethnicity, parental education level and monthly household income) among primary school children at Pre-Intervention.
2. To determine the attendance rate and programme feedback among intervention respondents (teachers, canteen food handlers and primary school children).
3. To determine the differences of the School Nutrition Programme in
[Primary outcomes]:
 - i) knowledge, attitude and practices on nutrition
 - ii) eating behaviours (meal frequency and snacking consumption)
 - iii) physical activity
 - iv) body composition (body weight status, waist circumference and body fat percentage)
[Secondary outcomes]:
 - v) psychological distress
 - vi) cognitive performance
 - vii) health-related quality of life (HRQoL)between intervention and comparison groups before the programme, after the programme and three-month follow-up after the programme.

1.5 Null Hypotheses

- H₀1: There is no significant difference in knowledge, attitude and practices on nutrition between intervention and comparison groups before the programme, after the programme and three-month follow-up after the programme.
- H₀2: There is no significant difference in eating behaviour between intervention and comparison groups before programme, after the programme and three-month follow-up after the programme.
- H₀3: There is no significant difference in physical activity between intervention and comparison groups before the programme, after the programme and three-month follow-up after the programme.
- H₀4: There is no significant difference in body composition between intervention and comparison groups before the programme, after the programme and three-month follow-up after the programme.
- H₀5: There is no significant difference in psychological distress between intervention and comparison groups before the programme, after the programme and three-month follow-up after the programme.
- H₀6: There is no significant difference in cognitive performance between intervention and comparison groups before the programme, after the programme and three-month follow-up after the programme.
- H₀7: There is no significant difference in health-related quality of life between intervention and comparison groups before the programme, after the programme and three-month follow-up after the programme.

1.6 Conceptual Framework

Figure 1.1 shows the dependent variables in the present study. The dependent variables include primary outcomes such as knowledge, attitude and practice on nutrition, eating behaviour, physical activity, body composition; secondary outcomes such as psychological distress, cognitive performance and health-related quality of life among primary school children in Batu Pahat district. The differences in these dependent variables within each group of children and the differences between intervention and comparison groups before the intervention programme, after the intervention programme and 3-month follow-up after intervention programme were evaluated. The process evaluation was conducted to assess the quality of the School Nutrition Programme.

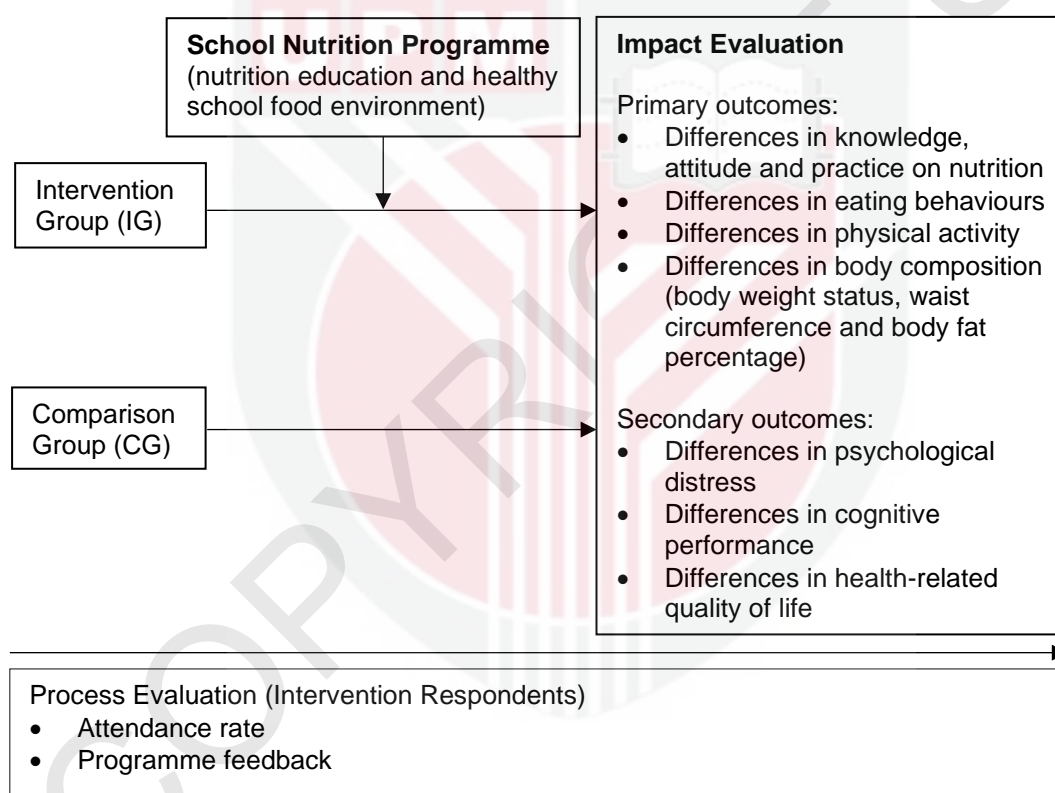


Figure 1.1: Conceptual Framework of the Study

1.7 Conceptual and Operation Definition of Terms

School Nutrition Programme: School nutrition is to safeguard the health and well-being of the nation's children by providing nutritional meals and snack as well as milk each school day. This ensures that participating children gain a full

understanding of the relationship between proper eating and good health as well as participating in learning experiences that will improve their eating habits (United State Department of Agriculture [USDA], 2018). In the present study, School Nutrition Programme (SNP) is referred to an intervention that integrated two main components, (1) delivering nutrition education through School Nutrition Campaign for three months; and (2) serving healthy menu during school recess time to the children over a period of three months.

Nutrition Education: A key element to promote lifelong healthy eating and exercise behaviours and should start from the early stages of life. School-based nutrition education should focus not only on the provision of nutrition information, but also on the development of skills and behaviours related to areas such as food preparation, food storage; social and cultural aspects of food and eating; enhanced self-esteem and positive body image (Perez-Rodrigo & Aranceta, 2001). In the current study, the SNP provided primary school children with the knowledge and skills on nutrition and physical activity that are important for long-term behavioural change.

School Food Environment: A school's environment and policies related to promote and support healthy eating and the provision of access to healthy foods within the school setting (USDA Food Stamp Nutrition Program, 2007). In the present study, the trained canteen food handlers prepared healthy menu to the primary school children over a period of three months, in order to practise healthy eating during school recess after having attended the nutrition education in the classroom.

Socio-demographic Background: Socio-demographic background was characterised by a combination of factors related to sociology and population characteristics (Merriam-Webster, 2016). Socio-demographic background normally refers to age, sex, ethnicity, area, number of siblings, monthly pocket money, parental monthly income and parental educational level.

Process Evaluation: Process evaluation refers to an assessment designed to assess the implementation process in general, and tracks and measures what went well, what went poorly and how these factors contributed to the success or failure of a particular programme. Process evaluation also measures how many products were distributed or how many services were offered as well as how many people participated in the programme (McKenzie, Neiger & Thackeray, 2013). In the current study, process evaluation comprised the evaluation of attendance rate and programme feedback of respondents among the intervention group.

Attendance Rate: In this study, attendance rate refers to the percentage of intervention respondents who attended the intervention.

Programme Feedback: Programme feedback in the current study refers to the percentage of intervention children who agreed that the intervention sessions which were run as camps, were easily understood and well-liked. The percentage of teachers who were satisfied with the programme and who agreed that the Training of Trainers (TOT) sessions were easily understood and interesting.

Impact Evaluation: Impact evaluation tends to focus on intermediary measures such as behavioural changes or changes in attitudes, knowledge and awareness (McKenzie, Neiger & Thackeray, 2013). In the current study, impact evaluation comprised the evaluation of primary outcomes which included knowledge, attitude and practice on nutrition, eating behaviours, physical activity and body composition; secondary outcomes which included psychological distress, cognitive performance and health-related quality of life of respondents before and after the intervention programme.

Knowledge, Attitude and Practice on Nutrition: Knowledge refers to a set of understandings; attitude refers to a tendency or constant tendency towards certain objects, individuals or situations; while practice refers to an observable action towards the stimulus (Baranowski, Cullen, Nicklas, Thompson, & Baranowski, 2003). In the present study, knowledge, attitude and practice on nutrition refers to the understanding, tendency and observable actions in the practice of healthy eating and being physically active.

Eating Behaviour: A broad term that encompasses food choices and motives, feeding practices, dieting, and eating-related problems such as obesity, eating disorders and feeding disorders (Marc, 2013). In the present study, eating behaviour refers to the mean number of days of main meal and snack consumptions.

Physical Activity: Any bodily movement produced by skeletal muscles that requires energy expenditure (WHO, 2019). In the current study, physical activity refers to a summary activity score and physical activity level.

Psychological Distress: Anxiety is a condition of persistent and uncontrollable nervousness, stress and worry that is triggered by anticipation of future events, memories of past events, or rumination over day-to-day events, both trivial and major, with disproportionate fears of catastrophic consequences (Chansky, 2004). In the present study, psychological distress refers to major depression disorder, panic disorder, social phobia, separation anxiety disorder, generalised anxiety disorder and obsessive-compulsive disorder.

Body Composition: Body Composition refers to quantification of body components, the quantitative relationships between components and component alterations related to various influencing factors (Wang, Perison, & Heymsfield, 1992). In this study, body composition refers to body weight, height, body mass index-for-age z-score, abdominal obesity and percentage of body fat of the respondents.

Cognitive Performance: A person's capacity to acquire and use the information to adapt to environmental demands. This process involves many skills including attention, creativity, memory, perception, problem solving, thinking and the use of language (Neisser, 1976). In the current study, cognitive performance refers to the Raven's cognitive test, which depended on non-verbal logical thinking.

Health-related Quality of Life (HRQoL): Quality of life is a broad multidimensional concept that usually includes subjective evaluations of both positive and negative aspects of life (WHO, 1998). The health-related quality of life encompasses those aspects of overall quality of life that can be clearly shown to affect health, either physically or mentally (Centers for Disease Control Prevention, 2000; Selim et al., 2009). In this study, the HRQoL refers to a multidimensional construct including physical well-being and psychosocial well-being which included emotional functioning, social functioning and school functioning.

Modified Intention-to-treat (mITT): ITT analysis includes every subject who is randomised, ignores noncompliance, protocol deviations, withdrawal, and anything that happens after randomisation (Gupta, 2011). mITT is a subset of the ITT population and allows the exclusion of some randomised subjects in a justified way (Sainani, 2010). In the present study, the children who fulfilled the following criteria were included in the data analysis process:

- i. Children of the intervention group who attended at least two camps in the School Nutrition Programme;
- ii. Children from both the intervention and comparison groups who had completed Pre-Intervention, Post-Intervention I and Post-Intervention II.

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BIODATA OF STUDENT

Teo Choon Huey was born in Muar, Johor on 19th February 1981. She had her primary education at Sekolah Jenis Kebangsaan Cina Chung Hwa Presbyterian Muar. She completed her secondary education at Sekolah Menengah Kebangsaan Sri Muar and pre-university program (Form 6) at Sekolah Menengah Kebangsaan Tinggi Muar. She graduated from bachelor degree in Nutrition and Community Health at Universiti Putra Malaysia (UPM) with Second Upper Honour. After graduated, she worked as Nutritionist at Marie France Bodyline Slimming Centre Malacca Branch, Pantai Hospital Batu Pahat and Nestle Product Sdn. Bhd. for two years, respectively. Then, she joined the Nutrition Division of Ministry of Health as Nutritionist in Muar Health Centre for four years and transferred to Batu Pahat Health Centre before further her Master study. With the passionate in research, she continued to pursue Master in Community Nutrition in UPM under the supervision of Assoc. Prof. Dr. Chin Yit Siew.

She is accredited as International Society for the Advancement of Kinanthropometry (ISAK) Level One anthropometrist. She presented her research findings in poster session in 1st Southeast Asia Public Health Nutrition (SEA-PHN) conference and oral presentation in 11th Johor Scientific Meeting in 2017. In the year 2018, she presented her research findings in oral session in 33rd Nutrition Society of Malaysia (NSM) Annual Scientific Conference and Johor Research Day. She has received the Best Oral Presentation Award 2018 – First prize in the Young Researcher Symposium in 33rd NSM Annual Scientific Conference and also First prize in Oral Presentation in Johor Research Day. In January 2019, she received the Special Award from Johor State Health Director for her contributions.

LIST OF PUBLICATIONS

- Teo, C. H., Chin, Y. S., Lim, P. Y., Shahril, A. H. M. & Zalilah, M. S. (2019). School-based intervention that integrates nutrition education and supportive healthy school food environment among Malaysian primary school children: a study protocol. *BMC Public Health*. 19(1), 1-10.

List of Proceedings

- Teo, C. H., Chin, Y. S. & Shahril, A. H. M. (2017). *Perceptions and experiences of school meal program (SMP) among school communities in selected primary schools in Batu Pahat District*. Paper presented at the 11th Johor Scientific Meeting 2017, Johor Bahru. **(Oral)**
- Teo, C. H., Chin, Y. S., Kerk, S. B. & Shahril, A. H. M. (2017). *Associations between socio-demographic characteristics, body weight status and eating behaviors with cognitive performance among primary school children in Batu Pahat District*. Paper presented at the 1st Southeast Asia Public Health Nutrition (SEA-PHN) Conference 2017: Together in Advancing Public Health Nutrition, Kuala Lumpur. **(Poster)**
- Teo, C. H., Chin, Y. S., Lim, P. Y., Zalilah, M. S. & Shahril, A. H. M. (2018). *Evaluation of school-based Healthy Lifestyle Program (HLP) for primary school children in Batu Pahat District, Johor, Malaysia*. Paper presented at the 33rd Scientific Conference of the Nutrition Society of Malaysia (NSM) 2018: Investing in Nutrition: Act Now, Kuala Lumpur. **(Oral)**
- Chin, Y. S., Teo, C. H., Lim, P. Y., Zalilah, M. S. & Shahril, A. H. M. (2018). *Effectiveness of a primary school-based intervention in Malaysia*. Paper presented at 50th Asia-Pacific Academic Consortium for Public Health 2018: Moving Forward to Address New Challenge in Regional Health, Kota Kinabalu. **(Oral)**
- Teo, C. H., Chin, Y. S., Lim, P. Y., Zalilah, M. S. & Shahril, A. H. M. (2018). *Effect of "Program Cara Hidup Sihat" among Batu Pahat primary school children in Johor, Malaysia*. Paper presented at Johor Research Day 2018, Johor Bahru. **(Oral)**
- Teo, C. H., Chin, Y. S., Lim, P. Y., Shahril, A. H. M. & Zalilah, M. S. (2018). *School Nutrition Program for primary school children – experiences and learnings*. Paper presented at the 34rd Scientific Conference of the Nutrition Society of Malaysia (NSM) 2019: Healthy Nutrition: Key to Disease Prevention, Kuala Lumpur. **(Oral)**



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