UNIVERSITI PUTRA MALAYSIA

EFFECTIVENESS OF "EAT RIGHT, BE POSITIVE ABOUT YOUR BODY AND LIVE ACTIVELY" PROGRAMME IN PREVENTING OVERWEIGHT AND DISORDERED EATING AMONG MALAYSIAN ADOLESCENTS

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FPSK(p) 2019 36

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

April 2019

Abstract of thesis presented to the Senate of Universiti Putra Malaysia in fulfilment of the requirement for the degree of Doctor of Philosophy

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Obesity and disordered eating (DE) have potential shared risk factors, including dietary practice, physical activity level and body image perception. Thus, prevention of both obesity and DE can be done simultaneously. The present study aimed to evaluate the effectiveness of the 'Eat Right, Be Positive about Your Body and Live Actively' (EPaL) intervention programme for preventing risk of becoming overweight and DE in Malaysian adolescents. The EPaL intervention programme promoted three main components of healthy lifestyle, namely healthy eating, positive body image and active lifestyle. The present study comprised two phases, in which Phase 1 of the study aimed to develop the EPaL intervention programme and Phase 2 of the study aimed to evaluate the effectiveness of the EPaL intervention programme.

The Phase 1 of the study started with a needs assessment, and followed by the development of the EPaL Educational Package (EPaL Educational Module, EPaL Activity Book and EPaL Educational/ Activity Cards and Posters) for adolescents. The needs assessment was conducted using focus group discussions involved 72 secondary school adolescents in Form 1 and Form 2. The EPaL Educational Package, which consisted of EPaL Module: Volume 1 (Topic 1 until Topic 4) and EPaL Module: Volume 2 (Topic 5 until Topic 8), was developed. Content validity of the EPaL Educational Package by a team of expert panels was conducted. The face validity assessment of the EPaL intervention programme involved 54 adolescents aged 11-16 years who evaluated the EPaL intervention programme.

The Phase 2 of the study was the evaluation of the effectiveness of the EPaL intervention programme among secondary school adolescents. This study used a quasi-experimental study design. Peer education was applied in coveying the knowledge and skills on healthy lifestyle to the adolescents. It compared the effects of the intervention on personal, eating and physical activity behaviour variables, and health outcomes, between intervention (IG) and comparison groups (CG). The comparisons were determined at three time points - before intervention (pre-intervention), after intervention (Post I) and 3 months after intervention (Post II). The IG received EPaL intervention programme for 16 weeks while CG received no intervention and had their standard Physical Education and Health classes. There were 76 adolescents (IG: n=34; CG: n=42) in Form 1 and Form 2 included in the final analysis.

The IG reported significantly higher knowledge score at both Post I (adjusted mean difference = 3.34; 95%CI = 0.99, 5.69; p = 0.006) and Post II (adjusted mean difference = 2.82; 95%CI = 0.86, 4.78; p = 0.005), a higher percentage of energy from carbohydrate at Post I (adjusted mean difference = 4.41; 95%CI = 0.80, 8.03; p = 0.017) and a higher emotional functioning at Post II (adjusted mean difference = 10.98; 95%CI = 1.07, 20.89; p = 0.030) as compared to CG. The IG demonstrated significantly lower uncontrolled eating at Post II (adjusted mean difference = -2.48; 95%CI = -4.65, -0.32; p = 0.025) compared to CG. There was a significant increase over time in the proportion of adolescents who correctly estimated their weight status (Q = 6.118, p = 0.047) and a decrease in the proportion of adolescents who consumed afternoon tea (Q = 6.750, p = 0.034) in IG.

In conclusion, the EPaL intervention programme was effective in improving knowledge, perception of body weight status, uncontrolled eating and emotional functioning among the adolescents. The present study added to the knowledge and evidence on the effectiveness of health interventions. Hence, it can be used as a model to develop future health and nutrition interventions for adolescents in Malaysia.

Abstrak tesis yang dikemukakan kepada Senat Universiti Putra Malaysia
sebagai memenuhi keperluan untuk ijazah Doktor Falsafah

KEBERKESANAN PROGRAM *"EAT RIGHT, BE POSITIVE ABOUT YOUR BODY AND LIVE ACTIVELY"* UNTUK MENCEGAH MASALAH BERLEBIHAN BERAT BADAN DAN GANGGUAN PEMAKANAN PADA REMAJA DI MALAYSIA

Oleh

SHARIFAH INTAN ZAINUN BINTI SHARIF ISHAK

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Obesiti dan gangguan pemakanan mempunyai faktor risiko yang sama, termasuk amalan pemakanan, aktiviti fizikal dan persepsi terhadap imej tubuh. Oleh itu, pencegahan obesiti dan gangguan pemakanan boleh dilakukan serentak. Kajian ini bertujuan menilai keberkesanan program intervensi 'Eat Right, Be Positive about Your Body and Live Actively' (EPaL) untuk mencegah risiko berlebihan berat badan dan gangguan pemakanan di kalangan remaja di Malaysia. Program intervensi EPaL menggalakkan tiga komponen utama gaya hidup sihat, iaitu makan secara sihat, imej tubuh yang positif dan gaya hidup aktif. Kajian ini terdiri daripada dua fasa, iaitu kajian Fasa 1 yang bertujuan untuk membentuk program intervensi EPaL dan kajian Fasa 2 yang bertujuan untuk menilai keberkesanan program intervensi EPaL.

Kajian Fasa 1 bermula dengan penilaian keperluan dan diikuti dengan pembentukan Pakej Pendidikan EPaL (Modul Pengajaran EPaL, Buku Aktiviti EPaL dan Kad Pengajaran/ Aktiviti dan Poster EPaL) untuk remaja. Penilaian keperluan telah dijalankan menggunakan perbincangan kumpulan sasaran yang melibatkan 72 orang remaja sekolah menengah di Tingkatan 1 dan 2. Pakej Pendidikan EPaL yang terdiri daripada Modul EPaL: Jilid 1 (Topik 1 hingga Topik 4) dan Modul EPaL: Jilid 2 (Topik 5 hingga Topik 8) telah dibentuk. Kesahan kandungan bagi Pakej Pendidikan EPaL oleh sekumpulan panel pakar telah dijalankan. Penilaian kesahan muka bagi program intervensi EPaL telah melibatkan 54 orang remaja berumur 11-16 tahun yang telah menilai program intervensi EPaL.

Kajian Fasa 2 adalah penilaian keberkesanan program intervensi EPaL di kalangan remaja sekolah menengah. Kajian ini menggunakan reka bentuk penyelidikan kuasi-eksperimen. Pendidikan rakan sebaya telah digunakan untuk menyampaikan pengetahuan dan kemahiran gaya hidup sihat kepada remaja. Kajian ini membandingkan kesan intervensi ke atas pembolehubah peribadi, tingkahlaku pemakanan dan aktiviti fizikal, dan dapatan kesihatan, antara kumpulan intervensi (IG) dan perbandingan (CG). Perbandingan telah didapatkan pada tiga titik masa – sebelum intervensi (pra-intervensi), selepas intervensi (Post I) dan 3 bulan selepas intervensi (Post II). IG telah menerima program intervensi EPaL selama 16 minggu manakala CG tidak menerima intervensi dan menerima kelas Pendidikan Jasmani dan Kesihatan yang standard. Terdapat 76 orang remaja (IG: n=34; CG: n=42) di Tingkatan 1 dan 2 yang telah dimasukkan dalam analisis akhir.

IG mencatatkan skor pengetahuan yang lebih tinggi dan ketara pada kedua-dua Post I (perbezaan min yang diselaraskan = 3.34; 95%CI = 0.99, 5.69; p = 0.006) dan Post II (perbezaan min yang diselaraskan = 2.82; 95%CI = 0.86, 4.78; p = 0.005), peratus tenaga daripada karbohidrat yang lebih tinggi dan ketara pada Post I (perbezaan min yang diselaraskan = 4.41; 95%CI = 0.80, 8.03; p = 0.017) dan fungsi emosi yang lebih tinggi dan ketara pada Post II (perbezaan min yang diselaraskan = 10.98; 95%CI = 1.07, 20.89; p = 0.030) berbanding CG. IG menunjukkan amalan makan tidak terkawal yang lebih rendah dan ketara pada Post II (perbezaan min yang diselaraskan = -2.48; 95%CI = -4.65, -0.32; p = 0.025) berbanding CG. Terdapat peningkatan yang ketara dengan masa pada kadar remaja yang menganggar status berat badan mereka dengan tepat (Q = 6.118, p = 0.047) dan penurunan yang ketara pada kadar remaja yang mengambil minum petang (Q = 6.750, p = 0.034) pada IG.

Kesimpulannya, program intervensi EPaL telah berkesan dalam menambah baik pengetahuan, persepsi terhadap status berat badan, amalan makan tidak terkawal dan fungsi emosi di kalangan remaja. Kajian ini dapat menambahkan pengetahuan dan bukti berkenaan keberkesanan intervensi kesihatan. Oleh itu, kajian ini dapat dijadikan model untuk membentuk intervensi kesihatan dan pemakanan bagi remaja di Malaysia pada masa akan datang.

ACKNOWLEDGEMENTS

In the name of Allah, the Most Gracious, the Most Merciful. Every praise is due to Allah S.W.T alone, and peace and blessings be upon His messenger, Prophet Muhammad S.A.W. The completion of this thesis would not be possible without individuals who have assisted and motivated me throughout the whole process.

First and foremost, I would like to express my deepest gratitude to my supervisor, Assoc. Prof. Dr. Chin Yit Siew. Her expertise, knowledge and skills has added considerably to my graduate experience. I also appreciate her assistance, patience, understanding and most importantly, her trust in me for being her postgraduate student. I am personally very grateful for her in nurturing my academic and personal development in so many ways.

Special credit to the other members of my supervisory committee, Prof Dr. Zalilah Mohd Shariff and Assoc. Prof. Dr. Chan Yoke Mun, and also Assoc. Prof. Dr. Mohd. Nasir Mohd. Taib for their assistance at all levels of my research project. Their comments, recommendations and guidance to improve this research were really decisive and appreciated.

Getting through my research project required more than academic support, and I have many, many special friends and postgraduate students to thank for listening to and, at times, having to tolerate me throughout my study. First, a heartiest thank you to my husband, Muhammad Faizal Murat. Words cannot describe how lucky I am to have him in my life. He has selflessly given more to me than I ever could have asked for. He has been a never-ending source of motivation and encouragement. Special thanks also goes to my lovely son, Muhammad Fateh Irsyad, who has motivated me in his adorable ways. May Allah bless both of you and I am really looking forward to our lifelong journey till Jannah.

Special thanks to all my undergraduate and postgraduate friends, as well as research assistants who assisted me throughout this research journey. Thanks for the invaluable help, advice, motivation and encouragement throughout my study. It's been pleasure to have met all of them. May Allah bless and reward them with success.

Finally, and most importantly, none of this could have happened without the great support from my family members, particularly my mom and dad, as well as my in laws. Thanks for the wholehearted prayers and for patiently waited for me to finish my study. I love you all dearly.

I certify that a Thesis Examination Committee has met on 10 April 2019 to conduct the final examination of Sharifah Intan Zainun binti Sharif Ishak on her thesis entitled "Effectiveness of "Eat Right, Be Positive About Your Body and Live Actively" Programme in Preventing Overweight and Disordered Eating Among Malaysian Adolescents" in accordance with the Universities and University Colleges Act 1971 and the Constitution of the Universiti Putra Malaysia [P.U.(A) 106] 15 March 1998. The Committee recommends that the student be awarded the Doctor of Philosophy.

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This is to confirm that:

- the research conducted and the writing of this thesis was under our supervision;
- supervision responsibilities as stated in the Universiti Putra Malaysia (Graduate Studies) Rules 2003 (Revision 2012-2013) are adhered to.

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LIST OF ABBREVIATIONS

BAZ	BMI-for-age z-score
BF%	Body fat percentage
BMI	Body-mass-index
BMR	Basal metabolic rate
CG	Comparison group
EAT-26	Eating Attitudes Test-26
EBQ	Eating Behaviour Questionnaire
EE	Energy expenditure
EI	Energy intake
EPaL	Eat Right, Be Positive About Your Body and Live Actively
FGD	Focus group discussion
HRQoL	Health-related quality of life
IG	Intervention group
IPH	Institute for Public Health
ITT	Intention-to-treat
KAP-ELQ	Knowledge, Attitude and Practice of EPaL Lifestyle Questionnaire
MVPA	Moderate-to-vigorous-intensity PA
NCCFN	National Coordinating Committee on Food and Nutrition
NEDC	National Eating Disorders Collaboration
NHMS	National Health and Morbidity Survey
PAL	Physical activity level
PAQ-C	Physical Activity Questionnaire for Older Children
PedsQL	Pediatric Quality of Life Inventory
RMR	Resting metabolic rate
SPSS	Statistical Packages for Social Sciences
TDEE	Total daily energy expenditure
TFEQ-R18	Three-Factor Eating Questionnaire-R18
WC	Waist circumference
WHO	World Health Organization

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CHAPTER 1

INTRODUCTION

1.1 Background of the study

Globalisation, urbanisation and economic development have stimulated nutrition, physical activity and body composition transitions in both the developed and developing nations (Hu, 2011; Popkin, Adair, & Ng, 2012). Adolescents are one of the groups which are affected by these transitions (Popkin et al., 2012). Adolescents can be defined as individuals who are between childhood and adulthood, with the age range of 10-19 years. In Malaysia, the population of adolescents is 5.5 million, which makes up 18.9% of the total Malaysian population (Department of Statistics Malaysia, 2012).

Adolescence is a period of changes in physical, psychological and social aspects. This stage of life is recognised as the second chance of catch-up growth before entering adulthood, and nutrition demand of adolescents is second greatest to infancy. Inadequate nutritional intakes of carbohydrate, protein, fat, vitamins and minerals may interfere with adolescents' growth, sexual maturation and functions (Savige, Macfarlane, Ball, Worsley, & Crawford, 2007), whereby excessive intake of food in adolescents may cause detrimental effects to health by increasing susceptibility to diseases such as diabetes, heart disease and hypertension (Adesina, Peterside, Anochie, & Akani, 2012; Shi, Lien, Kumar, & Holmboe-Ottesen, 2005).

Adolescence is the life stage where body image problems develop as a result of body changes associated with physical maturation (McCabe & Ricciardelli, 2001), and the developmental period when eating disorder symptoms may first emerge (Patton & Viner, 2007). Negative body image, such as body dissatisfaction can have significant weight-related health consequences, especially in children and adolescents. Lower body satisfaction among both male and female adolescents is predictive of greater levels of disordered eating such as dieting and binge eating. This is in turn engaging them at an increased risk of poor overall health (Neumark-Sztainer et al., 2006). Weight-related problems, including obesity and disordered eating behaviours, such as unhealthy weight-control practices and binge eating, have become major public health problems in adolescents (Neumark-Sztainer et al., 2007).

Obesity and overweight, which are defined as abnormal or excessive fat accumulation that may impair health (World Health Organization (WHO), 2000), have become a global epidemic and is a serious concern worldwide. It has become a major health problem globally, where the prevalence of obesity has nearly tripled since 1975 worldwide (WHO, 2017). Overweight and obesity

have become a global epidemic not only among adults, but also among children and adolescents. Globally, over 340 million children and adolescents aged 5-19 years were overweight or obese in 2016 (WHO, 2017). A recent national survey found that the prevalence of overweight and obesity among children and adolescents in Malaysia were 5.4% and 6.7% (Institute for Public Health (IPH), 2011), respectively. The prevalence of overweight and obesity among Malaysian adolescents was 8.2% in 2007 (Rampal et al., 2007), and it has doubled to 19.5% in 2012 (Fara Wahida, Chin, & Barakatun Nisak, 2012). The prevalence continued to increase to 23.9% in 2014 (Hazreen et al., 2014). Immediate actions should be taken to prevent the increase in the incidences of overweight and obesity, as this problem in childhood and adolescence have adverse consequences on premature mortality and physical morbidity in adulthood (Reilly & Kelly, 2011).

Eating disorders, such as anorexia nervosa, bulimia nervosa and binge eating disorder affect a much smaller percentage of the adolescent population (1-3%). However, there are about one-third of adolescents who exhibit disordered eating behaviours without meeting the criteria for eating disorders (Harpaz-Rotem, Leslie, Martin, & Rosenheck, 2005; Jones, Bennett, Olmsted, Lawson, & Rodin, 2001). Disordered eating is not a clinical diagnosis. It involves a pattern of eating which can lead to eating disorders. The signs of disordered eating include: a) eating even when one is not hungry, b) not eating even when one is hungry, c) skipping meals, d) eating too little or too much at one time, e) avoiding certain foods or categories of food, then eating large quantities of these foods, f) hiding from others while eating, g) feeling guilty after eating, and h) excessive preoccupation with food and weight (American Dietetic Association, 1997). The term of 'disordered eating' is also used to describe dieting and unhealthy weight loss behaviours (Bryla, 2003).

In Malaysia, the problem of disordered eating should not be neglected. Soo, Zalilah, Mohd. Nasir and Bahaman (2008) reported that 22.3% of female adolescents in Kelantan had disordered eating, whereas a study by Farah Wahida, Mohd Nasir, & Hazizi (2011) reported that 27.8% of adolescents in Kuantan, Pahang had disordered eating. Other studies have also reported high prevalences of disordered eating of 18.5% in Sarawak (Cheah, Hazmi, & Chang, 2015) and 19.8% in Selangor (Karen Sharmini, 2016).

1.2 Problem statement

The prevalences of overweight and obesity, as well as disordered eating continue to increase dramatically and have become major public health concerns. Overweight and obese adolescents were shown to be significantly more likely to involve in disordered eating behaviours than non-overweight and non-obese adolescents of similar age groups (Musaiger et al., 2013; Norhayati, Chin, Mohd. Nasir, Zalilah, & Chan, 2015; Tam, Ng, Yu, & Young, 2007; Tanofsky-Kraff et al., 2004). These unhealthy behaviours are associated with higher risks of non-communicable and chronic diseases in adulthood.

Therefore, immediate actions to prevent overweight and disordered eating in Malaysia seem to be highly necessary.

Overweight and obesity, and disordered eating share a number of risk factors, such as unhealthy eating behaviours, body dissatisfaction and weight-related teasing among adolescents (Duffey, Gordon-Larsen, Jacobs, Williams, & Popkin, 2007; Haines & Neumark-Sztainer, 2006; Neumark-Sztainer, Wall, Story, & Sherwood, 2009; Nurul-Fadhilah, Teo, Huybrechts, & Foo, 2013; Traub et al., 2018; van den Berg et al., 2007). Moreover, the co-occurrence of overweight and obesity, and disordered eating has been shown in many cross-sectional studies (Haines, Kleinman, Rifas-Shiman, Field, & Austin, 2010; Musaiger et al., 2013; Neumark-Sztainer, Story, Hannan, Perry, & Irving, 2002). Hence, tackling overweight and obesity, as well as disordered eating may be achieved using the same approach.

Poor body image can result in negative effects on a child's or an adolescent's weight. The physiological changes that happen to the body during adolescence contribute to negative body image (Ackard & Peterson, 2001; Patton & Viner, 2007), and are associated with a number of weight-related issues, including obesity, disordered eating, binge eating and extreme weight-control practices (Neumark-Sztainer et al., 2007). Hence, to be effective, interventions aiming to decrease the incidences of overweight and obesity, and disordered eating among adolescents should promote positive body image, eating habits and physical activity (van den Berg et al., 2007). The present study aimed to effect positive changes in the prevalences of overweight and obesity, and disordered eating in adolescents aged 13–14 years, who are in Forms 1 and 2 of secondary schools. Most Malaysian adolescents experience puberty and an increase in body fat around this age, which is coincidently the age at which students frequently build new friendships and establish new group norms. The physical and psychological changes during puberty often contributes to body dissatisfaction and unhealthy dietary choices, such as extreme dieting and binging (Neumark-Sztainer et al., 2006; Swarr & Richards, 1996), leading to poor overall health status (Neumark-Sztainer et al., 2006). School students aged 12–15 years are suggested as the ideal group to study the effects of universal prevention approaches as majority of these social, psychological and environmental risk factors that can trigger eating disorders and lead to overweight are most noticeable during this period (National Eating Disorders Collaboration (NEDC), 2013). Therefore, the present intervention was designed by applying peer education to drive students during this stage of early adolescence to develop attitudes and behaviours that would cultivate healthy lifestyles.

Advantages of the peer-led approach were acknowledged in several studies (Birnbaum et al., 2002; Harden et al., 2001; Story et al., 2002). There was a general agreement among peer educators that being a peer educator had provided them with a valuable opportunity for personal development, acknowledgement and the capability to build upon one's skills and abilities (Harden et al., 2001; Story et al., 2002), confidence in leadership skills, as well

as greater improvement in healthy lifestyle practices (Birnbaum et al., 2002). Moreover, Mellanby, Rees, & Tripp (2000) found that peer-led education effected greater positive changes in health behaviour compared to adult-led interventions, even though the systematic and methodological issues of these studies showed that the effectiveness of the peer-led education is not so much demonstrated.

Accomplishing nutritional goals, promoting physical activity and positive body image have become the pillars of both obesity and eating disorder prevention programmes. Integrating obesity prevention approaches into behavioural interventions designed to tackle eating disorders has been shown to be more advantageous than separate programmes as this prevents mixed messages. Separate programmes tend to provide different messages that may confuse participants (Neumark-Sztainer, 2005; Sánchez-Carracedo, Neumark-Sztainer, & López-Guimerà, 2012). For instance, in programmes aiming to prevent overweight, the suggested strategy of monitoring intake and portion sizes may promote excessive preoccupation on body weight and shape, and disordered eating behaviours. Meanwhile, in programmes aiming to prevent disordered eating, strategies such as eliminating restrictive and restraint eating, and size acceptance, may lessen individual's motivation to implement healthy nutrition and active lifestyle.

Several integrated interventions implemented previously that have shown to be successful in the past, include MABIC (Sánchez-Carracedo et al., 2013) and New Moves (Neumark-Sztainer, Story, Hannan, & Rex, 2003). New Moves utilised integrated concepts and teaching strategies adopted from both obesity and eating disorder prevention programmes. It promoted physical activity and improved eating patterns in female adolescents by altering negative body image conventions and effecting positive behavioural changes. Another integrated intervention, Healthy Buddies, achieved similar goals in elementary school students by using a peer-led approach (Stock et al., 2007).

In Malaysia, there has been several interventions developed to promote healthy eating and lifestyle among primary school children, for example, Healthy Lifestyle in Children (HELIC) (Siti Sabariah, 2003), Healthy Kids Programme (Zawiah, Tee, Norimah, & Chin, 2012), and Nutrition Education Intervention (Zalilah et al., 2008; Ruzita, Wan Azdie, & Ismail, 2007). In addition, there is also body image education package developed for adolescents (Rasyedah et al., 2003), as well as interventions for secondary prevention of overweight and obesity, namely the Malaysian Childhood Obesity Treatment Trial (MASCOT) (Wafa et al., 2011) and Juara Sihat (Mok, Poh, Wee, Devanthini, & Ruzita, 2018). The content of these existing interventions mainly consist of two components of healthy lifestyle, which are healthy eating and physical activity. The Juara Sihat intervention has content on body image in addition to nutrition and PA components. However, this study was designed for primary school children and it was a secondary prevention intervention, which focused on overweight and obese children. Moreover, the main components of Juara Sihat are nutrition education classes on healthy eating

and active lifestyle; physical activity sessions; and active involvements of parents and teachers. To date, Malaysia has not seen a comprehensive intervention programme that promotes all three components of a healthy lifestyle, namely healthy eating, active lifestyle and positive body image.

The integrated approach, which combines the components of healthy eating, positive body image and active lifestyle may deliver strategies for preventing overweight and disordered eating simultaneously, which balances the importance of healthy and balanced diet, active lifestyle and acceptance of differences in body size and shape. Hence, in the present study, an integrated intervention for preventing overweight and disordered eating was developed for Malaysian adolescents, which focused on three main components of healthy lifestyle - healthy eating, positive body image and active lifestyle. Unlike Healthy Buddies, this present study did not use a one-to-one approach (Stock et al., 2007), but rather involved training a group of adolescents to become peer educators, who then led others to fully implement the intervention. The present study was differed from MABIC as it required adolescents as educators, rather than health care providers, such as tutors, clinical psychologists and nurses (Sánchez-Carracedo et al., 2013).

In the present study, the Eat Right, Be Positive about Your Body and Live Actively (EPaL) promoted three main components of healthy lifestyle: (1) healthy eating, (2) positive body image and (3) active lifestyle. The intervention aimed to prevent overweight and disordered eating among secondary school adolescents. Eating behaviours such as skipping breakfast, snacking, fast food consumption and family meals have significant contributions on body weight status and disordered eating (de la Hunty, Gibson, & Ashwell, 2013; Fraser, Edwards, Cade, & Clarke, 2011; Hammons & Fiese, 2011; Szajewska & Ruszczyński, 2010). Body image dissatisfaction has been shown to have an association with overweight/ obesity and disordered eating (Gan, Normasliana, & Law, 2018; Khor et al., 2009; Prioreschi et al., 2017). The association between physical activity and body weight status has been demonstrated in previous studies, in which there was a significant difference in PA between overweight/ obese and non-overweight/ non-obese children (Kreuser, Kromeyer-Hauschild, Gollhofer, Korsten-Reck, & Röttger, 2013; Lee et al., 2015; Wafa, Hamzaid, Ruzita, & Reilly, 2014).

1.3 Significance of the study

The findings of the present study contributed to a better understanding of the adolescents' perceptions on healthy eating, active lifestyle and body image. The 'Eat Right, Be Positive about Your Body and Live Actively' (EPaL) Educational Package can be used as references and teaching materials by various levels working with adolescents, such as the Ministry of Health, Ministry of Education, non-government organisations (NGOs), health professionals, schools and parents. This study will be the kick-off for other future nutrition and health promotion programmes in Malaysia to include body image as one of the

important components for intervention, besides nutrition and physical activity, in preventing overweight and disordered eating. Moreover, the results of this study will add to the knowledge and evidence on the effectiveness of school-based health interventions, hence it can be used as a model to develop future health and nutrition interventions for adolescents in Malaysia

This intervention study may contribute to be one of the enabling strategies in achieving the target set by the National Plan of Action for Nutrition of Malaysia III (NPANM III) 2016-2025, which is no increase in the prevalences of overweight and obesity by the year 2025. Moreover, this study may also contribute to one of the 17 Sustainable Development Goals (SDGs) of the 2030 Agenda for Sustainable Development, in which to ensure healthy lives and promote well-being for all at all ages. One of the target in the goal is to reduce by one third premature mortality from non-communicable diseases through prevention and treatment and promote mental health and well-being by the year 2030.

1.4 Objectives of the study

General objective:
To evaluate the effectiveness of the 'Eat Right, Be Positive about Your Body and Live Actively' (EPaL) intervention programme for preventing risk of becoming overweight and disordered eating in Malaysian adolescents.

Specific objectives:

(a) Phase 1: Development of the EPaL intervention programme.
- To conduct needs assessment among Form 1 and Form 2 secondary school students to explore the perception of the adolescents on their eating behaviour, physical activity and body image.
- To develop an EPaL Educational Package for adolescents.

(b) Phase 2: Evaluation of the effectiveness of the EPaL intervention programme.
- To determine and compare the effects of the intervention on:
  - Personal variables: knowledge, attitudes and practices towards nutrition and eating, physical activity and body image; self-esteem and body image,
  - Eating behaviour variables: cognitive restraint, uncontrolled eating, emotional eating, meal consumption, meal skipping, snacking, family meals and food-away-from-home, energy intake and energy balance; and macronutrient intakes, stages of change for healthy diet, breakfast and food portion size,

- Physical activity behaviour variables: level of physical activity and energy expenditure, stages of change for screen-viewing time and physical activity,
- Health outcomes: anthropometric indicators (BMI z-score, waist circumference and body fat percentage), body weight status, disordered eating status, and health-related quality of life,

in adolescents between intervention and comparison groups, before intervention (pre-intervention), after intervention (Post I), and at 3 months after intervention (Post II).

1.5 Hypothesis

1. There is no significant difference in personal variables between intervention and comparison groups at pre-intervention, Post I and Post II.
2. There is no significant difference in eating behaviour variables between intervention and comparison groups at pre-intervention, Post I and Post II.
3. There is no significant difference in physical activity behaviour variables between intervention and comparison groups at pre-intervention, Post I and Post II.
4. There is no significant difference in health outcomes between intervention and comparison groups at pre-intervention, Post I and Post II.

1.6 Conceptual framework

The conceptual framework of the study is presented in Figure 1.1.

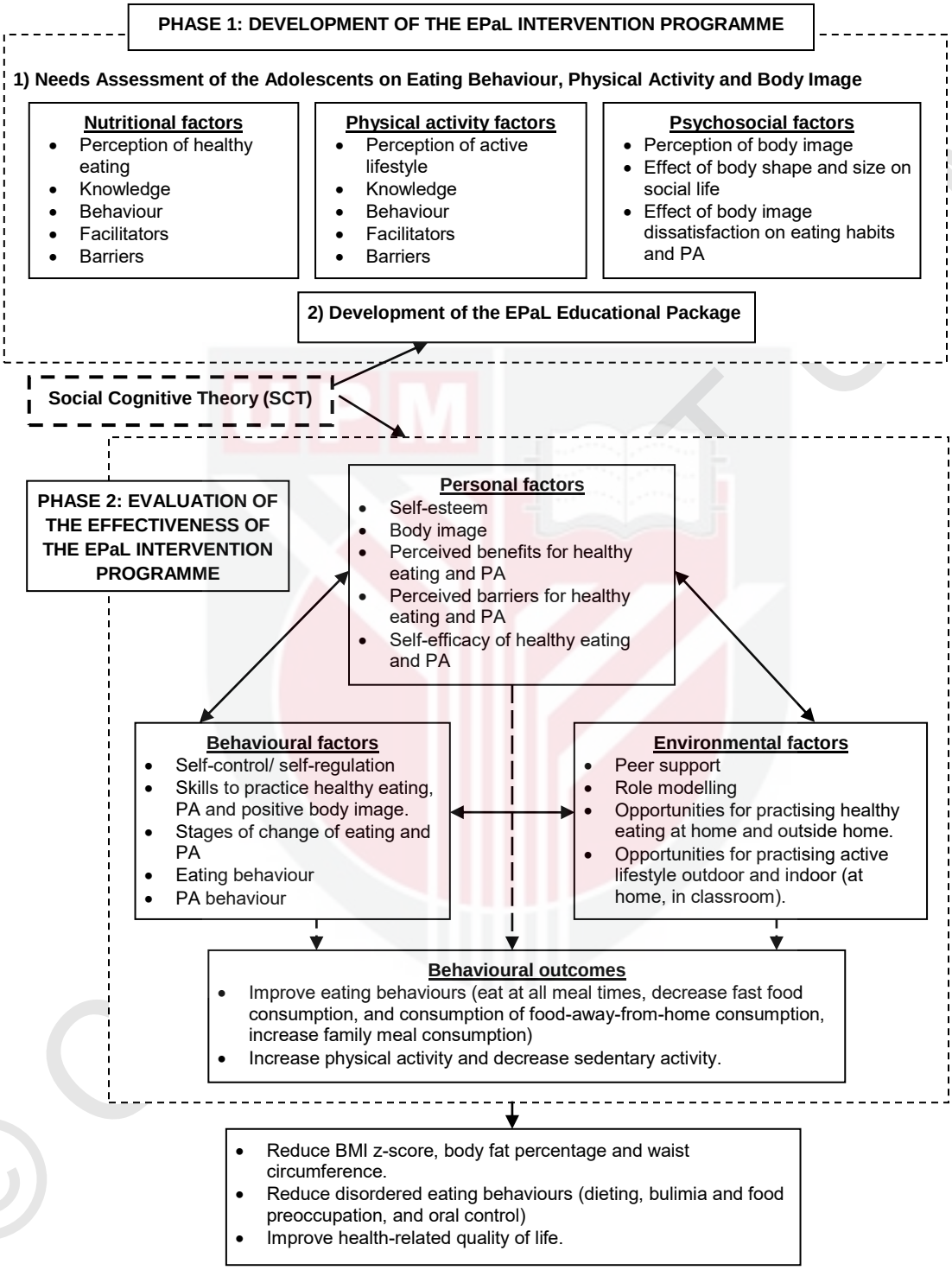

Figure 1.1: Conceptual framework of the study

The conceptual framework for the present study consists of two phases, which are Phase 1 (Development of the EPaL intervention programme) and Phase 2 (Evaluation of the effectiveness of the EPaL intervention programme).

In Phase 1 of the study, needs assessment using focus group discussions (FGDs) among adolescents was carried out to explore the nutritional factors, PA factors and personal factors in terms of their perception, knowledge, behaviour, facilitators and barriers. The Phase 1 also comprised the development of the EPaL Educational Package, and it was based on the outcomes from the FGDs and review of the guidelines and previous intervention programme modules.

The development and evaluation of EPaL was guided by the principles of Social Cognitive Theory (SCT) (Bandura, 1989), which emphasises the importance of social and environmental factors in determining the psychosocial and behavioural risk factors of both obesity and disordered eating. In the SCT, the main key concepts are behavioural capability, expectation, expectancies, reciprocal determinism, reinforcement, self-control, collective efficacy and emotional-coping response (Glanz, Rimer, & Lewis, 2002). Hence, the EPaL intervention was designed to address: (1) environmental factors, such as peer support, presence of a role model, opportunities for practising healthy eating in/outside the house, and opportunities for practising active lifestyle indoors/outdoors; (2) personal factors, such as self-esteem, body image, perceived benefits for healthy eating and PA, perceived barriers for healthy eating and PA, and self-efficacy of healthy eating and PA; and (3) behavioural factors, including self-control/ self-regulation, skills to practise healthy eating, physical activity and positive body image, stages of change of eating and PA, eating behaviour, physical activity behaviour.

The EPaL intervention provides students with cognitive and behavioural skills to effect change in targeted behaviours. It aims to alter disordered eating behaviours, promote physical activity, prevent sedentary lifestyle and enhance healthy eating behaviours by eating at all meal times, decrease fast food consumption and consumption of food-away-from-home, and increase family meal consumption. This in turn contributes to the decrease in BMI z-score, body fat percentage and waist circumference, disordered eating behaviours and improves health-related quality of life.

According to SCT principles, peers acting as educators should accept increasingly important roles towards developing self-awareness among adolescents (Bandura, 1989). The EPaL intervention is based on the observational learning concepts of SCT and it was designed to engage adolescent-educating-peers in promoting health by means of cooperation and information sharing. Adolescents tend to accept new information and change their behaviours when observing and learning from their peers (Glanz, Rimer, & Lewis, 2002).

Self-esteem was under the personal factors since self-esteem can lead to better physical and mental health (Li, Chan, Chung, & Chui, 2010), social behaviour (Mann, Hosman, Schaalma, & de Vries, 2004), as well as strong belief in one's ability to engage in a healthy lifestyle (Melnyk et al., 2007). Body image was also under the personal factors as negative body image is connected prospectively to unhealthy weight control behaviours, binge eating and lower levels of physical activity (Field et al., 2008; Neumark-Sztainer et al., 2006). Moreover, perceived barriers to healthy eating have been shown to fully mediate the relationship between self-efficacy and fruits and vegetables consumption (Bruening, Kubik, Kenyon, Davey, & Story, 2010).

1.7 Operational definition of terms used

Overweight and obesity

Overweight and obesity are defined as abnormal or excessive fat accumulation that may impair health (WHO, 2000). In the present study, body weight status was determined by using BMI-for-age (z-score) (BAZ) for each adolescent, based on their BMI and height, respectively. The categorisation of body weight status was based on WHO Growth Reference 5-19 years old (WHO, 2007). For overweight, the BAZ value was in the range of +1SD to <+2SD, and for obesity, the BAZ value was ≥+2SD.

Disordered eating

Disordered eating is defined as a constellation of unhealthy eating and weight related behaviours and attitudes that do not meet the criteria for an eating disorder, but that have medical and/or psychological consequences (Ackard, 2004). Disordered eating behaviours could be defined as problematic eating behaviours, such as purgative practices, bingeing, food restriction, and other inadequate methods to lose or control weight, which occur less frequently or are less severe than those required to meet the full criteria for the diagnosis of an eating disorder (Pereira & Alvarenga, 2007). In the present study, disordered eating behaviours comprised dieting, bulimia and food preoccupation, and oral control.

Healthy eating

Healthy eating provides adequate and balanced combinations of energy and nutrients, which incorporates good principles of nutrition such as having a variety of foods, balanced intake of nutrients and eating in moderation (National Coordinating Committee on Food and Nutrition (NCCFN), 2013). In the present study, healthy eating refers to having adequate energy and macronutrient intakes, eating at all meal times, limiting fast food consumption, limiting consumption of food-away-from-home, and having regular family meal consumption.

Physical activity

Physical activity is defined as any bodily movement produced by skeletal muscles that require energy expenditure (WHO, 2018). In the present study, active lifestyle refers to the practice of physical activity according to the Physical Activity Pyramid by increasing daily physical activity and limiting sedentary activities. Moreover, physical activity in the present study also refers to PAQ-C activity summary score, total daily energy expenditure and physical activity level.

Body image

Body image is defined as the perception that a person has of their physical self, and the thoughts and feelings that result from that perception. Positive body image occurs when a person is able to accept, appreciate and respect his/her body (NEDC, 2016). In this study, body image comprised of body image importance, body image satisfaction and perception of actual body weight status.

1.8 Thesis orientation and outline of chapters

This thesis is organized into six chapters. Chapter 1 begins with the introduction to the background of the study. It then describes the problem statement, significance of the study, objectives of the study, hypothesis, conceptual framework and operational definition of terms used.

Chapter 2 presents the literature review that connects adolescents, prevalence of overweight, obesity and disordered eating, association between overweight/ obesity and disordered eating, shared risk and protective factors for overweight and disordered eating, integrating overweight/ obesity and disordered eating prevention, school-based intervention programmes for preventing overweight and disordered eating, and peer education in health intervention programmes.

Chapter 3 provides the methodology of the present study, including Phase 1 (needs assessment of the adolescents on eating behaviour, physical activity and body image, and development of the EPaL educational package) and Phase 2 (evaluation of the effectiveness of the EPaL intervention programme) of the study. The methodology of Phase 1 (needs assessment) includes the study design and setting, ethical approval and permission, sampling procedures, instruments, data collection and data analysis. For the methodology of Phase 1 (development of the EPaL educational package), it includes the review of the guidelines and previous intervention programme modules, application of theory in the development of EPaL intervention programme, components of the EPaL intervention programme and validity of the EPaL Educational Package. The methodology for Phase 2 (evaluation of the effectiveness of the EPaL intervention programme) includes study design

and setting, ethical approval and permission, sample size calculation, sampling procedures, instruments, data collection and data analysis.

Chapter 4 describes the results and discussion of Phase 1 of the study. For the needs assessment, the results includes socio-demographic characteristics, body composition, and perception of the adolescents on health, eating behaviour, physical activity and body image. For the development of the EPaL educational package, the results includes content and face validity for the EPaL Educational Package, and final EPaL Educational Package. The results are then followed by the discussion.

Chapter 5 describes the results and discussion of Phase 2 of the study. The results includes pre-intervention results, changes in knowledge, attitude and practice towards nutrition and eating, physical activity and body image, self-esteem, body image, eating behaviour, energy and macronutrient intakes, energy expenditure and physical activity behaviour, body composition, disordered eating behaviours and health-related quality of life. The results are then followed by the discussion.

Chapter 6 concludes the thesis by summarising the whole study, which covered Phase 1 and 2 of the study. This chapter also includes the strengths and limitations of the study and recommendations for future research.

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