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Preliminary Development of Health Education in Curbing Obesity among Preschool Children

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Abstract

An obese preschool child may grow up to be an obese adult. The factors of obesity among preschool children have been documented as one of the factors that will lead to the risks of hypertension, psychosocial disturbances and heart complications that increase adult morbidity and mortality. Preliminary data were collected to identify the components needed in the construction of preschool health education in preventing obesity. Four main components were obtained: i) dietary, ii) physical development, iii) psychosocial development, and iv) physical activities. Therefore, a health education based on the above components will be developed as a guideline in order to assist with the problem of obesity among the preschool children.

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1. Introduction

Obesity is an issue that may cause various problems among adults and also children. At the end 2009, the problem of obesity in Malaysia continued to increase especially among children aged 7 – 10 years old with 6.6% increment for the children aged 7 and 13.88% for the children aged 10 years old (Priya, 2010). Must (2006) report that 20% of deaths among adults are due to coronary disease and atherosclerosis which are associated with childhood obesity. Most worrying, preschool children who are facing obesity will normally grow up as obese adults who are exposed to dangerous diseases such as hypertension, diabetes, heart complications, and cancer (Zulkifli, 2011). A study by Whitaker et al (2007) showed that obese children between the ages of 3 – 6 are significantly at high risk of obesity in their adulthood. This issue was supported by Chee et al (2008) who stated that children with obesity problem are at risk to continually be obese when they are growing up that will lead to risk of having chronic diseases such as cardiovascular, gastrointestinal, endocrinology or orthopaedic diseases for long run or in the future.

A study by Martorell et al (2000) showed that 32 out of 50 developing countries have high prevalence of obesity among children at the ages between 1 to 5 years old. This high prevalence of obesity has become a public health problem among preschool children especially in the United State of America. Canning et al (2004) also reported similar issue where 25.6% of preschool children between the ages of 3 – 5 years old have excessive body weight or obese. Meanwhile, a retrospective cohort studies conducted by Manios et al (2007) aimed to record the prevalence of obesity and the relationship between obesity and parents' level of education, parents' body mass index (BMI), and the living area of preschool children in Greece. The study showed that 31.9% of children between the ages of 1 – 5 years old are at the risk of being obese. Other than that, Manios et al (2007) also reported that parents' body mass index is the factor that will cause the children to face with the risk of excessive body weight at very young age (1-2 years old). It shows that obesity at the age of 1 – 2 years old will increase the risk of obesity among the teenagers and adults in the future. The study suggested that the prevention of obesity should start at preschool level through the preparation of health programmes. Hence, this study aims to identify the components needed in constructing preschool children health education programme in preventing obesity.

2. Obese Preschool Children

Without realising it, obesity is a major contributing factor to metabolic syndrome faced by many Asians (Lian, 2012). Obesity is often associated with diseases such as cardiovascular disease, respiratory problems, and diabetes. Thus, children with obesity are at high risk of having the mentioned diseases. The issue that needs to be taken seriously is that children with obesity will normally have overweight problem when they grow up (Department of Information, 2008). According to World Health Organisation (WHO), it is estimated that in year 2015, approximately 2.3 billion of people in the world will have overweight problem and approximately 700 million of them will have obesity problem (DewanMasyarakat, 2010).

If the problem of obesity affected the adults, they would find the best alternative that would help to reduce their weight. However, if this happened to children especially preschool children, it would be mostly ignored by their parents (Lian, 2010). Various techniques and methods can be used in preventing obesity such as taking healthier food (vegetables and fruits), reducing the time spent for watching television, ensuring that the children are active in routine activities, and exercising. Despite of that, it is difficult to convey this knowledge to the parents as they have the perception that obesity among preschool children is not a big problem (Department of Information, 2008). Therefore, the researchers agreed that the inculcation of health education programme should start in nurseries and day care centres and the effort should be continued by parents at home. The past studies which were conducted outside Malaysia had also prepared various programmes as prevention methods and techniques in the nurseries and preschools in their countries. It is also hoped that these programmes can be used as guidelines for the researchers to develop health education programmes suitable with Malaysian context.

3. Health Programmes as Obesity Prevention Methods among Preschool Children

3.1 Aerobic Exercise Programme

A study by Mo-suwan et al (1998) was conducted to examine the effects of school-based aerobic exercise programmes to children with obesity index. The study did not use behavioural framework or theory as guideline in conducting the intervention programme. The study was conducted by using randomised controlled trial on 292 children from 2 preschools in Hat Yai, Songkhla district, southern Thailand. Obese children in the study were defined as percentile ≥ 95 triceps skinfold (TSF) for their age and gender.

The study was conducted on year 2 preschool children (4-5 years old); 29.3 weeks in the first school and 30 weeks on the second school and overall 9 months of intervention conducted on the samples. The children were divided into two groups: intervention group (n=145) and controlled group (n=147). The exercise programmes were prepared based on the concept of cardio-respiratory fitness for children between the ages of 6 – 17 years old with the minimum of 20 minutes of energetic physical activities ≥ 3 times a week. “Superkids/Superfit” exercise programme was introduced and conducted to restore physical fitness. The controlled group was allocated 1 hour of Physical Education per week meanwhile the intervention group was allocated with 1 hour of Physical Education per week with 15 minutes of walk before the morning classes started and 20 minutes of aerobic dance after their nap. The programme was conducted 3 times per week and the aerobic exercise session was conducted by trained staff.

Mo-suwan et al (1998) only ensured that 1 hour of Physical Education including swimming lesson per week. However dietary aspect was not controlled in the study. The children were provided with lunch and 2 snacks and they were allowed to bring additional snack. Data were collected by using a set of questionnaire filled by the parents. Anthropometric Outcome assessment was used on the children to measure their weight, height and triceps skinfold thickness in order to measure their portliness. The measurements were taken four times: the beginning of intervention, before semester break, beginning of second semester, and by the end of intervention. Detecto Scale and Stadiometer were used to measure weight and height. Meanwhile TSF were measured by using Harpenden Calliper. BMI calculation method was based on method of Moore et al (1995) and Wilcoxon Signed-Rank was used for data analysis.

The result of the study showed no significant BMI difference (mean \pm SD): 16.25 ± 2.35 to 15.76 ± 2.46 for intervention group, and 16.36 ± 2.22 to 15.94 ± 2.26 for controlled group. Obese children (percentile $> 95^{\text{th}}$ TSF) in intervention group had their weight decreased from 12.2% to 8.8%. Meanwhile for the controlled group, the percentage of weight lost was from 11.7% to 9.7%. Statistical test showed no significant difference in body weight status between intervention group and controlled group, $p = 0.179$. The analysis also showed that the augmentation of BMI slope among female children from intervention group was lesser than controlled group (odds ratio, 0.32; 95% CI, 0.18, 0.56). Mo-suwan et al (1998) concluded that the intervention study did not show significant changes in weight/height³, TSF, and BMI slope for male children. However, the prevalence of obesity by using 95th National Centre for Health Statistics Triceps-Skinfold-Thickness Cutoff were found to decrease for intervention group (which performed exercises) and controlled group.

3.2 Parenting Support Programme: Diet and Exercise

Intervention study by Harvey-Berino&Rourke (2003) were conducted on 40 mother-child pairs to observe whether parental exposure to parenting skill support programme can be used to prevent obesity. A programme known as “Obesity Prevention plus Parenting Support (OPPS)” was conducted on Native American children as intervention group and the results were compared to the group which only undergone Parenting Support (PS). This programme encouraged discussion on children dietary and exercise reported by their parents. It was a pilot study which used the concept of home visits based on Adelarian Parent-Education Model. The model was adapted and became the main focus of the study to examine the influence of parents towards children’s behaviour.

The intervention was conducted for 16 week with children aged 9 to 36 months. Convenient Sampling was used where the children were chosen through advertisements in media, day-care programmes, and clinics for mother and child special nutrition supply. The participation of the study was random (volunteer) and based on the criteria of the study: family with children aged between 9 – 36 months old; children who were able to walk; mothers with BMI not

more than 25 kg/m²; and mothers who agreed to fulfil all treatment appointments. The mother-child pairs were divided into controlled and intervention groups. Controlled group practiced Parenting Support, PS (actively using parental curriculum) and not focused on dietary and behaviours towards exercise for 1 hour per week. Meanwhile, intervention group practices Parenting Support added with additional practices for mothers in children dietary and exercise aspects, OPSS for 1 hour per week. Assessments were made by the end of week 0 and week 16 of the treatment. There were 11 topics on parental education used in the intervention which were: Parenting: A Special Job, Ages and Stages of Children, Parenting Style, Preventing Problems before They Start, Building a Bond, Self-care or Care of the Caregiver, Discipline, Rules, Routines, Special Problems, Power of Encouragement. Obese children were defined as children with percentile $\geq 95^{\text{th}}$ for weight and height. Height and weight were measured by using Stadiometer and Recumbent Length Board which was plotted based on the growth chart of National Centre for Health Statistics (National Centre for Health Statistics, 2003). Weight to height Z score was measured by using Epi Info 2000. Dietary diary was analysed dieticians from Vermont University to obtain total calorie and fat intake. Physical activities were measured by using TriTrac Accelerometers and were recorded in the same time as dietary diary records.

The results of the study showed that mean score for weight to height Z score for intervention group decreased 0.27 ± 1.1 (SD), but increased for children in controlled group 0.31 ± 1.1 (SD), $p = 0.06$. Prevalence of obesity in intervention decreased from 15% (n=3) to 5% (n=1) but was found to increase in controlled group from 25% (n=5) to 30% (n=6), p =not significant. There was no significant difference in children's fat intake, physical activities, or mothers' weight and BMI between intervention and controlled group. Harvey-Berino&Rourke (2003) concluded that the findings of the study in a whole showed that the preschool children had slight decreased in weight status and energy intake after OPSS programme was conducted on them.

3.3 'Brocodile, the Crocodile' Programme: Dietary and Physical Activities

Intervention study by Dennison et al (2004) was conducted to observe the impact of duration for watching television to the weight status decrease among obese children in the outskirts of north New York. The study was designed based on documented facts which stated that obesity risk factors among children were related to the duration the children spent to watch television. Dennison et al (2004) developed 'Brocodile, the Crocodile' programme to promote health and the programme was conducted within 39 weeks.

The study did not use behavioural framework or theory as guideline in conducting intervention. Samples of the study were consisted of 163 children aged between 2.5 to 5.5 years old and included 16 preschools and day-care facilities. Children from 8 schools were included in controlled group and children from another 8 schools were included in intervention group. The study did not define obesity but it measured adiposity by using BMI and TSF. Intervention was conducted by promoting nutritious meal for 1 hour per week and by utilising 7 out of 39 sessions for children and teacher interaction which was designed to reduce the duration spent on watching television. Interaction and promotion on physical activities were conducted in 32 out of 39 sessions with 30 minutes of musical activities, 10 minutes for snacking and 20 minutes to be involved in interactive educational session. Meanwhile, controlled group was exposed to topics like safety, injury prevention, and health. All samples were measured through baseline and were followed up by using the same protocol. A set of questionnaire was distributed to the parents in order to gather baseline and follow up information regarding the average time spent by the children watching television or video, playing video or computer games, surfing internet throughout the week, eating behaviour while watching television, and whether the television was placed in the children's bedroom or not. Parents were instructed to keep a week diary on the children's behaviours while watching television throughout the duration of the study to raise their awareness on the children's behaviours while watching television. The children were provided with weekly calendar with stickers as a reward if they did not watch television. Controlled variables in the study were gender, age and media use before intervention. Data were collected through reports made by parents on their children's activity in watching television. The heights of the children were measured by using portable stadiometer meanwhile their weights were measured by using digital scale. All measurements were conducted twice and mean score was used for the analysis. The measurements used were based on the guidelines from World Health Organisation (WHO). TSF was measured by using Gibson's Protocol. Meanwhile, Z score for BMI was measured based on the growth chart by

Centre for Disease Control and Prevention. Data of the study were analysed by using Statistical Package for Social Science (SPSS).

The results of the study showed that the duration spent in watching television for intervention group decreased (mean = 3.1 hours per week), while the duration spent by controlled group increased (mean = 1.6 hours per week). There was significant relationship between parents and children in the frequency of snack intake while watching television ($p < 0.001$) on baseline data. The study also found out that there was no significant difference in BMI changes between controlled and intervention group. Dennison et al (2004) summarised that intervention in preschool level should be conducted as such programme will be able to reduce the frequency of the children to spend their time watching television or video.

3.4 'Weight Control Intervention' Programme: Diet, Exercise and Physical Activities

Fitzgibbon et al (2005) has conducted a study to examine the effects of intervention (healthy diet and physical activities) on the changes of body mass index (BMI) among preschool children. 12 preschools represented Chicago, Illinois for the intervention programme (N=420, n = 35 per school). Six of the preschools were categorised in weight control intervention (WCI) and another six were classified in general health intervention (GHI). The study was conducted on children aged between 3 to 5 years old and follow up were conducted after 1 and 2 years. After a year of intervention, the total number of children involved was 289 and after 2 years, 300 children were involved in this study. The samples were consisted of overweight children together with children with normal weight.

The study was conducted based on randomised controlled trial design and the schools involved were paired based on the class size. A sample from each pair was chosen randomly for intervention from intervention group (WCI) and a sample was randomly chosen to be controlled (GHI) in order to get the main outcome for BMI changes. Other than that, Fitzgibbon et al (2005) also wanted to observe the percentage calorie intake from fat and saturated fat (grams/1000kcal) by the children (remembered by parents), physical activities (frequency and intensity per week), and watching television behaviours (hours per day). In the study, obesity was defined as percentile BMI $\geq 85^{\text{th}}$ for age and gender, but only the changed value of BMI and Z score were used as outcome of the study. Intervention involved was designed based on the information gathered from preschool educator, children specialists, nutritionists, exercise physiologist, community health experts, medical experts, and focus group. Children from WCI schools were intervened within 14 weeks (40 minutes; 3 times a week) by using healthy dietary component and exercise. In each week, the intervention covered dietary topic of 'go and grow', fruits and reduction of time spent to watch television. The 3 times a week lesson plans were merged with two main components: 1) 20 minutes of lesson which expose healthy diet, exercise and activity concepts, and 2) 20 minutes of continuous physical activities by including activities related to colours, puppets and activities based on the 7 tiers of food pyramid. Puppet concept was used to bring the sense of adventure to the children and in the same time to vary the activities. For physical activities component, activities like warm up with teacher's guides was conducted for 5 minutes, aerobic for 10 minutes and cool down activities were conducted for 5 minutes. Teachers involved used various games and approaches such as 'zoo visit' where the children pretended to be different animals in the aerobic session. Parents who were involved in the intervention received weekly letters on the information on children's exercises and diets as well as their assignments. The parents were to spend 5 – 15 minutes per day to complete the assignment and the details of the assignments were also included in the weekly letters. As for example, the parents were asked to observe fruit and vegetable intake among their children. The parents received \$ 5.00 grocery shopping coupons for completed and returned assignments. Meanwhile, children in group GHI (controlled group) also practiced the activities within 14 weeks (20 minutes, once a week). These children learned various general health concepts like dental health, immunisation, safety belt awareness, and 911 procedures. Parents for the children involved also received monthly letters on GHI programmes without any information on diet and physical activities.

The measurement used in the study was Hip Hop to Health Jr. (Stolley et al, 2003), 2000 Centres for Disease Control (CDC) Growth Chart which used NutStat module of Epi Info 2000 (Kuczmarski et al, 2002) to measure BMI, Dietary Recall (Nutrition Data System for Research, 2002) to measure children's food intake within 24 hours, and parents' observation on frequency and intensity of the children's routine activities and hours spent in watching television daily. Data were analysed by using SAS Proc Mixed and Statistical Package for Social Science: Two-sample T Test were conducted to test continuous variables and Chi-Square was used to test categorical variables.

The results of the analysis showed that in the Z score for adjusted model BMI in the first year of follow up (mean \pm SE) was 0.08 (0.05) for intervention group while 0.16 (0.05) for controlled group with $p = 0.006$. In the second year of follow up, the Z score for changes (mean \pm SE) in adjusted model BMI was 0.00 (0.04) for intervention group and 0.17 (0.04) for controlled group with $p = 0.015$. The percentage of saturated fat for the first year in intervention group decreased compared to controlled group; 11.6% vs. 12.8% ($p = 0.002$). In overall, there was no significant in the changes of BMI (0.05 kg/m^2 vs. 0.14 kg/m^2 , $p = 0.234$) or BMI Z score (0.06 vs. 0.08, $p = 0.665$) after intervention (14 weeks). The results also showed that there were no significant changes in physical activities or watching television in 14 weeks, first year of follow up, or second year follow up after the intervention. In conclusion, Hip Hop to Health Jr. is one of the effective methods that can be used in preventing the augmentation of BMI among preschool children and is a good approach to prevent obesity among preschool minority children.

3.5 'Planet Health' Programme: Diet and Physical Activities

Intervention study by Gortmaker, Peterson, Wiecha, Sobol, Dixit, Fox & Laird (2009) was conducted to examine the effects of intervention on school based health behaviours. It was conducted on 1295 children at the age between 6 to 10 years old. The intervention programme which was known as Planet Health was conducted by including male and female children with obesity. The study was conducted at 10 schools located in 4 communities in Boston, Massachusetts. The study was designed based on randomised controlled trials by including the school system whereby it was conducted in classrooms, during Physical Education period and within school curriculum. Random number table was used to divide the samples into intervention group ($n = 5$) and controlled group ($n = 5$). The intervention was conducted within 2 years and the data were collected at the beginning of intervention and followed up after 2 years.

The data were measured by using three instruments: 1) Body Mass Index (BMI) and Triceps Skinfolds (TSF) (World Health Organisation, 1995) were used to measure obesity among the samples and were known as the National Health Examination Survey of Children (NHES), ii) Nutrition and Your Health (US Department of Agriculture, 1995) was used to measure continuous diet intake based on dietary guidelines. This instrument was known as Food Survey and iii) American Academy of Paediatrics: Children, Adolescents and Television (1986) was used to measure behavioural changes on four aspects: watching television, physical activities, high fat diet intake, as well as fruit and vegetable intake. This instrument was known as Activity Survey. The study focused on behavioural-choice and social-cognitive theories aimed to alter individual behaviours. The concept in behavioural-choice theory was applied whereby the reduction of free time to diet may reduce obesity problems among children. Meanwhile the concept in social-choice theory was applied where social and environment factors influence psychosocial and behaviours of individuals at risk of obesity. Planet Health Programme was conducted on intervention group and the teachers were trained to use the programme in classrooms. Every theme was focused on one learning subject (art, language, mathematics, science and social) which were consisted of 16 out of 32 subjects added with 2 weeks of campaign to reduce the time spent to watch television. Behavioural objectives were also instilled in the lesson (targeted to change 4 aspects of behaviours) and the learning objectives were included in the activities for samples. The learning activities were conducted once or twice in a week with 45 minutes for each session. The data collected were analysed by using equation and regression analysis.

The results of the study showed that prevalence of obesity decreased among female children in intervention schools as compared to children in controlled schools (odd ratio, 0.47; 95% confidence interval, 0.24 – 0.93; $p = .03$), however there was no difference shown among male children between intervention and controlled group. The results also showed that the intervention programme had reduced the amount of time spent to watch television among male children, increased fruit and vegetable intake among female children, and slightly increased the energy intake among female children. The reduction of the time spent in watching television was a predicted factor for obesity changes and intermediate on the effects of intervention (odds ratio, 0.85; 95% confidence interval, 0.75 – 0.97; $p = .02$). In all, Planet Health Programme may be used to reduce the risk of obesity among female children. Therefore, the researchers of the study recommended that school based promotional approach via Planet Health Programme should be continued as this programme may help in reducing the risk of obesity among preschool children.

3.6 Parents Involvement on Obese Preschool Children

Golan & Crow (2004) studied on long term differences on excessive body weight based on family-based health-centred approach. Fifty out of sixty children aged between 7 – 12 years old took part in the original study which was followed up 7 years later. Data collected were analysed by using repeated measure ANOVA to examine the differences in the percentage of excessive body weight on different points. The results of the analysis showed that the mean for percentage of decreased excessive body weight in parents groups were greater than the children's group ($p < 0.05$). Seven years after the programme ended, the mean of decreased excessive body weight among the parents was 29.0% and 20.2% were reported for the children's group ($p < 0.05$). As a conclusion, obese children's treatment with the involvement of parents as exclusive transformation agent in long term is better than conventional approach.

4. Application of Components from Previous Researches in Health Education Programme to be Constructed

The researches above are intervention studies which used various programmes as methods or techniques in preventing obesity on preschool children. Table 1.0 is an overall display for the past researches and indirectly summarised the application of components from previous studies in the health educational programme to be developed in this study.

Table 1.0: Summary for Application of Components from Previous Researches in the Health Educational Programme to be Developed

No.	Previous Studies	Intervention programmes as methods / techniques to prevent / cure obesity		
		Diet	Physical Activities	Exercise
1.	Mo-suwan et al (1999): Aerobic Exercise Programme			√
2.	Harvey-Berino&Rourke (2003): Parenting Support Programme	√		√
3.	Dennison et al (2004): 'Brocodile, the Crocodile' Programme	√	√	
4.	Fitzgibbon et al (2005): Weight Control Intervention Programme	√	√	√
5.	Gortmaker et al (2009): Planet Health Programme	√	√	
6.	Health educational programme to be developed	√	√	√

Referring to table 1.0, the studies conducted by Mo-suwan et al (1999), Harvey-Berino&Rourke (2003), Dennison et al (2004), and Gortmaker et al (2009) were intervention studies conducted outside Malaysia and were related to the prevention of obesity. These studies were conducted on preschool children and were mainly focusing on diet except for the study conducted by Mo-suwan which focussed on exercise component only. Exercise component was also used in the studies conducted by Harvey-Berino&Rourke (2003) and Fitzgibbon et al (2005). The study conducted by Harvey-Berino&Rourke is the only study which used Parenting Support approach combined with diet component in the programme developed. Meanwhile, the studies conducted by Dennison et al (2004), Fitzgibbon et al (2005)

and Gortmaker et al (2009) used physical activities as one of the components in their programmes. Most of these researches above used BMI percentile ≥ 95 for weight and height with high fat level in body as the definition for obesity. Various instruments were used by all the researches above in examining the effects of intervention programmes on obese preschool children such as National Centre for Health Statistics (2003), children's dietary diary, growth chart from Centre for Disease Control and Prevention, Hip Hop to Health Jr., dietary recall, National Health Examination Survey of Children (NHES), activity survey, Nutrition & Your Health, and American Academy of Paediatrics: Children, Adolescents and Television survey. These instruments were chosen based on the suitability to the components measured in the programmes developed. The results on the researches above showed that the programmes developed were able to help in preventing obesity among preschool children. These studies also recommended that health promotional programmes in preventing obesity should be implemented starting at preschool level.

Therefore, the results of document analysis on these studies have given ideas to the current researchers to develop health educational programme which contains components related to diet, physical activities and exercise. However, the current researchers will rename these components with different names which are dietary (diet), psychosocial development (physical activities) and physical activities (exercise). In addition to that, the researchers will add another component known as physical development. This element will be included as the researchers will measure height, weight, and BMI and intended to observe the outcome from those measurements. In previous studies, those aspects were measured but were not named. The current researchers intended to name these aspects as they intended to see the outcome based on the variable that will be constructed. The researchers will also inculcate the factor of parents' involvement not only to encourage discussions on children's exercise and diet reported by them, but more to the involvement in activities planned by the researchers. In addition to that, the researchers will also include the involvement from related experts such as psychologists, nutritionists, paediatricians, and rehab therapist in assisting the researchers to strengthen all the components involved in the health educational programme that will be developed. Suggestions and recommendations from the experts will be gathered through series of structured interviews related to the components for health educational programme such as dietary, physical development, psychosocial development and physical activities. The researchers will conduct a study on children at the age of 3 – 6 years old. This study is going to use Hip Hop to Health Jr., 2000 Centres for Disease Control (CDC) Growth Chart, 24-hour activity diary and dietary recall. These instruments are chosen as they are assumed to be suitable with the components that are going to be measured in the programme that will be developed (Table 1.0).

5. Conclusion

In conclusion, components related to dietary, physical development, psychosocial development and physical activities are needed in the development of a health educational programme. Thus, the development of this health educational programme is hoped to be able to assist medical team, community and parents of preschool children in preventing obesity. It is recommended that a structured health education programme to be prepared and instilled in preschool curriculum to further aim in preventing obesity.

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