

HARNESSING SOCIAL MEDIA IN FAMILY-BASED INTERVENTION FOR CHILDHOOD OBESITY: STUDY PROTOCOL FOR RANDOMIZED CONTROLLED FIELD TRIAL OF REDUCE PROGRAMME

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ABSTRACT

Background: Parents can play an important role in preventing childhood obesity as they can influence their children's intake and energy expenditure. However, interventions that involve parents more often than not have quite a high rate of attrition. Social media could be a potential alternative to conventional approaches of family-based intervention. This paper describes the study protocol of REDUCE (REorganise Diet, Unnecessary screen time and Exercise) programme, a family-based intervention using social media.

Materials and Methods: This is a two-armed, double-blinded, randomized controlled field trial of theory-driven intervention delivered using social media (REDUCE programme). Parents of children (7 – 11 years of age at recruitment, with a BMI z-score of +1SD or more, without chronic medical illness, or physical and learning disabilities) are eligible to participate if they are computer literate, have access to the Internet, are willing to use social media, and agree to participate in a four week training programme. The primary outcome is the BMI z-score. Secondary outcomes include other adiposity measurements (waist circumference percentile and percentage of total body fat), parents' mediators (knowledge, healthy behaviour practices, feeding styles and self-efficacy) and children's mediators (children's eating behaviour, sugar-sweetened beverages intake, fruits and vegetables intake, unhealthy snacks intake, physical activity and screen time). The assessments take place at baseline, immediately post-training, and at 3-month and 6-month follow-ups.

Conclusion: This study tests the effectiveness of social media in the management of childhood obesity. If proven effective, this programme may be extended to reach more children.

Keywords: *Childhood obesity, Family-based intervention, Social media, Randomised controlled trial, Internet*

1.0 Introduction

Obesity is a condition characterized by abnormal or excessive fat or adipose tissue accumulation resulting in disturbances in health. Overweight and obesity are leading risks for global deaths. These trends affect urban settings in particular (Hebebrand & Hinney, 2015). The recent Malaysia National Health Morbidity Survey (Ministry of Health Malaysia, 2015) reported the national prevalence of obesity among children less than 18 years of age was 11.9%. The prevalence was slightly higher in urban areas (12.1%) and among boys (13.6%). The highest prevalence was among children aged 5 – 9 years (14.8%) followed by children aged 10-14 years (14.4%). Besides the short term and long term health complications of obesity such as heart disease, type 2 diabetes, hypertension (Reilly et al., 2003), and cancer (De Pergola & Silvestris, 2013), it is costly to the nation. The United States estimated that obesity-related costs totalled \$316 billion in 2010 (Ogden, Carroll, Kit, & Flegal, 2014) and this cost is predicted to exceed \$850 billion in 2030 (Wang, Beydoun, Liang, & Caballero, 2008).

One of the approaches to prevent childhood obesity is to target parents as they are capable of creating an environment to foster children's healthy eating and physical activity (Lindsay, Sussner, Kim, & Gortmaker, 2006). Systematic review and meta-analysis of 42 weight-related health interventions showed that interventions which required parents' participation were more effective in reducing body mass indexes of children and adolescents (Niemeier, Hektner, & Enger, 2012).

Unfortunately, a range of 20% to 73% of participating families in family-based intervention dropped out of treatment (Skelton & Beech, 2011). Internet programs—and in particular, social media—could be an attractive option because they are not subject to common barriers to obesity treatment such as difficulties with scheduling or the need to be in proximity to a clinic or transportation and they have the advantages of accessibility at all times which increases personal convenience (Winett, Tate, Anderson, Wojcik, & Winett, 2005; Harvey-Berino, Pintauro, & Gold, 2002). The majority of Malaysian households (61.9%) have broadband access (Malaysian Communications and Multimedia Commission, 2015) and 59% of these use social media (Share, 2015). Randomized controlled trials on Internet-based family intervention found significant changes in adiposity and lifestyle behaviours with attrition rates in intervention groups ranging from 4% to 36% (Knowlden, 2013; Chen, Weiss, Heyman, Cooper, & Lustig, 2011; Williamson et al., 2006). Li, Barnett, Goodman, Wasserman, and Kemper (2013) found that based on several studies; there is a potential use of social media in weight management programme. The authors highlighted the need for further research to examine whether engagement within a social network could increase the effectiveness of intervention and promote sustainability.

This proposed intervention will be based on Social Cognitive Theory (SCT) (Bandura, 1986). SCT was one of the most frequently used theories among studies that used internet to promote health behaviour change (Webb, Joseph, Yardley, & Michie, 2010). Among internet family-based interventions that shown to produce improvement in adiposity and behaviours also incorporate SCT as the theory behind their studies (Knowlden, 2013; Chen et al., 2011; Williamson et al., 2006). SCT explains behaviour as a reciprocal interaction between person, behaviour, and environmental factors. Changing the children's behaviours on dietary intake and physical activity requires improvement in parental knowledge, self-efficacy, healthy practices, and parenting skills and having an environment conducive to change which helps

facilitate and influence the children's engagement in healthy behaviours. This paper describes a study design to evaluate the effectiveness of a new and innovative theoretically-driven family-based intervention which harnesses social media and is aimed at improving child adiposity. The primary outcome is BMI z-scores. Secondary objectives are to evaluate the effectiveness of the intervention on i) other children adiposity measures i.e., waist circumference percentile and percentage of total body fat; ii) parents' intervening variables: parents' knowledge of nutrition, physical activity and obesity-related health risk, healthy lifestyle practices, parental feeding styles, and parents' self-efficacy; iii) children's intervening variables: children's eating behaviour, dietary intake (consumption of sugar-sweetened beverages, fruits and vegetables, and unhealthy snacks), and energy expenditure (physical activity and screen time). We hypothesize that in comparison with the wait list group, children in the intervention group should have reduced BMI z-scores, waist circumference percentile, and percentage of total body fat. In addition to that: i) parents in the intervention group should have higher knowledge of nutrition, physical activity, and obesity-related health risks, practise healthier lifestyles, practise authoritative feeding styles, and have improved self-efficacy scores; ii) children in the intervention group should also improve their eating behaviour, reduce their consumption of sugar-sweetened beverages and unhealthy snacks, increase their intake of fruits and vegetables, increase moderate to vigorous physical activity, and reduce screen time. The description of this study protocol follows the CONSORT checklist for randomized controlled trials (Schulz, Altman, Moher, & Group, 2010).

2.0 Materials and Methods

2.1 Study location

The RCT is conducted in an urban area in one of the states in Malaysia. All five government primary schools in the area have been selected. The number of students for each school ranges from about 1600 to 2500 students. Figure 1 presents the study flow chart.

2.2 Study design

This study is a two-armed, parallel, double-blinded randomized controlled field trial (RCT) with intervention and wait-list control group. Parents and assessors who are research assistants (RAs) are unaware of the group allocation.

2.3 Participants and recruitment

Brochures explaining the study and requesting parental consent for BMI z-score screening have been sent to all the five schools. The age of children at recruitment is between seven to 10 years. Children with written parental consent are then screened. Parents of children with BMI z-scores of more than +1SD are invited to participate in this study. Parents also need to be computer literate, have easy access to the Internet, be willing to use social media as medium of interaction, agree to participate in a four-week training programme, and allow their children to be assessed. Parents are to be excluded if they report their child as having any co-morbidities, chronic diseases, physical disabilities, or learning disabilities; if their children are on any medication; or if they are participating in other research.

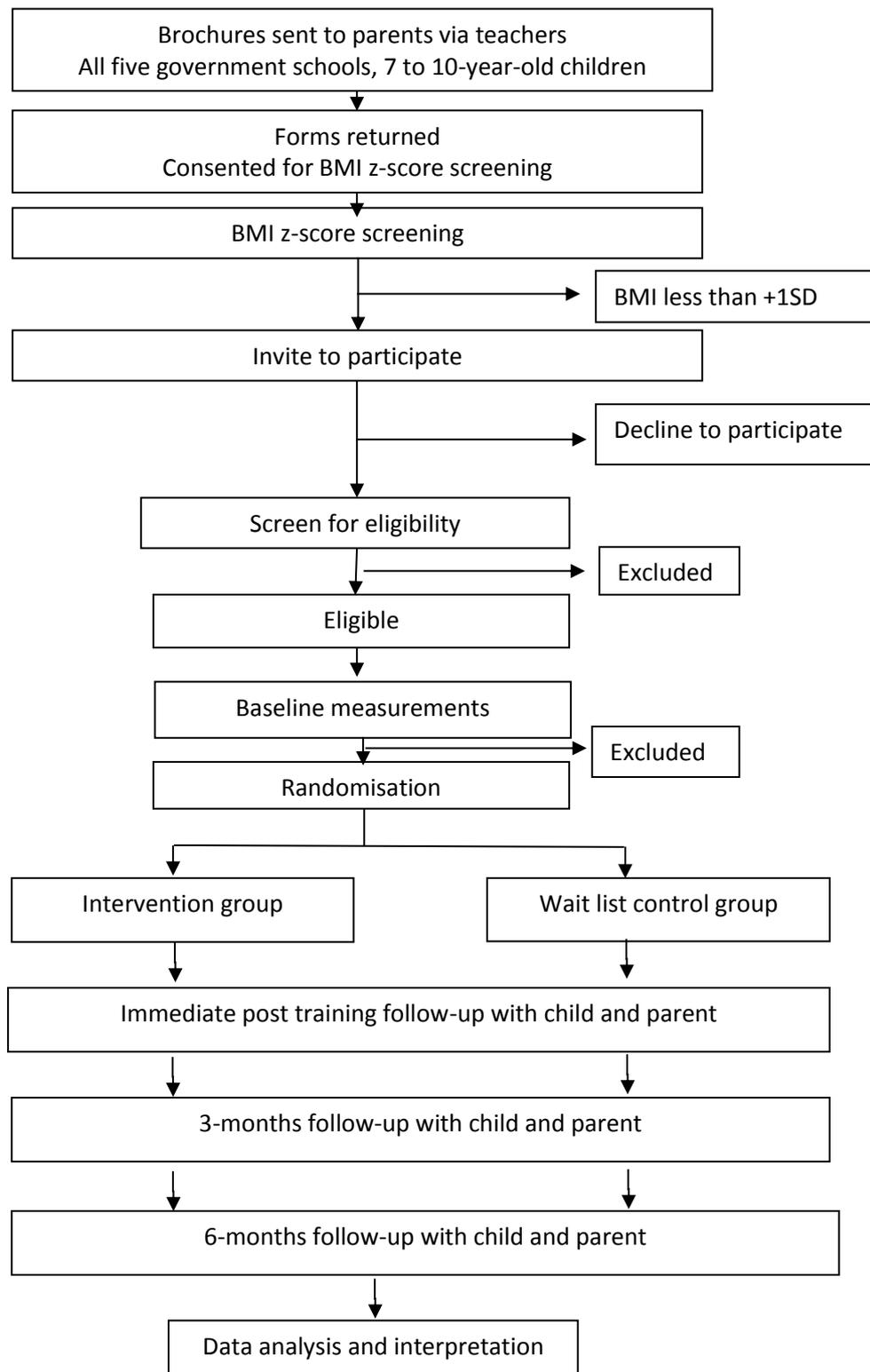


Figure 1: CONSORT diagram—recruitment and randomization of participants.

2.4 Randomization

Parents of overweight and obese children who are eligible and consent to participate are number coded prior to random allocation into treatment or wait list control groups. Randomization helps to ensure baseline equivalence and minimise selection bias. To ensure concealment of allocation, the codes are sent to an RA who produces a computer generated randomized list which allocates participants into intervention or wait list control groups following a simple randomization procedure with 1:1 allocation. The RA then provides the researcher with the allocated groups and parents are invited to participate according to the study protocol.

2.5 Sample size

The sample size calculation is based on detecting BMI z-score difference between the intervention and wait list control group using the standard formula for trial using individual randomisation, $n = 2\sigma^2[z_{1-\alpha} + z_{1-\beta}]^2 / (\mu_1 - \mu_2)^2$. A difference of 0.24 in BMI z-score with standard deviation of 0.48 was expected to be relevant based on a previous study (Sacher et al., 2010). A sample size of 49 per group is needed with 95% level of significance and 80% power. The drop-out rate was assumed to be about 15% after randomization. A minimum sample size of 56 parents per arm is required to detect this difference with a two-sample t-test.

2.6 Intervention

The intervention is based on Social Cognitive Theory, SCT (Bandura, 1986). The theory explains behaviour as a reciprocal interaction between person, behaviour and environmental factors. Changing the children's behaviours on dietary intake and physical activity requires improvement in parental knowledge, self-efficacy, healthy practices, parenting skills and environment conducive to change which help facilitate and influence the children's engagement in healthy behaviours. The key components of SCT used include self-monitoring, goal setting, self-efficacy, problem solving, relapse prevention and stimulus control. The REDUCE (REorganise Diet, Unnecessary sCreen time and Exercise) programme is delivered using face to face session, Facebook and WhatsApp. These types of social media are used because of its popularity in Malaysia. Almost half of Malaysian internet users use Facebook and one fifth uses WhatsApp (Share, 2015).

The REDUCE programme is formulated using strategies targeting diet, physical activity, and behaviour change techniques (SCT) which are proposed following systematic reviews of the treatment of childhood obesity (reference) and the Malaysian Dietary Guidelines, MDG 2013 (Ministry of Health Malaysia, 2013). Hence, the targets for the REDUCE intervention which are based on daily consumption or activity are: i) no sugar-sweetened beverages (SSB), ii) five daily servings of fruits and vegetables (at least 2 servings of fruits and at least 3 servings of vegetables), iii) no unhealthy snacks, iv) a minimum of 30 minutes of moderate to vigorous physical activities, and v) a maximum of 120 minutes of screen time. Even though the recommendation from MDG 2013 is at least 60 minutes of moderate-intensity physical activity daily, this intervention only requires at least 30 minutes of physical activity. Table 1 presents the contents of the REDUCE programme with all the five target behaviours. The module comprises a total of eight units which are delivered within four weeks, two units each week.

Table 1. Components of REDUCE (REorganise Diet, Unnecessary sCreen time and Exercise) programme

Week	Unit	Topic and Contents in REDUCE programme	Week	Unit	Topic and Contents in REDUCE programme
1	1	Introduction: <ul style="list-style-type: none"> • Introduction of program • Obesity and healthy lifestyles • Parenting skills and parental role • How to fill up food record • Information on REDUCE programme 	3	5	Physical activity <ul style="list-style-type: none"> • Target for physical activity • What is physical activity? • Why physical activity good for health? • Examples of moderate and vigorous activities • Examples of activity to strengthen muscles and bones • Tips to increase physical activity • Parenting skills and roles • Scenario of problem and suggested solutions • Physical activity record • Feedback and discussion in social media
	2	Sugar sweetened beverages (SSB) <ul style="list-style-type: none"> • Target for SSB • What is SSB? • Why SSB bad for health? • Tips to reduce SSB intake • Parenting skills and roles • Scenario of problem and suggested solutions • SSB Diary • Feedback and discussion 		6	Screen time <ul style="list-style-type: none"> • Target for screen time • What is screen time? • Why prolong screen time bad for health? • Tips to reduce screen time • Parenting skills and roles • Scenario of problem and suggested solutions • Physical activity record including screen time • Feedback and discussion in social media
2	3	Fruits and vegetables (FV) <ul style="list-style-type: none"> • Target for FV • Why FV good for health? • Example of servings for fruits and vegetables • How to cook vegetables • Tips to increase FV intake • Parenting skills and roles • Scenario of problem and suggested solutions • SSB and FV Diary • Feedback and discussion in social media 	4	7	Risky situations and review of performance <ul style="list-style-type: none"> • What are 'risky situations' • Examples of risky situation • Why these risky situations bad for health? • How to deal with 'risky situations' • Parenting skills and roles • Scenario of problem and suggested solutions • Feedback and discussion
	4	Unhealthy snacks/junk food <ul style="list-style-type: none"> • Target for snacks • What are snacks? • Why snacks bad for health? • Types of fat • Reading food labels • Tips to reduce snacks intake • Parenting skills and roles • Scenario of problem and suggested solutions • Food record • Feedback and discussion in social media 		8	Further role and action <ul style="list-style-type: none"> • Obesity issues • Exercise Tips • Calories needed and examples of serving according to age and sex • Examples of success stories • Summary of REDUCE programme • Parental role

The REDUCE programme involves two phases; the training phase and booster phase. The four weeks training phase comprises two sessions of face-to-face training; face-to-face session one occurs at week one (Unit 1 and Unit 2) and face-to-face session two occurs at week four (Unit 7 and Unit 8). Two sessions in between are delivered using Facebook (Unit 3 to Unit 6). Both training and booster sessions are conducted by the first author who is a public health physician. The exercise tips in Unit 8 are delivered by a sport medicine specialist. All sessions are delivered to parents only, except for face-to-face session two where both parents and children are invited. The training phase is followed by three months of weekly information blasts via WhatsApp on the same content of each unit, health tips, and performance feedback. The booster acts as a refresher and to strengthen their knowledge of the targeted behaviours of the REDUCE programme. Parents are encouraged to communicate with researcher and other parents in the designated social media to improve knowledge and skills of the parents in achieving the targeted behaviours. This module was finalized after pretesting with a clinical psychologist (fourth co-author) and mothers of obese/overweight children who were not participants of the RCT.

Table 2. Summary of training and booster sessions of REDUCE programme

Week	Phase	Session	Unit
1	Training	Face-to- face training	Unit 1 and 2
2		Facebook	Unit 3 and Unit 4
3		Facebook	Unit 5 and Unit 6
4		Face-to- face training	Unit 7 and Unit 8
5-16	Booster	WhatsApp	All units

2.7 Intervention's fidelity

To ensure the intervention's compliance with the training sessions, several measures are taken including incentives for attending training sessions (RM20 per session), returning questionnaires (stationery materials), and fee-free sessions. Intervention fidelity in social media is encouraged by group discussion among participants-researcher and participants-participants and ensuring confidentiality and privacy by creating a dedicated group in Facebook and WhatsApp which can be assessed by selected members only.

2.8 Wait list control group

The wait list control group families receive REDUCE intervention after the 6-month follow-up assessments are completed. To encourage participation and prevent drop-outs from the wait list group, incentives are given to children after the child's physical measurements are taken and upon the return of the parent-completed questionnaire for each follow-up. These incentives are similar to those received by the intervention group which are mainly stationery materials.

2.9 Data collection and time frame

There are two methods of data collection. Measurements for anthropometric (height, weight, and waist circumference) and percentage of total body fat are done by RAs. A pair of RAs is

assigned to one measurement; one performs the measurement and another one records the findings. This is to reduce inter-rater measurement bias and to reduce error in recording. The measurements are taken at the children's respective schools. Secondly, parents complete a questionnaire. Parents received the questionnaire via their children's class teachers. This data is collected at baseline, immediately post-intervention, and at 3-month and 6-month follow-ups for both the intervention and wait list control groups (Table 2). For practical reasons, parents' data collection occurs over a period of one month to accommodate parents' schedules so that they have time to fill out the questionnaires. Parents are also reminded to fill out the questionnaires by respective teachers in charge at each school. The study started in August 2014 and is expected to be completed in November 2016.

Table 2. Data collection for all parents and children at baseline, immediate post training, 3-months and 6-months

Assesments/Measurements	Time			
	Baseline	Immediately post- training	3-month	6-month
Parents' assessments				
i) Socio-demographic profile	X			
ii) Parental knowledge on nutrition, physical activity and obesity related health risks.	X	X	X	X
iii) Parents' healthy lifestyles practices	X	X	X	X
iv) Parents' feeding styles	X	X	X	X
v) Parents' self-efficacy	X	X	X	X
Children's assessments				
A) Parents administered questionnaire on:				
i) children's eating behaviours	X	X	X	X
ii) physical activity	X	X	X	X
iii) food record	X	X	X	X
B) Anthropometric measurements: (height, weight, waist circumference)	X	X	X	X
C) Percentage of total body fat	X	X	X	X

2.10 Outcome measures

2.10.1 Child outcomes

Anthropometric measurements and percentage of total body fat

Height is measured without shoes to the nearest 0.1 cm using a mobile Seca stadiometer, model 213 (Seca, Hamburg, Germany). Weight and percentage of body fat is measured with light clothing, without shoes, and empty pockets, using a calibrated 2-point body fat analyser, portable scale, Omron Karada Scan, model HBF 212 (Omron, Kyoto, Japan). The measurements are recorded to the nearest 0.1 kg and 0.1% respectively. The BMI z-scores are determined using WHO AnthroPlus software. A different RA converts the height and weight measurements into BMI z-scores to maximize validity of the assessment. Children with BMI z-scores between +1SD and +2SD are identified as overweight and with BMI z-scores of

more than +2SD are classified as obese children (WHO, 2007). Waist circumference is measured between the edge of the lower chest and iliac crest bone, with clothing, using an outstretched tape meter (Seca, Hamburg, Germany) without any pressure on the body surface. The measurements are recorded to the nearest 0.1 cm. The waist circumference is then converted to waist circumference percentile for Malaysian children (Poh et al., 2011).

Dietary intake

Children's dietary intake is assessed with a parent-administered three-day food diary covering two week days and one weekend day. Nutrient intake is calculated using Nutritional Pro software by two different RAs. The measures include vegetable consumption (servings/day), fruit consumption (servings/day), unhealthy snack consumption (servings/day), and SSB consumption (servings/day).

Child eating behaviours

Child eating behaviours are measured using the Children's Eating Behaviour Questionnaire, CEBQ (Wardle, Guthrie, Sanderson, & Rapoport, 2001). This questionnaire measures 8 constructs of eating behaviour, namely: responsiveness to food, enjoyment of food, emotional overeating, satiety responsiveness, slowness in eating, food fussiness, emotional under-eating, and desire for drinks. It is a parent-administered questionnaire with 35 items and 5 Likert scale responses: never (1), rarely (2), sometimes (3), often (4), and always (5). The CEBQ has good internal consistency and adequate test-retest reliability, Cronbach alpha = 0.72 to 0.91, and correlation coefficients = 0.52 to 0.87 respectively. The questionnaire are translated into Bahasa Malaysia and back translated. However, only three constructs are analysed to evaluate the changes during the course of the intervention. These dimensions are enjoyment of food, satiety responsiveness, and food responsiveness, which are related to the development of overweight and obesity in children (Santos et al., 2011). Emotional overeating was not included as this behaviour is not managed in the REDUCE intervention. Slowness in eating was not included as this item may not reflect the intentions of the intervention.

Physical activity and sedentary behaviours

Physical activity is measured subjectively using a parent-administered questionnaire; i.e., the children's physical activity questionnaire (c-PAQ). The questionnaire has been validated for use in Malaysia for adolescents with acceptable validity in assessing moderate physical activity (Nor Aini, Poh, & Chee, 2013). Parents need to complete the questionnaire related to their children's physical and sedentary activity over the previous seven days. The first item includes type and frequency of sports activities. The second item constitutes type and frequency of activities during leisure time. The third item assesses activity at school which includes physical education classes, walking, and cycling to school. The fourth item is regarding sedentary activities; for example, watching television and playing computer games. The cut-off points of metabolic equivalent (MET) for the various physical activities are determined using the Compendium of Physical Activities, 2011 (Ainsworth et al., 2011). Physical activity is then computed and categorized into vigorous, moderate, and light and sedentary activity by a researcher who is blinded to the children's group allocation.

2.10.2 Parental outcomes

Parental feeding styles

Parents' feeding styles are measured using the Caregiver's Feeding Style Questionnaire, (CFSQ; Hughes, Power, Orlet Fisher, Mueller, & Nicklas, 2005). This questionnaire is a self-administered, 19-item instrument that collects information on parenting approaches in the context of feeding. Each of the constructs is measured through a series of questions and scored on a 5-point Likert scale (never, rarely, sometimes, most of the time, always). Test-retest reliability measure $r = 0.85$ for demandingness and $r = 0.82$ for responsiveness. In order to categorize participants into 4 categories of parenting styles—authoritative, authoritarian, indulgent, and uninvolved—two scores are derived; demandingness and responsiveness. To score demandingness, a total mean score is calculated across all 19 items. To score responsiveness, a ratio of child-centred 7 items over the total score is calculated. These items are questions number 3, 4, 6, 8, 9, 15, and 17. Median splits are used to categorize the parenting styles (Hughes, Cross, Hennessy, 2012). The questionnaire are translated into Bahasa Malaysia and back translated.

Parents' self-efficacy

Parents' self-efficacy is measured using the Parent Efficacy for Child Healthy Weight Behaviour Scale (PECHWB; Nelson & Davis, 2012; Palmer & Davis, 2014). This scale measures parental self-efficacy in promoting healthy weight behaviours in their children. These behaviours include eating three or more servings of fruit, eating four or more servings of vegetables, minimizing consumption of foods high in fat and sugar, at least one hour of vigorous exercise, and spending a maximum of two hours engaged in sedentary activities. This 65-item questionnaire needs parents to rate their level of confidence in promoting healthy weight behaviour in their child. The original scale is from 0 to 100 with 0 being not at all confident and 100 being extremely confident. However, for this trial some amendments to the questionnaire were made to suit the intervention targets mentioned earlier. The amendments also involve reducing the original 0 to 100 Likert scale to a 1 to 5 Likert scale for the purpose of standardising the Likert scale with other items in the study questionnaire and to make it easier for parents to rate their confidence in the local context. This scale has good internal consistency and test reliability (Cronbach's $\alpha = 0.98$, test retest reliability = 0.89). The questionnaire are translated into Bahasa Malaysia and back translated.

Parents' knowledge and practices

Since there is no validated questionnaire on this aspect to date, items were constructed to evaluate knowledge on nutrition, physical activity, obesity-related risks and healthy lifestyle practices. The healthy lifestyle practice items were based on the targeted behaviours of the children. This was done to assess whether the parents also practiced the same behaviours that are monitored and encouraged by them to their children.

2.10.3 Sociodemographic

This section collects information on the children's age, gender, ethnicity, number of siblings, order in family, marital status of parents, parents' education level, parents' income, and parents' height and weight.

2.11 Statistical Analysis

All analysis followed the intention-to-treat principle where all parents and children for whom data are available on the basis of the group they are allocated regardless of their adherence to the protocol. Data analyses will be performed using SPSS version 22.0. Normality check will be conducted on all data prior to further analysis. Not normally distributed data will be transformed accordingly. Descriptive analysis will use mean with standard deviation, 95% Confidence Interval with p value significant at ≤ 0.05 . Baseline demographic characteristics, BMI z-score, waist circumference percentile and percentage of total body fat will be compared between the intervention and wait-list control groups using Student's t-test and chi square test/ Fisher's exact test for continuous and categorical data respectively.

Changes in BMI z-scores, waist circumference percentile, and percentage of total body fat will be compared between intervention and wait-list control groups using Student's t-test for continuous variables. A further analysis using the mixed model, adjusted for baseline covariates, will be performed. Parental mediation skills (knowledge, healthy lifestyles practices, authoritative feeding styles, and parents' self-efficacy) and children's mediation skills (eating behaviours, dietary intake, physical activity, and screen time) will be analysed similarly (and will also include chi square test for categorical variables).

3.0 Discussion

The increasing prevalence of childhood obesity in Malaysia warrants special attention by the public health community. The impacts of childhood obesity on individuals/families and the nation cannot be underestimated. Furthermore, these children tend to be overweight and obese adults if no action is taken to change the unhealthy behaviours to healthier ones. The wide usage of social media in Malaysia could be an attractive platform in providing information, skills, and behaviour modification techniques to change children's unhealthy behaviours through their parents' intervention. To the authors' knowledge, this will be the first study to assess family-based intervention using social media related to childhood obesity in Malaysia. If the findings turn out to be positive, there may be a possibility to extend REDUCE intervention to a bigger population of overweight and obese children in Malaysia.

However this study is subject to several limitations. Due to financial and time constraints, the study can only be conducted in a small Malay urban community. Thus, the findings may not be representative of all parents of overweight and obese children in Malaysia. Parents may also not provide true answers to the questionnaires which can lead to measurement bias. For example, parents may only guess their children's physical activity and dietary intake. Physical activity assessment is best determined objectively, for example, using a pedometer. However due to financial constraints, this is not possible. The other limitation is that parents who do not agree to participate might have different characteristics than those who are willing to participate.

Acknowledgement

This study has been approved by University Putra Malaysia Ethical Committee, Ministry of Education, State Education Office, District Education Office and Headmaster of each school. This trial is funded by University Putra Malaysia, project's code GP-IPS/2013/9398400. The trial was registered with the National Medical Research Register, NMRR, Ministry of Health Malaysia, in July, 2014; NMRR-14-685-21874. Written informed consent was obtained from all parents prior to their enrolment in the REDUCE study. We would like to thank teachers, parents and children for their kind cooperation.

Declaration

Authors declare that they have no conflict of interest.

Authors' contribution

Author 1: Prepare research proposal, request funding, pretesting of REDUCE programme, conducting research activities and drafting manuscript.

Author 2: Contribute to conceptual framework, methodological aspects, planning the research activities, read and approve the manuscript.

Author 3: Contribute to conceptual framework, methodological aspects, read and approve the manuscript.

Author 4: Contribute to conceptual framework, methodological aspects, assist in pretesting of REDUCE programme, read and approve the manuscript.

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