MyBFF@school Study: The Effectiveness of a Psychology Module in Reducing the Emotional and Behavioral Problems among Overweight and Obese Secondary School Children in Malaysia

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Abstract

Background: Obesity may cause negative impacts on the physical and psychosocial aspects of the children. This study aimed to assess the effectiveness of MyBFF@school intervention program on emotional and behavioral problems in a clustered randomized controlled trial among 768 overweight and obese secondary school children in Malaysia. Methods: They were assessed by using the Youth Self-Report Questionnaire to measure their emotional and behavioral problems. Comparison between intervention group (447 children) and control group (321 children) at post-intervention were analyzed using ANCOVA. Results: There were significant reduction in the symptoms of anxious/depressed, F(1,740)=4.591, p < 0.05, withdrawn/depressed, F(1,745)=5.257, p < 0.05 and somatic complaints, F(2,729)=4.072, p < 0.05 post 6 months of intervention. MyBFF@school program was effective in reducing the aforementioned symptoms significantly, which prove the effectiveness of the psychology module used in the program. Conclusions: The findings demonstrated the importance of psychology component in programs combating obesity among overweight and obese secondary school children to reduce emotional and behavioural problems among them. Trial registration: National Medical Research Register: NMRR-13-439-16563. Registered 23rd July 2013. The intervention program was approved by the Medical Research and Ethics Committee (MREC), Ministry of Health Malaysia and Educational Planning and Research Division (EPRD), Ministry of Education Malaysia.

Keywords

Anxiety, Depressed, Obese, Somatic Complaints, Thought Problems, Withdrawn

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Background

Childhood obesity has become a global epidemic with increasing prevalence since 1990 particularly in developed countries and cities of developing countries.[1] It is a matter of great concern worldwide as it would affect the physical and mental health of the children. Overweight in children is associated with comorbidities such as metabolic syndrome, asthma, dental problems as well as psychological problems.[2] A systematic review among Australian children and adolescents found evidence that obese children and adolescents are having more psychological problems as compared to their normal weight counterparts.[3] Another study has found negative association between overweight and obese children with psychological comorbidities such as low self-esteem, depression, poor health-related quality of life as well as emotional and behavioral disorder.[4]

These problems are worrying as self-esteem is inversely related to having depression and anxiety while depression is interrelated to having somatic complaints.[5, 6] On top of that, children with low-self esteem could develop social problem when entering adulthood.[7] Mass media also exerts pressure on these children with the images of ideal thin bodies leading them to develop a negative body image on themselves together with disordered eating.[8] Moreover, these children are often faced with weight-based stigma and chronic bullying leading to social isolation.[9] Poor relationship status with their friends could also increase the prevalence of children having depressive mood, anti-social behavior and social anxiety.[10, 11]

The emotional and behavioral problems faced by the children call for stringent measures to be taken for the sake of the health of future generations. Childhood obesity intervention programs have been implemented across the world using a myriad of methods with varying degree of success. A meta-analysis has found that school-based interventions are effective in combating childhood obesity.[12] Past interventions usually target on improving the children’s physical activity, their dietary behavior or a combination of both.[12] However, there is a paucity of information on studies in childhood obesity intervention with additional psychological approach to address the issues of emotional and behavioral problems. The main objective of this study is to investigate the effectiveness of MyBFF@school obesity intervention program on the emotional and behavioral problems among overweight and obese secondary school children.

Methods

This was a school-based cluster randomised controlled trial that used a proportionate stratified random sampling that involved all government secondary schools from three states which are Kuala Lumpur, Selangor and Negeri Sembilan (within 100km radius from central Kuala Lumpur). 15 schools were randomly selected from 416 schools and the treatment types (intervention or control) were also assigned by systematic random sampling. Allocation of treatment types was not concealed because the selected schools need to be approved by the Ministry of Education prior to the commencement of the study. There were six schools in the intervention group and nine schools in the control group. Schools that were already involved in other overweight and obesity intervention program were also excluded from this study. The children in the control group followed the usual school program and standard national curriculums without receiving any intervention. On the other hand, trained personnel was assigned at each school in the intervention group that was involved in MyBFF@school program to carry out the intervention for 6 months from February 2016 until August 2016. This study was conducted according to the guidelines laid down in the Declaration of Helsinki and all procedures involving research study participants were approved by the Medical Research and Ethics Committee (MREC), Ministry of Health Malaysia and Educational Planning and Research Division (EPRD), Ministry of Education Malaysia.
(ethical code: NMRR-13-439-16563). Written informed consent was obtained from the parents or guardian of all subjects and written informed assent was obtained from all subjects.

Trained personnel was stationed at each participating schools to screen for eligible children for the program where their anthropometric parameters were measured. Only children in form 1, 2 and 4 were screened for the program. Children that have BMI-for-age of more than +1SD based on the WHO 2007 Growth Reference were invited to join the program.[13] 10866 secondary school children were screened for the program where 2910 (26.78%) children were found to be overweight or obese. Children with BMI-for-age more than +1SD and less than or equal to +2SD were categorized as overweight while obese children were those with BMI-for-age more than +2SD. All eligible children were approached to get consent from their parents to join the program. We received written consent from 1041 (35.8%) children but only 768 (73.8%) children completed the questionnaire for the psychology component where 447 children were in the intervention group and the remaining 321 children were in the control group.

Children with the following condition were not eligible to join the program; BMI-for-age lower than or equal to +1SD, mental or physical disability, medical condition that will impede him from doing moderate to vigorous physical activity; comorbidities that may affect the study such as diagnosed type 2 diabetes mellitus, attention deficit hyperactivity disorder (ADHD), hypertension, nephritic syndrome, epilepsy, congenital heart disease and skeletal anomalies; and also those that were on long-term medication.

Researchers collected the data from the participating children at baseline and at the end of intervention (month-6). Data was collected from the children through a survey using a self-report questionnaire as well as anthropometric measurement. The intervention programme comprises three modules which are small-sided games (SSG), nutrition and psychology. The SSG was carried out twice a week with 40 minutes per session while the nutrition and psychology module were carried out every alternate week with a duration of 45 to 60 minutes per session and 30 to 45 minutes per session respectively. All modules were carried out during the physical education classes and the co-curriculum activities. The SSG module is a mixture of physical activity comprised of small-sided football games, hand games, fun games and aerobic exercise. The nutrition module is an interactive education module for the children as well as healthy catering courses for the canteen operators and relevant school teachers while the psychology module aims to strengthen the psychological aspects of the children during the intervention through fun games and motivational talk with five different themes.

The psychological module comprising of five aspects (self-esteem, friendship, assertive, positive thinking for healthy life and stress management) had been adopted and adapted by a team of researchers based on literature review and developmental theories.[14] The module aims to build the children’s self-confidence and resilience in facing challenges during the intervention and to minimise the dropout rate of the children. Since overweight and obese children often face stigma due to their body weight,[9] the module is crucial to boost their will power in order to sustain and complete the program.

Instrument

Data on symptoms of emotional and behavioral problems had been gathered using the Youth Self-Report (YSR) questionnaire. The YSR questionnaire was derived from the Child Behavior Checklist and was first developed in 1991 by Thomas M. Achenbach.[15] Scores were obtained from the items by eight narrow-band scales (withdrawn, somatic complaints, anxious/depressed, social problems, thought problems, attention problems, rule-breaking behaviour and aggressive behaviour) and three broad-band scales (internal problems, external problems and total behaviour).[15] The instrument contains 112 items where children were
asked to rate each item as zero (not true), one (somewhat/sometimes true) or two (often/really true).[16]

The content validity of the instrument was proven from previous findings and supported by four decades of research, consultation, feedback and revision. The construct validity of the instrument was supported through four ways namely; proof of significant association with Diagnostic and Statistical Manual of Mental Disorders (DSM) criteria and other instruments that have similar scale; Achenbach System of Empirically Based Assessment (ASEBA) syndromes cross-cultural replication; genetic and biochemical evidence; as well as prediction of consequences over a long period of time.[17]

The Cronbach alpha of the instrument when tested during a pilot study was 0.70. In this study, the overall Cronbach alpha for the instrument is .95 that proves the reliability of the instrument. Levene's test showed that the variances for attention problems, F(3,737)=5.396, p=0.001 and rule-breaking behavior, F(3,738)=3.088, p=0.027 were not equal. The assumptions of equality of variances are met for all other symptoms.

**Statistical Analysis**

The continuous variables were presented as mean. All statistical tests were conducted at 5% significance level. Chi-square test of homogeneity was used to determine the distribution of the children across different variables. ANCOVA was used to compare the mean of the symptoms of emotional and behavioral problems between intervention and control group. In this analysis, we controlled for socioeconomic and demographic variables that are confounding factors. Potential confounding factors (from the literature) that could be associated with the symptoms of emotional and behavioral problems were also incorporated. All data analyses were run using IBM Statistical Package for the Social Sciences (SPSS) version 20 (SPSS Inc., Chicago, IL, USA).

**Results**

The mean age (SD) of the children participating in this study is 14.57 (1.318) years old. Chi-square test shows that there are statistically significant differences in the location of the children’s school, X^2(1)=25.869, p<0.001 and the ethnicity of the children, X^2(3)=22.376, p<0.001. There are not many children from rural schools in the control group. The majority of the children in this study are from the Malay race and most of them are in the overweight and obese category. On the other hand, the Chi-square test shows no significant differences in the sex, age groups and body weight groups of the children. The test shows that the distribution of the children are the same across these three socio-demographic characteristics.

<table>
<thead>
<tr>
<th>Characteristic of respondents</th>
<th>Intervention</th>
<th>Control</th>
<th>Chi-square</th>
<th>p value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sex, n(%)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Boys</td>
<td>172 (38.5)</td>
<td>129 (40.2)</td>
<td>0.229</td>
<td>0.632</td>
</tr>
<tr>
<td>Girls</td>
<td>275 (61.5)</td>
<td>192 (59.8)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Location, n(%)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Urban</td>
<td>264 (59.1)</td>
<td>246 (76.6)</td>
<td>25.869</td>
<td>&lt; 0.001*</td>
</tr>
<tr>
<td>Rural</td>
<td>183 (40.9)</td>
<td>75 (23.4)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Table 2 shows that there are significant mean differences between intervention and control group at post-intervention for the symptoms of anxiety/depressed, F(1,740)=4.591, p <.05, withdrawn/depressed, F(1,745)=5.257, p <.05 and somatic complaints, F(2,729)=4.072, p <.05 after controlling for the respective symptoms at baseline. To remove the confounding effects of the symptoms at baseline, the analysis was done using the adjusted group means of the children’ gender for the symptoms of anxious/depressed and withdrawn/depressed. On the other hand, the group mean of the BMI category was adjusted in the analysis of somatic complaints. Thus, there is significant effect of MyBFF@school program on the symptoms of anxious/depressed, withdrawn/depressed and somatic complaints.

In addition, the means of the symptoms of social problems, F(1,738)=0.114, p >.05, thought problems, F(1,730)=1.144, p >.05 and attention problems, F(1,736)=2.702, p >.05 in the intervention group are better than their means in the control group of the respective symptoms at post-intervention although they are not significant. However, the means of the symptoms of rule-breaking behavior, F(1,737)=1.094, p >.05 and aggressive behavior, F(1,720)=1.148, p >.05 for the intervention group is lower than their means in the control group at post-intervention which are also not significant. On top of that, the size of treatment effect is small (partial eta squared less than 0.2) for all symptoms of emotional and behavioral problems with 95% confidence interval.

Discussion

The study revealed that children’ symptoms of anxiety and depression reduced with significant effect at the end of the intervention which could be attributed to the success of the module especially the aspect of friendship and self-esteem. Studies have shown that support from friends are vital in supporting each other in facing difficulties and challenges.[18] One of the study found that high conflict or low support in friendship would increase the depressive mood among the children regardless of the gender.[10] Another study also revealed that relationship with peers is associated with social anxiety.[11] The friendship aspect aimed to improve the relationship among them by understanding each other better. They could deepen their friendship or make new friends through the activity that could reduce
<table>
<thead>
<tr>
<th>YSR Syndrome</th>
<th>Sample size</th>
<th>Mean (SD) at baseline</th>
<th>Adjusted mean at baseline</th>
<th>Mean (SE) at month-6</th>
<th>Mean (SE) difference</th>
<th>$F$ ratio</th>
<th>p value</th>
<th>partial eta squared</th>
</tr>
</thead>
<tbody>
<tr>
<td>Anxious /depressed</td>
<td>445/311</td>
<td>7.836 (4.342)</td>
<td>7.662</td>
<td>7.288 (0.174)</td>
<td>7.525</td>
<td>-0.238</td>
<td>0.032*</td>
<td>0.006</td>
</tr>
<tr>
<td>Withdrawn /depressed</td>
<td>447/316</td>
<td>5.360 (2.822)</td>
<td>5.218</td>
<td>4.830 (0.117)</td>
<td>5.248</td>
<td>-0.418</td>
<td>0.022*</td>
<td>0.007</td>
</tr>
<tr>
<td>Somatic Complaints</td>
<td>443/315</td>
<td>5.009 (3.390)</td>
<td>4.900</td>
<td>4.549 (0.164)</td>
<td>5.137</td>
<td>-0.587</td>
<td>0.017*</td>
<td>0.011</td>
</tr>
<tr>
<td>Social Problems</td>
<td>445/315</td>
<td>6.429 (3.392)</td>
<td>6.326</td>
<td>6.171 (0.146)</td>
<td>6.485</td>
<td>-0.314</td>
<td>0.022*</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Thought Problems</td>
<td>444/313</td>
<td>5.876 (3.815)</td>
<td>5.856</td>
<td>5.926 (0.171)</td>
<td>5.960</td>
<td>-0.034</td>
<td>0.285</td>
<td>0.002</td>
</tr>
<tr>
<td>Attention Problems</td>
<td>445/312</td>
<td>6.764 (3.058)</td>
<td>6.576</td>
<td>6.648 (0.127)</td>
<td>6.829</td>
<td>-0.181</td>
<td>0.101</td>
<td>0.004</td>
</tr>
<tr>
<td>Rule-breaking Behavior</td>
<td>446/315</td>
<td>4.601 (3.588)</td>
<td>4.508</td>
<td>5.062 (0.158)</td>
<td>4.918</td>
<td>0.144</td>
<td>0.296</td>
<td>0.001</td>
</tr>
<tr>
<td>Aggressive Behavior</td>
<td>441/307</td>
<td>9.270 (5.081)</td>
<td>8.946</td>
<td>9.468 (0.208)</td>
<td>9.265</td>
<td>0.203</td>
<td>0.284</td>
<td>0.002</td>
</tr>
</tbody>
</table>

1 intervention/control
2 adjusted for covariate
3 intervention-control(adjusted for covariate, at month-6)
*p<.05
SE – Standard Error
the feeling of anxiety and depression. The children were also taught on how to manage their stress such as through problem sharing or doing enjoyable physical activities as stress could contribute to depressive mood and avoidant coping that can also lead to unhealthy eating habit.[19]

Improving the self-esteem of the children through the module is beneficial for them in reducing the problems of anxiety, depression and feeling withdrawn. It could assist them in identifying their strengths and weaknesses in order to make them value their self-worth and increase their self-confidence. This is important for their emotional health as self-esteem is inversely related to having anxiety or depression.[5, 20] Lower self-esteem could also lead the children to having social problem later in adulthood.[7] Thus, increasing their self-esteem while they are still young is imperative for their future psychological development by preventing them from becoming withdrawn at early stage.

Somatic symptoms that are medically unexplainable among the children have shown significant improvement at the end of the program. A study has revealed that even though causal relationship could not be established between somatic complaints and anxiety and depression, there are strong evidence that suggest interrelationship between them.[21] Since the program has significant effect on both anxiety and depression, children that join the program also reported less somatic complaints at the end of the intervention program due to lower level of anxiety and depression.

Tremblay and Lariviere found that peer pressure is one of the main predictor of disordered eating behavior.[22] Weight-based teasing might cause negative body image among children resulting in disordered eating behavior. On the other hand, pressure to be thin from mass media is identified to be one of the predictor of negative body image as well as disordered eating to a certain extent.[8] Disordered eating might increase attention problems among the children as Kaisari et al. found in a study that there is evidence with moderate strength for a positive association between ADHD and disordered eating particularly overeating disorder.[23] The psychology module of MyBFF program equipped the children with skills to cope with stress as well as improving their self-esteem. These skills could help them in dealing with the urge to practice unhealthy eating habit. The nutrition module also helps to create awareness on the importance of healthy eating habit. The reduction in attention problems among the children could be the result of acquiring the aforementioned skills and awareness from this program.

The reduction of social problems among the children could be an indication of the success of the aspects of friendship and assertive of the psychology module. The friendship aspect of the module teaches the children on the must-have skills in maintaining a good relationship. On the other hand, the aspect of assertive could help them to deal with negative situations in their relationship with their peers. These skills could be crucial in empowering the children to have better relationship at school which in turn reducing the symptoms of social problems. Moreover, thought problems could also reduce as a result of the improved relationships among the children. This improvement can in turn prevents social isolation which is associated with thought problems such as self-harm.[24]

Being the victims of bullying is not an unusual occurrence among overweight and obese children.[25] However, a study shows that severely obese male children tend to be both the victims and the perpetrators of bullying,[26] which could probably be due to past experience as the victims. Boja suggested inducing assertive behavior to prevent bullying.[27] However, it appears that the assertive aspect of the psychology module does not have much effect in improving behavioral problems among the children. One of the reasons could be because children with obesity that commit bullying were not taken into account in the assertive aspect as it was made specifically for the victims.
This intervention program could be further improved by taking social environment into account. A study has found that weight-based teasing still persists 2 years after an obesity intervention program was implemented in the schools.[28] This could cause the emotional and behavioral problems faced by the children to remain unchanged or become worse. The exclusion of children with normal BMI-for-age from this program eliminate the possibility of educating them with the detrimental effects of stigmatization of their peers with obesity and the importance of social support for their peers with unhealthy weight.[9, 29] Taking lesson from the Whole School, Whole Community, Whole Child (WSCC) model in improving the health of the children by involving all children in the program,[30] the likelihood of reducing the emotional and behavioral problems among the children could probably be improved by following the approach in the aforementioned model.

One of the limitations in this study is the use of an assessment tool to infer the emotional and behavioral problems of the children. Another limitation is the varying degrees in the implementation of the intervention due to the different pre-existing facilities in each schools (such as the field for the SSG) as well as the differences, albeit minor, in how each trained personnel carried out the intervention in each school due to non-compliance. Apart from that, there are lack of studies that are similar to our study to be compared with. The lack of similar studies in turn make it difficult to interpret the size of the treatment effect in our study by making comparison. Even though we reported the size of treatment effect as small based on standardized way of interpreting it, the fluidity of psychological research requires a non-standardized approach to reasonably match our research question.[31]

**Conclusions**

MyBFF@school program is effective in reducing the symptoms of anxious/depressed, withdrawn/depressed, somatic complaints, social problems, attention problems and thought problems which proves the effectiveness of the psychology module used in this school-based intervention program. Reviewing the module and redesigning more activities focusing on the other symptoms contextually can improve the reduction in rule-breaking behavior and aggressive behaviour. The finding further demonstrated that it is crucial to include psychology component in programs combating obesity among overweight and obese secondary school children to achieve sustainability among them.

**Declarations**

*Ethics approval and consent to participate*

This study was conducted according to the guidelines laid down in the Declaration of Helsinki and all procedures involving research study participants were approved by the Medical Research and Ethics Committee (MREC), Ministry of Health Malaysia and Educational Planning and Research Division (EPRD), Ministry of Education Malaysia (ethical code: NMRR-13-439-16563). Written informed consent was obtained from the parents or guardian of all subjects and written informed assent was obtained from all subjects.

*Competing interests*

The authors declare that they have no competing interests.

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