

ASSESSMENT ON ACCEPTANCE OF EXERCISE BOARD GAME AMONG OVERWEIGHT AND OBESE CHILDREN IN SELECTED PRIMARY SCHOOL IN KUALA LUMPUR

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Abstract

This study aims to assess the acceptance and effectiveness of an exercise board game in improving knowledge of physical activity among overweight and obese children. A *quasi*-experimental research design was carried out. This study was conducted among 68 overweight and obese children aged 7-11 years old from four primary schools in Kuala Lumpur. Children in the intervention group (n=34) played the exercise board game, while those in the control group (n=34) were given explanations using the Ministry of Health Malaysia's physical activity pyramid. Both groups were tested on their knowledge of physical activity using a pre-tested questionnaire before and after the study. The results showed a significant increase in the knowledge of physical activity among both the intervention and control groups. In the intervention group, the total scores before and after intervention were respectively: median (25th – 75th percentile), 8.0 (6.0 - 9.0) and 8.0 (8.0 – 10.0), p=0.005. In the control group, the total scores before and after intervention were respectively: median (25th – 75th percentile), 9.0 (7.0 – 10.0) and 10.0 (8.8 – 10.0), p=0.005. Overall, the acceptance score of children on the exercise board game was high [7.0 (6.0 – 8.0)] from total score of 8.0. In conclusion, both groups improved their knowledge of physical activity after the intervention sessions. This study confirms the acceptance of the exercise board game among overweight and obese children in primary schools. Further research is needed to evaluate the attitudes and practices of children towards physical activity after playing the exercise board game.

Keywords: Acceptance, knowledge of physical activity, overweight and obese children, exercise board game

Introduction

Nowadays, high technology gadgets such as tablets, mobile phones, computers, and gaming consoles are commonly used by children. Using these gadgets further increases screen time, which was already high among children (Lee et al., 2015). Most Malaysian children spend a lot of time on sedentary activities, with an average of 3.1 hours of screen-based activities per day, which exceed the current recommendation of 2 hours of screen-based activities a day (Lee et al. 2015). High amounts of screen time and physical inactivity have been found to be associated with a higher prevalence of overweight and obesity among children (Hills, Andersen, & Byrne, 2011; Lee et al., 2015).

In 2010, Malaysia was ranked as the sixth country in Asia with 60% of the population overweight and obese, of which 38% were children (World Health Organization, 2009). The recent National Health and Morbidity Survey (NHMS) reported an increase in the percentage of overweight and obese Malaysian children below 18 years of age – from 5.4% in 2006 to 6.1% in 2011 and 11.9% in 2015 (Ministry of Health Malaysia, 2015). In Kuala Lumpur itself, the prevalence of obesity was 19.4% (Ministry of Health Malaysia, 2015). In Malaysia, a study among ethnic Malay children aged 8 to 12 in Kuala Lumpur and Selangor showed that 13.1% were overweight, while 16.5% were obese (Yang et al., 2017).

According to the South East Asian Nutrition Survey of Malaysia (SEANUTS Malaysia and report card on physical activity for children and adolescents), less than 40% of primary school children reported being physically active (Sharif et al., 2016; Wong, Parikh, Poh, & Deurenberg, 2016). A review paper showed that increasing physical activity was associated with a decreased risk of obesity. It suggested that obesity among children may be reduced by the promotion of physical activity and the reduction of screen time (Lee et al. 2015). Malaysia Active Healthy Kids Report (2016) also suggested that more effort to raise awareness of health-related physical activity to children is required (Sharif et al., 2016).

To increase physical activity and to reduce sedentary behaviour, while managing overweight and obesity among children, an interactive solution could be introduced to instil awareness of the benefits of physical activity among children. Games, with their cooperative and experience-based learning, can highly motivate young people. A therapeutic board game is an influential tool to enhance learning among children (Hromek & Roffey, 2009). A study has shown that using board games can create a dynamic learning environment (Abdulmajed, Park, & Tekian, 2015). Another study conducted on the effectiveness of educational board games showed improvement in knowledge and behavioural changes among the school children (Ejike et al., 2017). Therefore, an exercise board game could be introduced to manage the problem among overweight and obese children.

To date, there have been no studies in Malaysia using board games as the exercise intervention tools to manage overweight and obese children. Therefore, this study aims to evaluate the acceptance and effectiveness of an exercise board game to improve knowledge of physical activity amongst overweight and obese children in Kuala Lumpur.

Study design & Methods

Exercise board game

The exercise board game was developed by a group of postgraduate students from Universiti Kebangsaan Malaysia (UKM) in 2016. The purpose of this board game is to increase the physical activity level of children aged 7-11 years old. This exercise board game gets all players (maximum four players) up and moves for a fun burst of physical activity. It is an interactive game which parents can play together with their kids to minimize sedentary time at home. It took around 30-45 minutes to complete the game. It is played with a dice, four Power cards, fifteen Chance cards and twelve Knowledge cards. All players need to do a warm-up session for 3-5 minutes to get the Power Card. This card can be used throughout the game to stop a player from moving one round or move five steps backward. Each location of the board game corresponds to different types of physical activity task (an exercise video guide is provided). A stamp will be given if the player can do the activity twice (maximum two stamps). However, the player needs to move 3 steps backward if he/she refuses to do the activity. If a player land on a square marked 'Knowledge', the player has to memorize any three of the vegetable or fruits name. If a player land on a square marked '?', the player has to follow the instructions given from the card he/she chose. If a player land on an ambulance, go to the hospital, he/she has to start the next turn from square marked 'hospital'. A player that reach the finish point first and have at least 5 stamps will be the winner. The game ends with cooling down session. Players need to move their arms and legs slowly and breathe in and out 4 times.

This study was divided into three phases: (i) development and validation of questionnaires on knowledge of physical activity and acceptance of the exercise board game; (ii) assessing the effectiveness of conventional physical activity education through explanation on physical activity pyramid versus an interactive education session through playing the exercise board game; and (iii) assessing the acceptance of the exercise board game among the intervention group.

This study was approved by the Medical Research and Ethics Committee of UKM and written informed consent was obtained from the parents or guardians of the subjects.

Phase I was conducted in two public locations (Titiwangsa Lake and National Library of Malaysia) and children aged 7-11 years old were randomly included to pre-test the questionnaires. Phase II and phase III were conducted in four selected primary schools and children were divided into two groups: control and intervention groups. The inclusion criteria include primary school children aged 7 to 11 years old and can read and write. The exclusion criteria included physically disability.

Phase I: Development and validation of the acceptance and knowledge of physical activity questionnaires

The questionnaire of knowledge of physical activity was adapted from Maruf, Chianakwana, & Hanif, (2017), which was then modified and translated into a Malay version. The questionnaire included ten criteria on knowledge of physical activity, including example on type of physical activity, benefits of physical activity, effect of physical activity and cost of physical activity. The questionnaire was pre-tested on 19 respondents aged 7-11 years old to

assess their understanding of the sentences used, difficulty level and suggestion for the questionnaire.

The questionnaire of acceptance of the exercise board game was modified from Oung (2002). 12 respondents were recruited to evaluate their understanding of the sentence used. There were eight criteria included in the questionnaire, including whether it is attractive, easy to follow and play, understanding of the instructions given, and whether there is a need to improve the board game.

For both questionnaires, each criterion was rated with emoticons; a smiley face indicated 'yes', a sad face indicated 'no', and an emotionless face indicated as 'not sure'. Cronbach's Alpha was used to test the reliability level. The test is considered reliable when the overall Cronbach's Alpha value is higher than 0.7 (Cho & Kim, 2015).

Phase II: Evaluation of increasing knowledge of physical activity

The pre-tested questionnaires of knowledge of physical activity were given before and after the study for both the active play in intervention group (exercise board game) and conventional education in the control group (pyramid of physical activity). Changes in subjects' knowledge were evaluated for both groups. The results were analysed using Wilcoxon signed rank by SPSS software (IBM Corp, version 22).

Phase III: Acceptance of the exercise board game

Only the intervention group was involved in this phase. The pre-tested questionnaire of acceptance of the exercise board game was given to the children in intervention group at the end of the session.

Findings

The reliability level was tested using Cronbach's Alpha for knowledge of physical activity and acceptance of the exercise board game questionnaires. Both questionnaires were reliable, with a Cronbach's Alpha value of 0.723 for knowledge of physical activity questionnaire and 0.741 for acceptance on the board game.

A total of 68 children were recruited, with no significant difference in sociodemographic and physical characteristics between the intervention and control groups (Table 1). Table 2 shows a significant increase in the total score of knowledge of physical activity in both the intervention ($p = 0.005$) and control group ($p = 0.005$). Based on the answers on knowledge of physical activity, for the control group, there was a significant difference in increasing knowledge of the three criteria i.e. the type extent and cost of physical activity. Whereas there was a significant difference in increasing knowledge of two criteria which both were the type of physical activity (Table 2). According to the level of knowledge, for control group, most of the children were good $n = 26$ (76.5%) while for intervention group, most of the children were found to be moderately satisfactory $n = 19$ (55.9%) ($p = 0.003$) (Figure 1).

Table 3 shows that the acceptance level of the children on the exercise board game were high (67.7%). Overall, the children enjoyed playing the board game (91%) and perceived that the game was interesting (97%), useful (94%), easy to learn (82%) and understand the instructions (79%). They also would like to continue playing the board game (82%) and will invite their friends to play with (82%). A higher proportion of them (85%) disagreed that the current board game needed any modifications (Table not shown).

Table 1: Socio-demographic profiles and physical characteristics of subjects

Socio-demographic characteristics	Intervention n = 34	Control n = 34	All n = 68	p-value ^a
Age	9.09 (1.08)	9.56 (1.21)	9.32(1.17)	0.096 ^b
Sex				0.622
Boy	21 (61.8)	19 (55.9)	40(58.8)	
Girl	13 (38.2)	15 (44.1)	28(41.2)	
Household income (RM)				0.614
< 1000	1 (2.9)	-	1(1.5)	
1000 - 4999	18 (52.9)	18 (52.9)	36(52.9)	
> 5000	14 (41.2)	16 (47.1)	30(44.1)	
Undisclosed	1 (2.9)	-	1(1.5)	
Maternal Education Level				0.246
No formal education	-	2(5.9)	2(2.9)	
Lower secondary school	1(2.9)	-	1(1.5)	
Upper secondary school	10(29.4)	16(47.1)	26(38.2)	
Pre-University	5(14.7)	5(14.7)	10(14.7)	
University/College	17(50.0)	11(32.4)	28(41.2)	
Undisclosed	1(2.9)		1 (1.5)	
Paternal Education Level				0.247
No formal education	-	1(2.9)	1(1.5)	
Lower secondary school	1(2.9)	5(14.7)	6(8.8)	
Upper secondary school	19(55.9)	15(44.1)	34(50.0)	
Pre-University	1(2.9)	4(11.8)	5(7.4)	
University/College	10(29.4)	7(20.6)	17(25.0)	
Undisclosed	3(8.8)	2(5.9)	5(7.4)	
Weight, kg (mean, SD)	44.6 (10.9)	46.4 (9.5)	45.5(10.2)	0.465 ^b
Height, cm (mean, SD)	133.5(8.3)	137.1(8.7)	135.3(8.6)	0.087 ^b
BMI, kg/m ² (mean , SD)	24.8(4.5)	24.5(3.8)	24.7(4.1)	0.779 ^b

^a Analysed using Chi Square test.

^b Analysed using Independent-t test.

Table 2: Comparison of mean score of knowledge of physical activity between control and intervention group.

	Intervention Group				p-value	Control Group				p-value
	Pre-study (n=34)		Post-study (n=34)			Pre-study (n=34)		Post-study (n=34)		
	median	25 th -75 th percentile	median	25 th -75 th percentile		median	25 th -75 th percentile	median	25 th -75 th percentile	
Total Score	8.0	6.0-9.0	8.0	8.0-10.0	0.005**	9.0	7.0-10.0	10.0	8.8-10.0	0.005**

**significant difference (p<0.05) between pre and post score

Total score (score = 10)

Analyzed using Wilcoxon Signed Rank test.

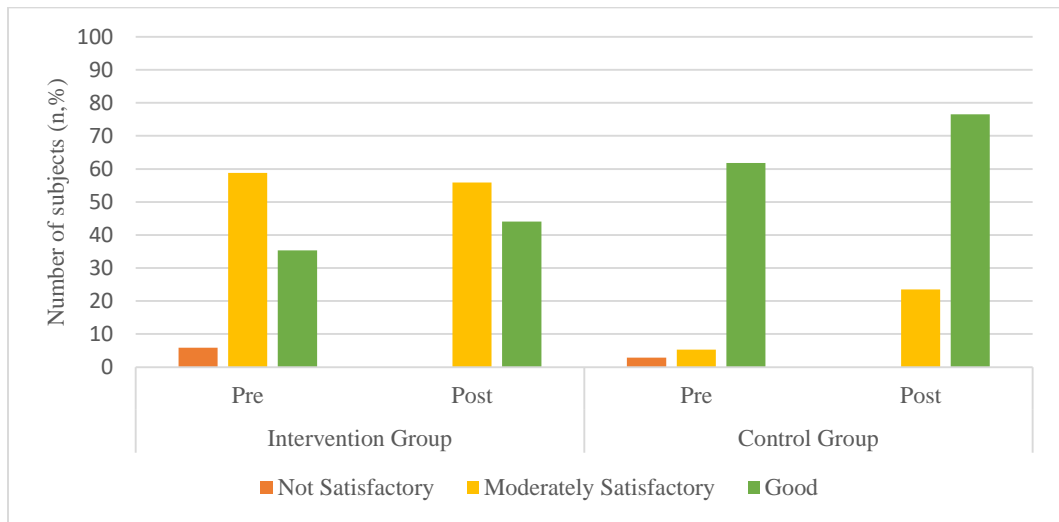


Figure 1: Level of knowledge on physical activity for pre- and post-study between the intervention and control groups.

Table 3: Level of acceptance on the exercise board game among the intervention group

Level on knowledge of physical activity	Intervention group (n=34)	
	n	%
Low	-	-
Medium	11	32.4
High	23	67.6

Percentage of score, 0-40 represented low; 41-85 represented medium; 86-100 represented high.

Discussion

This study examined the level of acceptance of the exercise board game among overweight and obese children and its effectiveness in improving knowledge of physical activity.

This study showed a significant improvement in the total score of knowledge on physical activity for intervention group and control group from pre- and post-intervention study. For the control group, education was given conventionally, while the intervention group received

the education while playing. It was discovered during the intervention for the exercise board game, some of the children showed no interest in doing physical activity with their friends. According to Cebolla et al. (2015), overweight and obese children have different thoughts on physical activity as compared to normal children. Overweight and obese children dislike participating in physical activities compared to normal children who were always motivated when doing physical activity (Cebolla et al., 2015). When we look into the criterion of knowledge in physical activity which is '*physical activity does not have to be hard*', there was a significant difference in the control group; however, no significant differences in the intervention group either pre- and post-study were perceived. It was observed that overweight and obese children easily lose breath during exercise. Also, overweight and obese children tend to have low self-esteem and lack of confidence when doing exercise (Knott, 2018).

The board game is an educational tool with physical activities to promote healthy lifestyle among primary school children. The acceptance of the exercise board game among obese and overweight children was high in this study, with a total score of acceptance of 7.00 (6.0-8.0) compared to the full score of 8 points. The board game was printed in A2 size for maximum 4 players to play. Children enjoyed the exercise board game because it is fun and interactive. The exercise board game is meant to promote increased physical activity level among overweight and obese children through the concept of learning while playing. Studies showed that children aged 6-12 years enjoy games and rules (PearsonSchools, 2015) while they were motivated to participate in active play (McWhorter, Wallmann, & Alpert, 2003). Furthermore, board games with the concept of physical activity especially for children have not yet launched in the Malaysian market, but some studies have proven that these types of board games can be accepted and used as an educational tool. A study conducted in Malaysia had been performed using the board game as an educational material to promote weight reduction through dietary and physical activity interventions, named '*JejaKalori*'. (Fatahudin, 2014).

The strength of this study was the pre-tested questionnaire, which was related to exercise board game and Malaysia's pyramid of physical activity. In addition, this was the first study to focus on the effectiveness of an exercise board game in improving knowledge of physical activity among overweight and obese children. The current study only involves Malay primary school overweight and obese children and evaluates knowledge of physical activity in the context of the exercise board game. In future, the study could be extended to evaluate the attitude and practice of different races of the primary school children on the exercise board game, which will require the use of questionnaires in their native languages. Furthermore, follow-up sessions should also be conducted in order to investigate the effectiveness of the exercise board game on the children's body composition.

Conclusion

In conclusion, the exercise board game was well accepted by the overweight and obese children and was effective in improving the children's knowledge of physical activity. For future studies, we recommend studying the changing of knowledge, attitude and practice of physical activity instead on only focussing on knowledge of physical activity. Additionally,

a follow-up study is recommended to evaluate the effectiveness of the exercise board game in improving body weight status among overweight and obese children.

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