

# Early Detection and Education of Potential Obesity for Prospective Brides Using an Android-Based Botting Macca Application

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## Abstract

Non-communicable diseases related to being overweight or obese have become a worldwide problem. There are various ways to help the weight loss program. This research aims to develop an android-based application for early detection and education of potential obesity for prospective brides, to test validation of media and material experts on products, small and large sample trials with a pre-post test on prospective brides. This study is categorized as research and development (R&D) based on Borg and Gall development model. Quasi-experimental design with a pre-post test was used in the research. Purposive sampling was used with 20 respondents of the prospective bride who were given an android-based application and 20 respondents were given print media. The research was conducted in Makassar, South Sulawesi in January - July 2020. The final results were carried out by the Man-Whitney statistical test to see the effect of giving applications to the prospective bride. The results of the research obtained the Botting Macca application was feasible to be developed based on the assessment of the media and material expert validation tests, and the results of small sample trials. The results of the large sample trial obtained p-value  $0.001 < p < 0.05$  meaning that the Botting Macca application affects early detection and education of potential obesity in the prospective bride. The research implies an Android-based of Botting Macca application program is applicable and suitable for future use.

**Keywords:** Applications, Android, Media, Obesity, Print Out

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## 1. Introduction

Obesity and overweight play a big role in the increase of morbidity and mortality worldwide (Wang et al. 2016); Sebastian, 2020). The prevalence of overweight and obesity has globally increased. Adults increased by 2.75%, children by 47.1%, men by 13.9% lower than women by 23.8%, urban areas by 23.8%, and rural areas by 16.3% from 1980 to 2013. This number continued to increase from 921 million to 2.1 billion (Rosengren et al 2015; Risk and Collaboration 2017).

The proportion of overweight and obesity among adults has increased from year to year in South Sulawesi Province, Indonesia . The proportion of overweight increased by 8.6% in 2007, 11.5% in 2013, and 2.1% in 2018 (Pujilestari et al 2019). Meanwhile, the proportion of obesity raised from 10.5% to 14.8% in 2013 and 7.0% in 2018 (Pengpid and Peltzer 2017).

Some factors cause overweight and obesity including genetic factors, food choices, eating habits, food portions, environment, and lack of physical activity (Pengpid and Peltzer 2016). Obesity can increase the risk of various health problems such as asthma, diabetes mellitus types 1 and 2, cardiovascular disorders, hypertension, sleep disorders, bone disorders, hormonal disorders, and sexual disorders (Pegington, French, and Harvie, 2020; Nurwanti et al., 2018). Besides, overweight and obesity are the risk factors for infertility (Mooyaart, Liefbroer, and Billari, 2019; Leech and Johnson, 2012).

Several research programs related to the problem of overweight and obesity have been carried out (Ambrosini et al 2018; Hernandez 2020). Traditional use of books or leaflets is considered ineffective and inefficient to implement (Khusun and Fahmida, 2016; Fransen et al 2018; Ambrosini et al 2018). The advance of technology in smartphone and web-based application is expected to give a positive impact on weight loss, behavioral changes in food selection, physical activity, and a good understanding in utilizing the application (Hernandez, 2020; Afshin et al., 2016; Beleigoli et al., 2018; Buchan and Morgan, 2019; Duncan et al., 2018; Dunn et al., 2019; Foley et al., 2016). Furthermore, people understand relatively little about the dangers of overweight and obesity (Hutchesson et al., 2016; Lee and Michaelides, 2017; Matthews et al., 2017). Therefore, the researchers intend to develop an Android-based of Botting Macca application program for early detection and education of potential obesity for prospective brides.

## 2. Methods

### 2.1 Study design

This study used Research and Development (R&D) based on Borg and Gall development model and quasi-experimental pre-post test (Huang et al. 2019). This research method intends to develop or validate products applied in education (Short et al. 2018). The product undergoes a validation test by a media expert, two material experts, and a small (n = 10) and large (n = 40) sample trial (Amelia et al. 2020).

### 2.2 Participants

The research respondents were prospective brides registered in January - July 2020 at Religious Affairs Office Biringkanaya. Respondents were taken by purposive sampling. The experimental group (n = 20) was given Botting Macca Application, and the control group (n = 20) was given print media.

### 2.3 Data collection

The respondents in each group were required to inform their weight, height, and abdominal circumference for early detection as well as underwent monitoring for research activities once a week for 4 weeks.

### 2.4 Statistical Data Analysis

Data were analyzed using small sample trials and questionnaires assessed by the media expert and two material experts while large sample trials used the Man-Whitney test. The average score for each expert's assessment is included in Table 1. If the calculation results show the value of each aspect is in the range 2.51 - 3.25 or 3.26 - 4.00, it categorizes valid and does not need to be revised.

**Table 1. Value ranges and scales**

Very good	3.26 - 4.00
Well	2.51 - 3.25
Enough	1.76 - 2.50
Less	1.00 - 1.75

### 2.5 Research Ethics

The study received a recommendation of ethical approval from the Faculty of Public Health, Hasanuddin Makassar University with protocol number 7420092136.

## 3. Result

### 3.1 Android-based of Botting Macca Application Product

The name of Botting Mecca was adapted from the traditional language, *Buginese*, meaning a smart bride. The researchers expect that the application can be useful and give a positive impact on users.

### 3.2 Media Expert and Material Expert Validations, and Small Sample Trial

According to the results of the application feasibility test, it could be concluded that the result of the assessment from the media experts was in a good category with an average score of 3.25 (see Table 2). The assessment included the size of the application, cover design, and application content. Meanwhile, the result of the assessment from the material experts was in a very good category with an average score of 3.30 (see Table 3). The assessment consisted of the feasibility of content, presentation, and, language and context. Also, the result of the assessment in the small sample trial was in a very good category with an average score of 3.63 (see Table 4). The assessment is composed of components of interest, content, and language. Based on the above description, the result of the total average score of media experts, material experts, and small sample trials on the Botting Macca Application product was in a very good category with a minimum score of 3.56.

**Table 2. The results of the media expert's test of the Botting Macca application for early detection and education of potential obesity**

ASSESSMENT ASPECT		MEDIA EXPERT	AVERAGE RATING
<b>Application Size</b>		<b>3.5</b>	<b>3.5</b>
1.	Suitability of application size with ISO standards	3	
2.	Suitability of size with the content of the application	4	
<b>Cover Design</b>		<b>3.25</b>	<b>3.25</b>
3.	The appearance of layout elements	3	
4.	Color layout elements	4	
5.	The letters used are attractive and easy to read	3	
6.	Application cover illustration	3	
<b>Application Content Design</b>		<b>3</b>	<b>3</b>
7.	Consistency of appearance layout	3	
8.	Printable and space layout elements	3	
9.	Title layout elements and illustrations	3	
10.	Embedding layout	3	
11.	The typography of simple application contents	3	
12.	The typography of the app content is easy to understand	3	
13.	Content illustration	3	
<b>Average</b>		<b>3.25</b>	<b>3.25 (Good)</b>

**Table 3. The results of the material expert's test on the Botting Macca application for early detection and education of potential obesity**

Component		EXPERT I	EXPERT II	Average rating
<b>Content Feasibility Aspects</b>		<b>3,6</b>	<b>2,65</b>	<b>3,12</b>
1.	Material feasibility	4	3,5	
2.	Material accuracy	3,4	2,6	
3.	New and advanced materials	3	2,5	
4.	Encourage curiosity	4	2	
<b>Presentation Feasibility Aspects</b>		<b>3,95</b>	<b>2,6</b>	<b>3,27</b>
1.	Presentation technique	4	3	
2.	Serving support	3,8	2,4	
3.	Presentation of learning	4	2	
4.	Coherence and sequence of thought	4	3	
<b>Aspects of Language Eligibility</b>		<b>3,8</b>	<b>3,2</b>	<b>3,5</b>
1.	Straightforward	4	4	
2.	Communicative	4	3	
3.	Diagnosis and interactive	4	3	
4.	Conformity with development	3	3	
5.	Compliance with language rules	4	3	
<b>Aspects of Contextual Eligibility</b>		<b>3,65</b>	<b>3</b>	<b>3,32</b>
1.	Contextual nature	3,5	3	
2.	Contextual component	3,8	3	
<b>Average</b>		<b>3,75</b>	<b>2,86</b>	<b>3,30 (Very good)</b>

**Table 4. Results of trials of respondents on the Botting Macca application for early detection and education of potential obesity**

User	I	II	III	IV	V	VI	VII	VIII	IX	X
Interest	3.66	3.16	3.16	3.83	3.83	4	3.5	4	3.5	3.66
Theory	3.66	3.5	3.16	4	3.33	4	3.66	4	3.5	3.83
Language	3.66	3	4	3.33	3.66	3.66	3.66	4	3.33	3.66
<b>Component</b>		<b>Average value</b>								
Interest		3.63								
Theory		3.67								
Language		3,6								
<b>Average</b>		<b>3.63 (Very good)</b>								

### 3.3 Large Sample Trials

Table 5 shows normal and overweight and obese respondents who are mostly at the age of 20-30 with 90% or 18 respondents in the experimental group (given the Botting Macca application) and 100% or 20 respondents in the control group (given print media). The respondents in the two groups mostly work in private sector with 10 respondents (50%) in the experimental group and 15 respondents (75%) in the control group. Based on the respondents' mid-upper arm circumferences (MUAC) 9 respondents (45%) in the experimental group were  $\geq 23.5$  cm - 25 cm of MUAC and 11 respondents (55%) were  $\geq 25.5$  cm of MUAC. Meanwhile, 7 respondents (35%) print media were  $\geq 23.5$  cm - 25 cm of MUAC and 13 respondents (65%) were  $\geq 25.5$  cm of MUAC in the control group.

**Table 5. Description of Characteristics**

Variable	Botting Macca Application						Total	
	Normal		Overweight		Obesity		n	%
Age	n	%	n	%	n	%	n	%
$\leq 19$ years	1	5%	-	-	1	5%	2	10%
20-30 years	6	30%	6	30%	6	30%	18	90%
$\geq 30$ years	-	-	-	-	-	-	-	-
<b>Total</b>							<b>20</b>	<b>100%</b>
<b>Media Print</b>								
$\leq 19$ years	-	-	-	-	-	-	-	-
20-30 years	8	40%	7	35%	5	25%	20	100%
$\geq 30$ years	-	-	-	-	-	-	-	-
<b>Total</b>							<b>20</b>	<b>100%</b>
Profession	Botting Macca Application						Total	
	Normal		Overweight		Obesity		n	%
IRT	n	%	n	%	n	%	n	%
IRT	1	5%	-	-	-	-	1	5%
entrepreneur	-	-	-	-	-	-	-	-
Private	2	10%	4	20%	4	20%	10	50%
PNS / Honorary	1	5%	-	-	2	10%	3	15%
Work / other	3	15%	2	10%	1	5%	6	30%
<b>Total</b>							<b>20</b>	<b>100%</b>
<b>Media Print</b>								
IRT	-	-	-	-	-	-	-	-
entrepreneur	-	-	-	-	-	-	-	-
Private	6	30%	6	30%	3	15%	15	75%
PNS / Honorary	2	10%	1	5%	2	10%	5	25%
Work / other	-	-	-	-	-	-	-	-
<b>Total</b>							<b>20</b>	<b>100%</b>
Upper Arm Circumference (LILA)	Botting Macca Application						Total	
	Normal		Overweight		Obesity		n	%
	n	%	n	%	n	%	n	%
$< 23.5$ cm	-	-	-	-	-	-	-	-
$\geq 23.5$ cm - 25 cm	7	35%	2	10%	-	-	9	45%
$\geq 25.5$ cm	-	-	4	20%	7	35%	11	55%
<b>Total</b>							<b>20</b>	<b>100%</b>
<b>Media Print</b>								
$< 23.5$ cm	-	-	-	-	-	-	-	-
$\geq 23.5$ cm - 25 cm	5	25%	2	10%	-	-	7	35%
$\geq 25.5$ cm	3	15%	5	25%	5	25%	13	65%
<b>Total</b>							<b>20</b>	<b>100%</b>

The average pre-test and post-test results for early detection of potential obesity are shown in Table 6. The respondents' body weight and abdominal circumference in the experimental group decreased while in the control group print media increased. Besides, the respondents' height in both groups was stable. It implies that the Botting Macca application can be used for early detection of potential obesity and as a tool to help weight loss and reduction of abdominal circumference for brides.

**Table 6. Average Pre-Test and Post-Test Results for Early Detection of Potential Obesity**

Item	Control (Print)			Experiment Botting Macca Application)		
	Pre - Test		Post - Test	Pre - Test		Post - Test
	Score	(%)	Score (%)	Score	(%)	Score (%)
BB (kg)	63.90	25%	64.80	20	62.65	25%
TB (cm)	156.90	35%	156.90	20	156.75	35%
Abdomen (cm)	76.35	40%	76.90	20	75.60	40%

Table 7 shows the pre and posttest results of education of potential obesity monitoring. Seven respondents (35%) were categorized obese and after using the Botting Macca application the number of obese respondents decreased by 10% (2 respondents). It implies that the Botting Macca application can be further developed to provide overweight and obesity education for prospective brides.

**Table 7. Results of Pre-Test and Post-Test Monitoring of Potential Obesity Education**

Category	Control (Print Out)				Experiment (Macca Botting Application)			
	Pre - Test		Post - Test		Pre - Test		Post - Test	
	Score	(%)	Score	(%)	Score	(%)	Score	(%)
Obesity	5	25%	8	40%	7	35%	2	10%
Overweight	7	35%	9	45%	6	30%	5	25%
Normal	8	40%	3	15%	7	35%	13	65%
amount	20	100%	20	100%	20	100%	20	100%

The result of data analysis by using the Man-Whitney statistical test was shown in Table 8. The result obtained p-value 0.001 < p value 0.05 with Ho was rejected and Ha was accepted meaning there was a difference in the effect of using the Botting Macca application for early detection and education of potential obesity with print media. The results of the mean ranks of the experimental group and control group were 26.05 and 14.95 respectively.

**Table 8. The Mann-Whitney test**

Media	n	Mean Rank	P-Value
Botting Macca Application	20	26.05	0.001
Print Media	20	14.95	

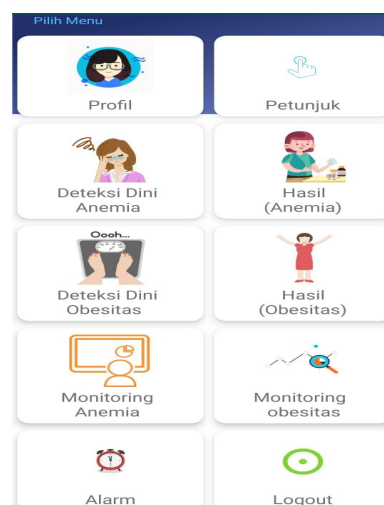
#### 4. Discussion

The android-based Botting Macca application can be used and developed as a tool for early detection in terms of body weight, height, and abdominal circumference as well as education for potential obesity in terms of food menu selection and physical activity for prospective brides.

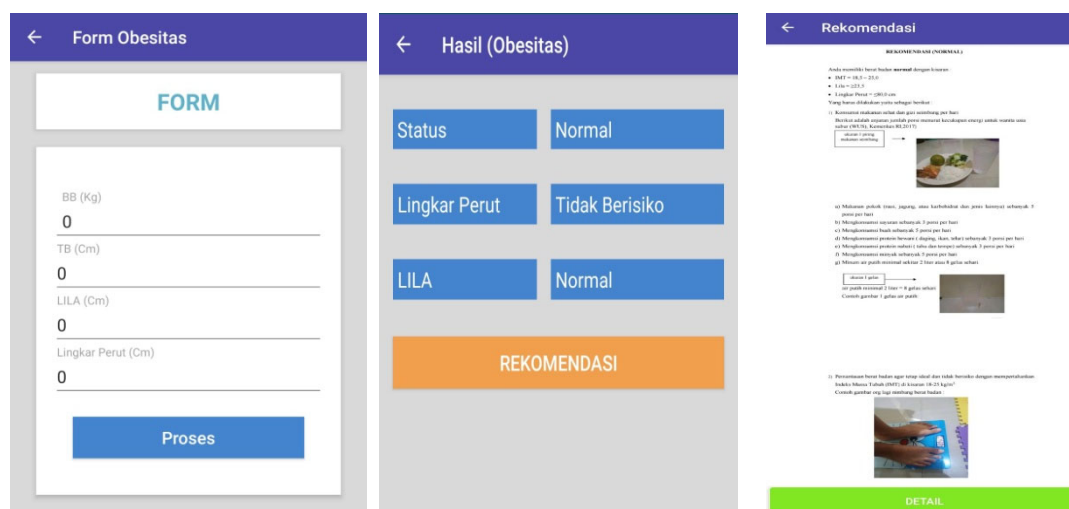
The Botting Macca application has some menus in it. The users would find a login menu consisting of a user and a password as the initial screen shown in Figure 1. After logging in, the user would get several advanced features, such as profiles, instructions for use, early detection features, results of early detection, and educational monitoring adjusted from early detection results. Users also can see a logout menu if they want to exit the application at any time. All of these features are shown in Figure 2. Figure 3 describes the items of early detection from the early detection feature, recommendation, and education that the application suggests to users.



**Figure 1: Login Features Menu**



**Figure 2: Advanced Features Menu**



**Figure 3:** Early Detection Features Menu, Result Features, and Recommendations

The use of the smartphone-based application can be an important component in preventing and reducing cases of being overweight or obese for prospective brides (Schoeppe et al. 2016; Survey and Aljuraiban 2019; Kliemann et al. 2019). This is in line with another research (Matthews et al. 2017) developing an application and web-based namely "HelpMeDofit!" for adult respondents with obese conditions so that they can obtain social support and build their awareness of the detection results generated by the application.

According to the results of the validation test by media and material experts and small sample trials, they suggest that the assessment results from material and media experts and a small sample trial show an average score of 3.30 (see Table 2,3.25 (see Table 3), and 3.63 (see Table 4) respectively. These numbers are categorized into very good, good, and very good category The criteria for the assessment results matched the results of the study so that the product was very feasible and could be used without revision (Amelia et al. 2020).

This study described the characteristics of the respondents in two groups (Table 5) There were 29.4% of women aged 19 - 55 years observing at risk for obesity and most of them had a sedentary lifestyle or light activity. Examples of a sedentary lifestyle are students (not working), housewife, entrepreneurs/traders, workers in private sector, etc) (JY Lee et al. 2019). The use of MUAC in this study is in line with the research conducted by Shane HR and Pasiak (2016) stating that there is a relationship between upper arm circumference and obesity. This study obtained a spearman correlation value of 0.7111 meaning that MUAC is strongly associated with obesity and body mass index (BMI). If a woman's MUAC is more than the normal limit of 25.5 cm, she is at risk of being overweight and obese.

Several changes occurred in both experimental and control groups during the study. The first change is related to weight loss. Twenty respondents in the experimental group with Botting Macca application had an average body weight of 62.65 kg and it significantly decreased for 4 weeks with an average of 59.95 kg. On the other hand, 20 respondents in the control group with print media had an average body weight of 63.90 kg, and it increased to 0.9 kg for 4 weeks. The second change is related to the abdominal circumference. The experimental group experienced an average of 1 cm decrease of abdominal circumference from 75.60 cm to 74.60 cm whereas an increase of 0.55 cm from 76.35 cm to 76.90 cm was experienced by 20 respondents in the control group for 4 weeks (see Table 6). The results of this study were in line with the previous one testing an application called Track Unit to 20 overweight and obese respondents for 4 weeks. The findings show the respondents' body weight decreased with an average median value of -2.7kg (Buchan and Morgan 2019). Another result from a previous study in Seoul reveals that there was a reduction of body fat -6.0 - 5.4%. This study used an application namely NOOM for 15 weeks to 104 respondents aged between 20-60 with overweight and obese conditions, The reduction of body fat affected the decrease of the abdominal circumference by 1cm or -3.4% - 2.7 kg over 6 weeks (D. Lee and Michaelides 2017). The above results suggest that the respondents experiencing body weight changes in the control group were mostly at risk based on BMI categories (Ministry of Health of the Republic Indonesia, 2017). Some of them were from rural areas (Lancet 2015). A healthy lifestyle (Nurwanti et al. 2018) and education for brides and grooms are important to prevent overweight and obesity (Mahmudiono et al. 2016). The third change is related to body height. There was no significant change in body height for both groups, however. This study result was in line with another research result saying that the given intervention does not affect height, but it affects body weight based on the BMI calculation of respondents (2018 Sofa).

Table 7 shows the results of the pre-and post-test of education of potential obesity. There was a reduction in the number of respondents categorized into obese and overweight after using the application. The reduction



occurred from the first week until the fourth week of monitoring was from 35% (7 respondents) to 10% (2 respondents) in the obese category and from 30% (6 respondents) to 25% (5 respondents) in the overweight category. The changes in these categories gave a positive impact on the increase of normal category from 35% (7 respondents) to 65% (13 respondents) meaning that there was a 30% increase in the normal category. The change occurred because most respondents understood their condition. They regularly checked themselves and the education given was based on the explanation in the application. The changes in terms of lifestyle (Pengpid and Peltzer 2017) such as adapting good sleep habit, doing physical activity (Nurwanti et al. 2018), diet (Khusun and Fahmida 2016), and more understanding in nutritional balance were carried out by most respondents (Gerson et al 2011). Any increase in respondents' knowledge about a healthy life will make their life better (Mahmudiono et al. 2016) as they know the impact of adopting a healthy life (Susiyadi 2016) for now (Dune, Barnes, and Marsh 2014) and the future (Soltani et al. 2017). The results of this study are in line with the research results of 20 female respondents with overweight and obese categories. The results show changes every week. The initial median BMI was 32 kg / m<sup>2</sup> and it became 30.8 kg / m<sup>2</sup> for 4 weeks so that the intervention could affect the category of respondents (Buchan and Morgan 2019). The results of the study in the control group show 25% (5 respondents) were categorized obese and then increased to 40% (8 respondents). Also, there was an increase of 10% from the initial value of 35% (7 respondents) to 45% (9 respondents) in the fourth week for the overweight category. Meanwhile, there was a decrease in the normal category from 40% (8 respondents) in the first week to 15% (3 respondents) in the fourth week. Hence, there was a decrease of 25% for 4 weeks (see Table 7). Based on the data collection, the respondents were in the normal category initially. (Oddo, Maehara, and Rah 2019), but they did not apply a healthy lifestyle (Pengpid and Peltzer 2017), and still lacked an understanding of the potential dangers of obesity that could threaten their future (Pengpid and Peltzer 2016). The results of this study were similar to another research using 2 methods, namely using an application using paper to rewrite what had been consumed for 24 hours (24h food recall). The results of the study show that mean energy intake was 8854 ± 2267 and total mean fat intake was 34.0 ± 6.2 in the experimental group. On the other hand, mean energy intake and total mean fat intake was 9123 ± 2337 and 34.8 ± 6.7 respectively in the control group (Ambrosini et al. 2018)

The results of the statistical tests in Table 8 used the Mann-Whitney test with a p-value of 0.001 < 0.05. This is in line with what has been said by Ambrosini et al. (2018) saying that there is a significant difference in the changes experiencing by the respondents in the obese category of the experimental group in terms of energy intake and total fat intake compared to those in the control group.

Instead of using print media, using the application eases the users to educate themselves. Various forms of application such as web-based and smartphone are proven to increase the effectiveness of health promotion (Granado-font et al. 2015). Studies on the use of media applications to solve overweight and obesity problems have been widely carried out to promote a healthy life (Schoeppe et al. 2016).

The use of the application makes it easier for public and medical personnel to control and reduce the number of overweight and obesity and other health problems (Amelia et al. 2020). Several policies in some countries have established countermeasures through surveys from the results of application assessments for some health problems (JY Lee et al. 2019).

The implication of this research is to facilitate early detection and help people in getting proper education that has been recommended by the application for prospective brides. The application is proven to change the respondents' attitudes and behavior towards overweight and obesity. Therefore, the use of the Botting Macca application is considered feasible and can be developed as an educational media. The health education through media applications helps women with overweight and obesity categories to lose weight (D. Lee and Michaelides 2017), change their lifestyle (Duncan et al. 2018) and at the same time provide social support for the health problems they face (Matthews et al. 2017)

## 5. Conclusion

The development of an android-based application product called Botting Macca was suitable for use without any revision and could be developed as a medium for early detection and education of potential obesity for prospective brides. The product was developed based on the assessment results from media and material experts as well as small sample trials including the components of application size, cover design, application content design, aspects of the feasibility of the content, presentation, language and context, components of interest, and material. Large sample trials of prospective brides using the Botting Macca application were carried out as early detection and education of potential obesity affecting body weight and abdominal circumference while the height did not change significantly.

The development for further research is expected to develop a component of automatic calorie counting by using food photos equipped with a consultation sheet or consultation number which could describe the kinds of food calories to eat. Besides, a feature of the walking tracker as many respondents prefer doing morning and evening walks as alternative options for physical activity in the Botting Macca application for early detection and education of potential obesity in prospective brides.

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