



DEVELOPMENT OF APPLICATION FOR OBESITY-CARE

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ABSTRACT

The increasing adoption of the mobile device and widely use of application of Android operating system has provided a significant boost to use mobile as a platform for providing healthcare services. As the implement of health application in Android platform is costless and convenient has motivate the increasingly develop of health care application in mobile devices. This paper presents the development of obesity-care application for the Android Platform which can be used effectively in mobile devices. The obesity-care application will obtain the age, gender, weight and height of the user as the input of the system. Next, physical condition (underweight, normal and overweight) and suggestion of calories intake are given to the user to enhance the awareness of public on obesity issue. Further study and efforts is necessary to be undertaken to improve and discover the usefulness and effectiveness of health care application in android system.

Keywords: android operating system, mobiles devices, obesity-care application.

1. INTRODUCTION

In our looks-obsessed society, lots of people think that being obesity is an appearance issue, yet being overweight is actually a health problem which will lead to some serious disease like diabetes and heart disease. As the mobile device has become widely used in the world, provide a platform to implement health care application. These applications are costless, time-saving, and enable the user to frequently monitoring their body condition by using their mobile data and sensor. The reason of using mobiles devices to monitoring health problem instead of going to hospital are preventing traffic congestion and medical expenses. [1-3]

However, prevention is always better than cure, an application which could analyze user body condition and provide recommendation are important for the user to implement a healthy lifestyle. [4] A healthy lifestyle including regular exercise and good eating habits with adequate nutrients and portion of food intake. Regular exercise can help reduce body fat as well as protect against chronic diseases associated with obesity. [5] Whereas portion control is important for weight management, which encourages people to increase the proportion of foods low in energy density in their diets while limiting portions of high-energy-dense foods. [6] These health care applications enable people to get factual information and can have suggestion against their health. This would help them to understand their body physical condition and illness. [7]

Moreover, as obesity becoming a more serious problem which also included children, who not perceived about health issue, there are some application that are particularly design for children to monitoring their body conditions. Monitoring is the first step of resolve a health problem as it could let user to understand his illness and further action can be taken by guardian. [8] Besides, motivation is one of the key of success in preventing obesity. Many applications had design in different way such as games to motivate public to exercise and take care of their health. As we know that games are attractive to

both children and adults and by using gaming to promote prevention of health problem can a good response from public. [9-10]

This paper presents an obesity-care health application on the android platform. This application would categories user from a range of physical condition based on gender, age, and body mass index value (BMI). Next, suggestion on daily calories needed are given to enhance the awareness of user about obesity.

2. CALCULATION

The main purpose of this obesity-care application is to calculate the BMI value, daily calories need by the user and given recommendations and motivations.

A. Calculates BMI value and categories

$$\text{BMI} = \frac{\text{weight}}{\text{height}^2} \quad (1)$$

BMI is calculating by using (1) based on user's weight and height.

After calculating the BMI value, the application wills categories user's body condition from a range of BMI categories.

Table-1. BMI Categories Based on BMI.

BMI categories	BMI value
Underweight	<18.5
Normal weight	18.5-24.9
Overweight	25-29.9
Obesity	>30

Table-1 depicts the categories of body condition based on BMI value. Useris categories as underweight if his BMI value smaller than 18.5, normal weight if the BMI value between 18.5 and 24.9, overweight if the BMI



value between 25 and 29.9, and if the BMI value of the user is bigger than 30, the user is obesity.

B. Calculate daily calories needs

Daily calories needs depend on user's metabolic rate, and physical exercise.

$$\text{Total Calories} = \text{BMR} + E \quad (2)$$

Where BMR is basic metabolic rate value and E is the energy for physical exercise. Equation (2) shows the calculation of daily calories needs where basic metabolic rate is the number of calories your body uses to carry out basic function like breathing, repairing food processing and growing tissue and circulating blood. Metabolic rate is depending on several factors, including:

- Body size and composition

The bodies of people who are larger or have more muscle burn more calories, even at rest.

- Gender

Men usually have less body fat and more muscle than women of the same age and weight, and they burning more calories.

- Age

As you get older, the amount of muscle tends to decrease and fat accounts for more of your weight, slowing down calorie burning.

Beside, energy needs for food processing (thermogenesis) are the energy requirement for the body to digesting, absorbing, transporting and storing the food. Basically, this accounts for 100 to 800 of the calories used each day and energy requirement for food processing are relatively steady and not easily changed.

Moreover, energy needs for physical activity account for the rest of the calories user's body burns up each day for body movement like walking, exercising, and even sleeping. Physical activity is the most variable factors that determine how many calories you burn each day.

To calculate basal metabolic rate (BMR), it is first considered for gender.

- For males:

$$\text{BMR} = 66.47 + (13.7 \times \text{weight [kg]}) + (5 \times \text{height [cm]}) - (6.8 \times \text{age [years]}) \quad (3)$$

- For females:

$$\text{BMR} = 655.1 + (9.6 \times \text{weight [kg]}) + (1.8 \times \text{height [cm]}) - (4.7 \times \text{age [years]}) \quad (4)$$

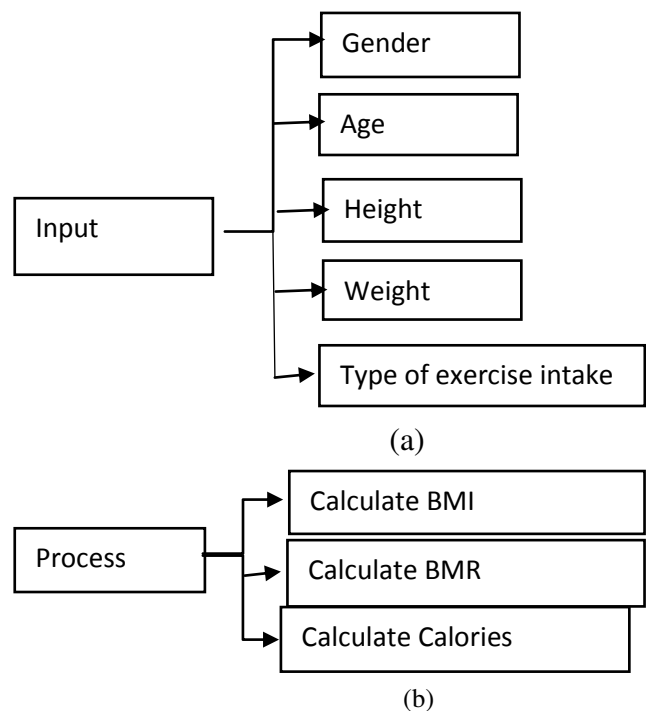
Next, BMR value is then put into the Harris Benedict Formula, which calculates the total calorie intake required to maintain current weight.

Table-2. Formulae for calculating the total calories need depend on different type of physical exercise.

Type of physical exercise	Total calorie need
Little/no exercise	BMR * 1.2
Light exercise	BMR * 1.375
Moderate exercise(3-5 days/week):	BMR * 1.55
Very active (6-7 days/week)	BMR * 1.725
Extra active (very active & physical job)	BMR * 1.9

Table-2 depicts the formulae for calculating the total calories need depend on the different type of physical exercise. The total calories need for user who have little or no exercise is calculate by multiply previous BMR value with 1.2, for user who does light exercise is calculated by multiply BMR value with 1.375, for moderate exercise (3 to 5 days per week) calculate by multiply BMR with 1.55, for very active (6 to 7 days per week) calculate by multiply BMR with 1.725, and for user who is extra active due to physical job are calculate by multiply BMR with 1.9.

3. SYSTEM AND APPLICATION OVERVIEW



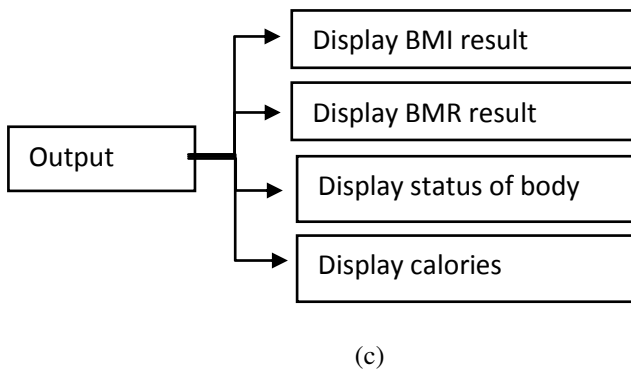


Figure-1. Operation system of the application.

Figure-1 shows the operation system of the application which include of input, process, and output system. In input system as shown in Figure-1(a), this application will get data directly from the user such as gender, age, height, weight, and type of exercise intake by the user.

Other than that, this application also will perform two process system with are calculating Body Mass Index (BMI) and Basal Metabolic Rate (BMR) as shown in Figure-1(b).

This application will have several output system as shown in Figure-1(c) such as display the result of BMI, display the result of BMR, display the status of body condition, and display the calories and exercise recommended for the user to do to keep their body fit.

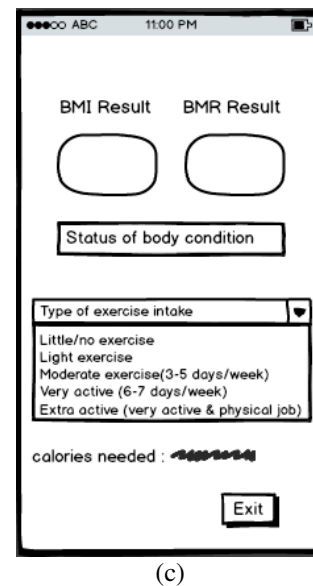
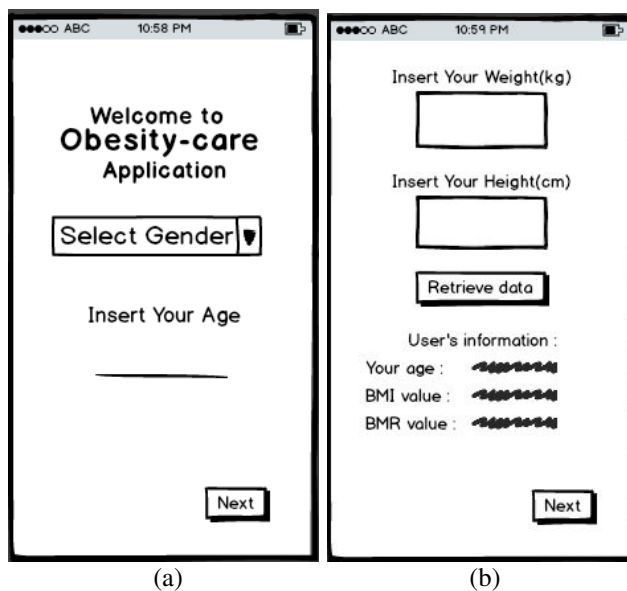


Figure-2. Roughly template of the application.

Figure-2 shows roughly template for the template of this application. In Figure-2(a), there will be provided one spinner button for the user to choose their gender. In gender button, the user can choose for male or female. Then, user will need to insert their age in the age area provided. There will be pop out the keypad number for the user to enter the value. Other than that, a “next” button also provided for user to proceed to the next page. Then, for Figure-2(b), the user will insert their weight in kilogram and height in centimeter in the box provided. There will provide a button for user to retrieve data. After that, user’s age, BMI result and BMR result will be displayed under the user’s information. A button to proceed to the next page also will be provided. On the next page, the BMI and BMR result, and the status of body condition will be display. Besides that, a button for the user to select their type of exercise intake also will be provided as shown in Fig. 2(c). Lastly, calorie required for the user also will be displayed.

4. APPLICATION FLOWCHART

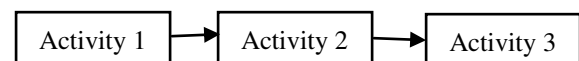
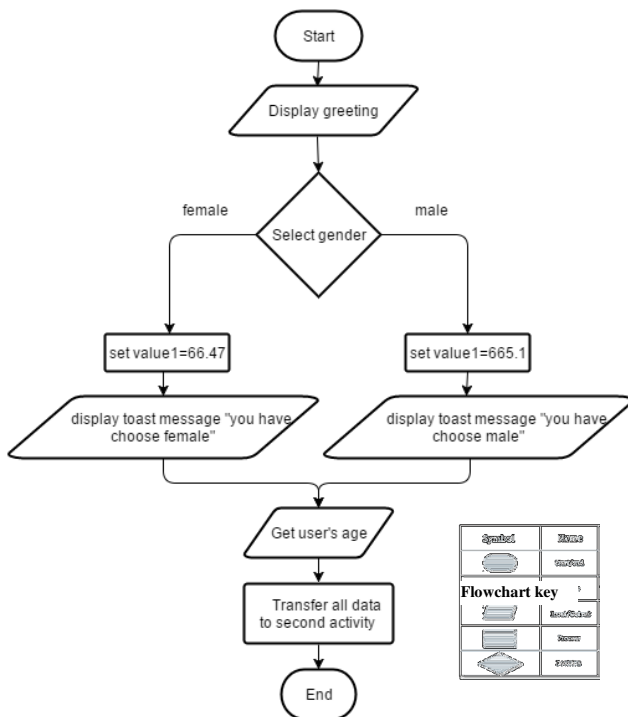


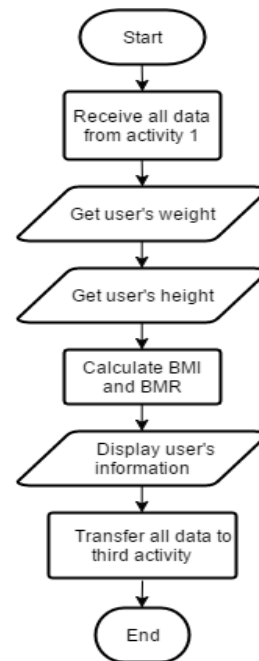
Figure-3. The flow of activity in the application.

This application contains of three activity with is activity 1, activity 2, and activity 3 as shown in Figure 3. These activities involved many process and related to each other which mean that the data collected from one activity will be used back in other activity to perform another process. This application will start with activity 1 and will end with activity 3 whereby the process of each activity will be elaborate more by the following flowchart:



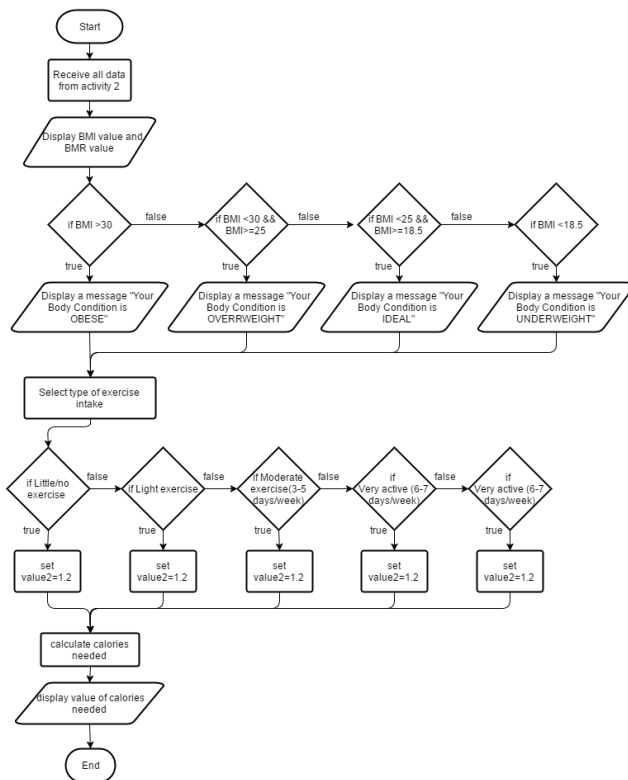
Flowchart-1. Activity 1.

For activity 1 as shown in Flowchart-1, the activity start with greeting the user using Text View. After that, the application involved a process for selecting gender. This process was using if else statement in the coding segment to set a different value in each selection. Soon after user made a selection, this application will display out a toast message to tell the user about their choice. So, from this message user will be aware of their choice and will not choose the wrong gender. Then, this application also will have an input process for getting the user's age. After user has insert their age, the values will be send to the next activity together with the value from the gender selected.



Flowchart-2. Activity 2.

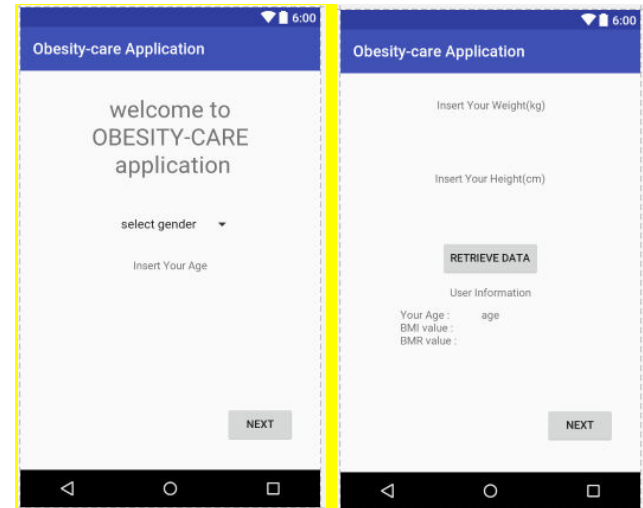
Activity 2 start by receiving all the data from Activity 1 as shown in the Flowchart-2. Then, on this activity, the application will perform input process for getting the user's weight and height. For this process, user will insert their weight first and then their height. From the values inserted by the user and the data from activity 1, this application will perform a process to calculate the Body Mass Index (BMI) and Body Metabolic Rate (BMR). Then, this application will display the user's information which consist of the user's age, user's BMI value, user's BMR value. Before this activity end, the application will send the data stored in this activity to the next activity.



Flowchart-3. Activity 3.

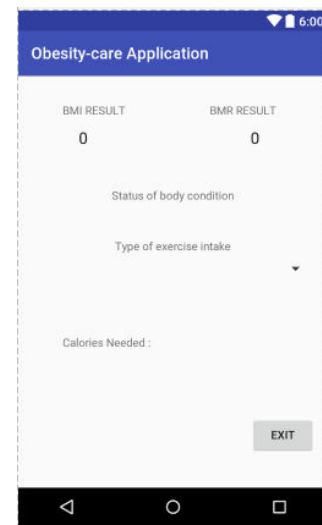
From the Flowchart-3, it shows that the activity 3 will start by receiving all the data from activity 2 such as BMI value, BMR value, and age value. Then by using the received data, this application will display back the BMI value and BMR value on the screen. After that, this application will perform a process to identify the status of body condition of user base on the BMI value. By using if else statement, this application will check and compare the BMI value with four categories condition such as BMI greater than 30, BMI more and equal to 25 and below than 30, BMI more and equal to 18.5 and below than 25, and BMI less than 18.5. So, once the process meet a true condition, this application will display out the status of body condition of the user depending on the four categories condition. Thus, by displaying the status of body condition, user will know whether their body is in a good shape or not, like having ideal weight, underweight, or obese. From this process, it will make the user aware of their health condition. Then, this application will perform another process for the user to select their type of exercise intake in a week. There will be listed five categories of type of exercise intake. Once user made the selection, this application will find a true condition of the selected categories from if else statement. Then, a value will be set from each of the categories and the value will be use together with BMR value in the process for calculating calories needed. Lastly, after the calculation process finish, the application will display the value of calories needed for the user depending on the category type of exercise intake chosen by the user.

5. APPLICATION LAYOUT



(a)

(b)



(c)

Figure-4. Layout in first activity.

Figure-4(a) shows the layout in the first activity of the application. The greeting text “welcome to OBESITY-CARE application” was created using text view widget. For the select gender part, it used spinner widget whereby user can choose either male or female. Then, a different value was defined in each gender and the value will be used in the next activity. Besides that, user will need to insert their age using integer value. The age written by the user will be stored under the edit text widget’s ID. When user click the “NEXT” button, all value stored in this activity will be sent to the next activity.

In second activity layout of this application as shown in Figure-4 (b), it received the values data from the first activity. Then, user will insert their weight and height in the edit text box. The values of weight and height will be stored under its edit text widget’s ID. Once user push the “Retrieve Data” button, the value of height and weight



stored will be used to calculate the BMI. Besides that, value of age received from the first activity will be used together with values of height and weight to calculate BMR. Then, the calculated values of BMI and BMR will be display on the screen. Lastly, all the values stored in this activity will be sent to the next activity by pushing the “NEXT” button as follow the coding below:

```
but2.setOnClickListener(new
View.OnClickListener() {
@Override
public void onClick(View v) {
Intent yop = new
Intent(MainActivity2.this,MainActivity3.cl
ass);
String b =
displaybmi.getText().toString();
yop.putExtra("bmi",b);
String c =
displaybmr.getText().toString();
yop.putExtra("bmr",c);
startActivity(yop);
}
```

Figure-4 (c) shown the third activity layout of this application. In this page, the values received from the second activity will be used back for calculating calories needed and displaying the BMR and BMI result. Besides that, the BMI value received will be used to determine the status of body condition by following the coding below:

```
if (bmi >= 30) { /* obese */
resulttext = "Your Body Condition is
OBESE.";
txtresult.setText(resulttext);
} else if (bmi >= 25) {
resulttext = "Your Body Condition is
OVERWEIGHT.";
txtresult.setText(resulttext);
} else if (bmi >= 18.5) {
resulttext = "Your Body Condition is
IDEAL.";
txtresult.setText(resulttext);
} else {
resulttext = "Your Body Condition is
UNDERWEIGHT.";
txtresult.setText(resulttext);
}
```

Then, the value of BMR received will be used to calculate calories needed. This calories value will change as the user choose the type of exercise intake from the spinner button. In the spinner button, a value was assign in each of the type of exercise intake:

- Little/no exercise =1.2
- Light exercise=1.375
- Moderate exercise(3-5 days/week)=1.55
- Very active (6-7 days/week)=1.725
- Extra active (very active & physical job)=1.9

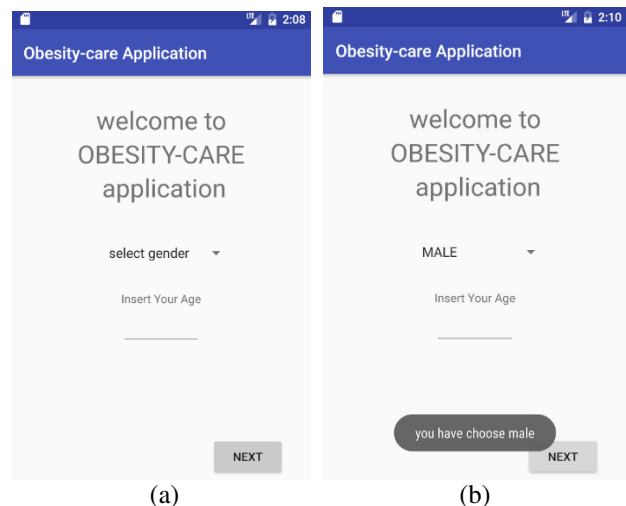
By pushing the “EXIT” button, the application will stop the system and close the application. In addition, in each activity of this application, a code was set up to end its process. The code statement is:

```
System.exit(0);
```

6. PERFORMANCE EVOLUTION

Figure-5 shows the main interface of the Obesity-care application. This application was operated using Android system in mobile device. In this interface, gender and age of user is required from user for further calculation. When the “next” button is click, the system will direct user to the next page. In second interface (fig. 6.), there are 2 columns of data to be inserted; weight in kilogram and height in centimeters, which allow system to calculate the BMI and BMR value. In the same interface, system provide another function that enable user to retrieve data. Age, BMI and BMR value was shows under user’s information as a references for user to ensure information entered is correct.

When user has enter all of his/her information in first and second interface, the system will direct user to the third interface where all the information will shows. This application emphasis on two main point which is body condition and calories needed by user. The body condition of user is shows based on his/her BMI value, whereas the calories needed is based on type of exercise from user’s selection (Figure-7).





(c)

Figure-5. First interface of Obesity-care applications.

We will demonstrate how this system works bases on one sample case scenario. A 20 years old male user with weights 60 kg and heights 170 cm was used as the example for demonstration. When this application was first operated, it come to the welcome page as shows in the Figure-5(a). After user chooses his gender, a message written “you have choose male” was pop out in the bottom of the interface (Figure-5(b)). Figure-5(c) shows the number keyboard provided for user to enter his age. The “next” on the right bottom is clicked by user, the system has pass the value of age and direct user to the next pages at the same times.

(a)

(b)

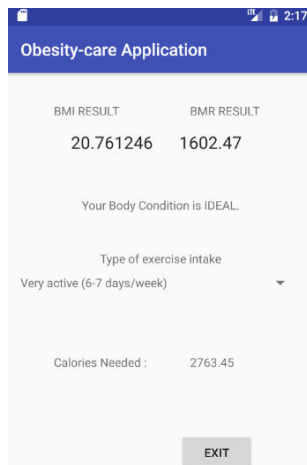
(c)

Figure-6. Second interface of Obesity-care applications..

Before user inserted any information in second pages, the ages of user which is 20 years old was shows below user information (Figure-6(a)). The weight and height was enter in the columns respectively by user for the calculation of BMI and BMR value (Figure-6(b)). In this example, when user click “retrieve data” button, BMI value of 20.761246 and BMR value of 1602.47 is calculated and shows under user’s information. The value under user’s information is pass and direct user to third pages with the click of “next” button.

(a)

(b)



(c)

Figure-7. Third interface of Obesity-care applications.

In the third pages, the body condition of user in this example is idea based on BMI value of 20.76 which lie between 18.5 and 24.9 which shows under BMI and BMR results. Before user chosen the type of exercise intake per week, the systems assume that user is in categories of “little/ no exercise”, and provided the calories intake for daily life (Figure-7(a)). The results shows calories needed for user with little or no exercise in this example needed 1922.4 calories for his daily life.

There is 5 selection in type of exercise: little/ no exercise, light exercise, moderate exercise (3-5 days/week), very active (5-7 days/week) and extra active (very active and physical job). The calories needed by user is calculated based on the selection of type of exercise respectively. In this example, user chosen “very active (5-7 days/week)” categories, the calories needed is recalculate as 2763.75 calories. The “exit” button on the right button is provided for user to quit this Obesity-care application.

In this interface, user can get the summary of information such as BMI value, BMR value, body condition and calories needed for daily life. This can let user understood his body condition and create awareness of before being obesity.

7. CONCLUSIONS

This paper presented the development of Android application for obesity-care. The idea is to take the advantages of widely used of mobile device to promote health-care awareness. Its main goal is to raise the awareness of obesity for public. Obesity-care application had calculate the BMI and calories intake and given motivation for user. This provided a convenient way for user to monitoring their body condition regardless time and cost. Future improvement of this obesity-care application is to increase the accuracy of calories intake and suggestion by considering illness. By doing this can increases the number of user from different body condition.

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REFERENCES

- [1] M. Kozlovsky, K. Karóczkai, B. Jókai, B. Ruda, D. Kacsuk and Z. Meixner. Children obesity treatment support with telemedicine. IEEE 37th International Convention on Information and Communication Technology, Electronics and Microelectronics (MIPRO).
- [2] I. M. Lopes, B. M. Silva, J. J. P. C. Rodrigues, J. Lloret and M. L. Proença. A mobile health monitoring solution for weight control. IEEE 2011 International Conference on Wireless Communications and Signal Processing (WCSP).
- [3] E. Seto *et al.* The Kunming CalFit study: Modeling dietary behavioral patterns using smartphone data. IEEE 36th Annual International Conference of the Engineering in Medicine and Biology Society.
- [4] Goh Kim Nee and Muhammad Syazwan Bin Abu Bakar. Android-based exercise application. IEEE2012 International Conference on Computer & Information Science (ICCIS).
- [5] Stacy Schmidt, M.S. 2016. Obesity and Exercise.
- [6] Rolls BJ. 2014. What is the role of portion control in weight management? 38(Suppl 1): S1-S8.
- [7] N. Nirwal, N. Sardana and A. J. Bhatt. Hopeful hearts: A mobile health care application. Seventh International Conference on Contemporary Computing (IC3).
- [8] M. Vazquez, E. Jimenez, J. I. Nieto, J. d. D. Sanchez, A. Garcia and J. P. Torres. Development of a Mobile Health Architecture to Prevent Childhood Obesity. in IEEE Latin America Transactions.
- [9] A. Amresh, R. Salla, M. Sinha and R. Birr. Design, implementation and evaluation of a game-based intervention targeting Latino children for improving obesity outcomes. IEEE International Conference on Serious Games and Applications for Health (SeGAH).
- [10] C. Mansart, S. Sukitphittayanon, P. Pantongkhum and S. Thaicharoen. Go Run Go: An Android Game-Story



Application for Aiding Motivation to Exercise. IEEE
International Symposium on Multimedia (ISM).